DRCSC

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08
LESSONS LEARNED

Inputs for policy considerations in developing resilience against climate risks for small scale farmers in semi-arid regions

A Supplementary Report

July 2022

Disclaimer

The viewpoints and opinions expressed in the document are of the authors and do not necessarily reflect those of DRCSC

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List of Acronyms

AAS	Agromet Advisory Services
AFB	Adaptation Fund Board
AWS	Automated Weather Station
CSO	Civil Society Organization
DAMU	District Agromet Units
DRCSC	Development Research Communication and Services Centre
GIS	Geographic Information System
GKMS	Gramin Krishi Mausam Sewa
ICAR	Indian Council of Agricultural Research
IMD	India Meteorological Department
KVK	Krishi Vigyan Kendra
NABARD	National Bank for Agriculture and Rural Development
NGO	Non-Governmental Organization
SHG	Self Help Group

About this report

How can a climate change adaptation program for small scale farmers maximize its effectiveness and impact? This report outlines eight lessons learned which has helped DRCSC design and implement an Adaptation Fund sponsored and NABARD supported climate change adaptation project in 40 villages of Purulia and Bankura districts of West Bengal in between 2015 and 2021. The lessons, thus, have a strong evidence base, and this report offers practical solutions for climate change practitioners, policymakers, government, and private organizations who want to implement similar climate change adaptation programs in drylands, drought-prone areas, and semi-arid regions of India. The document aims to raise interest in the program, and inspire organizations to invest, partner and collaborate to scale the impact.

This report is supplementary to the 8-page lessons learned brief, and contains in-depth insights around the eight key lessons along with selected success stories.

Acknowledgments

This report is a culmination of contribution, support and guidance from multiple individuals and organizations. We thank the DRCSC leadership team, project team, and field staff for co-shaping the report with us, and helping us plan and undertake the field research.

Additionally, we are grateful to the NABARD team for sharing their inputs and helping us in enriching the report. We also want to extend our sincere gratitude to the Government Departments, CSOs, and other project stakeholders like School of Oceanographic Studies, Jadavpur University whom we could consult during the research phase of the lessons learned study.

Finally, we are immensely grateful to the community including Women SHG members and Farmers who participated in the focus group discussions and interviews during the field research of the study.

Note: The annexure section in this report contains the list of all respondents including project beneficiaries and stakeholders whom we have consulted while developing this lessons learned report.

ADAPTATION FUND

www.adaptation-fund.org

The Adaptation Fund finances projects and programs that help vulnerable communities in developing countries adapt to climate change. Since 2010, the Adaptation Fund has committed US$ 850 million to projects and programs to date, including 123 concrete projects. This spans nearly 100 countries, including 19 small island developing states and 33 least developed countries, serving about 28 million total beneficiaries. The Fund is financed largely by government and private donors and also from a two percent share of proceeds of Certified Emission Reductions (CERs) issued under the Protocol's Clean Development Mechanism projects. The Adaptation Fund Board has sponsored the Climate Change Adaptation (2016-2022) program by DRCSC.

NABARD

www.nabard.org

NABARD came into existence on 12 July 1982 by transferring the agricultural credit functions of RBI and refinance functions of the then Agricultural Refinance and Development Corporation (ARDC). National Bank for Agriculture and Rural Development (NABARD) is an apex regulatory body for the overall regulation of regional rural banks and apex cooperative banks in India. It is under the jurisdiction of the Ministry of Finance , Government of India. The bank has been entrusted with "matters concerning policy, planning, and operations in the field of credit for agriculture and other economic activities in rural areas in India." NABARD is active in developing & implementing Financial Inclusion. NABARD has supported the climate change adaptation program as the grant management and technical support partner.

DRCSC

www.drcsc.org

In 1982, DRCSC was formed as a Resource Training Centre primarily in the field of development communication and community media focusing on child labour and informal sector workers. In 1987, the organization started consultation with several rural NGOs engaged in training local staff and volunteers. During this phase (1987-1993), DRCSC also started to identify and tackle problems around sustainable agriculture and biodiversity. In the next phase (1994 to 2014) of its work, DRCSC gradually deepened its focus on action research & participatory learning on sustainable resource management, particularly diversified integrated agriculture, focusing on problems faced by women/men who were sharecroppers & marginal farmers. In 2015, the organization realized the need for scalable solutions for climate change adaptation and disaster risk reduction, and since then has been focusing on implementing climate change aligned program in partnership with a network of multi-specialized NGOs, Inter Government Agencies, Donor Institutions and Academia.

Re-emerging World
Strategic Advisory Services

www.re-emergingworld.com

As a strategic advisory firm, Re-emerging World works on identifying opportunities, designing, growing businesses, and evaluating investment ideas that serve the lower-income population in the emerging markets. Over the last 15 years, Re-emerging World has delivered over 85 research and advisory projects across 12 development sectors and 11 countries. As a knowledge partner to DRCSC, Re-emerging World has led the development of the lessons learned brief document along with the supplementary report.

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Executive Summary

Environmental degradation leads to unsustainable food systems, limited water availability and less secure livelihoods. But, most mainstream programs primarily focus on the income need of the poor while not necessarily being climate or environment conscious. This ad hoc way to alleviate poverty misses the long-term overall wellbeing of poor marginalized communities.

DRCSC looks at poverty alleviation to protect the environment and respond to the climate change needs of the community. Aligned with this principle, since 2015, DRCSC has been developing climate adaptive capacities for 5000 climate threatened families in two of the driest districts in the state of West Bengal – Purulia and Bankura. Funded by the Adaptation Fund Board and supported by NABARD, this program over the past five years has encouraged collective stewardship of soil, water, and green cover, driven the adoption of integrated farming practices, and strengthened food and livelihood systems for the marginalized tribal communities.

The program has taken a multistakeholder approach and engaged with specialized partners who can multiply the impact and effectiveness. Additionally, it has capacitated the community members as active designers, implementers, and evaluators of the program which ensures program sustainability.

This supplementary report captures eight key lessons among the many innovations, good practices and recommendations which has emerged out of the Climate Change Adaptation program. These eight lessons outline the use of climate smart technologies, resilient practices and guiding principles adopted in executing the program. DRCSC believes these lessons will work as actionable inputs for policy considerations in developing resilience against climate risks for small scale farmers in similar climate change adaptation programs in drylands, drought-prone areas, and semi-arid regions of India.

01

BACKGROUND AND CONTEXT

THE PROGRAM

Key Messages

1. Semi-arid regions face multipronged climate risks affecting water, food, and livelihood securities among vulnerable communities

2. A combination of local knowledge, climate smart technologies, and sustainable farming practices can minimise these risks and develop resilience

3. To execute that, there is a need to encourage collective capacities within the community to manage natural resources, more so with women

Erratic rainfall with long dry spells in between is a barrier to sustainable livelihoods for the small and marginal farming communities from the drylands of Purulia and Bankura

Rainfall in the semi-arid regions of Purulia and Bankura is characterized by its uncertain and erratic nature, sometimes with long dry spells in between. Moreover, the community lacks means to harvest the short span high quantum rainfall, which rapidly erode the uncovered topsoil from the sloping terrains. During summers, the region experiences very high temperature unsuitable for farming.

The most vulnerable communities staying in this region depend on rain for farming and hence largely cannot grow anything beyond paddy during the Kharif season. These multipronged climate risks mean unreliable access to food and water and uncertainties in livelihoods. Furthermore, there is an asymmetry in land allocation - most poor tribal farmers have their agricultural land mostly in uplands or medium uplands, adding another layer of difficulty in practicing farming.

The Program in Numbers

05
Years of testing, piloting, and scaling up the program

5,000
Climate vulnerable families impacted

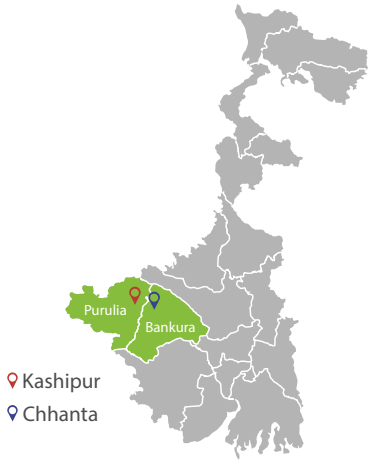
40
Villages in Purulia and Bankura intervened

To that end, DRCSC has intervened to develop resilience against these climate risks, which disempower poor tribal families residing in these climate impacted areas

Since 2015, DRCSC has been building climate adaptive capacities for 5,000 small and marginal farmer households in 40 villages – 22 villages in Kashipur block of Purulia district and 18 villages in Chhatna block of Bankura district. To do that, DRCSC developed within the community diversified livelihood systems, encouraged collective stewardship of soil, water, and green cover, and drove the adoption of sustainable farming practices. The interventions are propelled by harnessing the traditional wisdom of the community about the local conditions, adopting modern technologies such as local weather stations and satellite technology to map landforms, and developing local leaders who can cascade the learnings within their communities. Furthermore, DRCSC established institutional linkages for providing access to services, resources, and information.

THE RESULTS

SCALE OF THE PROGRAM



05
Years of testing, piloting, and scaling up the program

5000
Climate vulnerable families impacted

40
Villages in Purulia and Bankura

443
Groups formed with similar climate vulnerability levels

KEY IMPACTS DELIVERED

84%
beneficiary households are practicing agriculture for two seasons now (2021)

as compared to **2%** in 2015

86%
beneficiary households do not experience any hunger period now (2021)

as compared to **2%** in 2015

62%
beneficiary households are practicing fisheries to diversify livelihoods now (2021)

as compared to **No Household** in 2015

68%
beneficiary households are practicing nutrition garden to improve food security

as compared to **No Household** in 2015

35%
Reduction in input cost by beneficiary farmers who apply local weather advisory services into their agricultural practices

EMERGING LESSONS LEARNED

Key Messages

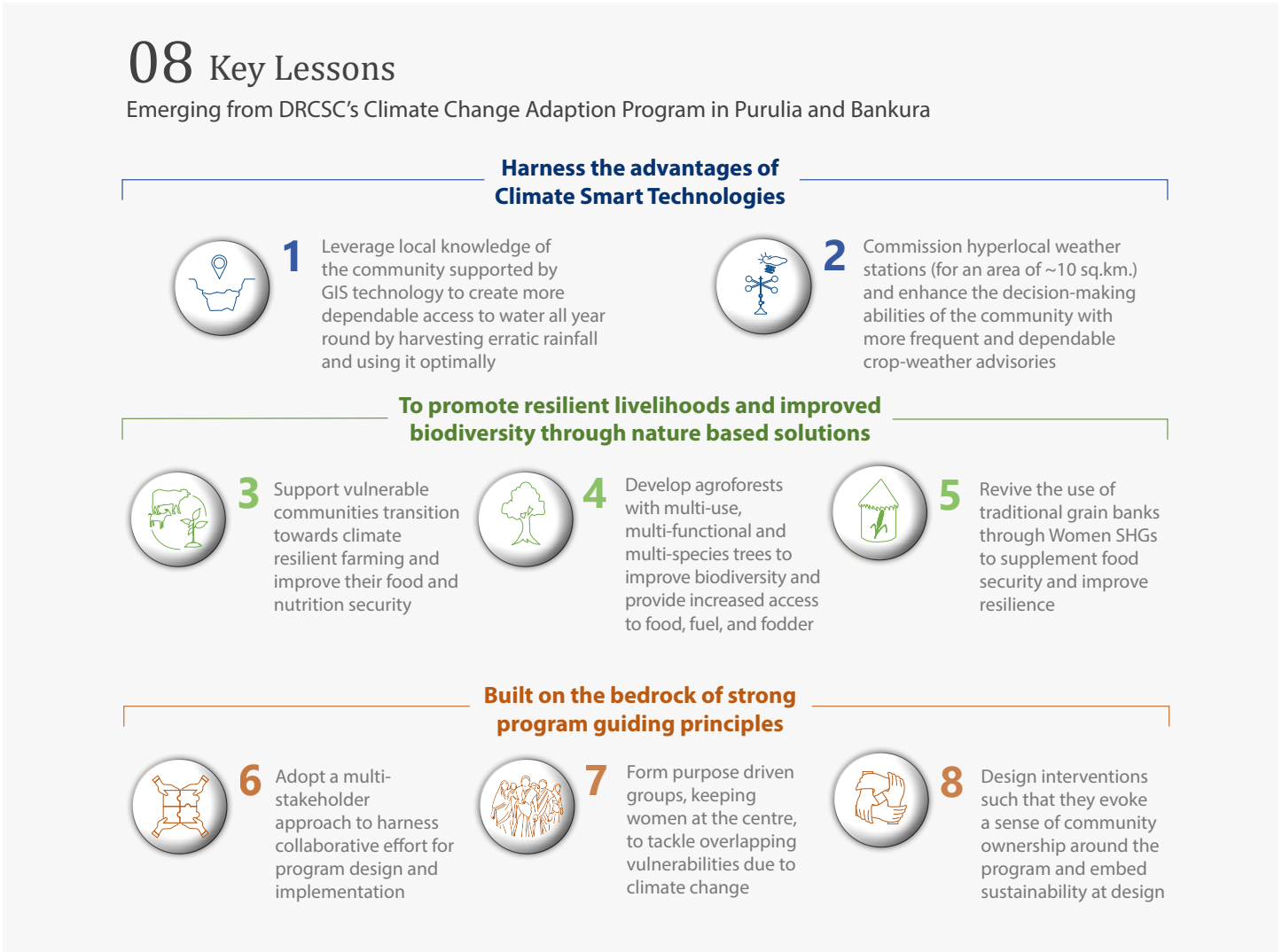
1. Refine the outcomes of local knowledge with climate smart technologies to enable vulnerable communities prepare and respond to climate change more effectively

2. Promote resilient livelihoods and improve biodiversity through nature based solutions

3. Design climate change adaptation program on the bedrock of strong program guiding principles to improve impact and effectiveness

The eight lessons learned highlighted in the report (*refer to the exhibit below*) surfaces from rigorous piloting, iterations, and gradual scaling up across 40 villages in semi-arid regions of Purulia and Bankura districts in West Bengal over the last five years. Thus, the lessons have a strong evidence base, and this report offers practical solutions for climate change practitioners, policymakers, government, and private organizations who want to implement similar climate change adaptation programs in drylands, drought-prone areas and semi-arid regions of India. This report highlights eight of the host of innovations and good practices which have emerged from the program, and together have maximized the effectiveness and impact of the climate change adaptation program.

Exhibit1: 8 Key Lessons



02

HARNESS THE ADVANTAGES OF CLIMATE SMART TECHNOLOGIES

LESSON

01

LEVERAGE LOCAL KNOWLEDGE OF THE COMMUNITY SUPPORTED BY GIS TECHNOLOGY TO CREATE MORE DEPENDABLE ACCESS TO WATER ALL YEAR ROUND BY HARVESTING ERRATIC RAINFALL AND USING IT OPTIMALLY

Key Messages

1. Facilitate a participatory land use resource mapping involving both men and women of all ages from the community to collect local knowledge and insights on natural resources

2. Create long term partnerships to plan, implement, continuously monitor, and assess impacts of GIS technology on more dependable water harvesting structures

3. Encourage sharing of community labour to invoke a sense of ownership around developing more dependable community ponds as village level assets

In Brief

Farmers intuitively understand which are the more suitable locations for developing water harvesting structures in the community, but seldom has the confidence to act on it as they lack clear understanding around the risks and rewards. When this local knowledge is considered for building farm ponds (*happas)* or renovating community ponds, it improves their effectiveness as perennial water harvesting structures. In this program, DRCSC collects insights from the local community members before initiating the construction work for *happas* and community ponds and triangulates them with the analysis from GIS mapping. GIS technology precisely maps landforms, contours, water tables, and direction of rainwater runoffs to identify locations for water harvesting structures which can provide more dependable access to water all year round by harvesting erratic rainfall.

Challenges Addressed

Traditionally, small and marginal farmers refrain from parting away with a portion of their land to construct water harvesting structures. Even if they do, they select a location where they usually do not grow crops – generally uplands or medium uplands. This lack of scientific basis in selecting locations for water harvesting structures may not guarantee a continuous source of irrigation throughout the year. Hence, the difficulties associated with water scarce conditions do not get fully resolved.

DRCSC's scientific approach in identifying locations for water harvesting structures improves their success rates of being perennial, i.e., they can provide water 10 to 12 months in a year. **In this program, 80 to 90% of the water harvesting structures developed by using satellite technology have become perennial.**

80 to 90%

Farm Ponds developed and community ponds renovated under this program has turned out to be perennial with 10 to 12 months of water available annually for farming

Impacts

When *happas* and ponds become perennial, community members can increase the number of cropping seasons, improve their farm productivity per season, secure food for themselves and make their livelihoods more resilient.

It is observed that most farmers who used to practice agriculture only during the Kharif season could now utilize the improved availability of water and extend farming during Rabi season as well as growing oilseeds, seasonal vegetables, and pulses. Some farmers can even grow vegetables during summer. Furthermore, the majority of beneficiary farmers have been experiencing improved farm productivity, especially for paddy.

84%

of beneficiary farmers in this program **are practicing agriculture for two seasons** in a year now (2021) as compared to only 2% before (2015)

4% of beneficiary farmers have also started to grow crops during summer – a third cropping season.

DRCSC also promotes growing creeper family of vegetables like bitter gourd, ivy gourd and ridge gourd in the corner of *happas* using locally made trellis. This arrangement checks evaporation from the farm pond during summers and provides an additional source of food.

This shift in agricultural practices, thanks to the perennial water harvesting structures, is helping the families grow different food crops for themselves, preventing the need for migration and drudgery as agro-laborers during lean seasons, more so for women.

Implementation Strategy

As a part of the program, DRCSC has identified rivers, perennial community ponds, and dug wells suitable for commissioning **low cost Lift Irrigation systems.** These solar powered irrigation systems are installed and run by the community based groups which in turn improves the impacts and effectiveness of the perennial water harvesting structures, especially for summer and winter crops.

DRCSC champions the use of local drought tolerant crops among adopter farmers to further optimize the water use. Additionally, DRCSC promotes erection of a frame above the pond to grow vine crops to reduce evaporation loss.

The strategy around developing improved and more dependable farm ponds, dug wells and community ponds lie in collecting traditional local wisdom documented through watershed maps and corroborating them through data derived from satellite technology.

To execute this, a trained DRCSC field mobilizer conducts a village walkthrough to identify potential sites for developing individual farm ponds and community ponds to be renovated. Location for farm ponds should be such that each can irrigate the farmland of the farm pond owner as well as 2 to 3 neighbouring farmlands.

Next, the field mobilizer facilitates a series of sessions consulting with the community members verifying that the identified site is fit for developing water harvesting structures. The consulting sessions sometimes include convincing individual farmers through a detailed cost-benefit analysis for developing farm ponds and coaxing joint owners of the community pond for allowing the renovation work. For renovating community ponds in this program, DRCSC facilitated a formal agreement between landowners and SHG members, wherein all community members are free to use the water, SHG will shoulder the responsibility of maintaining the pond, and the income generated through the pond will be distributed 1/3rd and 2/3rd between the SHG and pond owners.

Once the community level consultations are done, DRCSC, in partnership with the School of Oceanographic Studies, Jadavpur University, uses satellite technology to scientifically validate the insights from the community. This is followed by suggestions around improving the precision of the location and dimensions of the water harvesting structures.

After the location is finalized, community members, including SHG members, people from the village, and adjoining villages, share their labour in excavating the water harvesting structures. Following DRCSC's guiding principle on community-owned approach community members contribute 25% of the cost of developing the *happas* and community ponds. Usually, the excavation process starts during winters and can continue before the arrival of the monsoon, taking 5 to 6 months.

Key Success Factors

Meet Arati Hembram from Jibanpur village of Purulia. Earlier, her family used to grow only paddy in their 3 bighas of farmland, which in a good year could produce 400 Kg of paddy. Since 2019, when she has developed a 30x30x12 cu.ft. perennial *happa* under the program she has been growing 30 kinds of crop round the year including vegetables, leafy greens, oilseeds and local fruits. Arati's paddy productivity has increased 1.5 times now.

- Cost-benefit analysis of farm ponds help field mobilizers convince farmers who can then take a leap of faith to part away with a portion of land
- Borrowing traditional wisdom of the community helps in shortlisting potential sites to be corroborated using satellite technology
- Community-owned approach motivates people in the village to develop an asset for themselves

Key Risk Factors

- Unavailability of labour might delay the process. Consider starting early and keeping a buffer in the excavation work plan.
- Coming to a consensus with multiple owners of a pond might be challenging. Develop ways to facilitate and finally document a formal agreement.

Sustainability and Replicability

The water harvesting structures require minimum maintenance and can continue to be perennial. The agreement signed between community pond owners and SHG members will sustain the shared value creation. Additionally, the community-based volunteers will continue to monitor, coordinate, and cascade learnings. The community fund maintained by block-level watershed committees will be used to develop and renovate similar *happas*, ponds, and wells in other villages.

In Pictures: Perennial Water Harvesting Structures






Case Study

Once a 3-feet deep wetland, the renovated pond in Pabrapahari village of Purulia is now a perennial source of water for irrigation and fish farming, thereby building resilience against dry periods and diversifying livelihoods for the community

In the last four years, the community members of Pabrapahari village have developed 33 perennial *happas* and renovated 02 community ponds under DRCSC's program. As a result, at least 60 marginalized families in the village have increased their cropping seasons, and diversified their livelihoods through fish farming. Moreover, the increased availability and access to water has reduced the drudgery of women and improved their dignity. "*Now we do not have to trudge through dense forests in search of water*", shared the members of Maa Lakshmi Mahila Dal SHG. However, even a few years back, the community in Pabrapahari used to experience severe water scarce conditions leading to loss of paddy sown.

"Earlier, in most dry years we could not save our Paddy due to lack of water for irrigation"

ASHALOTA SINGH PATAR,
SHG MEMBER,
Ma Lakshmi Mohila Dol

The Situation Before

The 3.5 *Bigha* perennial community pond in Pabrapahari was a small knee-deep wetland even four years ago, used primarily for domestic chores like washing clothes and utensils. Due to lack of water in the village, women in groups used to travel for hours through forests in search of water for bathing themselves and collecting water for livestock and other domestic use.

The rain-dependent agrarian families could hardly use the water for irrigation. Hence, with uncertain rainfall in the region and limited source of irrigation in the village the main crop, paddy, usually succumbed to the adverse weather conditions. This also meant limited food and livelihood security for the poor tribal families.

But, with the renovation of the pond the situation has improved today for the community in Pabrapahari.

Transformation Story

"*A couple of generations ago, there used to be a large pond here*.", shared the SHG members. Although they have not witnessed it first-hand, but this traditional knowledge has been passed on to them by the elder and more experienced people in the community. However, over time the water in the pond had receded to a small 3-feet deep wetland.

During the initial transect walk and community consultations, DRCSC gathered insights around this erstwhile pond from elder community members. The insight around identification of location to renovate the pond was scientifically validated using Geo Information System technology. "*This was the first time an organization was consulting us for developing an asset for the community. Otherwise, we are just directed to perform construction activities in other programs*", shared the SHG members, who perceived an improved level of dignity through this collaborative process.

Once there was a consensus on the location, DRCSC facilitated a 20-year lease agreement between 10 owners of the pond and the Maa Lakshmi Mahila Dal SHG. The agreement mentions the owners and the group will share the income 1/3rd and 2/3rd respectively, while all community members in the village are entitled to collect water from the pond for domestic use.

DRCSC mobilized around 130 community members to renovate the wetland into a perennial step pond over 8 months between April 2017 to June 2019. The 3.5 bigha perennial pond today stands 12 to 15 feet deep and is helping 60 families in taking additional cropping seasons and practicing fish farming.

08 months
Total Duration to renovate the community pond

70 to 100
Community members at any given point in time who were engaged in construction work. 130 community members in total were engaged in the pond renovation work.

12 to 15 feet
Depth of the step-pond covering an area of 3.5 bighas

Key Results

1. Increased Cropping Seasons: 60 households in the Pabrapahari village can access water for irrigation now from the renovated pond and have started to take a second cropping season in Rabi. Furthermore, the community can now save their paddy despite drought conditions and enjoys resilience against climate risks.

2. Diversification of Livelihoods: The renovated pond is also supporting fish farming for the group. At any given point in time the pond rears 300 to 400 Kg of local fish helping group members in diversifying their livelihoods. In 2021, the group has sold about 100 Kg of fish at INR 100-150 per Kg. Additionally, for at least 5 months in a year the group members have fish as a part of their diet for 3-4 times in a week.

3. Reduced drudgery for Women: Women in Pabrapahari can now source water for domestic chores and livestock from the pond in their own village instead of travelling long distances in search of water. Additionally, women perceive an improved dignity as they have a convenient place for bathing themselves in their own village.

At least 02
Cropping cycles per year now as compared to only one before

5 Months / Year
When SHG members and their families can consume fish from the pond, 3-4 times a week

INR 10,000-15,000
Earned by the SHG in 2021 by selling 100 Kg of fish in a year locally at social events

LESSON

02

COMMISSION HYPERLOCAL WEATHER STATIONS (FOR AN AREA OF ~10 SQ.KM.) AND ENHANCE THE DECISION-MAKING ABILITIES OF THE COMMUNITY WITH MORE FREQUENT AND DEPENDABLE CROP-WEATHER ADVISORIES

Key Messages

1. Create an enabling ecosystem leveraging partnerships with climate experts, agriculture universities, community members, and a network of Automated Weather Stations and Manual Data Collection centres.

2. Develop local leaders from the community to introduce, train and drive regular usage of weather information

3. Use local language and a common meeting point in the village to disseminate weather information so that it improves the effectiveness

4. Support local rural enterprises with frequent and dependable weather information, and improve income opportunities

In Brief

The Gramin Krishi Mausam Sewa Scheme supports setting up Agro-automatic Weather Stations at District Agromet Units located in the Krishi Vigyan Kendras under Indian Council of Agricultural Research network. However, the weather prediction precision is up to block level while DRCSC's program predicts and shares weather forecast lower than Gram Panchayat level. To explain this – DRCSC's intervention block, Kashipur has an area of 450 sq.km., with 13 Gram Panchayats each having area of 35 to 40 sq.km. In this program, DRCSC uses hyperlocal Automated Weather Stations, tracks, and disseminates weather forecast for 10sq.km.

Most mainstream weather services in India provide a forecast of district-level weather. However, weather can change every 5 sq.km., and communities depending on weather information for taking decisions around farming and other livelihood practices may often find these broad weather predictions less reliable in addressing their needs.

Inaccurate weather information can cause havoc in the lives of small and marginal farmers, especially in regions with higher levels of weather uncertainties. This includes damages to harvested crops, loss of return on labour, and increased cost of cultivation, among many other adversities. Yet, there is a tremendous lack of systems delivering precise weather advisories to these marginalized communities which are relevant to their farm practices and livelihoods. Through this program, DRCSC, in collaboration with an experienced climatologist, Kailash Pandey, provides localized weather forecasts (within an area of ~10 sq.km.) and customized advisory every 5 days in their program areas. To execute this, DRCSC has commissioned in this project six Automated Weather Stations and twelve Manual Data Collection centres and set up a system for community-led weather information dissemination.

Challenges Addressed

Tribal communities find clues of the shift in weather through birds, insects, wind, and the sky. The communities from the DRCSC program villages of Purulia and Bankura were no different. Before, they used to source their weather information by analysing the movement of ants, word of mouth and traditional wisdom of older community members. However, these methods had lower accuracy levels in predicting the weather. A handful of families who had radio sets could get access to state or district-level weather information which were very generic and seldom addressed local weather information needs. This meant that the families would be less prepared to handle weather-related situations resulting in loss of livelihood opportunities from their agricultural land.

By setting up weather stations to provide weather forecasts in ~10 sq.km. and delivering hyperlocal weather advisory services, DRCSC has catered to specificities of the community needs and managed to overcome these challenges.

Impacts

75% to 80%
Beneficiary farmers use local weather advisory services in irrigation and applying fertilizers

Local weather stations and tailored location-specific advisories have improved preparedness levels around weather uncertainties. This has particularly supported women who otherwise remain the more vulnerable to climate change risks. Women collect firewood and set it to dry, collect locally available leaves from the forest for livelihoods, boil the harvested paddy and keep it out for drying. The success or failure of these activities directly depends on the weather conditions. Armed with more accurate weather predictions, women can now take informed decisions around these activities and reduce their drudgery.

Furthermore, the community members now take more informed decisions around their farm practices – when to irrigate the land, when to apply fertilizers, when to harvest the crop, etc. The weather advisory comes with a set specific

crop advisory, and the package of solutions has enhanced the decision-making abilities within the community, helped them avoid losses, and made livelihoods more resilient.

35%
Reduction in input cost by beneficiary farmers who apply local weather advisory services into their agricultural practices

The program has also observed a couple of unintended impacts of the local weather station, however, creating positive impacts in the lives of the people. For instance, brick kiln workers and people associated with making bidi follow the weather predictions to take decisions around respective processes, which otherwise can face adversities.

Implementation Strategy

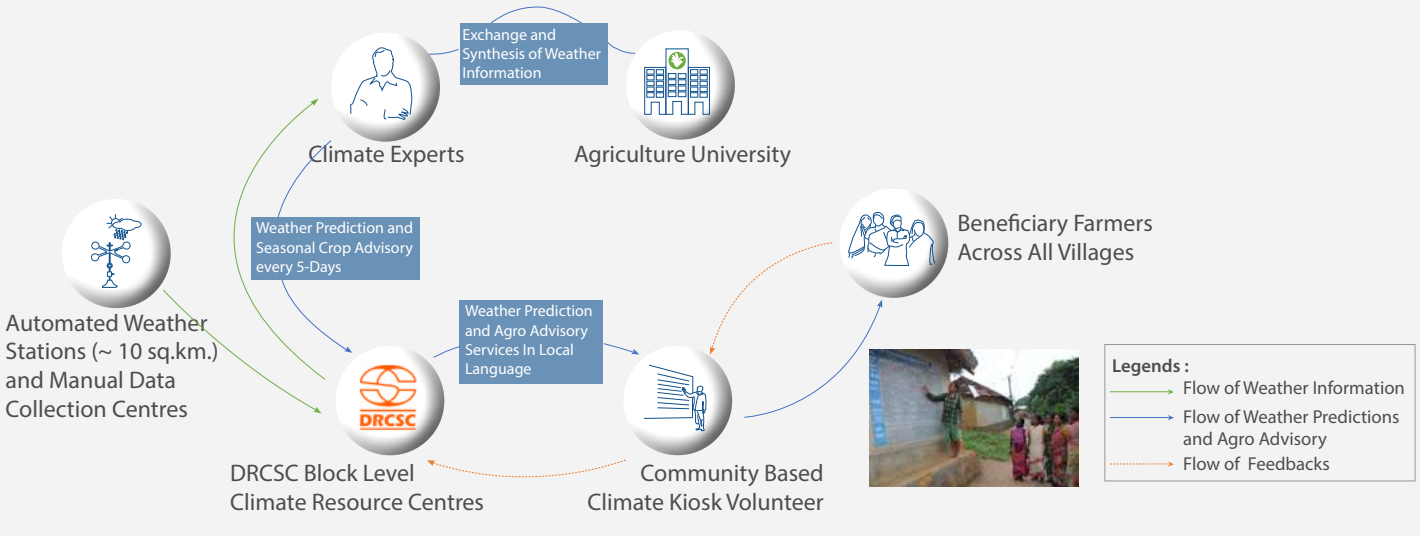
DRCSC has created enabling weather information and agro advisory ecosystem leveraging partnerships with climate experts, agriculture universities, community-based climate kiosks, and a network of six Automated Weather Stations and twelve Manual Data Collection centres. This ecosystem is responsible for delivering weather and seasonal crop advisory every 5 days. DRCSC facilitates the interlinkages and finally, disseminates the weather information and agro advisory services at the village level.

DRCSC's implementation strategy takes into consideration local collection and dissemination of dependable weather information through trained climate volunteers in the community

To execute this on the ground, DRCSC identifies and trains community-based volunteers to run village-level climate kiosks – receive and process weather information and agro advisory services, sensitize the community, and become a key touchpoint for weather information. DRCSC selects a strategic meeting point in the village, for instance, a handpump where local women come in groups to collect water and places a blackboard where the climate kiosk volunteer writes down the weather information every 5 days. DRCSC is currently testing SMS-based weather advisory services to disseminate the information.

The Automated Weather Station (AWS) machine commissioned inside the village needs a 200 to 250 sq. ft. space, usually shared by a community member. Every 5 days, a DRCSC field staff collects the data digitally and shares it with the key partners who run an analysis and interpret the data to share weather information and agro advisory services at the district level. DRCSC district resource centres finally translate the key messages into local language and deliver at the village level with the climate kiosk volunteers.

Exhibit 2: Enabling weather information and agro advisory ecosystem created by DRCSC



Key Success Factors

- Communities will be sceptical about trusting the weather information initially; however, once they observe evidence of forecast accuracy, the trust gradually builds up
- Weather information and agro advisory synthesised and translated in local language improves the sensitization effectiveness
- Climate kiosk volunteers are from the community and help in driving a behavioral change among community members by bringing weather information as a topic in everyday meetings, conversations, and discussions

Key Risk Factors

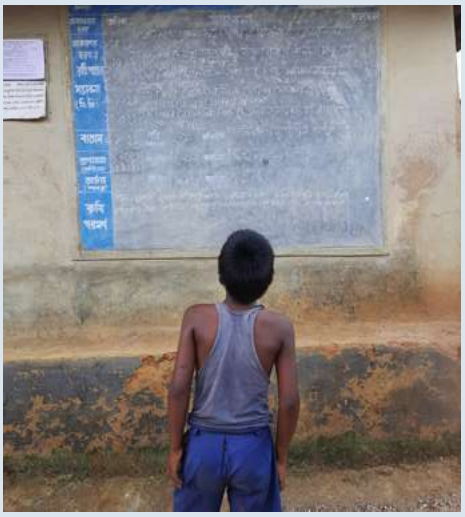
- Scheduled or breakdown maintenance of Automated Weather Stations will pause the weather advisory services for the short term. To mitigate this, create backup plans e.g., fetching data from IMD; however, this information may not be localized at the block level.
- Most community members, specifically in tribal areas, will be less literate and will have challenges in reading the written information. To mitigate that, DRCSC ensures the climate kiosk volunteer reads out the information to a group of community members, which in turn spreads via word of mouth.

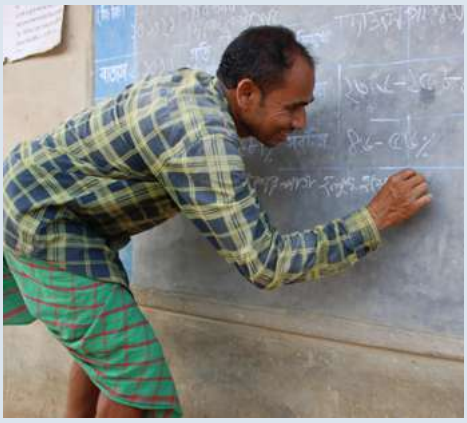
Sustainability and Replicability

Currently, local DRCSC field mobilizers lead the last-mile delivery of weather information and agro advisory services from the district resource centres to the villages. As part of the exit strategy, DRCSC is testing SMS-based weather advisory services to disseminate the information at the household level. This will require a service fee of INR 20 per month per subscriber. With one subscriber per household, there is a willingness to pay for this service.

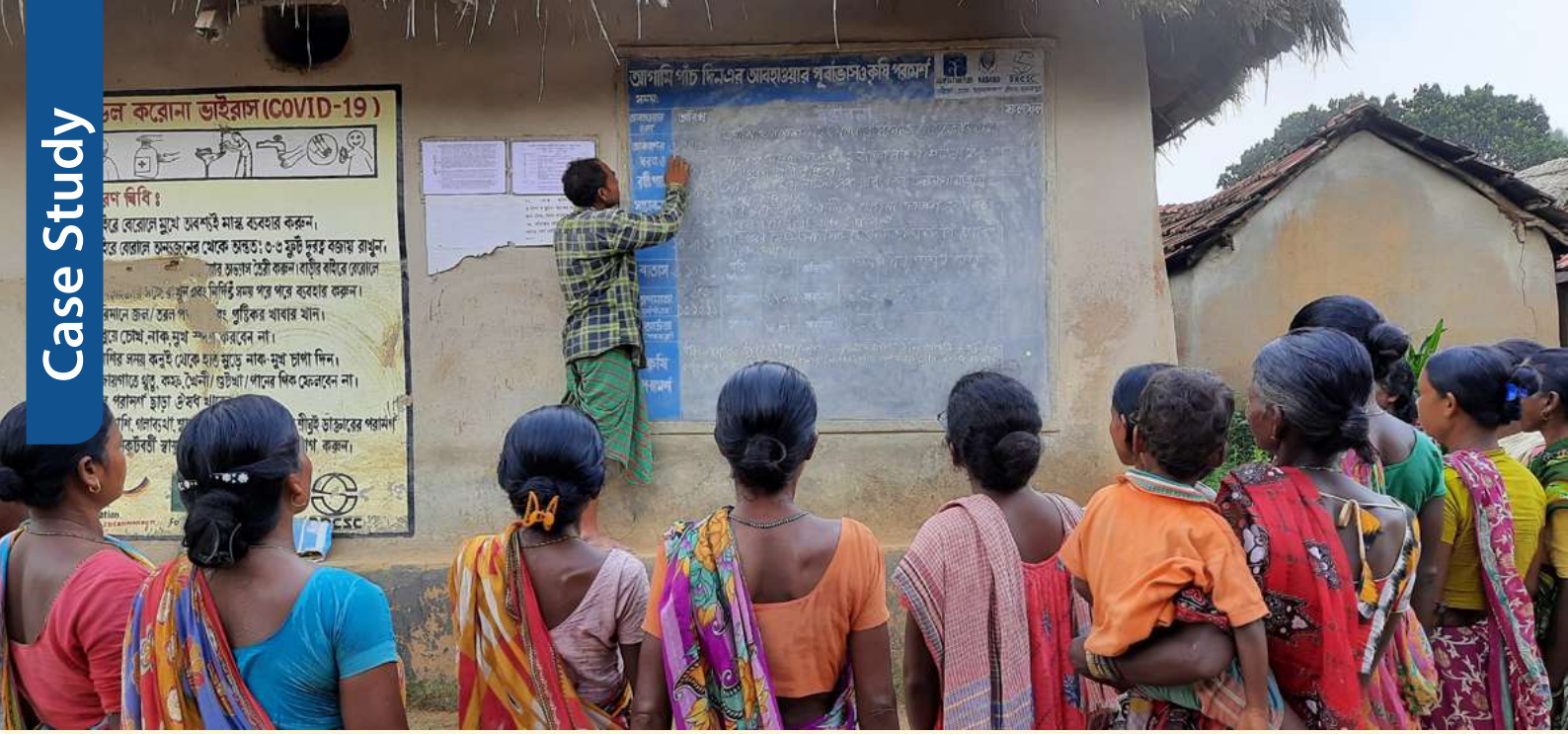
The efforts can be replicated under relevant Government programs delivering localized weather information and agro advisory services. Currently, under the Gramin Krishi Mausam Sewa (GKMS) scheme India Meteorological Department (IMD) has undertaken installation of Agro-AWS at District Agromet Units (DAMUs) located in the Krishi Vigyan Kendras (KVKs) under Indian Council of Agricultural Research (ICAR) network. This initiative aims to augment block-level Agromet Advisory Services (AAS).

In Pictures: Hyperlocal Weather Stations in the Community





Case Study



Find out how the five-day weather prediction, along with seasonal crop and livestock advisories, is empowering the community members from Chhanchanpur village in Bankura district better prepare and respond to climate change risks to their livelihoods

Since ages, the tribal community from Chhachanpur has been relying on their traditional wisdom to predict the weather. In the recent years, few villagers who could afford a radio set got access to state or district-level weather information, but it could not address the location-specific needs of the local community. So, when DRCSC installed an Automated Weather Station in their village, it was hard to believe for the community that it can predict the weather in and around its village with precision. But, community members noticed how the prediction matched the actual weather conditions, which helped in gradually building trust towards the technology. Today, almost all households in the village follow the weather board in the village and apply the advisory in their livelihood practices.

The Situation Before

Loss of paddy due to unforeseen rains was quite common in the village of Chhachanpur even a few years ago. "*Once a sudden rainfall destroyed 02 quintals of my paddy harvest*," shared Romoni Hansda.

The community relied on the wisdom of elder and more experienced members of the village, and natural elements like movement of birds and ants to predict the weather. But these predictions had limited accuracy, and lack of precise weather information exposed the community members to climate linked vulnerabilities. Women had to disproportionately bear the vulnerabilities as the success of livelihood activities they practice are directly dependent on weather – from collection of saal leaves, and firewood from the forests to setting boiled rice for drying.

The Transformation Story

Why Binay Mandi is a suitable climate kiosk volunteer?
Familiar face in the community
Has the ability to persuade and influence others
Can read and write
Knows basic mobile phone operations

DRCSC leveraged its 17-year long association with Binay Mandi, an active community member to introduce Automated Weather Station (AWS) in the village. Binay allowed to set up the AWS in a portion of his land, and the Weather Information board on the exterior walls of his house. Binay, who was already a popular face in the community, got trained as the Climate Kiosk Volunteer and that helped him sensitize the villagers of Chachanpur around the benefits and workings of AWS.

In the beginning, it was difficult for Binay to convince the community members to follow the weather advisory, however, once the early adopters started to share their success stories other community members gained confidence.

Today, every fifth day, the community members enquires about the latest weather forecast. Literate community members, children who can read the weather board help in disseminating the advisory verbally among others. In Chachanpur, the weather board is situated just near the handpump, where women come in groups to collect water. This has improved the effectiveness of dissemination.

"*Every fifth day, we enquire about the latest weather forecast. In Binay da's absence, we ask the school-going children to read out from the blackboard*," shared member of a women SHG. The crop-weather advisory board is also drawing the attention of neighboring villages, who stop by just to glance through the weather information board.

The Results

1. Improved Decision Making in Agriculture: With access to accurate crop-weather advisories, the small and marginal farmers of Chhachanpur can now avoid pre and post-harvest losses, reduce costs and increase their return on effort. "*If it rains just after we sow the mustard seeds, then it will not germinate*," shared Tarapada Murmu. The farmers in Chhachanpur now follow the weather prediction for farm practices like sowing, irrigation, applying inputs and harvesting.

2. Improved Decision Making in Livelihoods: The success of most tribal livelihoods depend on how well people time the activities around the climate. The crop-weather advisories have helped the community in and around Chachanpur village to take improved decision on livelihoods like *bidi* making, collection and drying of firewood, collection activities in brick kilns, soil excavation work etc.

3. Reduced Drudgery of Women: Most on and off farm activities that women are engaged in e.g., collecting firewood and leaves from the forests, setting boiled rice for drying, applying fertilizers, irrigation – depend heavily on climate. Women members from the community in Chachanpur now regularly track the crop-weather advisories, and have reduced avoidable drudgery. Furthermore, they now use the information at a more social level e.g., sending the children to school with an umbrella if there is prediction of rain.

03

PROMOTE RESILIENT LIVELIHOODS AND IMPROVE BIODIVERSITY THROUGH NATURE BASED SOLUTIONS

LESSON

03

SUPPORT VULNERABLE COMMUNITIES TRANSITION TOWARDS CLIMATE RESILIENT FARMING AND IMPROVE THEIR FOOD AND NUTRITION SECURITY

Key Messages

1. Use native crops and livestock which are more adaptive to extreme and uncertain local climate conditions
2. Promote diversified farming systems with cereals, pulses, vegetables, oilseeds to improve subsistence even during adverse climate conditions
3. Build capacities for farmers to prepare bio-fertilizers, bio-pesticides, seeds with locally available ingredients, and reduce cost of cultivation

In Brief

The concept of integrated or ecological farming is not new, but carefully combining traditional farming practices with modern agriculture technologies is truly innovative. DRCSC's climate resilient farming approach uses low-cost environmentally sustainable inputs with scientifically tested farming methods to improve the farm productivity of small and marginal farmers. Furthermore, the organization promotes native variants of crops, trees and livestock which can adapt to extreme local weather conditions. Following DRCSC's climate resilient farming techniques communities from drought-prone regions of Purulia and Bankura districts have increased their cropping seasons, secured more food from their farm, and reduced their cost of cultivation. Together this has increased their resilience towards uncertain climate conditions and positively impacted their livelihoods.

Challenges Addressed

Over the last five decades, Indian farmers have gradually shifted from traditional agricultural methods to expensive chemical intensive farming. Combined with monocropping with a single variety of crop this farming practice has subjected poor farming communities to more risks than rewards, especially in climate threatened regions.

For example, rampant use of chemicals in semi-arid regions of Purulia and Bankura, DRCSC's program districts, have increased farming costs, degraded the quality of soil, and reduced farm productivity over the course of time. The poor tribal communities who depend on rainfed irrigation could mostly cultivate their land only during Kharif season, growing only paddy in the characteristic red laterite soil. The food and livelihood challenges surfacing from these practices have pushed the small and marginal farmers to work as migrant workers and agro-labourers, especially during lean seasons and women, in particular, experience a disproportionate increase in burden.

Seed Banks

High Yielding Variety seeds purchased from the market are not always suitable for small scale farmers in semi-arid regions. They require more water and fertilizers for the crops to be productive. Moreover, crops grown from these seeds are more vulnerable to pests.

DRCSC in this program has set up 05 seed banks each of them preserving 50 to 60 varieties of native seeds all year round. This intervention is helping beneficiary farmers in crop diversification, nutrition security, and reducing cost of cultivation

Impacts

86%

Beneficiary Households in the program do not experience any hunger period now (2021), as compared to only 24% of the households before (2015)

DRCSC's climate resilient farming aims at rejuvenating farmlands of poor tribal farmers so that they can source nutritious food for the family from their own land all year round. This is by transferring knowledge to the community to implement sustainable farming methods and providing means to prepare and use natural, low-cost farm inputs.

As a result, farmers who typically used to practice mono-cropping of paddy using chemicals only during Kharif, are now growing a diverse set of vegetables, oilseeds, and pulses over 2 to 3 cropping seasons in a year. The use of bio-fertilizers like vermicompost, biopesticides and self-prepared seeds has reduced the cost of cultivation, improved the soil quality, and increased productivity.

The improved food security and livelihoods resulting from the resilient farming practices have decelerated forced migration, helped poor farmers avoid taking high-interest loans from local moneylenders, and improved health and nutrition of the family members through increased food consumption volume and frequencies.

Nutrition Gardens

68% of the beneficiary households are now additionally practicing Nutrition Garden, primarily managed by the women. They generally sow vegetables with diverse gestation period so that there is a constant flow of nutrition dense food from their backyard almost all year round.

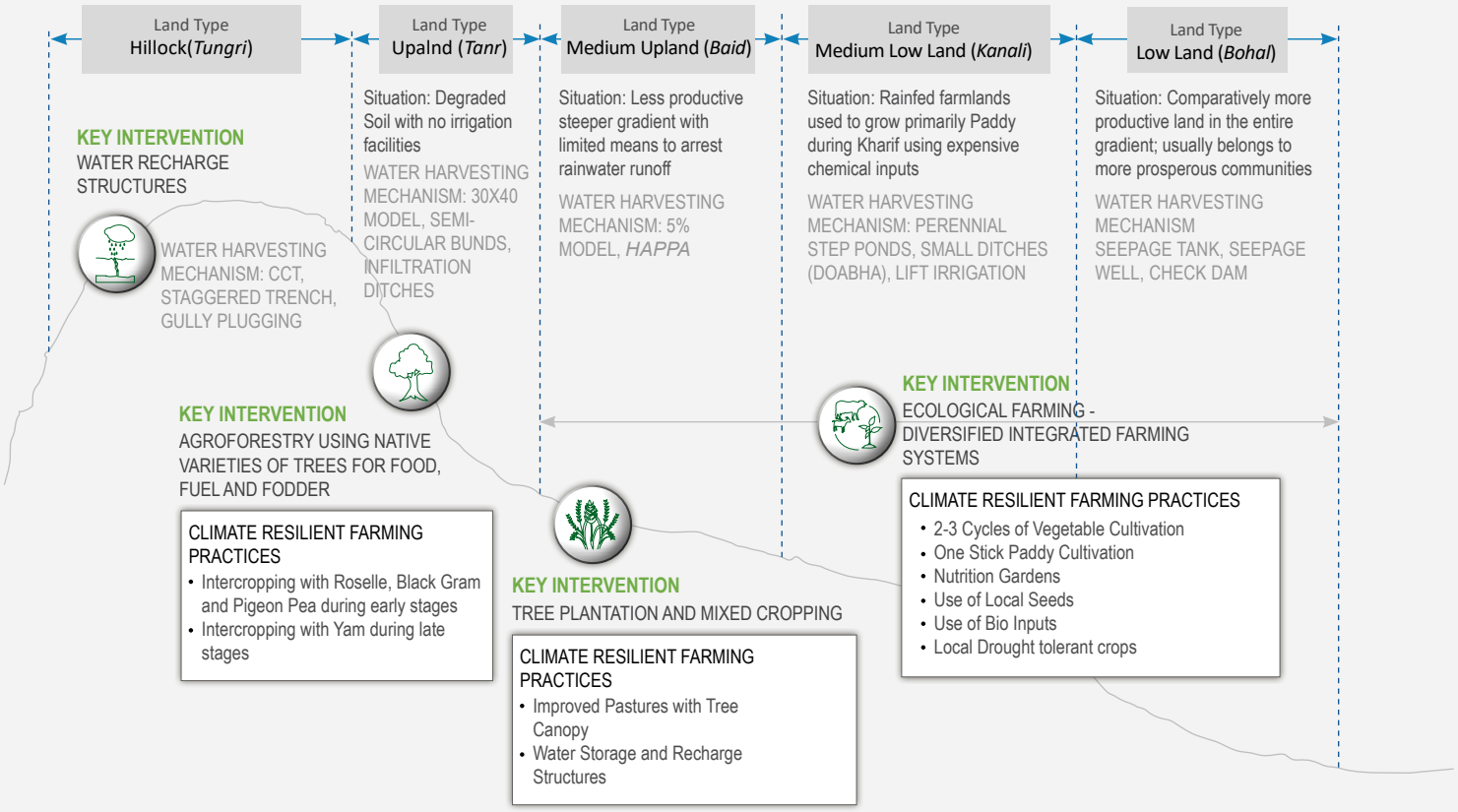
Implementation Strategy

DRCSC promotes using **one stick paddy cultivation,** a technique wherein a farmer sows only one paddy seedling instead of a bunch with adequate spacing. This exposes the seedling to ample nutrient, light and air which results to better productivity than local practices of sowing in bunches.

DRCSC leverages the components of diversified, integrated farming systems using native variants of crops and livestock to drive the adoption of climate resilient farming among small and marginal farming. Additionally, DRCSC supports in the development of *happas* and community ponds to harvest rainwater which helps farmers in irrigation during water scarce seasons. To create an enabling ecosystem of services, DRCSC facilitates the preparation and use of vermi-compost, green fodder, local seeds and bio-pesticides at group or individual levels. The program also promotes use of locally grown fodder cultivated using bio-inputs as a part of integrated farming systems.

DRCSC facilitates the functioning of the strategy through trained field resource persons who support beneficiary farmers in adopting the key components, continuously engage for support, and monitor progress.

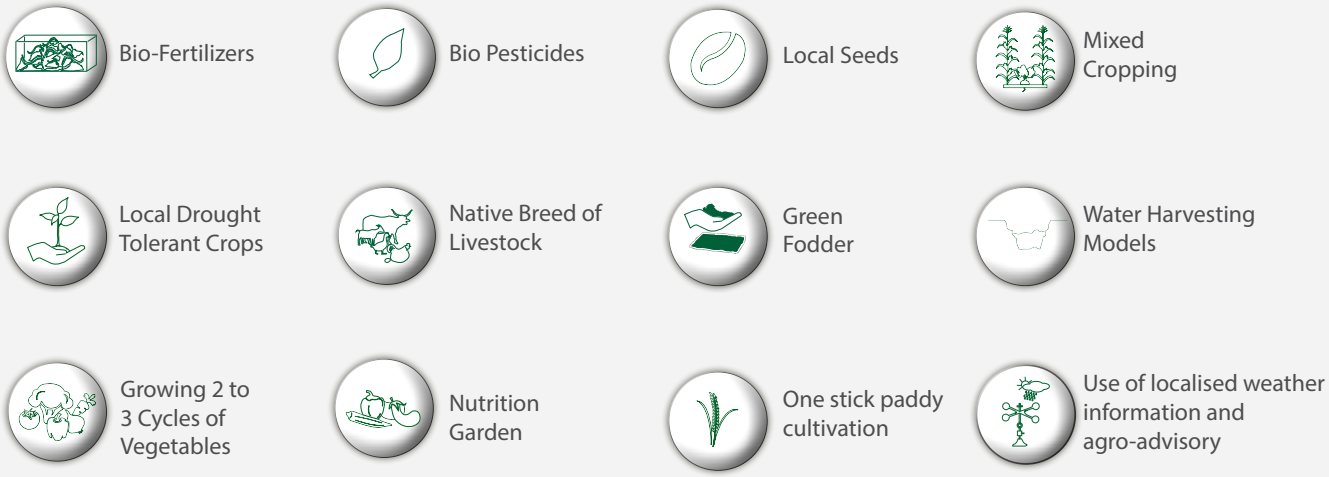
Exhibit 3: Ridge to Valley Approach - tailored interventions for different land types in the region



Key Success Factors

- Access to an ecosystem with key resource linkages, e.g., farm inputs, water, training etc. has helped beneficiary farmers in making the transition
- Local community resource persons developed by DRCSC has been pivotal for the success of on-field delivery of the model

Exhibit 4: Twelve key Climate Resilient Farming components promoted by DRCSC



Key Risk Factors

- It is difficult to practice climate resilient farming in the absence of bovine livestock, and such farmers will need access to bio inputs to initially adopt integrated farming
- One stick paddy cultivation, though it improves resilience, includes a laborious sowing process as compared to the more conventional practice of sowing seedlings in bunches at irregular intervals. Some farmers may find it difficult to make the trade off. Plus, the method needs thicker bund walls which might shrink some usable land for the neighbouring land which belongs to another farmer.

Sustainability and Replicability

Climate resilient farming is self-sustainable once a farmer has access to the key subsystems – bio-inputs, water for irrigation, and technical know-how. However, it might take time to scale up the adoption from a small piece of land to the entire agricultural land. Additionally, DRCSC has developed local community resource persons – usually the early program adopters who voluntarily lend their support to replicate the climate resilient farm practices in the community. However, dedicated government support will accelerate the replication and deepen the adoption in existing villages.

In Pictures: Climate Resilient Farming Practices by Beneficiary Farmers in this program






Case Study

Meet Chandana Tudu, whose indomitable spirit helped her family in escaping food poverty and becoming self-sufficient in producing food from their own farm all-year-round, thanks to the climate resilient farming practices she adopted

Chandana once traveled from her village, Ranjandih in Purulia, to the metropolitan city of Kolkata to attend a DRCSC facilitated program workshop carrying in her arms her 2-month-old baby. Chandana's strong spirit and eagerness to learn and apply them have catapulted the family from taking a single crop (paddy) in a year to now growing 25 different varieties of crops including vegetables, fruits, oilseeds, pulses, and leafy greens – using low cost locally available bio-inputs. "*We now only purchase salt, sugar, and some spices from the market*", gleamed Chandana with pride, who once had to part away with her share of food and stay hungry only to feed her children.

The Situation Before

One Season/ Year
When the Tudu family could grow crops for themselves before program adoption

One Meal/ Day
For Chandana and her husband for 06 months in a year before program adoption

INR 700
Expenditure on chemical fertilizers and pesticides for the family per year before program adoption

If you would have peeped into the kitchen of the Tudu family even five years back, you would have found a weeping mother in Chandana struggling to arrange a meal for her children from the limited harvest of paddy she could manage from their farm.

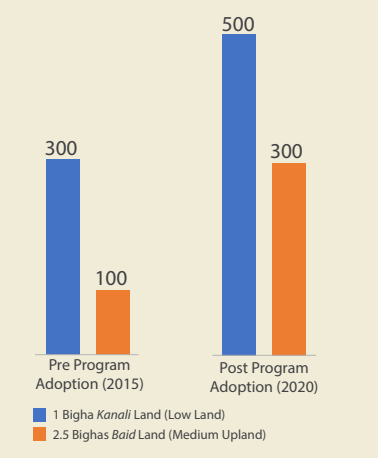
About 70% of the 3.5 *Bigha* agricultural land the family owns is situated in less productive elevated *Baid* (medium upland) lands. So, the family could barely produce 400 Kg of paddy during the Kharif season which could sustain the 4-membered family for six months a year. However, to do that, the adults had to consciously curb their consumption volume as well as frequencies. For days, Chandana had parted away with her share of food and stayed hungry only to feed her children. Furthermore, the use of market bought chemical fertilizers and pesticides was expensive for the family, but just like the other community members Chandana and her husband were programmed to use them anyways.

For the other six months of the year, the family could not grow any crops due to lack of water for irrigation and limited know-how on growing anything but paddy. So, to make their ends meet, Chandana had to work as an agro-labourer with a meagre wage while her husband sporadically worked as a mason. However, the INR 3,000-4,000 per month earned jointly by them barely met their needs.

But there was light at the end of the tunnel for the Tudu family.

Transformation Story

Productivity Transformed
2x increase in Paddy Production
(in kilogram)



In 2016, under the Climate Change Adaptation program, Chandana became a part of the village SHG formed by DRCSC. Apart from learning various resilient farming practices, Chandana, with shared labour from other SHG and community members, developed a 7,200 cubic feet small fam pond (*happa)* near her paddy field in May 2017.

Today, the *happa* has helped the family in doubling the paddy production from 400 Kg to 800 Kg and farm 4 to 5 local breeds of fish for the family to consume. Furthermore, armed with know-how and new techniques of sustainable farming, Chandana now grows 24 additional food crops including vegetables, fruits, leafy greens, pulses, and oilseeds – with exclusive use of low-cost self-prepared seeds, bio-fertilizers, and bio pesticides. After the initial support from DRCSC, Chandana now prepares and uses vermicompost for farming. Continuing the spirit of integrated farming, she has also started using the slurry from the biogas chamber which she has been using since 2020.

The improved farm and farm allied practices have not only transformed the food security for the family but also helped them have resilient livelihoods. Chandana now sells surplus marketable produce from the farm and spends the money primarily on the health and education of her children. Additionally, with support from DRCSC Chandana has also started to rear different varieties of native livestock including goats, sheep, ducks, hens and pigs – diversifying income streams for the family.

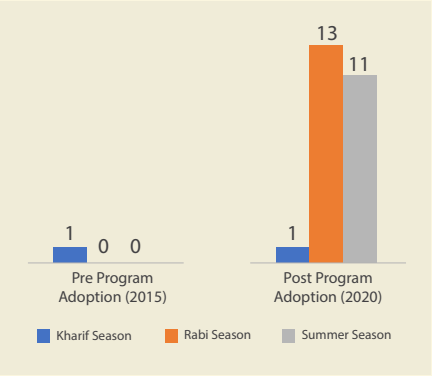
The project focusses on building *happas* in such a way that the community members can support each other, and no farmer loses paddy they sow due to shortage of water. Chandana's *baid* land is hard to reach and her own *happa* cannot irrigate the paddy grown there. She has been using water from the *happa* of a neighbouring farmer and since 2018 has not lost any paddy in the *baid* lands. Earlier on most occasions the paddy on the *baid* land will not survive

At a Glance: Key Climate Resilient Farming Practices adopted by Chandana

- Bio-Fertilizers like Vermicompost and Slurry from Bio-Gas
- Bio Pesticides like Amrit Pani
- Use of Local Seeds
- Nutrition Garden
- Crop Diversification with 10-12 kinds of local food crops per season
- Native Breed of Livestock like goats, sheep, ducks, hens, pigs
- Perennial *Happa* for Irrigation all year round
- Growing 2 Cycles of Vegetables in Rabi and Summer Seasons
- Use of localised weather information and agro-advisory
- One stick paddy cultivation

The Results

Food Security
24 Additional Food Crops grown in 2020 as compared to pre program adoption

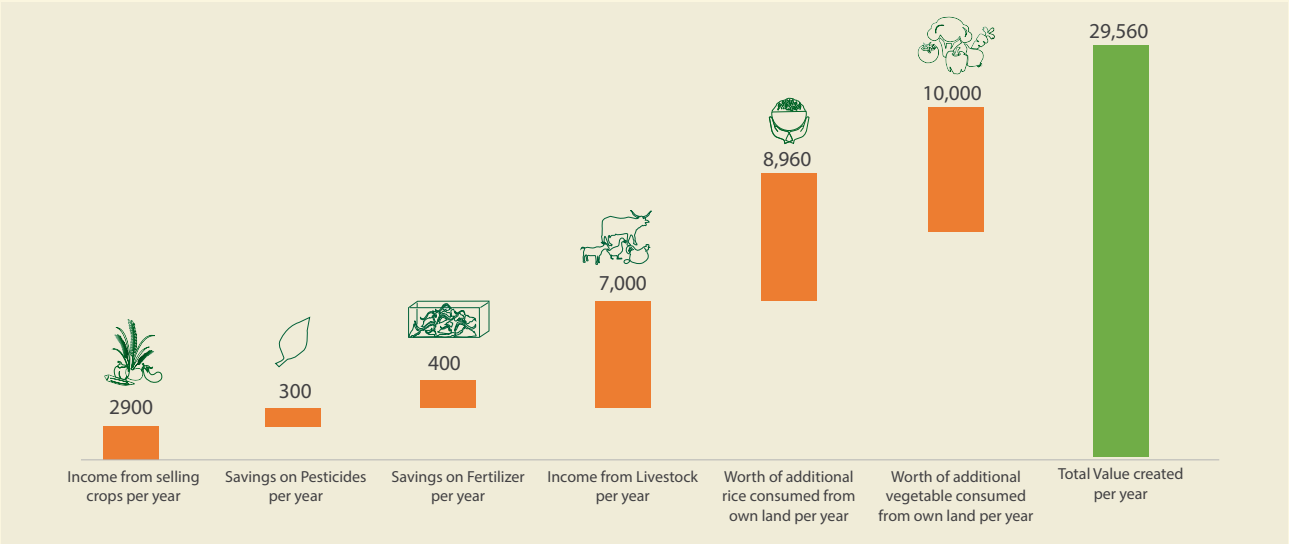


1. Improved Food Security: The Tudu family once used to have boiled rice with locally collected weeds growing in the wild to partly satiate their hunger. They could manage even this very humble meal only once or twice a day. However, the program has changed the situation for the family. "*We now have 2 to 3 different kinds of vegetables with rice every meal, having three fulfilling meals a day*", shared Chandana with a wide grin. Additionally, the family now consumes fish from the *happa* 3 to 4 times a week for at least 5 months in a year. Chandana supplements this food security by diligently maintaining a nutrition garden where she grows root vegetables, fruits, leafy greens all year round.

2. Increased Economic Resilience: The adoption of climate-resilient farm practices has reduced the cost of cultivation, diversified income streams, and decreased the dependency on market-bought food items. Additionally, the family now consumes additional rice and vegetables from their own farm which is worth INR 18,960 annually.

The chart below details the total economic value created for the family through adoption of climate resilient farming:

Total Economic Value
Annual Value Created by the Family through Adoption of Climate Resilient Farming (in INR)



"I am spending INR 200 every month towards private tuitions of my daughter from the increased income I am having by selling vegetables"

CHANDANA TUDU,
Farmer

3. Improved Social Impact: The program has unlocked the potential Chandana had within and transformed her from an agro-labourer to a decision maker in her family and the community at large – in just five years. She does not need to work as an agro-laborer now for food as the family completely supports itself. Additionally, she can produce marketable surplus for vegetables and support her daughter's education by selling them. Chandana has emerged as an agri-leader and trains other women in the community of sustainable farming practices.

LESSON

04

DEVELOP AGROFORESTS, WITH MULTI-USE, MULTI-FUNCTIONAL AND MULTI-SPECIES TREES TO IMPROVE BIODIVERSITY AND PROVIDE INCREASED ACCESS TO FOOD, FUEL, AND FODDER

Key Messages

1. Identify unutilised stretches of land with the help of local community members which have potential to get transformed into agro-forests

2. Include climate-adaptive trees in the agroforest design which can sustainably provide food, fuel, and fodder

3. Train and engage local community members in forest development activities, and follow a continuous monitoring for quality control

In Brief

Locally mainstreamed practices are not always curated keeping in mind the needs, concerns, and priorities of the community. For example, planting Earpod Wattle (*Sonajhuri*) and Eucalyptus trees are quite popular in the Purulia and Bankura districts of West Bengal. When you drive through the forests in this region, you will observe a continuous series of these slender trees symmetrically standing in line. The locals harvest the wood for fuel and livelihood, and some even collect the leaves for domestic use. But these species of trees pose several environmental hazards to the already climate threatened region. Eucalyptus, in particular, is known to deplete groundwater, have dominance over other species and degrade soil fertility. DRCSC's innovation lies in deeply analysing the situation and introducing a number of native varieties of trees to address the biodiversity risks and improve climate adaptive capacities of the community. They do this by identifying unutilized stretches of land which have the potential to be transformed into social forests and facilitating the implementation by engaging key stakeholders – landowners, community members, SHGs, and local field mobilizers.

Challenges Addressed

The soil in the red laterite zones of Purulia and Bankura are characterized by hard and stony top layer devoid of vegetation, which is unsuitable for practicing agriculture. Landowners and community members seldom know how to best use these pieces of land and hence they continue to remain unutilized. On the other hand, the widespread plantation of non-native trees like Earpod Wattle (*Sonajhuri*) and Eucalyptus has fuelled environmental degradation.

DRCSC addresses these longstanding challenges through their social forestry model, wherein they develop local biodiversity hotspots for the community by the community. In the long term, these community-owned assets have the capacity to provide a sustained source of income and improve the natural ecosystem. In the process, community members increase their knowledge and capacities around multifunctional native trees that can be grown locally.

143 Hectares

of unutilized land converted into agroforests in the program with different varieties of multifunctional native trees which can provide food, fodder, and fuel

Impacts

DRCSC enables the community through knowledge transfers, inputs, and continuous monitoring of the development of social forests. Besides 20 to 30 variants of native trees, social forests are also designed to have micro watersheds and trenches which arrest runoffs, recharge groundwater, and restore soil moisture. Together, the design ensures enriched biodiversity and increased green cover in the selected stretch of land. The forests become a potential source of livelihoods in the longer term, where DRCSC envisions SHG members associated will sell the forest products and share 25% of the income with the landowners.

Though social forests are developed with a long-term impact in mind, in the shorter term, they help in improving the natural habitat of the community, breaking deep-rooted notions through evidences that certain trees can grow locally, and creating income streams for community members engaged in developing the forest.

The presence of dense local grass called *kharang*, rabbits, local birds, and moist fertile soil are early evidence of the social forests as emerging biodiversity hotspots. Locals have started to hunt animals and birds for food and collect *kharang* for making brooms and selling them – an indication of livelihood support system.

Implementation Strategy

DRCSC facilitates the engagement of key stakeholders, and through field mobilizers develop the social forests over four key phases.

Phase 01 Identification of land: DRCSC's community-based field mobilizers conduct a transect walk in the intervention villages to identify unutilized stretches of land which can be converted into social forests.

Phase 02 Consultation with the Community: Tracing who owns the land the field mobilizers conduct a series of initial meetings with the landowners to convince them to allow the development work in their land. These meetings run in parallel with consultations with SHG and community members to reach a consensus.

Phase 03 Signing an Agreement: The community consultations are followed by signing an agreement between two parties – the landowners and the Self Help Group formed by DRCSC. The agreement includes a deed wherein the landowners lease the entire land to the SHG for 25 years, and the income from the forest will be shared between the landowners (25%) and SHG members (75%). The SHG members will be responsible for maintaining the forest.

Phase 04 Development of the Forest: Once the agreement is signed, it takes about 6 to 8 months to plan and develop the forest. DRCSC engages the SHG members and other members from the village for digging pits for planting trees, developing water harvesting structures, applying inputs e.g., cow dung, vermicompost, muck, and *neem khol* and finally planting the trees. DRCSC provides access to the inputs including sapling, trains the community on the activities and continuously monitors the process. DRCSC has a standard forest design and stringent quality control procedure to develop the forests.

The Stakeholders

Joint Landowners: Leases the land for 25 years

Self Help Group: Leads development and maintenance of forest

Community Members: Shares labour and contributes 25% of cost of development

DRCSC: Facilitates the process end to end, provides resources, continuously monitors, and ensures quality

Agroforestry Design

DRCSC has synthesised the use of multipurpose trees – both indigenous and modern, which are suitable for the local climate. Additionally, DRCSC promotes soil and water conservation techniques which further improves the conditions for the agroforests to thrive

Key Success Factors

- Continuous monitoring and evaluation against stringent internal standards by DRCSC ensures success
- An agreement between landowners and SHG members helps in formalizing the equation and avoid future discords

Key Risk Factors

- Unavailability of labour can be a bottleneck for the completion of the development work
- Key resources like saplings, cow dung, vermicompost, muck, and neem khol are currently provided by the program, which can limit replication and scaling up of the efforts

Sustainability and Replicability

The development of social forests, as promoted in the program, is a very meticulous, resource and effort-intensive process. This can hinder its sustainability once DRCSC exits the program. Replication and scaling up of the efforts will require an enabling ecosystem that can provide access to inputs, plus incentivization of labour put in by the community. However, the social forests already developed during the program will require minimum maintenance.

In Pictures : Social Forests developed by DRCSC in this program






Case Study

The Adibasi Bhumij Swanirbhar Mahila Dol in Lori village of Purulia, with support from DRCSC and fellow villagers, has transformed a 36-acre unutilized land into a biodiversity hub with 10,000 trees of 29 varieties

The forest in Lori village offers a break from the stretches of Sonajhuri and Eucalyptus forests. Spread across 36 acres of land, the forest in Lori is home to 10,000 trees of 29 varieties, with patches of lush green paddy fields covering 1.5 bighas of the total area. The 30x40 Model, farm ponds, and trenches act as water harvesting structures for the forest. The seepage from these water harvesting structures keeps the soil moist and helps the plants and paddy fields flourish in this upland region of Purulia. But this was not the situation even three years ago.

The Situation Before

"*When I visited this place in 2017, I could only find coarse soil with rock fragments all around this place.*", said Tarapada Mandi, DRCSC's field mobilizer, who identified potential in this unutilized stretch of land. On the entire stretch of 36 acres there were only two Date palm trees, one Palmyra palm tree, and one Butea tree. There were few patches of paddy fields that often could not survive the extreme agro-climatic conditions.

The community members including the four joint landowners had limited knowledge around making the unutilized land productive. Additionally, as only commercially mainstreamed trees like Earpod Wattle (*Sonajhuri*) and Eucalyptus were promoted in the region, it was difficult to see beyond the locally widespread practices to plant and nurture native trees.

Hence, when Tarapada initiated the group meetings and community consultations there were visible inhibitions among the community members to adopt native trees. However, gradually DRCSC facilitated a change in behaviour and managed to sow the seeds of innovation in the community.

Transformation Story

The initial planning for the forest started in November 2017 which included consultations with the SHG (Adibashi Swanirbahar Mahila Dal) members, other members from the community and four joint landowners. In the next three to four months Tarapada, DRCSC's local field mobilizer facilitated the community

08 Months

Duration for planning to planting 10,000 trees

60 to 70

Community members engaged per day on an average

04 Landowners

Engaged by DRCSC to lease the 36-acre land to the SHG for 25 years

consensus, and finally signing an agreement of lease between the Self Help Group and the landowners. The agreement states a 25-year lease wherein the SHG members will develop, maintain, and protect the forest. The four landowners and fourteen SHG members will divide the income from selling forest products between them in a 25:75 ratio.

After the agreement was signed, DRCSC trained and engaged SHG members and other community members in developing the forest – digging the pits, applying the inputs - cow dung, neem khol, muck, vermicompost, and planting the saplings. During this phase, the members sharing labour in this activity also dug trenches as part of water conservation measures. It took around 60 to 70 members every day for the next four to five months to plant 10,000 saplings. DRCSC's field mobilizer Tarapada played a crucial role in mobilizing the community and strictly monitoring the activities. "*We used locally available tools like wooden sticks to strictly measure the depth and uniformity of the pits.*", shared Tarapada.

DRCSC's guidance and vigilance ensured the plantation of saplings before monsoon. Between July to August 2018, the community built 30x40 Models in the forest as water harvesting structures and developed a farm pond in 2019 under the supervision of DRCSC. These structures ensure ample water seepage, adequate water recharge which in turn keep the soil moist for invigorating the trees.

29 varieties of Native Trees planted in the Agroforest of Lori

13 Large Trees

Arjuna, Bastard Myrobalan, Black Plum, East Indian Ebony, Mango, Manila tamarind, Butternut tree, Myrobalan, Neem, Pongamia, Shal tree, Silk Cotton, Woman's tongue

14 Medium Trees

Babool, Cashew nut, Custard Apple, Cutch Tree, Drumstick, Gamari Wood, Gliricidia, Indian Gooseberry, Ipil ipil, Kassod Tree, Orchid Tree, Persian Lilac, Teak

02 Small Trees/ Bushes

Bengal Currant, Lemon

The Results

The Forest At a Glance

36 Acres

Forest Area Developed

10,000

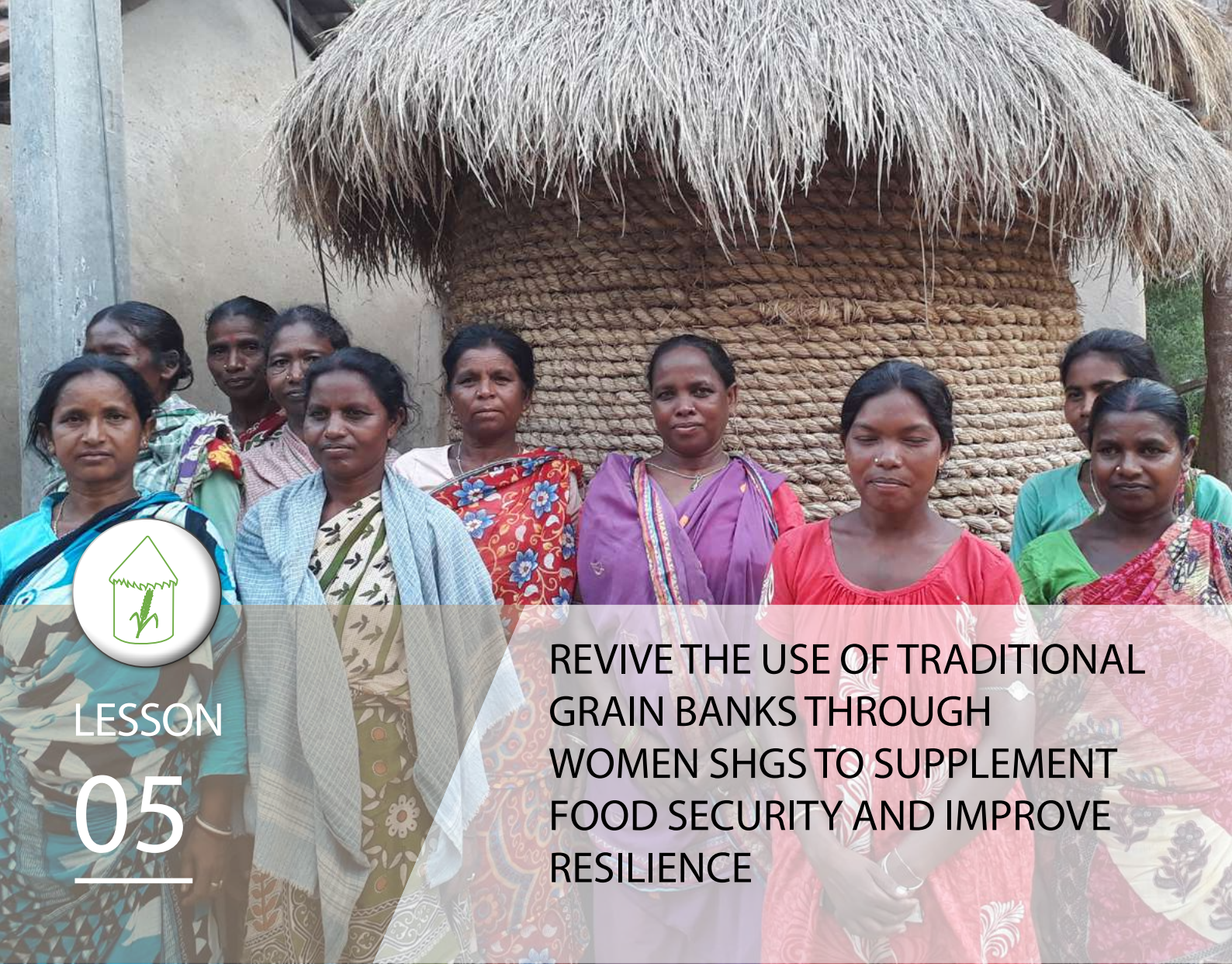
Trees Planted

29

Native Varieties of Trees Introduced

The forest in Lori has helped increase the greenery, check soil erosion, and improve the soil's fertility and water retention capacity. There are now 10,000 trees of 29 varieties - 13 varieties of Large Trees, 14 varieties of Medium trees and 02 varieties of Small Trees or Bushy Trees. Lori's forest is now attracting birds and rabbits, thus improving the associated biodiversity. The long grasses, locally known as *Kharangs*, are attracting people from neighbouring villages. These *Kharangs* are used for making brooms and also as cattle fodder. The key highlight of this forest is the successful cultivation of paddy in the uplands. It is a rare sight that one comes across in Purulia. The general notion is that the uplands are unsuitable for paddy cultivation. But Lori village has proved that proper fertilizers and irrigation facilities can lead to successful paddy cultivation even in the uplands of the red and lateritic soil zones.

The villagers in Lori now realize the untapped potential of the 36-acre land which they once neglected. The community is determined to protect and monitor their forest and hopes for an additional source of income after 20 years.



LESSON

05

REVIVE THE USE OF TRADITIONAL GRAIN BANKS THROUGH WOMEN SHGS TO SUPPLEMENT FOOD SECURITY AND IMPROVE RESILIENCE

Key Messages

1. Consider Grain banks as the solution to address unmet demand of staples after consumption from own land and public distribution systems

2. Every village might not need a grain bank. Assess the level of productivity and consumption needs to take a decision around introducing them.

3. Engage women to lead grain banks to leverage their food management skills and increase success rates of the solution

In Brief

In the undulating terrains of Purulia and Bankura, the steeper uplands (*tanr*) and medium uplands (*baid*) experience a loss of paddy productivity due to heavier runoffs. During drought conditions, the situation is even worse. This compels the poor tribal farmers to restrict how many times they eat in a day and the volume of food consumed every time. DRCSC found a solution in grain banks to address the unmet household demand for paddy. As a concept grain bank is not new; however, DRCSC's innovation lies in the way it has been operationalised in the program – construction, management and accounting completely executed by women self-help groups.

Challenges Addressed

To secure food during lean seasons, poor tribal farmers in DRCSC's program areas were forced to become migrant workers or work as agricultural labourers. The burden of drudgery disproportionately affects women as they act as caregivers at home, manage their own farm-related activities, and additionally work as labourers. Guided by social norms, they are even the first in line to reduce their food consumption in the family.

Furthermore, local paddy lenders demanded up to 50% interest which elevated the misery of the small-scale farmers. The paddy sourced from these lenders might often be inferior in quality deterring the food consumption experience amidst the already distressed conditions.

Locally managed by SHGs, Grain Banks provide an opportunity to these poor families to manage their food collectively. Functioning as a bank, a member needs to pay only a 10% interest on the paddy borrowed, which again becomes part of the group's paddy corpus. Stringent quality checks by members easily eliminates poor quality paddy.

Impacts

The Grain Banks are responsible for bridging the demand and consumption gap after paddy sourced from their own farm and Government run Public Distribution System.

Apart from increasing regular consumption volume and frequency of paddy, SHG members also borrow from the grain bank paddy in bulk during emergencies and social events like marriage in the families.

But most importantly, the community is now self-sustaining their consumption needs and has been able to free themselves from forced borrowing cycles.

Implementation Strategy

DRCSC through their needs assessment surveys, identifies the villages to develop grain banks. This is followed by a series of meetings with the SHGs led by local field mobilizers to emphasise the importance of grain banks, clearing emerging doubts, and finalizing the modus operandi.

The Grain Banks are developed by the SHG members and their families using local materials like hay. DRCSC promotes and supports constructing the concrete base which is important for rat proofing.

In the first year, DRCSC contributed an equal amount of paddy as contributed by the SHG members to kickstart the process, which means, out of the total 1000 Kg of paddy in the Grain Bank, the 10-membered SHG contributes 500 Kg in the first year with 50 Kg per member. Next year onwards, the SHG takes up 100% of the contribution and runs the grain bank independently.

First, the SHG selects a location for constructing the grain bank, usually an open space in front of a member's home, which is almost equidistant from the homes of other members. Constructing the grain bank takes about 6 days – one day to develop the cemented base, and five days to make the hay-based exterior. The SHG members and their families share the labour in the construction work. After the paddy is harvested, the members bring in and run a quality check for depositing the paddy in the grain bank.

In Pictures : Gradual development of a Grain Bank

Key Success Factors

- Developing, operationalizing, and managing the accounts together evokes a sense of ownership which is key to success
- Being the primary managers of food in the household, women have better organizational skills around grains, crucial to run the bank

Key Risk Factors

- Heavy rains can introduce moisture in the paddy and can be prevented through a *pakka* shed
- SHGs might be sceptical in the beginning about the volume of paddy they need to deposit; however, after a successful year, they overcome the fears

Sustainability and Replicability

Grain banks are self-sustaining interventions and require minimum support beyond the first year. The annual interests which the members contribute have the potential to develop a second grain bank that can be used for entrepreneurial activities and scale the efforts.

Case Study

The SHG members from Sagunmahal Mahila Samity in Bongora village, Purulia are independently managing a grain bank which has improved their food security and helped them break the cyclical borrowing of paddy from local lenders every year

Two to three months of erratic rainfall, poor soil conditions, and elevated *Baid* farmlands hindered the paddy productivity in the village of Bongora. This led to a rampant cyclical practice of borrowing paddy from local lenders who used to charge an interest of 50% on the principal. When DRCSC identified the situation and a need to intervene with developing an SHG led grain bank there were initial inhibitions among the members whether they will be able to contribute to the grain bank from their limited production. However, today the Sumangal Mahila Samity independently manages the grain bank and secures food for their family.

The Situation Before

2 to 3 Months

Hunger period experienced by the community members in Bongora village before 2015

"*When we surveyed the village initially, we found the people of Bongora lacked access to adequate food for 2 to 3 months in a year.*", shared Tarapada Mandi, DRCSC's field mobilizer. The less fertile soil and elevated *Baid* farmlands limits the paddy productivity for the families in Bongora. The poor tribal farmers of the village, hence, had to borrow paddy from local lenders at interest rates as high as 50%. "*If we used to borrow 50 Kg of paddy, we had to repay 75 Kg back to the moneylender*", shared one of the SHG members. This hunger period and high interest rates compelled the families, and especially women, restrict their food consumption volume and frequency.

It was difficult for the community members to think outside the cyclical paddy borrowing practice every year. This meant the farmers had to use most of their paddy produced from their own land for loan repayment.

Transformation Story

When Tarapada, DRCSC's field mobilizer approached the SHG members with the idea of setting up a grain bank they were initially apprehensive about it. It took almost 4 to 5 meetings for Tarapada to convince the group initially, however, once they started, they felt more comfortable, and later began to independently manage the operations.

In 2018, DRCSC facilitated the development of the grain bank, wherein, 10 SHG members along with male members from their families were engaged in developing the cemented base, and the hay-based exterior. All resources and labour for the construction work were shared by the SHG members and their families, while DRCSC provided cement as raw material for the base.

All ten SHG members from the group contributed 50 Kg of paddy each totalling to 500 Kg in the first year of the grain bank. DRCSC contributed an equal amount of 500 Kg which helped the grain bank start with 1000 Kg of paddy as the initial capital. From the next year onwards, the SHG members took full responsibility to contribute, withdraw and manage the accounts around the same.

20 people

Including ten SHG members a male member each from their families led the construction of the Grain Bank

06 Days

Total duration to construct the Grain Bank

2018

Year of Grain Bank development in Bongora Village

The Results

"*We could not feel the impact of the 2019 drought conditions on our food security as we had the Grain Bank*", shared a member from the Sagunmahal Mahila Samity SHG. The grain bank in Bongora village now supplements the food security of the SHG members and their families by providing ~100 Kg of paddy every year to each family.

The SHG members who borrow loan from the bank repays with an interest of 10%. "*This has lowered our individual interest rates and the additional paddy from interest stays with us in the group*", shared the members univocally.

Apart from instilling resilience and climate adaptive capacities among the SHG members and their families, the grain bank in Bongora is also helping the families in managing emergencies and social events by helping them borrow paddy in bulk. For example, an SHG member borrowed around 300 Kg of paddy from the grain bank for her son's marriage.

~ 100 Kg

Volume of Paddy the Grain Bank provides per SHG member per year

"We are now able to have rice three times a day, even during drought conditions instead of only once as we were having before"

RUPALI MAJHI,
SHG Member
Sagunmahal Mahila Samity

04

BEDROCK OF STRONG PROGRAM GUIDING PRINCIPLES

LESSON

06

ADOPT A MULTI-STAKEHOLDER APPROACH TO HARNESS COLLABORATIVE EFFORT FOR PROGRAM DESIGN AND IMPLEMENTATION

Key Messages

1. Create long term partnerships to co-design and co-implement the program
2. Identify and engage with partners who can multiply the impact of the program using modern technologies
3. Facilitate an ecosystem to foster cross-learning and symbiosis of ideas among stakeholders

In Brief

Climate change risks and the factors responsible are multipronged. Hence, the most effective way to conceptualize and deliver a climate change adaptiveness program is by bringing together specialized organizations from different spheres of the ecosystem. This multi-stakeholder approach helps in tackling each mutually exclusive factor responsible for increasing climate change vulnerabilities and collectively creates a robust, all-encompassing program. For example, DRCSC in this program engaged with the School of Oceanographic Studies, Jadavpur University as a technical partner right from designing the program. Leveraging their expertise, DRCSC could use satellite technology to map landforms in the program areas and identify locations for perennial water harvesting structures – a key innovation to improve water security for the communities.

The program also witnessed an innovative governance structure bringing together the Adaptation Fund Board as the grant offering body, NABARD as the grant management partner, and DRCSC as the project implementation partner. This engagement ensured drawing relevant expertise from each stakeholder and improving the project management, effectiveness and outcomes.

Innovative Governance structure followed in the program

Organization	Role in the Program	Why was this important?
Adaptation Fund Board (AFB)	Grant Offering Body	Being a pioneer in climate adaptation, financing AFB funds projects after thorough due diligence selecting the ones with promising impact, and making sense for impact investment
National Bank for Agriculture and Rural Development (NABARD)	Grant Management Partner	NABARD's engagement in the program governance ensured • Better grant utilization • Regular program assessments • Cross learning from other NABARD managed projects • Space for innovation • Technical support • Streamlining advocacy dialogues
Development Research Communication and Services Centre (DRCSC)	Program Implementation Partner	With a rich program implementation experience spanning across the last 40 years, DRCSC ensured • Building the right partnerships • Harnessing their bank of social intelligence • Creating effective execution strategies • Mapping actions to sustained outcomes

Implementation Strategy

In this program, DRCSC harnessed the collaborative effort of stakeholders at two levels: a. Program Design and b. Program Implementation. For program design DRCSC engaged with key local Government departments, NABARD, specialized technical partners, and NGOs. For program implementation, DRCSC engaged with the community members and self-governance bodies.

Multi-stakeholder engagement strategy followed in the program

Who?	What was the Engagement Strategy?	Why was this important?
Local Government Departments	Forming and activating a steering committee and convening quarterly meetings for decision making, sharing project updates, and seeking inputs. The District Magistrate was appointed as the Chairperson while key line departments participated in the meetings.	Alignment with the local government on the program and ensuring convergences.
School of Oceanographic Studies, Jadavpur University	Creating a long term technical partnership for integrated watershed development in the program areas. The partnership also helped the students of the university through exposure in a climate change adaptation program.	Multiplying the impact of water harvesting structures through a scientific approach
Kailash Pandey (Expert Climatologist)	Leveraging the expertise of Kailash Pandey and his team in commissioning block-level weather stations and delivering localized weather advisories to the community	Improving the program impact and effectiveness in developing resilience against climate risks
Non-Governmental Organizations	Establishing a Development Cluster Forum with ten NGO members including PRADAN, Shamayita Math, Rural Development Association, Child In Need Institute, Tagore Society for Rural Development, Vikramshila, etc.	Promoting cross-learning and exchange of ideas specific to climate change adaptation in semi-arid regions
Community Members	Encouraging the community to contribute 25% of the cost of developing shared assets like water harvesting structures and social forests. All interventions in the program were administered through groups formed during the program.	Developing a community-owned approach, and a revolving fund at group and cluster level – key for an effective exit strategy and sustaining the program thereafter
Self Governance Bodies	Liaising with the Gram Sabha and Panchayati Raj Institution members for project implementation	Ensuring local administrative support and thereby continuity in project activities

Key Success Factors

- In this program, DRCSC maintained a synergetic relationship across all stakeholder engagements, which ensured strong long-term collaborations. For example, DRCSC provided traditional seeds, azolla etc., sourced from beneficiary farmers to Government Departments, and that helped in building the program credibility.
- DRCSC created specialized technical partnerships and took well-researched scientific approaches wherever applicable. These engagements helped in creating the right impacts for the community and improving the program's effectiveness.

Key Risk Factors

- Take into consideration project delays while engaging with multiple stakeholders

In Pictures : Stakeholder Engagement Platforms from the Program

LESSON

07

FORM PURPOSE DRIVEN GROUPS, KEEPING WOMEN AT THE CENTRE, TO TACKLE OVERLAPPING VULNERABILITIES DUE TO CLIMATE CHANGE

Key Messages

1. Conduct a participatory climate vulnerability assessment in the beginning of the program to understand climate vulnerability levels and form purpose driven groups

2. Centre stage local women during program planning, execution and evaluation and leverage their inherent wisdom as primary users of natural resources

3. Tailor all program interventions based on the needs emerging from different climate vulnerable groups

In Brief

Development programs attempt to create groups of community members with similar socio-economic vulnerabilities. However, if overlapping vulnerabilities e.g., food security, water security, livelihoods securities, etc. are not assessed at household level, groups may have individuals with different issues, concerns, and priorities. DRCSC in this program has developed purpose driven gender segregated groups which complement one another in reducing overlapping vulnerabilities due to climate change. For example, while men primarily receive and implement sustainable paddy growing techniques – which is the main crop in the region, women supplement the food security and income by growing seasonal vegetables and managing livestock. When the group members recognize they have similar issues, concerns, and priorities, it creates cohesiveness, and the members function more effectively as groups.

443

Groups formed in the program with **312 groups exclusively with women**

Furthermore, DRCSC emphasizes keeping women at the centre of program interventions. Women are more vulnerable to climate change. During lean seasons with limited availability of water and food from their own land, women experience increased drudgery as agro-labourers, migrant workers, and managers of food and water for their families. But, when they are empowered to take decisions in groups, women can harness their knowledge and wisdom to play an important role in the stewardship of natural resources.

Implementation Strategy

DRCSC field mobilizers conduct regular walkthroughs to identify community needs, build rapport and facilitate a Participatory Rural Appraisal (PRA). Once the issues, concerns and priorities are clear, community members are selected, and gender-segregated groups are formed. It takes around 6 months to complete this entire process from walkthrough to activating the newly formed groups. Once the groups are formed, they go through different rounds of capability-building exercises.

Key Success Factors

- Homogeneity in groups promotes cohesiveness which results in improved functioning of the group
- Women are the primary users of natural resources – they collect firewood, water, leaves etc., and have inherent wisdom around them. When this wisdom is channelized properly, it helps in effective microplanning for the community.
- Local field mobilizers from the community can clearly understand the issues, concerns, and priorities of vulnerable groups. Additionally, they can better handle the initial scepticisms of the community in the formation of the groups.

Key Risk Factors

Community members may initially disagree to join a new group if they are already part of other groups created by Government or non-Government organizations. However, it is important to understand whether the existing groups are functional and they are effectively meeting the needs of the community.

In Pictures: Groups formed in this program






LESSON

08

DESIGN INTERVENTIONS SUCH THAT THEY EVOKE A SENSE OF COMMUNITY OWNERSHIP AROUND THE PROGRAM AND EMBED SUSTAINABILITY AT DESIGN

Key Messages

1. Transform community members from passive beneficiaries to active implementers of the program to instil sense of ownership
2. Recruit community-based leaders for supervising group activities, continuous monitoring, and dissemination of learnings
3. Encourage the community to contribute a portion of the cost of assets developed; this inculcates a strong sense of ownership

In Brief

INR 41,14,436

Financial contribution by the community in this program towards block level watershed development committees

Shifting the community members from the passive beneficiaries to active implementers has always been a challenge, and the focus of donors and funders. The innovation in DRCSC's strategy flips the narrative on its head. Here, the community plays an active role in co-designing the program, implementing it, monitoring it continuously and evaluating the impacts and outcomes – all under the facilitation of DRCSC. This embeds sustainability at the core of the program and creates a smooth exit strategy. Furthermore, the community members contribute 25% of the cost of developing different village level assets like water harvesting structures, social forests by sharing their labour, which evokes a strong sense of ownership among them. The contribution is maintained by the block level watershed committee set up by DRCSC, which acts as a lynchpin for sustaining the program efforts.

Implementation Strategy

DRCSC instils a sense of ownership through promoting the use of shared labour of the community by choice over mechanized operations. This guiding principle is used to excavate *happas*, refurbish community ponds, plant trees for social forests and develop other community-based assets. The strategy promotes working as a team towards achieving a common goal and by design inculcates a sense of ownership.

The sense of ownership is primarily instilled through the guiding principle of DRCSC – the use of shared labour by the community by choice over mechanized operations. This guiding principle is used to excavate *happas*, refurbish community ponds, plant trees for social forests and develop other community-based assets. The strategy promotes working as a team towards achieving a common goal and by design inculcates a sense of ownership.

Furthermore, the community members contribute 25% of the cost of developing different village level assets like water harvesting structures, social forests by sharing their labour, which evokes a strong sense of ownership among them. The contribution is maintained by the district-level watershed committee set up by DRCSC, which acts as a lynchpin for sustaining the program efforts.

DRCSC creates a network of community resource persons who volunteer in cascading the learnings, supervising field activities, and leading continuous monitoring. These community-based volunteers either emerge as early adopters of the program or show leadership abilities, thus getting appointed as resource persons for DRCSC.

Key Success Factors

- Sense of ownership is created by forming groups with members having similar priorities, issues, and concerns
- This is further supplemented by the use of manual labour shared by the community over mechanized tools
- Developing local leaders helps in binding the groups together through continuous monitoring, coordination, and cascading of learnings

Key Risk Factors

Community owned approach is a novel concept and regions which have been passive beneficiaries of development programs may not agree to this concept initially. It will require a number of community-based sessions and structured campaigns to bring that shift.

In Pictures : Community Owned Approach Adopted in this Program

05

ANNEXURES

Research Methodology

Research Objectives	To collect and distil insights on eight key lessons learned emerging out of DRCSC's Climate Change Adaptation program in the districts of Purulia and Bankura of West Bengal
Research Team	The core research team for the study comprised of 3 members: Mr. Avik Roy (Managing Director, ReW), Mr. Debanjan Nag (Consultant, ReW), Mr. Soumyabrata Basu (Analyst, ReW). Ms. Sulekha Laha and Mr. Soumya Sengupta from DRCSC supported the research team by providing insights during the field research design, field coordination and interviews.
Field Research Area	The research team conducted the study in two districts of West Bengal – Purulia and Bankura across 2 intervention blocks viz. Kashipur and Chhatna interviewing respondents across 11 villages: [Beldi, Bongora, Chhachanpur, Chingri, Jibanpur, Lori, Majhpara, Pabrapahari, Poradiha, Ranjandihi, Seja]
Research Process and Duration	The research team engaged with 122 respondents throughout the research process conducting 09 Focus Group Discussions, 04 In-depth Interviews, and 05 Semi-structured Interviews with direct beneficiaries of the program, and 12 Key Informant Interviews with project stakeholders, DRCSC project team members and key Government departments. Prior to the field research, the team conducted stakeholder workshops to identify the emerging recommendations, innovations and good practices from the program and shortlisted eight lessons learned which together have maximized the effectiveness and impact of DRCSC's climate change adaptation program. The team developed a research methodology to capture insights and case studies around the eight shortlisted lessons learned to conduct the field research. The field research was conducted in two phases over 06 days. The first phase was scheduled from 6th to 8th October 2021, and the second phase was scheduled from 24th to 26th November 2021.
Sampling Plan and Sample Selection Process	The research was aimed at collecting qualitative insights and success stories on the selected lessons learned, and the research team followed a biased sampling method to arrive at the sample selected for this study. The research included in the sample 97 Direct Beneficiaries, 14 Experts and Project Stakeholders and 11 DRCSC Project Team members.

Profile of Respondents	Sample Selected
Direct Beneficiaries	97
Experts and Project Stakeholder	14
DRCSC Project Team	11
Total Sample Interviewed	**122**

Data Collection and Analysis

The research team collected primary data and insights through focus group discussions, in-depth interviews and key informant interviews with direct beneficiaries, experts, project stakeholders and program management team. The data and insights were captured through audio and video recordings, and written notes. Additionally, the team undertook secondary research to synthesise and analyse the policy gaps. Quantitative data highlighted in the case studies of the report were analysed by the research team working on this report using MS Excel.

Quantitative data around project scale, impact, outcomes were sourced and analysed from a large scale endline survey conducted by DRCSC.


In Depth Interviews


Focus Group Discussions

Key limitations of the Study

- Data and insights collected from direct program beneficiaries, more so related to pre-intervention period is based on their recall aptitude and this research does not include an in-detail cross-verification.
- The impact realized by the community might be a combination of many factors apart from the program interventions and the study has not isolated the impact

List of Respondents

Table 2: Names and Profiles of Respondents included in the research through Focus Group Discussions and Key Informant Interviews

Sl No	Respondent Category	Profile	Name	District	Block	Village
1	Direct Beneficiaries	Leader of Adibasi Bhumij Swanirvar Mahila Dol	Rani Singh Sardar	Purulia	Kashipur	Lori
2	Direct Beneficiaries	Leader of Ma Lakshmi Mahila Dol	Bishaka Singh Pator	Purulia	Kashipur	Pabrapahari
3	Direct Beneficiaries	Leader of Poradiha Krishak Sodosso Dol	Dilip Roy	Bankura	Chhatna	Poradiha
4	Direct Beneficiaries	Leader of Poradiha Krishak Sodosso Dol	Mrinalkanti Roy	Bankura	Chhatna	Poradiha
5	Direct Beneficiaries	Leader of Seja Srijon Chashi Dol	Durjodhon Majhi	Purulia	Kashipur	Seja
6	Direct Beneficiaries	Leader of Seja Sarsagun Mohila Dol	Romoni Hansda	Purulia	Kashipur	Seja
7	Direct Beneficiaries	Asst.Leader of Seja Srijon Chashi Dol	Ramananda Hansda	Purulia	Kashipur	Seja
8	Direct Beneficiaries	Secretary of Adibasi Bhumij Swanirvar Mahila Dol	Shepali Singh Sardar	Purulia	Kashipur	Lori
9	Direct Beneficiaries	Secretary of Sagun Mahal Mahila Samiti	Binodini Kisku	Purulia	Kashipur	Bongora
10	Direct Beneficiaries	Secretary of Chhachanpur Adibasibi Mahila Dal	Sumitra Mandi	Bankura	Chhatna	Chhachanpur
11	Direct Beneficiaries	Asst. Secretary of Sagun Mahal Mahila Samiti	Rupali Majhi	Purulia	Kashipur	Bongora
12	Direct Beneficiaries	Treasurer of Adibasi Bhumij Swanirvar Mahila Dol	Subhadra Singh Sardar	Purulia	Kashipur	Lori
13	Direct Beneficiaries	Treasurer of Sagun Mahal Mahila Samiti	Lakshmirani Kisku	Purulia	Kashipur	Bongora
14	Direct Beneficiaries	Treasurer of Chhachanpur Adibasibi Mahila Dal	Romoni Mandi	Bankura	Chhatna	Chhachanpur
15	Direct Beneficiaries	Treasurer of Self-Help Group	Thandamani Kisku	Purulia	Kashipur	Jibanpur
16	Direct Beneficiaries	Treasurer of Seja Srijon Chashi Dol	Molindo Soren	Purulia	Kashipur	Seja
17	Direct Beneficiaries	Member of Adibasi Bhumij Swanirvar Mahila Dol	Kalibala Singh Sardar	Purulia	Kashipur	Lori
18	Direct Beneficiaries	Member of Adibasi Bhumij Swanirvar Mahila Dol	Shonoka Singh Sardar	Purulia	Kashipur	Lori
19	Direct Beneficiaries	Member of Adibasi Bhumij Swanirvar Mahila Dol	Bhutki Singh Sardar	Purulia	Kashipur	Lori
20	Direct Beneficiaries	Member of Adibasi Bhumij Swanirvar Mahila Dol	Chunibala Singh Sardar	Purulia	Kashipur	Lori
21	Direct Beneficiaries	Member of Sagun Mahal Mahila Samiti	Jabarani Kisku	Purulia	Kashipur	Bongora
22	Direct Beneficiaries	Member of Sagun Mahal Mahila Samiti	Dashi Kisku	Purulia	Kashipur	Bongora
23	Direct Beneficiaries	Member of Sagun Mahal Mahila Samiti	Sumitra Kishku	Purulia	Kashipur	Bongora
24	Direct Beneficiaries	Member of Sagun Mahal Mahila Samiti	Sadhana Kisku	Purulia	Kashipur	Bongora
25	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Lasaki Murmu	Bankura	Chhatna	Chhachanpur
26	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Bodoni Murmu	Bankura	Chhatna	Chhachanpur
27	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Sarala Murmu	Bankura	Chhatna	Chhachanpur
28	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Janani Mandi	Bankura	Chhatna	Chhachanpur
29	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Jamuna Murmu	Bankura	Chhatna	Chhachanpur
30	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Shonoka Hembram	Bankura	Chhatna	Chhachanpur
31	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Siduli Murmu	Bankura	Chhatna	Chhachanpur
32	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Nilima Hansda	Bankura	Chhatna	Chhachanpur
33	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Kiamoni Mandi	Bankura	Chhatna	Chhachanpur
34	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Satyabadi Soren	Bankura	Chhatna	Chhachanpur
35	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Kobita Tudu	Bankura	Chhatna	Chhachanpur
36	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Sumitra Tudu	Bankura	Chhatna	Chhachanpur
37	Direct Beneficiaries	Member of Chhachanpur Adibasibi Mahila Dal	Romoni Mandi	Bankura	Kashipur	Chhachanpur
38	Direct Beneficiaries	Member of Self-Help Group	Shibani Murmu	Purulia	Kashipur	Jibanpur
39	Direct Beneficiaries	Member of Self-Help Group	Shantimani Murmu	Purulia	Kashipur	Jibanpur
40	Direct Beneficiaries	Member of Self-Help Group	Shantashi Soren	Purulia	Kashipur	Jibanpur
41	Direct Beneficiaries	Member of Self-Help Group	Shakuntala Murmu	Purulia	Kashipur	Jibanpur
42	Direct Beneficiaries	Member of Self-Help Group	Rupashi Soren	Purulia	Kashipur	Jibanpur
43	Direct Beneficiaries	Member of Self-Help Group	Phulmoni Soren	Purulia	Kashipur	Jibanpur
44	Direct Beneficiaries	Member of Self-Help Group	Parbati Murmu	Purulia	Kashipur	Jibanpur
45	Direct Beneficiaries	Member of Self-Help Group	Jamuna Soren	Purulia	Kashipur	Jibanpur
46	Direct Beneficiaries	Member of Self-Help Group	Arati Murmu	Purulia	Kashipur	Jibanpur
47	Direct Beneficiaries	Member of Self-Help Group	Chintamani Soren	Purulia	Kashipur	Jibanpur
48	Direct Beneficiaries	Member of Self-Help Group	Sarathi Murmu	Purulia	Kashipur	Jibanpur
49	Direct Beneficiaries	Member of Self-Help Group	Thandamani Kisku	Purulia	Kashipur	Jibanpur
50	Direct Beneficiaries	Member of Self-Help Group	Goamoni Kisku	Purulia	Kashipur	Jibanpur
51	Direct Beneficiaries	Member of Self-Help Group	Shonamoni Hembram	Purulia	Kashipur	Jibanpur
52	Direct Beneficiaries	Member of Self-Help Group	Surajmoni Soren	Purulia	Kashipur	Jibanpur
53	Direct Beneficiaries	Member of Self-Help Group	Shilabati Murmu	Purulia	Kashipur	Jibanpur
54	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Brojobala Singh Pator	Purulia	Kashipur	Pabrapahari
55	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Mamata Singh Pator	Purulia	Kashipur	Pabrapahari
56	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Subita Modak	Purulia	Kashipur	Pabrapahari
57	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Ashalota Singh Pator	Purulia	Kashipur	Pabrapahari
58	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Mamata Singh Pator	Purulia	Kashipur	Pabrapahari
59	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Mitali Singh Pator	Purulia	Kashipur	Pabrapahari
60	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Sukhomoni Hansda	Purulia	Kashipur	Pabrapahari
61	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Urmila Hansda	Purulia	Kashipur	Pabrapahari
62	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Sobita Hansda	Purulia	Kashipur	Pabrapahari
63	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Subhodra Singh Pator	Purulia	Kashipur	Pabrapahari
64	Direct Beneficiaries	Member of Ma Lakshmi Mahila Dol	Radha Singh Pator	Purulia	Kashipur	Pabrapahari
65	Direct Beneficiaries	Member of Ranjandihi Rosika Sarsagun Mohila Dol	Sadmoni Tudu	Purulia	Kashipur	Ranjandihi
66	Direct Beneficiaries	Member of Ranjandihi Rosika Sarsagun Mohila Dol	Aloka Tudu	Purulia	Kashipur	Ranjandihi
67	Direct Beneficiaries	Member of Ranjandihi Rosika Sarsagun Mohila Dol	Shakuntala Hansda	Purulia	Kashipur	Ranjandihi
68	Direct Beneficiaries	Member of Ranjandihi Rosika Sarsagun Mohila Dol	Kalimoni Tudu	Purulia	Kashipur	Ranjandihi
69	Direct Beneficiaries	Member of Ranjandihi Rosika Sarsagun Mohila Dol	Phulosori Tudu	Purulia	Kashipur	Ranjandihi
70	Direct Beneficiaries	Member of Chhachanpur Maranburu Dol	Surai Murmu	Bankura	Chhatna	Chhachanpur
71	Direct Beneficiaries	Member of Chhachanpur Maranburu Dol	Anil Mandi	Bankura	Chhatna	Chhachanpur
72	Direct Beneficiaries	Member of Chhachanpur Maranburu Dol	Kalipada Mandi	Bankura	Chhatna	Chhachanpur
73	Direct Beneficiaries	Member of Chhachanpur Maranburu Dol	Sunil Murmu	Bankura	Chhatna	Chhachanpur
74	Direct Beneficiaries	Member of Chhachanpur Maranburu Dol	Parameshwar Murmu	Bankura	Chhatna	Chhachanpur
75	Direct Beneficiaries	Member of Poradiha Krishak Sodosso Dol	Pradip Roy	Bankura	Chhatna	Poradiha
76	Direct Beneficiaries	Member of Poradiha Krishak Sodosso Dol	Sanjay Roy	Bankura	Chhatna	Poradiha
77	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Joydeb Tudu	Purulia	Kashipur	Seja
78	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Bapi Das	Purulia	Kashipur	Seja
79	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Upendranath Murmu	Purulia	Kashipur	Seja
80	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Soshodhor Murmu	Purulia	Kashipur	Seja
81	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Sunilchandra Murmu	Purulia	Kashipur	Seja
82	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Sukanta Hembram	Purulia	Kashipur	Seja
83	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Satyaban Hansda	Purulia	Kashipur	Seja
84	Direct Beneficiaries	Member of Seja Srijon Chashi Dol	Somoychandra Hembram	Purulia	Kashipur	Seja
85	Direct Beneficiaries	Climate Kiosk Volunteer	Vinoy Mandi	Bankura	Chhatna	Chhachanpur
86	Direct Beneficiaries	Community Pond Volunteer	Amardas Kisku	Purulia	Kashipur	Jibanpur
87	Direct Beneficiaries	Community Member	Juel Singh	Purulia	Kashipur	Lori
88	Direct Beneficiaries	Community Member	Shaktipada Singh Sardar	Purulia	Kashipur	Lori
89	Direct Beneficiaries	Community Member	Durgadas Hembram	Purulia	Kashipur	Jibanpur
90	Direct Beneficiaries	Community Member	Tarapada Murmu	Bankura	Chhatna	Chhachanpur
91	Direct Beneficiaries	Community Member	Fatikchandra Mandi	Bankura	Chhatna	Chhachanpur
92	Direct Beneficiaries	Community Member	Narayan	Purulia	Kashipur	Pabrapahari
93	Direct Beneficiaries	Climate Resilient Farmer	Padmabati Mandi	Bankura	Chhatna	Chingri
94	Direct Beneficiaries	Climate Resilient Farmer	Sambhunath Mahato	Purulia	Kashipur	Beldi
95	Direct Beneficiaries	Climate Resilient Farmer	Chandana Tudu	Purulia	Kashipur	Ranjandihi
96	Direct Beneficiaries	Climate Resilient Farmer	Jaladhar Baske	Bankura	Chhatna	Majhpara
97	Direct Beneficiaries	Climate Resilient Farmer	Urmila Baske	Bankura	Chhatna	Majhpara
98	Experts and Project Stakeholders	Project Director,Agricultural Technology Management Agency (ATMA)	Sajal Bhoumik	Purulia		
99	Experts and Project Stakeholders	"DGM, National Bank for Agriculture and Rural Development (NABARD)"	Samrat Mukherjee			
100	Experts and Project Stakeholders	"National Bank for Agriculture and Rural Development (NABARD)"	Debabrata Das			
101	Experts and Project Stakeholders	"National Bank for Agriculture and Rural Development (NABARD)"	Kuntal Purkayastha			
102	Experts and Project Stakeholders	Professor, Department of Oceanographic Studies, Jadavpur University	Dr. Sugata Hazra			
103	Experts and Project Stakeholders	Commissioner PNRD (Retd.)	Dibyendu Sarkar			
104	Experts and Project Stakeholders	Associate Professor, Genetics and Plant Breeding, Bidhan Chandra Krishi Viswavidyalaya	Dr.Prabir Kr. Bhattacharyya			
105	Experts and Project Stakeholders	District Development Manager, National Bank for Agriculture and Rural Development (NABARD)	Goutam Chakraborty			
106	Experts and Project Stakeholders	PRI Member	Soumen Bheltoria			
107	Experts and Project Stakeholders	Senior Scientist, Krishi Vigyan Kendra	Manas Bhattacharya			
108	Experts and Project Stakeholders	Krishi Vigyan Kendra	Sudipto Thakur			
109	Experts and Project Stakeholders	PRADAN	Subhankar Chakraborty			
110	Experts and Project Stakeholders	Shamayita Math	Manish Kumar Misra			
111	Experts and Project Stakeholders	Rural Development Association	Nandini Basu			
112	DRCSC Project Team Members	DRCSC Leadership Team	Ardhendu Sekhar Chatterjee			
113	DRCSC Project Team Members	DRCSC Leadership Team	Sujit Kumar Mitra			
114	DRCSC Project Team Members	DRCSC Leadership Team	Somjita Chakraborty			
115	DRCSC Project Team Members	DRCSC Project Management Team	Sourav Ghosh			
116	DRCSC Project Team Members	DRCSC Project Management Team	Sulekha Laha			
117	DRCSC Project Team Members	DRCSC Project Management Team	Soumya Sengupta			
118	DRCSC Project Team Members	DRCSC ,Field Staff	Debabrata Ghosh			
119	DRCSC Project Team Members	DRCSC,Field Mobiliser	Tarapada Mandi	Purulia	Kashipur	
120	DRCSC Project Team Members	DRCSC,Field Mobiliser	Pintu Pochhali	Purulia	Kashipur	
121	DRCSC Project Team Members	DRCSC,Field Mobiliser	Padaki Mandi	Purulia	Kashipur	
122	DRCSC Project Team Members	DRCSC,Field Mobiliser	Sanjit Mandal	Purulia	Kashipur	

List of Trees and Crops which the Research Team observed

Table 3: Local names and corresponding scientific names and English names of crops and trees used in this report

List of Trees

Sl. No.	Local Names	English Names	Scientific Names
1	Aam	Mango	*Mangifera indica*
2	Amlaki	Indian Gooseberry	*Emblica officinalis*
3	Arjun	Arjuna	*Terminalia arjuna*
4	Ata	Custard Apple	*Anona squamosa*
5	Babla	Babool	*Acacia nilotica*
6	Bohera	Bastard myrobalan	*Terminalia bellirica*
7	Gamar	Gamari Wood	*Gmelina arborea*
8	Glyceria	Gliricidia	*Gliricidia sepium*
9	Haritaki	Myrobalan	*Terminalia chebula*
10	Jilipi	Manila tamarind	*Inga dulcis*
11	Jaam	Black plum	*Syzygium cumini*
12	Kaju	Cashew nut	*Anacardium occidentale*
13	Kanchan Gaach	Orchid Tree	*Bauhinia purpurea*
14	Kendu	East Indian Ebony	*Diaspyros melanoxylon*
15	Khayer	Cutch Tree	*Acacia catechu*
16	Koromcha	Bengal Currant	*Carissa carandas*
17	Koronjo	Pongamia	*Pongamia pinnata*
18	Lebu	Lemon	*Citrus spc*
19	Minjiri	Kassod Tree	*Senna siamea*
20	Mohaneem	Persian Lilac	*Melia azedarach*
21	Mohua	Mohua/Butternut tree	*Bassia longifolia*
22	Neem	Neem	*Azadirachta indica*
23	Saal	Shal Tree	*Shorea robusta*
24	Segun	Teak	*Tectona grandis*
25	Shimul	Silk Cotton	*Bombax ceiba*
26	Sirish	Woman's tongue	*Albizia lebbeck*
27	Sojne Gaach	Drumstick	*Moringa oleifera*
28	Subabool	Ipil ipil	*Leucaena leucocephala*

List of Crops

Sl. No.	Local Names	English Names	Scientific Names
1	Beans	French beans	*Phaseolus vulgaris*
2	Beet	Beetroot	*Beta vulgaris*
3	Begun	Brinjal or Eggplant	*Solanum melongena*
4	Bhendi	Okra	*Abelmoschus esculentus*
5	Bhutta	Maize	*Zea mays*
6	Borboti	Yarlong Beans	*Vigna s unguiculata*
7	Korola	Bitter gourd	*Momordica dioica*
8	Dhonepata	coriander	*Coriandrum sativum*
9	Fulkopi	Cauliflower	*Brassica oleracea var. botrytis*
10	Gajor	Carrot	*Daucus carota*
11	Jhinge	Ridge gourd	*Luffa acutangula*
12	Khero	Snap melon	*Cucumis melo var momordica*
13	Khesari	Grass Pea	*Lathyrus sativus*
14	Kolmi Saag	Water convolvulus	*Ipomoea aquatica*
15	Kumro	Pumpkin	*Cucurbita Maxima*
16	Lutni Sorshe	Mustard Leaf	*Brassica campestris*
17	Lonka	Chilli	*Capsicum annuum*
18	Motorsuti	Pea	*Pisum sativum*
19	Mulo	Radish	*Raphanus sativus*
20	Note Saag	Amaranth (Small)	*Amaranthus dubius*
21	Palong Saag	Spinach	*Spinacia oleracea*
22	Puin Saag	Malabar Spinach	*Basella alba/rubra*
23	Punjabi Palong	Water leaf	*Talinum triangulare*
24	Punka Saag	One variety of Amaranth	-
25	Rai Sorshe	Black Mustard	*Brassica nigra*
26	Sheem	Hyacinth Beans	*Dolichos lablab*
27	Tishi	Flax or Linseed	*Linum usitatissimum*
28	Tomato	Tomato	*Solanum lycopersicum*

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