german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

सत्यमेव जयते
Ministry of Rural Development
Government of India

NOT REINVENTING THE WHEEL

Compilation of successful livelihood models from rural India

Published by:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices:
Bonn and Eschborn, Germany

Enhancing Rural Resilience through Appropriate Development Actions (ERADA)

A2/18, Safdarjung Enclave, New Delhi 110 029 India
T: +91 11 4949 5353
F :+91 11 4949 5391
E: info@giz.de
I: www.giz.de/india

Responsible:
Rajeev Ahal
Director, Natural Resource Management and Agroecology, GIZ India
E: rajeev.ahal@giz.de

Author:
Amod Khanna, Director, Towards Action and Learning (TAAL)

Content Review:
Meekha Hannah Paul, Senior Policy Advisor, Project ERADA, GIZ India
Sharat Singh, Technical Advisor, Project ERADA, GIZ India

Editors:
Nisha Singh, Junior Technical Advisor, Project ERADA, GIZ India
Caroline Ostendorf, Intern, Natural Resource Management and Agroecology, GIZ India
Noah Mommartz, Intern, Natural Resource Management & Agroecology, GIZ India

Design/Illustration:
Caps and Shells Creatives Pvt. Ltd.

As at
June 2022

New Delhi, India

On behalf of the
German Federal Ministry for Economic Cooperation and Development (BMZ)

NOT REINVENTING THE WHEEL

Compilation of successful livelihood models
from rural India

Table of Contents

Abbreviations

ACWADAM	Advanced Centre for Water Resources Development and Management
AHD	Animal Husbandry Department
AI	Artificial Insemination
AKRSP	Aga Khan Rural Support Programme
APSAC	Andhra Pradesh Space Applications Centre
ATREE	Ashoka Trust for Research in Ecology and the Environment
AVFO	Assistant Veterinary Field Officer
BARC	Broadcast Audience Research Council India
BDO	Block Development Officer
BPL	Below Poverty Line
CDC	Centres for Disease Control and Prevention
CFT	Cluster Facilitation Team
CGWB	Central Ground Water Board
CIBA	Central Institute of Brackish Water Aquaculture
CIFA	Central Institute of Freshwater Aquaculture
CIFE	Central Institute of Fisheries Education
CIRTD	Centre for Integrated Rural and Tribal Development, Sundergarh
CIS	Climatic Information System
CISH	Central Institute for Subtropical Horticulture
CRP	Community Resource Person
CRISP-M	Climate Resilience Information System and Planning Tool for Mahatma Gandhi NREGS
CRP	Community Resource Person
CSR	Corporate Social Responsibility
DAP	Diammonium Phosphate
DAY-NRLM	Deendayal Antyodaya Yojana – National Rural Livelihoods Mission
DDUGKY	Deen Dayal Upadhyaya Grameen Kaushalya Yojana (Youth Employment Programme)
DPR	Detailed Project Report
DRDA	District Rural Development Agency
DSS	Decision Support System
EbA	Ecosystem-based Adaptation
ERP	Enterprise Resource Planning
FCR	Feed Conversion Ratio
FIG	Farmer Interest Group
FPO	Farmer Producer Organisation

FY	Financial Year
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoI	Government of India
GP	Gram Panchayat
GPDP	Gram Panchayat Development Plan
GRG	Goat Rearer's Groups
GVK	Gram Vikas Kosh
HKS	Haritha Karma Sena
HUDCO	Housing and Urban Development Corporation Ltd
ICAR-CIBA	Indian Agricultural Institute – Central Institute of Brackish Water Aquaculture
ICT	Information and Communication Technology
ICRISAT	International Crops Research Institute for the Semi- and Tropics
IIED	International Institute for Environment and Development
IIFM	Indian Institute for Forest Management
IIT Guwahati	Indian Institute of Technology Guwahati
IITM	Indian Institute of Technology Madras
IMD	India Meteorological Department
IPPE	Intensive Participatory Planning Exercise
JOHAR	Jharkhand Opportunities for Harnessing Rural Growth
JSLPS	Jharkhand State Livelihood Promotion Society
KVK	Krishi Vigyan Kendra Knowledge Network Agricultural Extension Centre
KYC	Know Your Customer
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee act
MoRD	Ministry of Rural Development
MoU	Memorandum of Understanding
MPCST	Madhya Pradesh Council of Science and Technology
NABARD	National Bank for Agriculture and Rural Development
NABKISAN	NABKISAN Finance Limited subsidiary of NABARD, notified as a Non-Banking Finance Company by RBI
NADEP	Method of Composting
NCDEX	National Commodity & Derivatives Exchange Limited
NCPR	National Centre for Pomegranate Research
NF	Nilagiri Foundation

NFDB	National Fisheries Development Board
NHG	Neighbourhood Group
NSSO	National Sample Survey Organisation
NTFP	Non-timber Forest Product
ODF	Open Defection Free
PA	Protected Area
PG	Producer Group
PM	Prime Minister
PMKVY	Pradhan Mantri Kaushal Vikas Yojana (Skill Certification Scheme, GoI)
RBI	Reserve Bank of India
RKVY	Rashtriya Krishi Vikas Yojana (Agricultural Development Scheme, GoI)
RRB	Regional Rural Bank
R&D	Research and Development
SAP	System Application and Product in Processing
SBM	Swachh Bharat Mission
SFAC	Small Farmer Agri-Business Consortium
SHG	Self Help Group
SIRD	State Institute of Rural Development
SOP	Standard Operating Procedure
SPMRM	Shayama Prasad Mukherji Rurban Mission (by MoRD)
SRI	Self-Reliant Initiative
SRIJAN	Self-Reliant Initiatives through Joint Action
SRLM	State Rural Livelihoods Mission
SVEP	Start-Up Village Entrepreneurship Programme
TATA-ICRISAT	Tata Cornell Institute of Agriculture and Nutrition International Crops Research Institute for the Semi- and Tropics
UID	Unique Identifier
VWC	Village Water Committee
WOTR	Watershed Organisation Trust
WRMS	Weather Risk Management Services Private Limited
WUG	Water User Group
WWF	World Wide Fund for Nature
NRLM	National Rural Livelihoods Mission

Executive Summary

The Indo-German development cooperation project on 'Enhancing Rural Resilience through Appropriate Development Actions (ERADA)' is commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, India is implementing the project in partnership with Ministry of Rural Development (MoRD), Government of India (GoI). It aims at strengthening livelihoods of vulnerable communities in selected rural areas based on locally available natural resources and development support programmes. The project is operational in eight blocks of eight Aspirational Districts of the Indian states of Bihar, Jharkhand, Madhya Pradesh and Rajasthan.

The project has three main outputs:

- **Output 1:** Improving wage work potential of vulnerable households and enhancing the natural resource base
- **Output 2:** Long-term green livelihood development, in convergence with National Rural Livelihoods Mission and other relevant national and state-level programmes
- **Output 3:** Improving convergence and strengthening of multi-stakeholder platforms for providing better access to vulnerable households.

Output 2 aims at enhancing livelihood opportunities in different sectors like agriculture, livestock, tree and forest, fisheries and the non-farm sector. To contribute towards this objective, the present study compiles existing best practices and successful livelihood models from rural areas of the country, especially targeted towards women, migrant households and other vulnerable communities. Relying on existing documentation of cases and models, the study goes beyond narration of the case to analyse and articulate learning and challenges faced, overcome and foreseen in promoting livelihoods in the ERADA project states.

The cases covered during the study have been organised in ten broad thematic areas, namely:

Horticulture
Contextualise, Converge and Complement

Fisheries
Converge, Collectivise and Capacitate

Livestock
Secondary to Significant Source of Income

Non-Farm Livelihoods
Skill-Organise-Enterprise

Green Enterprise
Finding Solutions to Environmental Problems

Agri-Business
Entrepreneurship within the Agriculture Value Chain

Eco-Restoration
Reviving the Natural Resource Base

Agroecology
Sustainable Farming Practices for Farmers

Climate Risk Management
Systemic, Inclusive and Contextual

Information and Communications technology (ICT)
Overcoming the Digital Divide in Agriculture

Each thematic chapter consolidates the learnings in terms of the role of women, strategies for up-scaling, and good practices that emerge from the cases.

The choice of thematic areas corresponds to the broad themes expected to be covered by ERADA in the four states. Each of the thematic areas has been expanded as a chapter in this knowledge product.

The case studies consist of two parts: first is the documentation of the case per se which captures the context in which the intervention was developed and implemented and second is the design analysis that emerges from the case studies as part of the larger themes they relate to, and the strategic components that contributed towards the desired impacts. Each thematic chapter consolidates the learnings in terms of the role of women, strategies for up-scaling, and good practices that emerge from the cases.

Thirty one cases have been documented and organised within the ten thematic areas. Of these, fourteen are from the ERADA project states and the remaining are from Uttar Pradesh, Maharashtra, Odisha, Kerala, Karnataka, Sikkim, Telangana, and Andhra Pradesh. Cases implemented by various government programmes such as Mahatma Gandhi National Rural Employment Guarantee Act (*Mahatma Gandhi NREGA*), National Rural Livelihoods Mission, various State Rural Livelihoods Missions such as Kudumbshree – State Poverty Eradication Mission of Kerala and Jharkhand Opportunities for Harnessing Rural Growth (JOHAR), *Mahatma Gandhi NREGS*, Deendayal Antyodaya Yojana-National Rural Livelihood Mission (DAY-NRLM), Shayama Prasad Mukherji Rurban Mission (SPMRM) are included along with interventions spearheaded by civil society organisations and the private sector.

Learnings from each of the thematic areas in the study have been further synthesised as essential inputs for design learning for programming in reference to the development of activities under the ERADA project. The critical elements for design learning include:

(a) Systems thinking

The study makes a strong recommendation for adoption of systems thinking as part of the design learning emerging from the analyses of the cases. **Projects aimed at livelihoods enhancement located in diverse geo-eco-cultural milieus, represent nuanced complexities of their contexts, giving rise to multiple vulnerabilities that demand attention.** Systems thinking goes beyond mere provisioning (e.g., making seeds available) to establishing systems that ensures continuity and sustainability at each stage (e.g., system of seed exchange). As systems thinking focusses on the replication of processes, it allows for the efficient expansion of such over larger areas.

(b) Convergence

The cases covered in this compilation showcase convergence as apart of the implementation process and not just as an outcome of implementation. The operational strategy of the project has been to engage with different stakeholders for their involvement in the

- Design of the programme to ensure their technical inputs in design and implementation;
- Pooling of resources as material, subsidy, grants or loans;
- Crisis management to find solutions for challenges faced in implementation;
- For institutional linkages so that the target groups/collectives are able to access different institutions concurrently.

The design elements that emerge for the projects are:

- Who to converge with
- What should be the technical form of convergence: material, financial or technical?
- At what stage of the project cycle should convergence be part of implementation design, implementation, trouble shooting?

(c) Collectives

Collectives enable providing scale to inputs; ensure larger coverage by making provisions for inputs- material, technical, financial, and human resource- efficient for the project, and creating opportunities to scale outputs/produce by acting as an aggregator. Generally, collectives are formed with members that have social and economic homogeneity, which allows the benefits arising from the collectives to be shared equally amongst its members.

The design learning aspects of collectives relate to:

- Determining the membership of the collective to ensure that there are no entry barriers that exclude the most marginalised;
- The role that the collective is expected to play during different stages of the project cycle andits own growth;
- Its organisational structure; and
- Its institutional linkage for sustainability.

(d) Para workers

Para-workers are drawn from and amongst the target group. They are subsequently trained on both the theoretical and practical aspects of their work and are mentored when they perform their role in the community. The strategy of developing para-workers has imparted multiple benefits to the project: regular availability of community-led extension service; in-time delivery of preventive services; reduction in response time as there is upward linkage with specialised service providers; delivery of designated services; and establishing linkage between the user and the government department. Projects that have developed women para-workers have accrued additional benefits as the access of trained para-workers is not constrained by socio-cultural constraints, especially where the user is also a woman, e.g. small livestock like goats; it breaks gender barriers as women are seen as information and service provider; provides insights of the user directly to the project; and develops technical capacity amongst the user groups itself.

The design issues related to para-workers developed as part of the project include: should para-workers be volunteers, or should the project pay them? In case of the former, there are frequent dropouts and in the case of the latter, the issue of continued payment once the project period is over remains. The other design question is related to capacity development of para-workers especially in areas where the law restricts them to perform certain roles, e.g. the Veterinary Council Act 1984 in case of Pashu Sakhi. Lastly, grading of para-workers so that the user community is aware of their competency levels, and it also generates possibilities of growth (in skill and coverage) of para-workers in their chosen field of service delivery.

(e) Gender transformation

Project interventions have had a major focus on women, both as an agent of change and as the beneficiary of the project in interventions aiming to impact livelihoods directly, e.g. horticulture, small livestock etc. However, projects that aim at climate risk management, agroecology, or landscape restoration often lack involvement of women as part of the implementation process and impact.

Projects have followed mainly the women empowerment framework to design and implement project interventions. There has been increased social, economic and political empowerment of women yet they fall short of the goal of SDG 5, namely to Achieve Gender Equality and Empower All Women and Girls, which is the driving force to design projects under ERADA. Gender Equality goes beyond empowerment to address the root causes of patriarchy, which impacts the distribution of work, assignment of roles and responsibilities between socially constructed gender and one that imposes restrictions in mobility, hence the inclusion in a range of activities within households and community.

The proposition to adopt gender transformative approaches necessarily implies a paradigm shift from women-centricity in programmes towards gender-centricity in perspective, design, and programmatic processes. Operational strategies that focus both on gender mainstreaming (gender situation analysis and incorporation of gender concerns in all stages of the project cycle); and gender transformation (developing agency of women, engagement with men on masculinity and gender distribution of work, and creating an eco-system to support gender equality within the community) will need to be contextualised and implemented to achieve pre-determined gender indicators (as distinct from indicators of women empowerment).

(f) Technical intervention

Projects constrained with low levels of literacy (education gap), access to information technology (technology divide), and usage (capacity gap) demonstrated the possibilities of technology multiplier when these are used sensitively and strategically by:

- Making technology available to the target group to be part of the project intervention itself;
- Use of a multi-media approach through audio and colours to establish two-way communication with target groups overcoming constraints of language and local dialects;
- Developing the capacity of the user and service providers as part of the intervention;
- Developing cadre to respond to the needs of the user to reduce response-time inprovision of service and information to the user;
- Enhancing the service by providing value-added services that also reduce the transaction cost of the user and service provider; and
- Employing GIS and remote sensing data to feed into decision-making of the farmers in real-time.

The design question for the use of ICT is not whether to, and how much to use, but rather on how to make it user friendly, how to make it provide multiple services, and how to develop the capacities of service providers (extension and technical) to respond in real-time to the issues raised by users? The design learning focuses on both: the capacity of the technology and the capacity to use the technology.

(g) Panchayats

Multiple design benefits accrued to the projects as they linked their interventions with Panchayats:

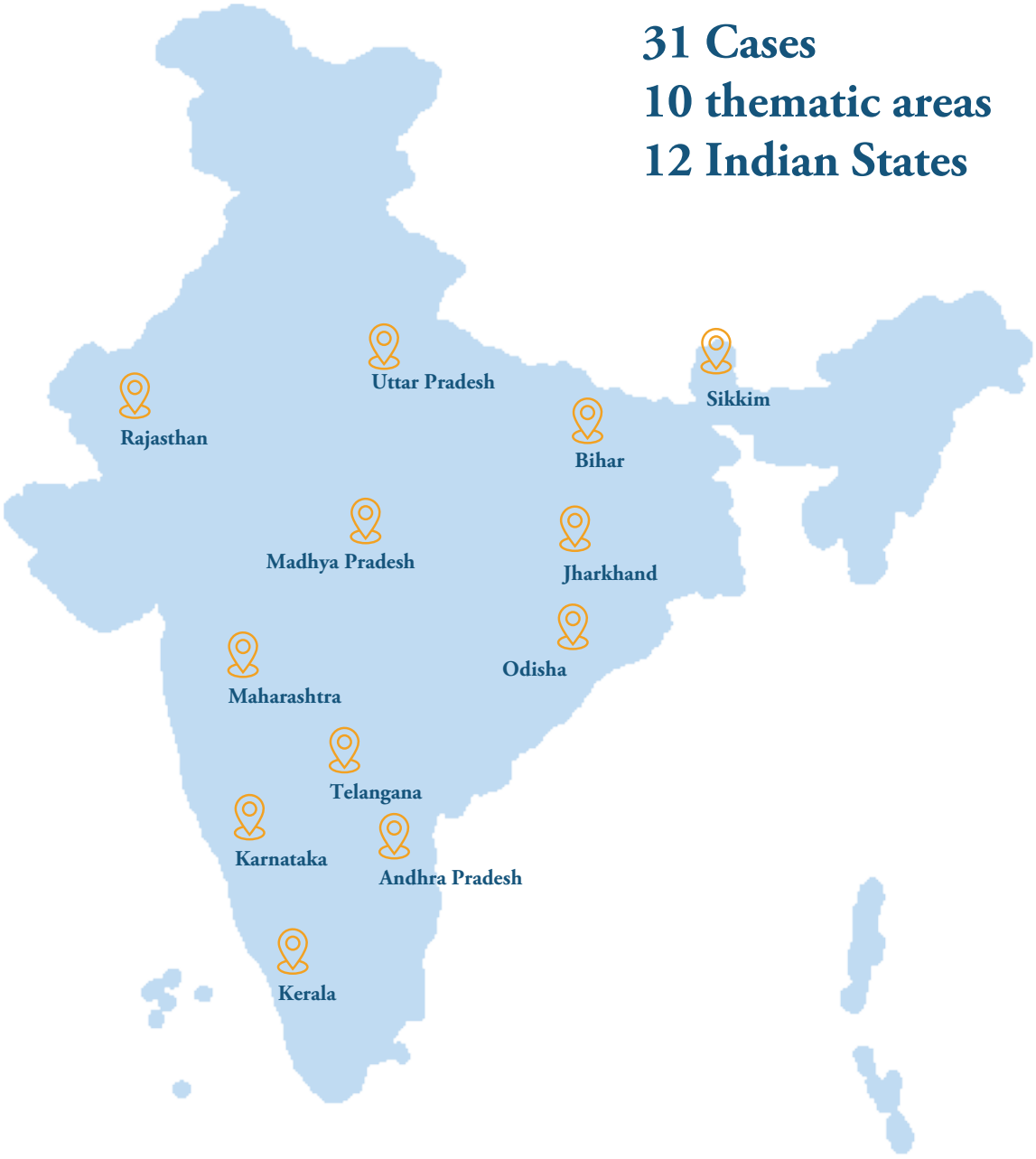
- GPs offer the institutional platform that facilitates convergence between different schemes both at the village and at the household level;
- GPs provide local leadership to projects that extend beyond boundaries of one Panchayat;
- GPs provided a platform that ensured institutional sustainability to the community-based collectives;
- GPs offer possibilities for the development of alternative livelihoods that in-turn fulfil their constitutional mandate as well, e.g. Green Technicians as paid-for waste management pool of service providers; and
- Administrative facilitation for making space available/endorsing collectives for the establishment of micro-enterprises/processing/production units.

The projects, in each case, have assessed the capacity needs of the Panchayat representatives and addressed these as part of their project intervention. The two outstanding issues that have not been focussed as part of the project implementation include incorporating project intervention as part of the Gram Panchayat Development Plan; and linkage of para-workers trained under the project as potential human resource that can be employed by GPs in future.The former will bring the project activities into the realm of public accountability and the latter will ensure the sustainability of services of para-workers on a long-term basis.

(h) Recognising traditional knowledge

Incorporating local knowledge, in the early stages of programme design and implementation, has been a major design learning from the cases that have been exemplified in interventions related to Climate risk management, Eco-restoration of natural resources, Agroecology, and Green enterprises. An increase in adoption of agricultural practices, the revival of local bio-diversity, recognition of traditional water management systems and mechanisms, the revival of local bio-supplements to effectively replace agro-chemicals, restoration of soil health and enhancement of climate resilience all have been demonstrated by the cases under different thematic areas and geographical locations.

The proposition to adopt gender transformative approaches necessarily implies a paradigm shift from women-centricity in programmes towards gender-centricity in perspective, design, and programmatic processes.



Legal Disclaimer: The geographical map used is for informational purposes only and does not constitute recognition of international boundaries or regions; GIZ makes no claims concerning the validity, accuracy or completeness of the maps nor assumes any liability resulting from the use of the information therein.

Introduction

1. ERADA

Enhancing Rural Resilience through Appropriate Development Actions (ERADA) is an Indo-German development cooperation project commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) in cooperation with the Ministry of Rural Development (MoRD) of the Government of India. It aims at strengthening the livelihoods of vulnerable communities in selected rural areas, based on locally available natural resources and development programmes. The project is operational in four Indian states viz., Bihar, Jharkhand, Madhya Pradesh and Rajasthan to achieve three output areas

Output 1: Improving wage work potential of vulnerable households and enhancing the natural resource base

Output 2: Long-term green livelihood development, in convergence with National Rural Livelihoods Mission and other relevant national and state-level programmes

Output 3: Improving convergence and strengthening of multi-stakeholder platforms for providing better access to vulnerable households.

2. Context of the Study

The key focus area of Output 2 of the ERADA project aims at enhancing livelihood opportunities in the farm and non-farm sector. In this context the project aims to compile best practices on integrated farm and non-farm livelihood models from rural areas of the country, especially those targeting women, migrant households and other vulnerable communities. The aim is thus to build on and/or scale-up tried and tested innovative livelihood models from the four project states as well as other rural areas of the country.

The study has therefore been designed to compile at least eight case studies that present unique, innovative and successful models covering different parameters including:

(i) Farm and non-farm-based models that are holistic and sustainable, as well as provide a long-term income generating capacity to the rural households;

(ii) Models that showcase convergence of different government programmes, especially *Mahatma Gandhi NREGS*, DAY-NRLM, SVEP, DDUGKY as well as bring in non-governmental programmes and private sector cooperation;

(iii) Models built for individual as well as group-based livelihoods for collectives such as women Self Help Groups (SHGs), Farmer Producer Organizations (FPOs), cooperative models etc;

(iv) Models that promote use of semi-skilled and skilled workforce;

(v) Examples of innovative use of digital tools and technologies in farm/non-farm/or a combination of both.

3. Scope of the Study

Geographically, the study focuses on identifying case studies in the four project states, namely Madhya Pradesh, Rajasthan, Bihar and Jharkhand. However, case studies from other states have been considered if these were innovative, promote green livelihoods or have potential for up-scaling in these states.

With a specific focus on women, migrants and vulnerable communities, the study has identified cases and models that deal with the vulnerabilities of these groups. Government programmes specifically targeting the promotion of these group's livelihoods have been covered by the study, including the impact of COVID-19 on rural livelihoods and the strategies adopted by project states for their recovery.

©GIZ/MGNREGA-EB

The study is not a mere documentation or narration of the case studies and models, but also analyses them in order to articulate learnings and challenges that have been faced/overcome and are foreseen in the promotion of livelihoods in the project states. A set of recommendations as design learning for the ERADA is also part of the study.

4. Methodology of the Study

4.1 Approach

The study relies on existing documentation of cases and models to provide inputs for documentation and analysis. The approach thus entails an extensive review of existing literature on livelihood promotion by the government, private and non-government agencies in rural areas of India. The information culled out from these studies is complemented by consultations with experts and institutions to gain deeper insight in the processes and challenges faced in the implementation and development of models aimed at livelihood enhancements for women, migrants and vulnerable communities.

4.2 Sources of information

Secondary literature is the primary source of information for the study. This includes the documents and guidelines on existing schemes of the central and respective state governments for livelihood enhancement; documented case studies, evaluation and review reports; research papers, studies and similar documents.

The secondary information is retrieved from the internet through the use of key words such as rural livelihoods, models of convergence for livelihood promotion, promotion of skilled and semi-skilled livelihoods, green livelihoods, integrated livelihoods, rural non-farm livelihoods, multi-sectoral (multi- faceted) livelihood intervention, institutional framework to promote livelihoods of women and vulnerable communities, livelihoods for migrant population, trends and status of rural labour, impact of COVID-19 on rural livelihoods/labour/migrants, group based livelihoods, livelihood promotion through FPOs/SHGs/ Cooperatives, digital technology for promotion of livelihoods/convergence of programmes etc. The tag words are refined further to specifically target the four project states and women, migrants and vulnerable

communities. To limit the search and contextualise the information, the search focuses on literature that dates from 2011 onwards (to focus on the last ten years of documentation).

4.3 Case Study Template

The structure for each case study is two fold: First, documentation of the case per se; and the second, learnings from the case studies as part of the larger themes that they relate to. In both cases a template was followed to bring consistency to the narration and for facilitating analysis. These templates are presented in the following:

(a) Case Documentation

To document the individual cases, the templates seeks to capture the context (the development issue, or the development challenge) in which the intervention was developed and how it was implemented. The narration of the cases retains a clear focus on highlighting the design and strategies adopted and implemented by the projects.

Title of the Case Study	
State (Location), Implementing Agency, and Supported by	
Abstract • Issues covered by the cases	The aim is to create an interest as to why is the case study important in the context of ERADA. What design issues and questions arise from the cases for the project?
Context • What is the context? • What is the challenge/ problem that was addressed?	A short description of the background where the intervention was carried out so that the reader may know about its location and the nature of problem it addresses. Specific vulnerability of the target person/group to be narrated to highlight the conditions under which these activities were implemented.
Strategy and its Implementation • What was the strategy for addressing the problem, e.g., collectivisation, capacity building, stakeholder engagement, financial linkage etc.?	Description in reference to the problem addressed and the strategies that were adopted- who was entrusted the responsibility to adress these problems, how were they addressed, why was the person institution selected for addressing the problem and so on are covered along with the strategies for targeting, coverage, delivery, outreach etc. Stakeholder engagement: Questions covered like Who was involved? How were they involved? What support was provided and by whom? How was participation ensured?
Impacts • Who gained and benefitted by the intervention? Direct benefit e.g. increase in income and indirect benefit e.g., improvement in health benefits etc? • What have been the positive/negative impacts?	Benefits directly related to livelihoods and indirectly to the well-being and life of the target households or the group are stated. It is possible that benefits may also have accrued at the community or Panchayat (as an institution) level. These too are documented to indicate spread of impacts and benefits over a larger area. Signs of change, in livelihoods and well-being, that are visible also formed part of impacts.

(b) Learning from Cases

Learnings from the cases in each thematic chapter were identified and analysed in this section. They mainly focus on how the design and implementation process ensured the generation of impacts and are a consolidation of the thematic cases included in each chapter. Additionally, if there were specific examples that supported the learning, these are also included in a separate box as part of the narrative.

The template developed for documenting the learning from cases is as follows:

Design learning • How was the intervention different from the business as usual? e.g., convergence, integration, developing partnerships and linkages, skill development etc.? • What are the conditions that need to be in place for the intervention to be successfully replicated? Has the intervention been replicated? • What are challenges for replication? • How are/ can these be addressed?	The narration focuses on how the intervention was perceived and implemented differently than interventions with similar aims. Innovation in approach, process, institution, capacity or resources are highlighted and their contribution to the success and accrual of benefit tracked. Has the livelihood intervention been replicated? training required/preparation of training manual, who should be trained; or document the practice and circulate, the dissemination strategy etc.?
Women • How do the cases involve women? How do women benefit directly from the project? • Does the intervention impact the gender relations within the household and/or the community?	How were women targeted and (how) was the intervention designed and implemented to be able to benefit women directly? What have been the benefits for women and does the intervention address the distribution and burden of work, and does it impact the gender relations in the community will be captured?
Up-scaling • What are the opportunities for and feasibility of up-scaling the intervention? What would be the challenges, and conditions to put in place, to up-scale the intervention for both men and women?	Has the intervention been up scaled? Process of institutionalisation at the project level? Does it require change in the method of working etc. are documented here?
Good Practices • What are the good practices that were adopted by the cases?	Identification of good practices adopted by the project which contributed to the success and generation of impacts.

5. Profile of Case Studies

The cases covered by the study have been organised in 10 broad thematic areas, namely: Agroecology, Agri-business, Eco-restoration, Climate risk management, Horticulture, Fisheries, Small Livestock, Green Enterprise, No-farm livelihoods, and Information Communication Technology. The choice of thematic areas corresponds to the broad themes that are expected to be covered by ERADA in the four states. The study does not attempt to define the scope of each of the thematic areas but largely relies on the common understanding of these themes, except in case of agroecology and green enterprise where these terms have been essentially defined to state the understanding within which the cases have been identified and documented.

A total of 31 cases has been documented and organised within the thematic areas. The categorisation is based on the core area of their intervention, although some cases may overlap thematically and could have been placed in other chapters. For example, Roof Rainwater Harvesting has been placed in the Non-farm Livelihoods chapter though it had an equal right to be part of Green enterprise; or the case of Manufacturing and Sale of Vermi compost could have been part of Agribusiness though in the study it has been placed under Green enterprise. The aim of categorisation of the studies has been to explore different perspectives, scope, and the dimensions of the thematic areasrather than attempt a rigid classification of the cases.

The cases documented in this study are profiled in terms of their location; implementing agency, convergence and collectives. The profile is primarily aimed to state the diversity in coverage with respect to the different geo-cultural contexts and involvement of implementing agencies. Profiling of case studies has also been undertaken to demonstrate how different collectives are formed, nurtured and developed for promotion of livelihoods, and the potential that exists for brining convergence in design and implementation of livelihood related interventions in rural areas.

(a) Location

Location refers to the state where the selected case has been implemented. The main focus was on selecting cases that demonstrate a thematic livelihood intervention, whereby the location in one of the ERADA states was incidental during finalisation of the selection.

Of the 31 cases documented, 14 are located in ERADA states and the remaining 17 in other states of the country (see Table: Location and Implementing Agency of Cases). Of the cases that are located in ERADA states, five have been implemented in Madhya Pradesh, four in Rajasthan, three in Jharkhand and two in Bihar. It is interesting to note that in all thematic areas there are cases from one (or more) of the ERADA states, except in the area of Green Enterprise where the study was not able to locate an already documented case that could be included in the present study.

The other states that are covered by the cases include Uttar Pradesh, Maharashtra, Odisha, Kerala, Karnataka, Sikkim, Telangana and Andhra Pradesh.

Table: Location and Implementing Agencies of Cases

Thematic Areas	Number of Cases	Location					Implementing Agency	
		ERADA States				Other States	Government	Civil Society
		MP	BI	JH	RJ			
Agroecology	3		✓			✓		✓
Agribusiness	3	✓		✓		✓	✓	✓
Eco-restoration	4				✓	✓	✓	
Climate Risk Management	4	✓		✓		✓	✓	✓
Horticulture	2	✓			✓			✓
Fisheries	2					✓		✓
Small Livestock	2	✓				✓		✓
Green Enterprise	3					✓	✓	✓
Non-Farm Livelihoods	4				✓	✓	✓	✓
ICTechnology	4	✓	✓	✓		✓	✓	✓

(b) Implementing Agency

Cases that have been implemented by Government Departments or agencies as well as those implemented by civil society organisations are well represented in the study. With respect to government agencies, Kudumbshree, JOHAR, *Mahatma Gandhi NREGS*, NRLM, and SPMRM are included as part of the documentation. Cases related to civil society organisations include projects that have been implemented by voluntary organisations, like WOTR, SRIJAN, CDC, SAHAJ SAMUDRA and AKRSP; as well as projects that are part of a collaborative effort of more than one organisation like TATA-ICRISAT or IIED-MPCST. Implementation of projects by private players have been included as part of civil society organisations like in case of Ergos, Sugana Poultry Farms Limited, and AGRIBUDDY.

(c) Collectives

Livelihood projects that focus on marginalised and/or vulnerable groups employ forming collectives (of the target groups) as a strategy to broadbase their intervention, develop technical and leadership capacities within these groups, establish linkages with government, institutions and markets, and to develop community based and managed mechanisms for implementation, operation and maintenance beyond the project period. The different types of collectives that the study has documented include SHGs, Livelihood Groups (farmers, seed saviours, fishers, etc), User Groups (Water User Group, Village Water Development Committee and son on), Farmer Producer Organisation whether as a Cooperative or as a Company, and other groups (see Table: Collectives and Convergences in Case Documented by the Study). The Neighbourhood Groups (as well as Joint Liability Groups) under Kudumbshree are placed under Others so as to distinguish them from SHG, which have the essential characteristic of thrift and credit as their basis of formation.

The cases documented by the study include a wide variety of collectives in each thematic area except for Eco-restoration where Committees that were formed are part of Panchayats, or for the implementation of maintenance of works that were implemented as part of the project.

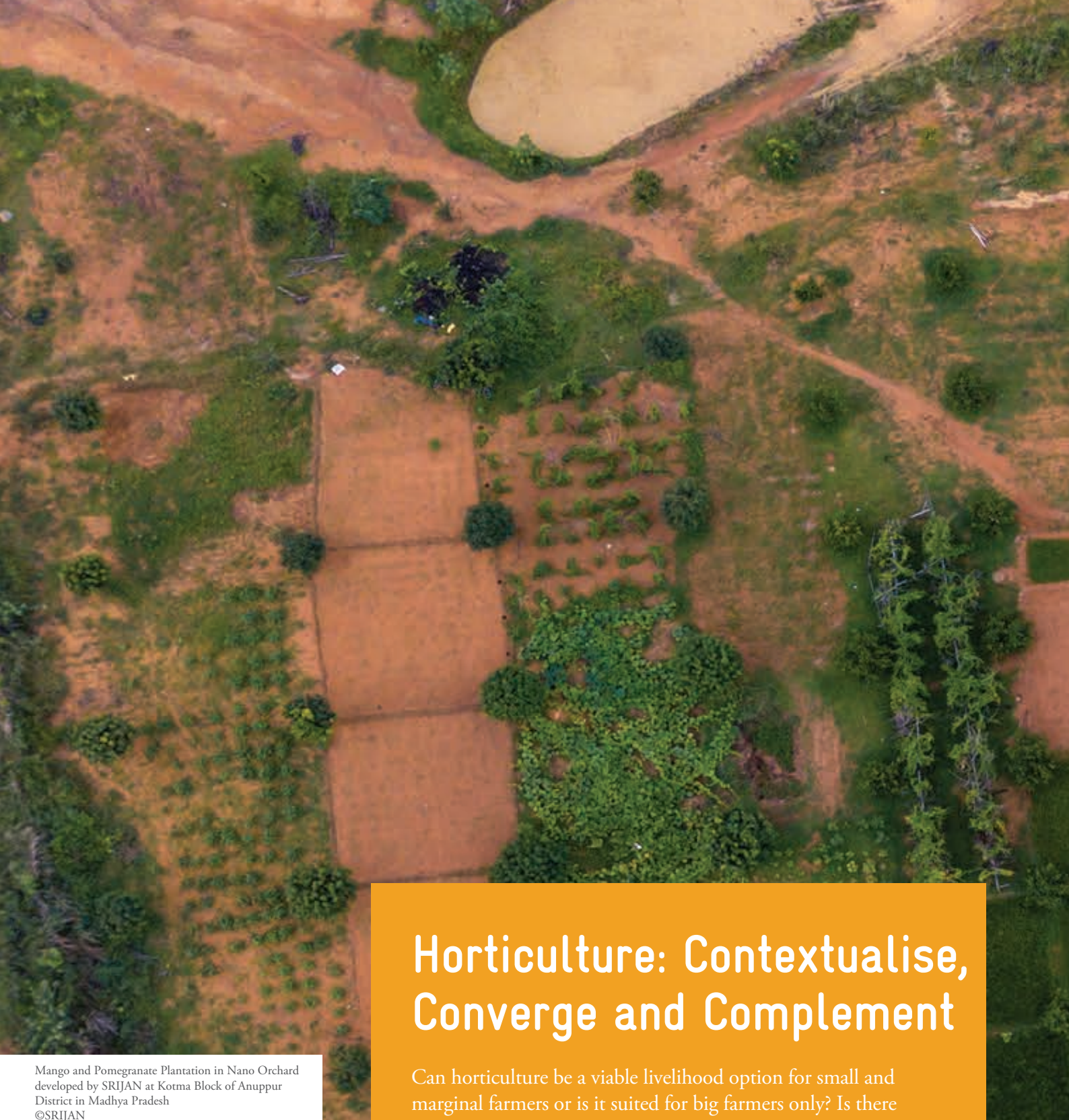
Table: Collectives and Convergences in Cases Documented by the Study

Thematic Areas	Number of Cases	Collectives					Convergence (Departments)								
		SHG	LG	UG	FPO	OTH	AG	RD	HT	AH	FR	WR	FO	PA	OT
Agroecology	3	✓	✓		✓		✓	✓							✓
Agribusiness	3	✓	✓	✓	✓		✓								✓
Eco-restoration	4					✓		✓				✓		✓	✓
CRManagement	4		✓			✓		✓					✓	✓	✓
Horticulture	2		✓		✓		✓	✓						✓	✓
Fisheries	2	✓			✓	✓		✓			✓	✓		✓	✓
Small Livestock	2		✓						✓	✓					
Green Enterprise	3		✓				✓	✓						✓	✓
NF Livelihoods	4		✓					✓							✓
ICT	4		✓				✓	✓	✓	✓					

CR: Climate Risk; NF: Non-Farm SHG: Self Help Group; LG: Livelihood Group; UG: User Group; FPO: Farmer Producer Organisation: OTH: Other Group AG: Agriculture; RD: Rural Development: HT: Horticulture; AH: Animal Husbandry; FR: Fisheries: WR: Water Resources; FO: Forest; PA: Panchayat; OT: Others

(d) Convergence

The different departments that appear as part of convergence under each thematic area are given in the Table titled Collectives and Convergences in Cases Documented by the Study. As part of the on-farm livelihoods the Departments of Agriculture, Horticulture, Animal Husbandry, and Fisheries are listed in all the thematic areas. *Mahatma Gandhi NREGS*, NRLM, SPMRM schemes of the Ministry of Rural Development have been instrumental in providing financial, institutional and technical resources for convergence at the field implementation level. The technical departments, notable Water Resources and Forests also have converged to not only provide technical inputs but also participate as part of the project implementation team. The category of Other in convergence includes Department of Revenue, Energy, Tribal Welfare, and other technical autonomous institutions of the central and state government, e.g., CIFA, CIFE, IIFM etc.



Mango and Pomegranate Plantation in Nano Orchard developed by SRIJAN at Kotma Block of Anuppur District in Madhya Pradesh
©SRIJAN

Horticulture: Contextualise, Converge and Complement

Can horticulture be a viable livelihood option for small and marginal farmers or is it suited for big farmers only? Is there scope for the use of horticulture plantation for restoration and revival of ecosystems on common lands? The cases presented here provide answers to these question that project agencies are often faced with during the course of their design and implementation of development interventions for vulnerable groups and/or ecologically stressed regions.

About 80% of farm households are small and marginal farmers, that cultivate 44% of the operational holding in the country. Constraint of size has led these farmers to adopt input-intensive mono cropping agriculture practices, and faced with capital inadequacies, skill-knowledge asymmetry, and increasing risks arising from climatic variabilities, especially in rain fed areas, have created situations where they are confronted with the prospect of losing agriculture as their primary source of sustenance. The avowed target of doubling farmers income brings forth the challenge of developing diversified models for this large group of farmers in the country as part of development measures.

Horticulture often conjures up the image of fruit/orchard plantations. The dominant paradigm of either agriculture or horticulture has constrained the adoption of synergetic and agri-horticulture farming practices. For its demand of high initial investment, perennial source of irrigation, and higher risk for plant survival and growth, horticulture promotion has mostly been perceived as an option for big farmers. At the same time, backyard horticulture, especially of vegetables and fruits mostly for self-consumption, has always been a traditional household activity for the small and marginal farmers.

Horticulture as livelihood promotion activity for vulnerable households and as afforestation works on common lands has been a permissible activity under Mahatma Gandhi NREGS[1]. The strategic and operational challenge is to use this opportunity to develop locally relevant, customised yet diversified models that evolve into profitable ventures for small and marginal farmers in different situations.

Success stories and good practices in promotion of horticulture have a common theme of the sensitivity of the project to the context and local needs of the farming community. The two cases presented here underline the importance of the larger context for designing and developing the contents and strategic thrusts of the programmes. The first case refers to villages located in the buffer zone of National Parks, where the livelihoods of communities are challenged due to restrictions on their ability to collect and profit from sale of forest produce that they have been doing historically and traditionally. The second case refers to the challenge faced in implementation of the Wadi Programme in the face of decreasing size of land holding within the agriculture sector.

Horticulture: Possible Option to Reduce Dependence on Forests

Buffer Zone of Kanha National Park, Madhya Pradesh
Implementing Agency: CDC, Balaghat[2]
Supported by: Paul Hamlyn Foundation

Context

With 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and four Community Reserves, the Protected Area (PA) network extends to 4.9% of the geographical area of the country. Primary objective of PAs being biodiversity conservation,the resource extraction and use by local communities is prohibited. These communities, bearing the brunt of cost of conservation, have often entered into long drawn conflicts and hostilities with the PA managers. The root cause of these conflicts has primarily been the absence of viable alternatives and affordable solutions to the economic and livelihood constraints faced by these communities.

Kanha National Park, declared as a reserve forest in 1,879, revalued as wildlife sanctuary in 1,933 and upgraded to national park in 1,955 has an area of 1,945 sq kms that includes the core and buffer zone comprising of luxurious meadows with wooden strands and dense forest cover. The area is heavily forested and has a wide diversity of Non-timber Forest Products (NTFPs). Villages in the buffer zone comprise Baiga and Gond tribal groups that have traditionally been dependent on the collection and sale of NTFP in the local markets. Main agriculture crop is paddy with arhar (pulse) cultivated on farm bunds. Intermittently, beans and seasonal vegetables are taken by farmers where there is a possibility of assured irrigation.

CDC in collaboration with WWF and supported with Department of Science and Technology, conducted experiments to find viable livelihood alternatives for the communities in the buffer zone. The evaluation identified vegetable cultivation and subsequent sale as the most successful and adaptable activity by the community. To upscale the pilot and to find out whether horticulture can be a viable alternative, CDC implemented the project in 28 villages (10 GPs) of Baihar block of Balaghat district comprising of villages in the buffer zone of Kanha National Park.

[1]Under Category A as part of Public Works relating to Natural Resources Management, horticulture is included in Afforestation that stipulates plantation and horticulture in commons, forest lands, road margins, canal bunds, tank foreshores, and coastal belt duly prioritising right to usufruct to the poor vulnerable households. Under Category B for Individual Assets to Vulnerable Households for Improving Livelihoods of households includes horticulture along withsericulture, plantations and farm forestry.

[2]Community Development Centre, Balaghat

Strategy and its Implementation

The project developed and implemented the following strategies for the promotion of horticulture crops in the project villages.

Strategy	Implementation	Case of Atar Singh Parte
Targeted Families Target of covering 30 families in each GP based on parameters size of land holding, migration status, and interest in horticulture activities.	Hamlet level meetings were conducted in all the 28 villages. These meetings led to the identification of a possible list of target beneficiary households of the project. Each of these households was visited for a detailed baseline studywhich profiled their livelihoods and mapped their access to, and availability of, different capitals required to conduct their livelihoods. 320 households in the 10 GPs were identified as target beneficiary households of the project.	Atar Singh Parte, resident of Mohrai GP located in Supkhar Range buffer zone of Kanha National Park in in Garhi block of Balaghat district, has five acres of land of which four is unirrigated on which he has been cultivating paddy, maize, chickpea and mustard. In addition to farming, to provide for a family of five, he also worked for agriculture works, in *Mahatma Gandhi NREGS*, and in nearby cities to work in construction works. With previous experience of cultivating vegetables Atar Singh expressed his willingness and desire to undertake horticulture activities.
Clustering of Farmers Develop cluster of farmers with similar crops so that technical and marketing inputs can be delivered and developed on a cluster approach.	Three distinct clusters of farmers were developed based on the horticulture crop that they cultivated during the course of project implementation: potato (45), ginger (155) and turmeric (52). 210 farmers had adopted at least two, and 50 farmers all the three the horticulture crop by the end of the project period.	Atar Singh started with cultivation of potato, ginger and turmeric in 2015. Initially he was part of the cluster of these three crops but over a period of time he has focused more on turmeric and ginger and is member of the cluster of these two corps. Atar Singh has received training on seed treatment, sowing and irrigation practices, use of compost, protection, harvesting and marketing of these two crops under the project. He has now graduated to the level where he is providing seeds of these two crops to other farmers in the Panchayat and to neighbouring villages.
Selection of Crops Selecting crops that would lead to significant increases in income levels	Students of SP Jain Institute conducted feasibility studies for different horticulture crops in the area and identified four crops that could benefit the farmers: potato, ginger, turmeric and arbi. These crops additionally had longer shelf-life and the farmer does not have to resort to distress sales. The project realised that arbi is widely cultivated in the region and hence dropped it from their list of horticulture crops.	Atar Singh started with sowing five kg each of ginger and turmeric seed. With each year he has increased the area under these crops (seed ten kilograms each) and with assured irrigation from dug well that he got under *Mahatma Gandhi NREGS* in the year 2017 he has now started cultivation of seasonal vegetables as well.
Market Linkages Market linkage included post-harvest practices and information of market and prices	Market support by way of information on markets, seasonality in price of produce, retail and wholesale selling, terms of sale/purchase, safe storage practices, grading, and qualitative parameters used by consumer for horticulture crops, was provided through training and information to the farmers.	Atar Singh sold potato, turmeric and ginger in local market at rates of INR 10, INR 50 and INR 80 respectively. He did not keep any part of the produce for himself nor for seed for sowing the next year. His total income from this sale was INR 7,520.

	Initially tribal farmers, not familiar to sit in local markets, were trained to sit and shout to advertise their produce and to weigh the produce before selling to consumer.	Next year Atar Singh kept part of the produce of ginger and turmeric for own use (thus saving on purchase of the same from the market) and also kept part of the produce as seed that he could use in the next season. His income this year was INR 11,850 a significant increase from the previous year. With assured irrigation Atar Singh has increased the area under horticulture crops and has also brought a motorcycle (worth INR 55,000) so that he can access markets in distant places and thus enhance his income.
Convergence For infrastructure, equipment and training convergence with Government schemes	Intensive engagement with departments at the block and GP level to familiarise with the eligibility and documentation required for accessing the schemes was followed with dissemination of the same to targeted households. Handholding in completing administrative processes and submission of required documentation was provided by the project team. Project was able to converge with Mahatma Gandhi NREGS (143 Kapil Dhara and 70 small ponds), the Agriculture Department (32 irrigation pump sets and 300 seed mini kits), PMUY (210 Cooking gas), Horticulture departments (800 seed mini kits and training to farmers on cultivation of ginger, turmeric and potato)	Atar Singh was beneficiary of Kapil Dhara sub scheme under *Mahatma Gandhi NREGS*, seed kits by Horticulture department and Agriculture department, training conducted by these departments. The household was also a beneficiary under Ujjwala scheme (PMUY). Atar Singh also gained by the purchase of agriculture equipment (sickle and winnowing fan) with subsidy provided by the Agriculture Department. The additional income earned by Atar Singh was used for purchase of irrigation pump (after the construction of dug well), replacement of tiles on roof, and motorcycle. With improved income he has been able to send his children to study at the block level. His daughter is in college and both his sons have completed their high school.

Impact

In the first two years, the project had focused on the introduction of horticulture crops through intensive engagement with farmers and building their capacities in understanding the technical and agronomy of these crops. The average baseline income of farmers was INR 20-25,000 in the project villages, which increased by INR 10-15,000 by the end of the second year. This increase was, however, not sufficient enough to wean them away from collection of NTFP that often brought them in to conflict with managers of National Park. Consequently, the project introduced Self-Reliant Initiatives (SRIs) along with the use of traditional seeds and use of compost for cultivation of paddy with the farmers. The farmers started adopting SRI for paddy along with the horticulturecrops introduced by the project. By the end of the fifth year, the project found that the average income of farmers has increased to INR 55-60,000 from agriculture and their dependence on NTFP for alternative source of income had decreased substantially. Moreover, with additional crops, they were constrained for time to visit forests for collection of NTFP as most of their time was spent on cultivation, harvesting and sale of horticulture corps from their fields.

Nano orchard with Thala Dali Bai, Village: Manpura, Suhagpura block, Distt Pratapgarh, Rajasthan
©SRIJAN

Nano Orchards: Pathways for Prosperity for Small and Marginal Farmers

Rajasthan, Madhya Pradesh and Chhattisgarh
Implementing Agency: SRIJAN[3]
Supported by: Various Agencies

Context

Wadi model was designed and implemented to overcome the bias against small and marginal farmers, especially in tribal areas, by promoting horticulture crops over an area of one acre with 60 plants with combination of at least two types of horticulture plants like mango, cashew, guava, pomegranate, gooseberry etc. The model supported by NABARD has been widely implemented and has found support by the Government of India which has launched the Wadi Scheme for implementation by State Governments by the Ministry of Tribal Affairs.

Changes in the average land holding from 1.84 ha in 1980-81 to 1.08 ha by 2015-16, accompanied with an increased number of small and marginal farmers by 1.9 times during the same period has constrained the farmers to adopt the wadi model. In this scenario, the classical wadi model seems to have lost its relevance and there was a need to develop an alternative paradigm customised for small and marginal farmers that makes their agriculture diversified, resilient and able to ensure food security and gain income from shrinking physical asset base.

SRIJAN tweaked the wadi model and piloted a 0.2 acre model of fruit tree plantation that could accommodate 40-60 saplings in a high-density mode of 3mx3m spacing between plants. The orchards were named as Nano Wadi (small) to indicate minimal space occupied by them. The model has been implemented in the states of Madhya Pradesh, Rajasthan, and Chhattisgarh.

[3]Self-Reliant Initiatives through Joint Action

Strategy and its Implementation

SRIJAN has been implementing the Nano Orchard model in different districts of the three states. The organisation developed abroad framework of implementation and enabled each of the locale specific teams to develop their own strategies and focus areas of intervention.

Strategy	Implementation	Case
Selection of Farmer and Plot Intensive consultation with farmers and an open discussion on potential benefits of nano orchard are discussed in small group meetings	Farmers with minimum of 0.5 acres of land and an assured irrigation, who are willing and interested are selected. This is followed by selection of a plot that has a gentle slope and is preferably located in the backyard of the farmer's house for ease of manuring, irrigation and monitoring. A total of 1,779 nano orchards were developed in eight districts located in Rajasthan (two), Madhya Pradesh (four), and Chhattisgarh (two).	Bati lives in Salaiyya village of Shivpuri district in Madhya Pradesh. She owns nine bighas of land of which four bighas is unirrigated. Her two sons migrated to cities for employment and the responsibility of farming is mostly on Bati's shoulders. Bati allocated 540 sq m behind her house for guava plantation along with inter-crop of papaya. Initially the project was sceptic in her ability to manage the plot but overtime Bati has picked up and has brought both the plants to fruiting stage.
Orchard preparation Pit digging, manuring, plantation and staking as part of orchard preparation	Layout of the plot is undertaken and if the plot is not rectangular than a 90º layout is designed. Pits are marked at a distance of 3m on all four sides and plant to plant and plant to row distance is based on choice of specific crop. Similarly, the dimension of the pit varies based on crop selected by the farmer. The project focused on promotion of guava, papaya, mangoes and pomegranate under its nano orchard initiative. Farmersare trained in the manner in which the top and bottom soil is kept separately so that the same can be used for pit filling. Training and preparation of organic manure and identification of saplings for plantation is given to the farmers. Once the plantation is done the farmers are trained in staking to protect the plant from wind and to give stability to its roots.	Dayaram Khatik living in Changeri village of Kotma block in Anuppur district of Madhya Pradesh has four acres of land on which he was cultivating paddy which was insufficient to feed his family. In 2017, he decided to establish a nano orchard on his land. He undertook all the necessary steps for the preparation of the orchard. The plot was, however, away from his home and once the plantation was completed, he started living in the orchard where he planted 40 guava and 20 mango plants.
Orchard Management Pruning, irrigation, pest, disease management and nutrient management.	Training in pruning of plants, and development of efficient system of irrigation (drip, pitcher, mulching etc.) are provided to farmers so that they are able to maintain continuous soil moisture in the orchard. Farmers are trained in the making of Jeevamrit (combination of cow urine, dung, jaggery, gram flour and water) and other organic plant nutrients along with their cycle of application in the orchard. Training on organic pesticides and identification of plant specific diseases and pest is also provided to the farmers.	Dayaram followed the entire cycle of manuring, irrigation and nutrient management for his plants. He was linked to the *Mahatma Gandhi NREGS* scheme where he was to be paid for the maintenance of the plants from the programme. Dayaram was linked to Nandan Phalo Udyan scheme where he procured 200 mango plants in 2018. In next year, he raised the demand for additional 100 plants of guava and has now 360 plants in his orchard. Dayaram prepares his own Jeevamrit and procures organic manure from his own farm.

Diversification Promotion of vegetables and other inter-crop plants in Nano orchards	Based on the capacity of the farmers, the project promoted inter crop and/or vegetable cultivation in the nano orchard. Papaya as an inter-crop was popular among farmers in Pratapgarh and Pali in Rajasthan and vegetable cultivation was undertaken by famers in Sagar district of Madhya Pradesh.	Dariya Meena, resident of Badayala village in Peepal Khont block of Pratapgarh district of Rajasthan, owns 1.69 acres of land. With limited opportunities for increasing their income from agriculture, the adult members of the family often resorted to work as agriculture labourers and migrated in search of work. Dariya Bai designated 0.2 acre of land for nano orchard with plantation of 60 guava plants. Along with this she also went in for high density plantation of papaya plants as inter-crop in the orchard. Starting in 2017 Dariya bai has harvested 1,050 kgs of papaya and with average price of papaya between 20-25 per kg, she was able to earn an income of Rs 15,000 in the first year.
Convergence Convergence with government schemes and programmes and collaborations with technical resource institutions	Project converged with *Mahatma Gandhi NREGS* and Department of Agriculture and Horticulture in accessing resources for the farmer beneficiaries. With *Mahatma Gandhi NREGS* the aim was not only to enable infrastructure facilities related to water (e.g. dug wells, small ponds) but also to link the beneficiaries to the Nandan Phal Udyan sub-scheme of the programme. With the Department of Agriculture and Horticulture convergence to access irrigation equipment, tools and equipment and seed kits for the farmers.	At Anuppur in Madhya Pradesh, farmers were linked to Nandan Phal Udyan sub scheme of *Mahatma Gandhi NREGS* that under which the farmers are paid INR 870 per plant per year for three years for ensuring 80% of the plant survival. 224 farmers in the district were paid labour payments under *Mahatma Gandhi NREGS* for making of Nano Orchards in their fields. 55 farm ponds and 9 dug wells were made on fields of farmers under *Mahatma Gandhi NREGS* to increase availability of water for agri-horticulture activities. 557 farmers have been provided with vermicompost and seed kits under the project.
Collaboration Collaborative partnerships with resource institutions to gain from their technical knowledge	The project collaborated with the National Centre for Pomegranate Research (NCPR) and Central Institute for Sub-Tropical Horticulture for technical support and guidance for pomegranate, guava and mango respectively.	NCPR has partnered with SRIJAN to provide frontline demonstration of pomegranate and to improve the capacity of the project team. 7 such orchards have been established in collaboration with NCPR and 20 farmers have been provided with materials and they gain from the benefit of regular visits from the scientists from the institute.
Collectivisation Collectivise farmers for production and marketing wherever there has been opportunity in their project areas	SRIJAN has organisational experience and band width of forming collectives. They have formed 5,500 Self Help Groups (SHGs) and seven Farmer Producer Organisations (FPOs) in their project areas. As an organisation, SRIJAN has been promoting collective farming and marketing in the project areas though the existing collectives or by forming new collectives.	Patadi village is located in Palera block of Tikamgarh district. A group of farmers in the village owned land near the main road but prone to frequent damage by the nilgai (blue bull). Away from the main settlement, this patch of land was devoid of proper protective measures from the animal and was largely left uncultivated. Eleven famers agreed for numbers guava plantation and planted 750 plants on three acres of land. As a group, the farmers collectively contributed for the cost of fencing, gate and bore a well on the land. From 2020, the farmers have started taking guava crop at an estimated production of three quintals for 100 plants. With increased availability of water and protection, the farmers have planted flowers and vegetables which is also source of regular income to them.

SRIJAN finds Nano orchards have the advantage of optimising returns, diversifying risks, have greater probability for sustainability based on natural systems, and support agriculture in multiple ways, e.g., increase the availability of organic matter and the possibility of inter-cropping with vegetables, efficiency in use of water, and reduced distress for sale of agro-produce as the farmers has additional cash income from their horticulture crop. In their experience, the produce from nano orchards starts giving returns from the fourth year onwards and the average income from these orchards has been estimated to be INR 70,000 per year.

Learning from Case Studies

Contextualise: Holistic Solutions

CDC contextualised the dependence of farmers on forests for their livelihoods and sought solutions through the promotion of horticulture in their fields. SRIJAN read the decreasing size of operational holdings of farmers in tribal areas as the primary reason for experimenting with Nano Wadi as a possible solution. Even other agencies, for example the District Collector of Chittorgarh in Rajasthan (see box Panch-Phal) and the project agency for Greening of Hillocks in Anantapuram district of Andhra Pradesh (see box Greening of Hillocks) had their own understanding of the context that led them to strategise horticulture as a possible solution to the issues that they had identified, namely, the removal of encroachment in case of Rajasthan, and reclaiming ecosystem services in case of the latter.

Panch-Phal: Reclaiming and Investing on Commons

Pasture lands faced with encroachments, soil erosion, and depleting tree cover were undertaken for afforestation works by the then District Collector of Chittorgarh under *Mahatma Gandhi NREGA* in 2011. 92 horticulture plantations, each on five ha of land, were identified and developed in all the eleven blocks of the district. In addition to the stated objective of removal of encroachments, the aim was to create productive, permanent, and environment beneficial assets and an income source for GPs. Strategically, it was decided to plant at least five fruits in each such plantation (e.g. lemon, guava, custard apple, timru, amla, pomegranate, jamun etc.) so that they complement each other and provide a regular source of income.

With the approval of Gram Sabhas, the proposals were included in the Annual Action Plan of *Mahatma Gandhi NREGS*. Training for officials and Sarpanches ware conducted and resource convergence with the National Horticulture Mission, Corporate Social Responsibility (CSR) (barbed wire fencing) and funds under Finance Commission (drip irrigation and bore wells) were effected along with the technical collaboration with the Department of Agriculture, Department of Revenue and Department of Panchayat Raj to coordinate and contribute at the field level.

A five-year development and maintenance plan under *Mahatma Gandhi NREGA* was prepared and implemented wherein the first year was for land development and plantation including ditch cum bund fencing, stone wall fencing, pit digging, application of fertilisers and pesticides, weeding, hoeing, watering, and watchman of horticulture plants. In the successive four years, activities related to gap filling plantation, care and nutrition of each plant was carried out.

An impact assessment of plantations identified direct benefits that included arresting soil erosion, improvements in micro climatic conditions, controlled grazing, increased availability of fodder, and additional income to the persons directly employed under *Mahatma Gandhi NREGS* works and subsequently in maintenance and protection of these plantations.

©SRIJAN

Context assumes relevance because the aim is not the promotion of horticulture per se, but to use horticulture as a strategic tool to improve livelihoods of the target group. The context defines the problem that enables the development of contours of the intervention strategy; and it tactically ensures engagement with the target groups in seeking solutions thus making the intervention rooted through the agency of the farmers. This is as much true for interventions that are targeted ar private lands of individual farmers as it is for the development of common lands. Where CDC and SRIJAN underline the intensity of engagement in targeting and the selection of target group, interventions under Panch-Phal and the Greening of Hillocks initiative exemplify the engagement with the community (through the agency of the Gram Sabha and later with the user groups) in developing action plans for implementation.

The projects are based on an extension approach, yet the agency of the farmer is central to their intervention. The baseline that provided information to the project becomes the basis for engagement with each farmer and also allowed the project team to appreciate the strengths and constraints faced by them. The adoption of the sustainable livelihood capital framework for data collection (by CDC) allowed the project to focus on the household (as compared to only promotion of horticulture) and enabled them to prioritise the areas of convergence with government schemes for these farmers.

Contextualising the issue enables the adoption of a holistic approach in design and implementation of the intervention. This is because the aim is to address the problem: the alternative paradigm of the Wadi Model in case of SRIJAN, reducing dependence on forestsin the case of CDC, arresting soil erosion and depleting groundwater in case of Greening of Hillocks; and removal of encroachments on commons in case of Panch-Phal initiatives.

Convergence: Benefit Multiplier

The holistic approach necessitates adopting convergence as an inherent strategy of implementation. As is evident from the cases presented, convergence can be of different types:

- **Technical knowledge:** Different agencies come together to provide technical input for the design, implementation and monitoring of interventions. For example, in case of SRIJAN the technical inputs provided by National Centre for Pomegranate Research (NCPR) and Central Institute for Subtropical Horticulture (CISH) has been instrumental during the design and later for monitoring of plants in the fields. Similarly, in Panch-Phal inputs from Krishi Vigyan Kendra (KVK) and National Horticulture Mission and in case of CDC the KVK and Department of Horticulture were instrumental in giving technical and expert inputs to the project.

- **Financial:** Convergence within the sub schemes of *Mahatma Gandhi NREGS*, with schemes and programmes of other department, CSR funds (Panch-Phal) created opportunities for leveraging additional resources for the beneficiaries and the area. Financial convergence has been in provisioning of additional funds (CSR funds) or provisioning of subsidy to the beneficiaries that enabled them to buy additional equipment (pumps and pipes).

- **Material:** Material by way of horticulture seeds (seed kits) or agriculture equipment (winnow fan) were accessed for beneficiaries under the schemes of Department of Horticulture and Agriculture respectively.

- **Coordination:** Administrative and managerial coordination, especially for marking of commons, organising of Gram Sabhas, have been instrumental in smoothening the implementation at field and village levels.

To be effective, convergence should be used as part of a conscious strategy. For example, in case of Panch-Phal, CSR funds were used to fill the critical gap in funding required for barbed wires, or in case of SRIJAN and CDC convergence with *Mahatma Gandhi NREGS* was used to ensure provisioning of dug well for the beneficiary. If the project intervention is based on a certain context, then it will allow, and demand, convergence with different programmes to make such interventions holistic and complete.

Convergence also enables value additions to the initial investments and allows beneficiaries to expand and set themselves a growth path. The case of Balakrishna (see Box: Balakrishna U Bandgar: Converging and Multiplying) has mostly been an individual's efforts but it does exemplify how convergence can give further impetus and sets in the benefit multiplier at the beneficiary level.

Balakrishna U Bandgar: Converging and Multiplying

Balakrishna, resident of Koregaon in Satara district of Maharashtra, used to graze his cattle for which he had to migrate in search of water and fodder. Earnings were falling as access to and the availability of water and fodder were decreasing. Attending Rojgar Diwas under *Mahatma Gandhi NREGS*, he came to know of the dug well scheme and applied for the same for his land. Once his application was approved, he got to know of more such schemes not only under *Mahatma Gandhi NREGS* but of other related departments as well.

With assured availability of water, he planted 350 pomegranate trees, the saplings that he got under Employment Guarantee Scheme. In addition to the irrigation well, he got subsidy for well recharge, NADEP, and vermicomposting from *Mahatma Gandhi NREGS*. Drip irrigation and power tiller were accessed from Agriculture Department which allowed him to intensify and diversify his agriculture. He has so far produced 20 tons of pomegranate and also cultivates and sells tomato, ginger and marigold in the local market. Balakrishna received a total subsidy of INR 3,06,000 from government under different schemes which has led to a total transformation from nomadic cattle grazing to a settled agriculture livelihood.

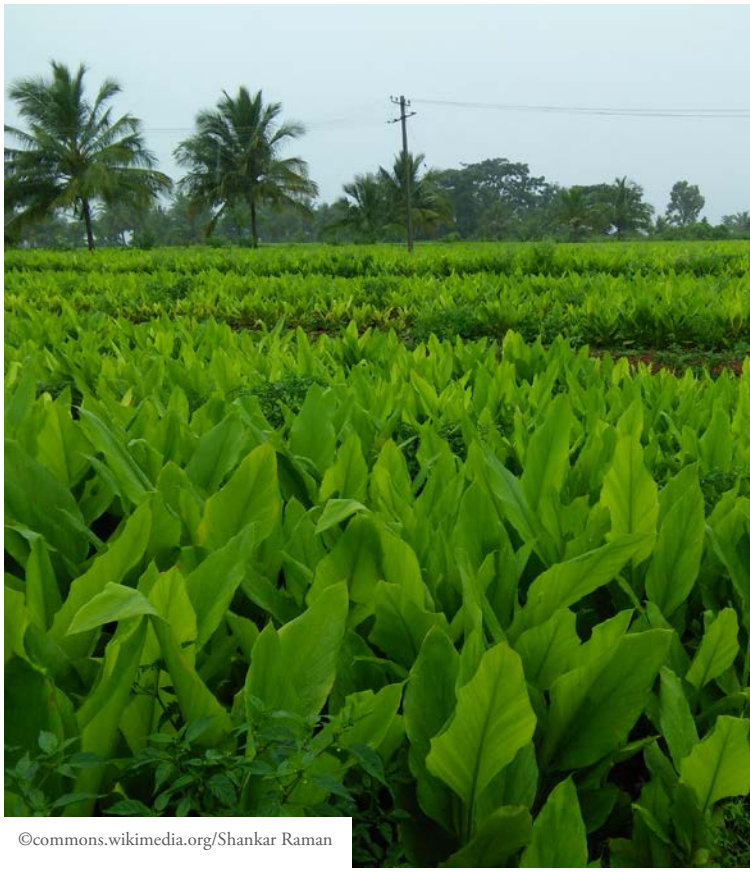
Complementarity: Risk Diversification and Adoption

Horticulture for improving livelihoods of the vulnerable group was promoted as a complementary activity to support the main livelihood activity, namely agriculture, by both CDC and SRIJAN in their respective projects. This was a conscious decision mainly on three counts: one, to diversify the risk (and not to replace it) inherent in the main livelihood activity, that is, agriculture; second, togive time and generate experience with the beneficiary so that they are able to gradually adopt these crops on a sustainable basis; and third, to enable the households to maintain the existing level of food security accorded by their existing agricultural activity.

Complementarity in the promotion of horticulture was instrumental which enabled the beneficiary to allocate asmall patch of land for cultivation of vegetable/fruit while retaining most of their land for their main agriculture crop.As the main beneficiaries of the intervention are small and marginal farmers, complementarity of horticulture as part of the livelihood portfolio of the beneficiary household, has been a contributory factor of their adoption and later onself-propelled growth by the beneficiaries themselves.

Complementarity of horticulture is evident in restoration of commons as well (see box Panch-Phal and Greening of Hillocks). In both the cases, the aim was reclaiming of common for pasture, for arresting soil erosion, and for improving water retention. Horticulture crops, especially fruit bearing trees, were used to create an ecosystem on common lands to hold the soil and to provide additional income earning opportunity to the GP/User groups through the sale of fruits. The aim was not to develop fruit orchards but to plant these trees intermittently whichcomplements other investments on soil and moisture conservation and pasture development.

Horticulture works well to develop synergetic models based on Agro-horticulture crops (CDC and SRIJAN) or Horti-pasture development (Panch-Phal) and Hort-silvi- pasture development (Greening of Hillocks). Use of horticulture for making investments on natural resources management and/or improvements in livelihoods of the vulnerable groups needs to incorporate the complementarity of horticulture in designing and implementation of such interventions.



©commons.wikimedia.org/Shankar Raman

Horticulture: Improving Ecosystem Services from Commons by Greening Hillocks

Anantapuram district of Andhra Pradesh has 15% area under uplands and hills andis located in a rain deficit region faced with erratic rainfall. The hills once had dense and diverse vegetative cover and served as commons that provided biomass, fodder, foods, and timber to communities for various livelihood activities. Enabling gently flow of water, these hills arrested soil erosion and made water available much after the rains had receded. Over time, due to various reasons, these hills have become barren and became infested with inflammable grasses (e.g. Cymbopogon contortus) that lead to frequent fires, adversely affecting the natural regeneration process, promoting soil erosion especially on slopes, and destroying the availability and abundance of vegetative resources for the community.

Greening of hillocks was undertaken on 160 ha through soil and moisture conservation works and integrated plantation techniques. Former included the digging of staggered trenches, draining of line treatments and construction of water harvesting structures, adopting a ridge to valley approach. Latter entailed high density plantation of drought hardy and quick germinating species like custard apple and Pongamia on down stream of mounds to increase greenery and survival rate of plants; and plantation of tall seedlings like Jamun and Tamarind as peripheral plantations. A GIS based Decision Support System (DSS) was used for planning that provided alternative scenarios for the greening of hillocks based ona number of natural and climatic parameters. User groups were developed to maintain plantations and to reap benefits from plants as they start bearing fruits.

Enhanced green cover, prevention of soil erosion, facilitation of groundwater recharge, increased availability of fodder, and improvement in soil moisture for farmers in the foothills of the hillocks were identified as the direct impact of the greening hillocks initiative. High participation of women in plantation and maintenance was noted by the assessment along with the fact that the plants were suited to local conditions and required low maintenance and hence are more likely to give sustainable returns to the communities. The project was identified as the 'most impactful intervention' and was taken up by the state government for upscaling in all the districts of the state. The area under the initiative increased from 160 ha in 2015-16 to 10,150 ha in 2018-19.

Women

Women, in both the initiatives, gain through multiple pathways:

(a) Employed as wage labour under *Mahatma Gandhi NREGS*. For example, under the Greening of Hills initiative, 200 women were employed as wage labour during the course of implementation.

(b) Additional income from sale of horticulture produces. Where SRIJAN specifically targeted women as the primary beneficiary of their Nano Wadi model, in case of CDC women's gain has been contingent on the increase in income through sale of vegetables. In case of Panch-Phal and Greening of Hillocks women have been part of the user groups that were responsible for the maintenance of plants (hence paid wage labour) and also the usufruct rights over the produce from these trees (additional income).

(c) Increase in technical knowledge and experience on plantation, care and harvesting of horticulture crops. Trainings of CDC and SRIJAN were targeted to both, men and women members of the households, and in case of Panch-Phal and Greening of Hillocks, women constituted the group that received training on various aspects of plantation and soil and moisture conservation works.

(d) Increase in access to natural resources including fodder, leaves, small wood and water which are traditionally reserved for women. Being able to collect the same from near their village reduced their burden of travelling long distances in search of these resources.

(e) The Greening of Hillock initiative noted the increased participation of women in Gram Sabha meetings indicating potential for political empowerment of women through the project.

(f) Enrichment of the food systems that are accessed by the households. In case of CDC and SRIJAN the addition to household food systems has been direct whereas in the other two cases the addition has been in the uncultivated food system that is accessible from and within the common lands of GPs.

The gains to women indicate that in cases where similar initiatives are planned, these can be women centric and women-led interventions so that gains to women are direct and within their own domain of access and control.

Mango Plantation: Leveraging *Mahatma Gandhi NREGA* for horticulture-based incomes in Jharkhand

Jharkhand
Supported by: *Mahatma Gandhi NREGS*

Context

Jharkhand state has low cropping intensity with high dependence on rain-fed farming activities due to very low irrigation cover which is only twelve percent. Barren and infertile land in the state is in abundance. Large-scale development of horticulture orchards has been promoted in the state as a part of the *Mahatma Gandhi NREGS*.

Strategy and Implementation

The Rural Development Department of the government of Jharkhand, rolled out detailed strategy, to support a combination of horticulture plantations with intercropping practice in some of the impoverished pockets of the state, focusing on the vulnerable groups with small or no landholdings, especially SC, STs, Particularly Vulnerable Tribal Group households (PVTGs).

As *Mahatma Gandhi NREGA* is a process-intensive programme and horticulture is a time bound activity making the integration of the two even more difficult as a process. While the success of horticulture initiative depends on strict adherence to timeliness to ensure the survival of the plantation, the success of *Mahatma Gandhi NREGA* relies on the timely payments. For implementation, Rural Development Department worked in collaboration with Civil Society Organisations (CSOs) in the state for the development of a workable model with strict timelines and clear guidelines.

Initially the plantation initiative was launched as a pilot in the state. This followed the launch of full-fledged state government level scheme called Birsa Munda Bagwaani scheme. The scheme has coupled fruit production activities undertaken by individual farmers with the social protection programme. Detailed government orders with the role and responsibilities of the relevant stakeholders, selection of the genuine beneficiary, selection of suitable patch of land (which is barren and irrigated), package of practices for maintenance, upkeep, irrigation, pest management, material procurement, etc. The necessary labour and material payments are covered through *Mahatma Gandhi NREGA* and there are provisions for replacement of plants in the subsequent year in case of mortality. The department engaged with experts and provided intense trainings for all the key stakeholders through the training of trainers approach to support the technical plantation activity across the state.

The state invested in developing its technical expertise as well as in its capacity to plan, execute, review, and monitor plantations. The Cluster Facilitation Team (CFT) project of the Rural Development Department in collaboration with CSOs helped plug the crucial gap at the field level. The CFT team provided the last mile connectivity and engaged intensively with the beneficiaries.

The scheme is well designed with the works which could be undertaken under *Mahatma Gandhi NREGS* especially related to plantations, soil and water conservation. Convergence with other government programmes is a crucial element under the scheme to fill the resource gap between schemes like drip irrigation system in erstwhile barren lands, promotion of inter cropping of vegetables, etc. This is helping the households to build assets to support livelihoods.

Impact

With the inter-departmental convergence, support from civil society organisations and help from the local administration households involved in the scheme were able to reduce the initial no-income period from horticulture plantation. Like in the first few years of the implementation beneficiaries were able to get incomes from vegetables apart from the incomes from the wages under *Mahatma Gandhi NREGS* for working on the horticulture site. Subsequently, when the fruits from mango plantation comes it leads to income generation in the season. Mango plantation can bring returns for approximately 30 years. The approach improves the productivity of works under *Mahatma Gandhi NREGA*. Under this scheme, the Rural Development Department has undertaken plantation in more than 50,000 acres (20,000 Ha) planting more than five million fruit trees and two million timber trees in all the 24 districts benefitting thousands of families across the state.

Taking in due consideration of the topography and landscape of Jharkhand, this scheme is an exemplary initiative. It can be a game changer as it can potentially provide up to INR 1,000 per plant to the beneficiaries.

Up-Scaling

The CDC case indicates that horticulture as an alternative option for small and marginal farmers can be employed in two contrasting situations: one, in areas where the farmers are dependent on forests (especially protected areas) to reduce dependence on forest for conduct of their livelihoods; and second, in areas where the forests are degraded as the households in these areas are facing depleting returns from their existing livelihood. With 5.03% of the geographical area in the country designated as protected area, either by way of national park, wildlife sanctuary, community reserve and conservation reserves there are large tracts of landscape where communities are housed and are/were dependent on forests for the livelihoods. Though similar data for areas near degraded forest is not available, if we take the data for scrub as degraded forest (canopy density less than 0.1) then 9.1% of the geographical area (and 42.6% of forest area) of the country comprise of degraded forest.

SRIJAN's Nano Wadi model has proved its relevance for small and marginal farmers in different geographical contexts- Rajasthan, Madhya Pradesh and Chhattisgarh. The model has proven its utility in tribal areas located in dry and semi-arid zones. In most cases, the small farmers take one crop and work as labour, in various capacities, for the remaining part of the year. Nano Wadis in such cases provide long term investments and once converged with schemes that ensure irrigation, these prove to be a profitable venture in the long run.

SRIJAN's Nano Wadi model has been adopted by the Government of Madhya Pradesh as part of the Nandan PhaloUdyan sub scheme of *Mahatma Gandhi NREGS*. The model of increased density of plantations and inter-cropping with horticulture crops has been incorporated as part of the sub-scheme. The districts have been advised to incorporate Nano Wadis as part of *Mahatma Gandhi NREGS* and the district Collector of Chhindwara has already issued orders to promote Nano Wadis in the district.

The Greening of Hillocks scheme has been up-scaled for the entire states as government found its relevance for different areas in these districts. Similarly, the Panch-Phal initiative was up-scaled in Bhilwara district of Rajasthan. Both these initiatives indicate a high potential for up-scaling in the restoration of permanent pasture lands which represent 3.92% of the total geographical area of the country. These lands not only provide fodder but are sources of major eco-system services that include water, organic material, availability of uncultivated foods, and bio-diversity banks that represent rich natural resource base of the country side. Restoration of these areas serve multiple purpose of securing food systems as well as strengthening the natural resource base at micro levels.

©SRIJAN

Good Practices

(a) Micro Planning
Projects have adopted a process (as against a blueprint) approach in designing and implementation of activities with the target groups/area. Intensive and participative micro planning exercises have been a common and running theme in all the case studies presented here. Conduct of PRA in case of common lands in Panch-Phal and Greening of Hillocks and households level planning and counselling in case of CDC and SRIJAN have been undertaken as part of planning for intervention under the project.

(b) Collectives
Kisan Panchayats, Cluster based farmer's group, Self-Help-Groups (SHGs) and the presence of FPOs have been the base that provided strong institutional support mechanisms not only to the target beneficiaries but also to the project implementation teams. These collectives have provided the opportunity for broad basing the interventions by providing platforms for reflection and assessing their usefulness, also finding ways for replicating and identifying additional beneficiaries for the interventions.

(c) Decision Support System (DSS)
Greening of Hillocks used the GIS based DSS computer programme using Multi-Criteria-Decision Analysis for identification of hillocks, planning for soil conservation, moisture and silviculture, and in selection of suitable species for propagation. Flexibility in DSS enables planning under different scenarios of hillock eco-system and being interactive, it enables prioritisation and visualisation of spatial and temporal dimension for greening. The planning entails multiple variables that include soil types, morphology, land use, wastelands, rainfall, temperature, nearness to habitation etc. Andhra Pradesh Space Applications Centre (APSAC) has developed the DSS as an open-source platform that can be accessed through the APSAC website.

(d) Linkage with Technical Agencies
SRIJAN linkage with technical institutions namely, National Research Centre on Pomegranate and Central Institute for Subtropical Horticulture provided valuable inputs on best practices to pomegranate farmers, and to Mango and Guava growers within the project. There was regular exchange and support in the form of training, exposure and interface with technical experts during crucial stages of crop cycle. Such linkages not only provided technical strength to the initiative but also added credibility in demonstrating the model to administration for upscaling.

(e) Income from maintenance
Wages under *Mahatma Gandhi NREGS* have been paid for maintenance of horticulture plants on common lands for three years. SRIJAN however was able to develop the mechanism for payment under *Mahatma Gandhi NREGS* for plants under their Nano Wadi initiative (through MoU with Zila Panchayat Anuppur in Madhya Pradesh). These wages were critical as they provided wage income to the family and enabled them to bridge the periods of livelihood stress until they were able to earn income through sale of produce from their crops.

©Pexel/Quang Nguyen Vinh

Fisheries: Converge, Collectivise and Capacitate

What are the possibilities in fisheries to emerge as a sustainable livelihood option for individuals and collectives? Do fisheries require a minimum scale for their operations or are they scale agnostic? How can women be gainfully employed in fisheries? What are the possibilities for convergence and potentials for growth in fisheries? The cases presented in this chapter suggest different pathways in fisheries,that the project agencies can adopt,especially for generating sustainable livelihood options for landless households, traditional fishers, and small and marginal farmers.

Out of the total fish production of 14.17 MT in the country in 2019-20, 73.6% (10.43 MT) came from inland fish production. The average annual growth rate of inland fisheries reached its all-time peak in 2017-18 at 14.62% and stands at 7.37% in 2019-20. The importance of fisheries in the Indian economy is underlined by the fact that as a sector, fisheries contribute 1.24% (INR 2,12,915 Crores) to the economy and 7.28% to the country's agriculture sector. India is the second largest producer of inland fisheries and the fourth largest exporter of fish in the world.

As a source of employment there are 2.8 crores fishermen in the country of which 83% are employed in the inland fisheries sector. Significantly, 44% of inland fishers are women, indicating a fair amount of the presence of women employment within this sector. However, of the total fishers employed in inland fisheries, only seven percent are employed on a full-time basis, the others work part-time or as occasional fishers.

Fish production in Bihar, Jharkhand, Madhya Pradesh and Rajasthan was 6.41, 2.23, 2.00 and 1.16 lakh tonnes resectively in 2019-20. These states have been reporting annual increases in fish production for the past five years. The fisher population in the districts of these states has been reported to be 1.58 lakhs per district in Bihar and 42,939, 5,870 and 1,735 per district in Madhya Pradesh, Jharkhand and Rajasthan respectively.

Fisheries as a livelihood activity can be adopted at different scales, at different points in the value chain, and by communities that may not have previous knowledge of fishing. The cases detailed here explore these aspects and underline the many possibilities that exist for small and marginal farmers and the landless households to adopt fisheries as a potential sustainable and profitable livelihood activity for their household.

Fisheries Promotion through *Mahatma Gandhi NREGS*

Tangra Village, Dubra Gram Panchayat, Chakdah block of Nadia district of West Bengal
Implementing Agency: Department of Rural
Supported by: *Mahatma Gandhi NREGS* Development, West Bengal

Context

Population of Nadia district was enumerated at 51.67 lakhs during 2011 Census with a sex ratio of 947. Predominantly rural in character, with 72% of the population residing in the countryside, the work participation and literacy rates indicate an adverse situation for women in the district. The literacy gap for females is 8% and with the total literacy of 75%, the district is below the state average of 78%. In terms of work participation rates, 11.9% of main workers were women, and within women only 7.5% were employed regularly for more than six months a year. Work participation rates of women as marginal workers was 3.9% indicating that women are neither getting employed on a regular basis nor even for shorter durations.

The gender gap in literacy and work participation is reflected in the prevalence of early marriage in Nadia district. A multi regression analysis[1] has placed Nadia district within the cluster of districts with high prevalence of child marriage in the state. Early marriage deprives girls from higher education, reduces job opportunities, relegating them to a life with high levels of economic dependency and subject to frequent exploitation.

To improve the quality of planning and durability of assets, the Government of India launched an Intensive Participatory Planning Exercise (IPPE) in 2,500 backward blocks in 2014. With a clear 'Outcome Orientation'the exercise brought the outcomes of work in to focus during planning and execution under the programme. The Chakdah block of Nadia district was covered under the IPPE in July 2014.

The importance of fisheries in the Indian economy is underlined by the fact that as a sector, fisheries contribute 1.24% (INR 2,12,915 Crores) to the economy and 7.28% to the country's agriculture sector. India is the second largest producer of inland fisheries and the fourth largest exporter of fish in the world.

[1]Srinivasan, Padmavathi; Khan, Nizamuddin; Verma, Ravi; Giusti, Dora; Theis, Joachim & Chakraborty, Supriti. (2015). District-level study on child marriage in India: What do we know about the prevalence, trends and patterns? New Delhi, India: International Centre for Research on Women; 2015

Strategy and Implementation

The strategic elements of the initiative for promotion of cat fish production in Chakdah block were initiated through the process of IPPE undertaken under *Mahatma Gandhi NREGS.*

The presence of Unnati Self-Help-Group (SHG) made it possible for the participatory exercise to focus on the promotion of specific livelihood activities in the block and the village.

Strategy	Implementation	Case of Atar Singh Parte
Targeting and Collectivising Women Identification of women of BPL families and mobilising them to form a collective	West Bengal SRLM identified and mobilised women below poverty line (BPL) to form a SHG in Tangra village of Budra GP	10 women belonging to BPL families formed Unnati SHG in the village in 2014. The main intention of the group was to undertake thrift and credit for its members.
Capacity Building Capacity Building Develop capacity of the women SHG for production as well in preparing a business plan of the produce/product of their livelihood activity	Building capacities of groups on different livelihood activities. Department of Fisheries had a regular programme for training on production of catfish in rural areas.	Members of Unnati SHG were linked with the training programme on cat fish production conducted by Department of Fisheries. The training included the technical skills related to fish rearing and also to understand the market for fish and preparation of business plan based on these inputs.
Convergence with *Mahatma Gandhi NREGS* *Mahatma Gandhi NREGS* provides funds for excavation of ponds for conduct of livelihood activities.	Unnati submitted their plan for taking land on lease for production of catfish to the GP which was endorsed by GP and approved under *Mahatma Gandhi NREGS*.	Unnati took fivekattahs of land on lease (one kattah = 720 sq ft) for starting production of cat fish fingerlings. Under *Mahatma Gandhi NREGS* seven pits were excavated at an expenditure of INR 147,999. These pits served as nurseries for cat fish production.
Production-sale of Fish The production and sale of cat fish was undertaken by the group as a collective entrepreneurial activity by the SHG.	Presence of fish-eating community locally ensured that there is a regular demand for fish within the village and in the local market.	Unnati SHG spent money on fingerlings, electricity, rent of land, labour, feed and others. For one cycle of 45 days the group spent INR 1.75 lakhs. This money was accessed from their own savings and from their own sources. Five such cycles were undertaken in the first year thus leading to a total expense of INR 8.5 lakhs. The income for the first year was Rs 13.86 lakhs through sale of catfish giving a net profit of Rs 5.36 lakh to the group and thus each member earned INR 53,600 annually.
Up scaling Demonstration effect and planned efforts by the Block Panchayat led to up scaling of the fish production in Chakdah block.	SHGs in Block Panchayat were motivated and they placed their demand to start similar activity to Dubra GP in 2015.	The success of Unnati SHG motivated two more SHGs to come forward and place their demand for starting catfish production to the GP in 2015 which in increased to 7 groups in 2016. The GP approved the plans for all these groups and they came in to production.

	Block Panchayat developed specific plan for promotion of small pond for fisheries within the block under *Mahatma Gandhi NREGS* and the State Rural Livelihood Mission. Banks were convinced on the feasibility of fisheries as a profitable activity and they were willing to provide loan for the same.	Plan of Block Panchayat led to construction of 210 small ponds in Chakdah block. Network of fingerling producers, fish cultivators, and feed providers emerged as part of promotion of fisheries in the block. RRB declared their intention of providing credit to groups for fisheries in the block. Unnati was sanctioned a loan of INR 1 lakh to upgrade and expand their fish related activities through backward (production of fingerlings) and forward (production of fish feed) linkages.

Cat fish, locally known as Magur, are popular among the fish-eating community because of their taste and texture. But because of its predatory nature, large scale cultivation of cat fish are not carried out in the country. However, small scale production of cat fishwith a controlled environment works well and is able to provide good returns to the fishers.

Within magur, there are two dominant varieties the Indian Magur and the Thai Magur. The latter is banned by most states and it is advisable to check with the local fisheries department before initiating and promotion of cat fish at a particular site.

Fisheries as a Game Changer for Communities Impacted by Floods

Dimbhe dam in Ambegaon block of Pune District
Implementing Agency: Shashwat Trust, Pune
Supported by: SWISS AID

Context

Dimbhe is one of the six dams constructed in Ghod basin that are part of the Kukadi project. The dam is located near Ambegaon in Pune district and aims to provide irrigation to 34000 ha in 19 villages that lie on its fringes. The dam is located in Schedule V area that houses tribes belonging to Mahadeo Koi, Thakkar, Kathodi, Katkhari, and Thokri Koi tribal communities. Construction of the dam has caused the submergence of 2202 ha of tribal land which has led to complete submergence of 11 villages and partial submergence of 13 villages. This has been a shock for the tribals as they had to move away from their best lands located near the river to the hill slopes above the water level. Though water is available for irrigation, the loss of appropriate land there has made a search for alternative livelihood opportunities necessary to compensate for the loss and enable the tribal people to develop another profitable source of livelihoods.

In 2003, members of Shashwat Trust from Pune observed that 25-40 tribals would venture in to Dimbhe dam's reservoir on truck rubber tubes along with the gill net to catch fish. The catch used to be low, just enough for their own consumption, but it struck the team that though the tribals have identified an alternative livelihood, they primarily lack the wherewithal to build on it.

Strategy and Implementation

Shashwat Trust has been the key agency in mobilising the community to look collectively at fisheries as a viable livelihood option. The Trust also engaged with the district administration and technical agency in developing a strategic plan for the Fisher's cooperative to make fisheries profitable and sustainable, for its members as well as for the tribal community in the region.

Strategy	Implementation	Case of Atar Singh Parte
Mobilisation and Collectivisation Participative and consultative process was started in all the dam affected villages by Shashwat Trust	Meetings were held with the community in 19 villages. The issue of fisheries and the need to form collectives for the same was discussed in these meetings.	Formation of 32 SHGs took place. Later Dimbhe Jalashay Shramik Adivasi Machimar Sahkari Society Maryadit was formed as a cooperative and federated structure of SHGs.
Collaboration with Technical Resource Agencies Shahswat Trust did not have any previous experience in fisheries and in the formation of collectives around it.	Bargi Dam Displaced People's Association, in Jabalpur Madhya Pradesh, was contacted for gaining insight in conducting meetings in the villages and also in formation of collectives. Central Institute of Fisheries Education (CIFE) was contacted to provide guidance on stocking of fish and later on for the introduction of technique of cage culture in the dam.	The People's Association of Bargi guided the SHGs and the community towards formation of the Cooperative; and in gaining fishing rights for the cooperative. CIFE visited on the invitation of the Divisional Commissioner. They provided the technique for aggressive stocking of fish comprising of rohu, catla and mrigal. In 2007 CIFE trained and introduced cage culture for rearing of fingerlings and later in in 2010 for rearing of ornamental fish by the cooperative.
Convergence with Poverty Alleviation Programme Divisional Commissioner developed a plan for poverty alleviation for 38 villages in which fisheries was one of the three key activities along with draw down cultivation and making of new paddy fields.	With Divisional Commissioner spearheading the poverty alleviation programme it enabled convergence between the Department of Fisheries, Revenue, Cooperatives, Irrigation, and Tribal Development.	Department of Cooperatives was instrumental in enabling in the formation of the Cooperative initially and later on in election of the Board of Director every five years. The Assistance Registrar provided inputs in enabling the cooperative to undertake compliances under the different acts and regulations. Department of Fisheries not only provided training but also enabled the cooperative and the fishers to buy nets, motor boats, and fingerlings for stocking in the reservoir. Further the department played a key role in getting the contract for fishing for the cooperative and endorsed their demand for cage with CIFE and National Fish Development Board on subsidised rates. Department of Revenue and Tribal Development were instrumental in identifying the dam displaced/affected persons and in demarcating the jurisdiction of the cooperative for the conduct of fisheries in the Dimbhe dam reservoir.
Production-sale of Fish With rights of fishing secured by the cooperative fisheries is carried out by the cooperative in dam reservoir on a continual basis	Dam reservoir was emptied twice between 2000-02 and all the fish died. The lease was with a private contractor who did not stock fish in later years. He brought in fishermen from outside for fishing in the dam. Tribals and the Cooperative protested which was upheld by the Department of Fisheries and in 2006 the Cooperative was granted the fishing rights in the dam reservoir.	Cooperative did not have enough money for pay for the lease amount and for stocking of fish seed in the dam. The contribution by the members was supplemented by a loan arranged by Shashwat Trust, grant from the Department of Tribal Development and grant from SWISS AID. Formation of 32 SHGs took place. Later Dimbhe Jalashay Shramik Adivasi Machimar Sahkari Society Maryadit was formed as a cooperative and federated structure of SHGs.

Growth and Diversification

With Cooperative able to sustain fisheries additional opportunities for growth and diversification were possible.

The Cooperative engaged intensively with technical agencies and the members were willing to learn and build upon the fisheries that they have started. They received support from Shashwat Trust in their journey of growth and diversification.

Women members of the cooperative and the SHGs have been vocal in placing their demand to Shahswat Trust and CIFE for further expansion and for forward and backward integration within fisheries. This interaction has led to increase in skills and diversification in fish rearing by the cooperative.

Advanced Fingerlings: Fingerlings of 25-35 mm size released in the reservoir had a low survival rate (10-15%) and hence led to loss in terms of decreased catch. With CIFE the cooperative learned to rear advanced fingerlings (100-150 mm) that enabled a survival rate of 85-90% in the reservoir.

Cage Culture: CIFE trained the cooperative members in the conduct of cage culture for rearing of advanced fingerlings. Initially 4 cages were given which the cooperative used diligently (regular cleaning, regularity on providing feed). This was recognised by CIFE and they further approved 16 more cages and later the National Fisheries Development Board (NFDB) sanctioned 32 cages for rearing of advanced fingerlings and rearing of ornamental fish.

Pen Culture: CIFE trained members in use of Pen culture for rearing of advanced fingerling. Though the installation of Pen is less costly than the cage, the uncertainty of rains made this a riskier investment than the cage.

Ornamental Fish: On demand of women members of the cooperative, CIFE provided training to women SHGs on rearing of gold fish and angel fish through the cage culture technique. The SHGs have gained proficiency and have sold brooder gold fish to CIFE.

The journey of Fisher's Cooperative at Dimbhe Dam had its share of heartbreak and moments of exhilaration. In 2008, there had been a pest attack on teak that led to falling of leaves in large quantities. These leaves fell in the reservoir and built a stock mass that used to get struck in the nets of fishermen as a result of which they were unable to catch fish and had to spent additional money and time in the cleaning of their nets. In 2011, there was excessive rain and the gates of the dam had to be opened. The fish escaped the reservoir and the cooperative estimated that it lost three tonnes of fish on this count, which translate in loss of revenue of Rs3.5 lakhs. The fishermen from the Cooperative were pressed into action during floods in 2011, when at the request of the Divisional Commissioner, they were the first to reach people marooned in remote villages and rescued 700 persons.

The inherent advantage that Dimbhe dam offers is the fact that the upstream of the dam is forested and there are no pollutants (chemical fertiliser or insecticide or industrial/urban pollution) that are released in water. Fish cultivated in the dam thus has a texture and taste that is preferred by the buyers.

Learning from Case Studies

Move from catch to culture

Traditionally, fisheries in the country had focussed on catch-fish from water sources, rivers, lakes, ponds and reservoirs. Tribal communities have the skill and knowledge of catching fish. The knowledge and experience of fish culture that includes rearing and releasing of fingerlings in water bodies, providing regular feed and nutrition, monitoring their growth, protection from predators, and monitoring water quality has not been undertaken by them. These communities are also not adept at using dragnets that is suitable for harvesting large catches. These are taught skills and the experience at Dimbhe dam and with Unnati SHG at Nadia district exemplifies that training and capacity building in these aspects enable these communities to organise themselves and adopt fish culture practices.Even in cases where there is no previous or traditional experience of fisheries, the learned skills have been well adopted and used for the livelihood enhancement (see Surendra: Agriculture to Fish Culture).

As traditional fishers move to fish culture, they often do not have the required equipment, for example, boats, drag nets and similar other items for harvesting and storing of fish. The Departments of Fisheries in all states have schemes that not only provide skill training to fishers but also equipment at subsidised rates.

Surendra: Agriculture to Fish Culture

Surendra was a farmer in Jhajjar district of Haryana. His income from agriculture averaged around 1 to 1.5 lakhs per annum. He was, however, attracted to his friend's farm Devendra who was practicing fisheries on his own farm. Surendra used to accompany his friend to attend meetings and trainings of the Fisheries Department. Through these interactions, he realised that he can increase his income through fish culture and not just rely on agriculture as the only option for his livelihood.

In 2010 Surendra took the plunge and, along with his friend, started participating in auction of ponds in and around his village. He started rearing fish in the ponds that he was able to gain in auction. Getting water tested for fisheries, buying fingerlings from nearby district, maintaining species ratio, undertaking trail netting, monitoring for growth and diseases in fish, and by providing good quality feed to the fish he cultured rohu, catla, pangasius, mrigal and common carp.

As an autodidact, Surendra learned through his own efforts and through his interaction with the Fisheries department and other fishers in the area. Within ten years he has expanded his business and now has 35 ponds on lease and supplies fish not only in the district but to neighbouring districts as well. His annual turnover in 2020 was INR20 lakhs and he has recently established a 1.8 ha pond where he aims to harvest 31 tonnes of fish on an annual basis.

Surendra was awarded Best Inland Fish Farmer from Haryana in 2020 on World Fisheries Day.

Collaboration with Technical Agencies

Technical agencies in the form of Department of Fisheries and the Central Institute for Freshwater Aquaculture (CIFA), Central Institute of Fisheries Education (CIFE) and the National Fisheries Development Board (NFDB) have proven to be critical in providing local solutions and for enhancing and diversifying fisheries in different geo-cultural context. For example, in case of Dimbhe dam CIFE found that the aquatic productivity of the reservoir is half of the potential that exists. One of the reasons for this was the scanty population of zooplankton which is the natural feed for fish. This problem was addressed by planting a field under draw-down area with green manure crop of Taag/Dencha. Within one year the crop reached knee high and fish with large mouth, namely catla, was

observed to come to these areas to eat leaves of the plants. The additional advantage was the increased productivity of wheat that was cultivated on draw-down areas in the reservoir.

Another advantage of associating technical institutions with such initiatives is that they enable convergence with other departments and with schemes of central government. As the technical institutes carry out research and development activities on a regular basis and hence have the knowledge of and often funds to pilot evolving new technologies (see Box: Wealth from Waste) e.g., Fibreglass reinforcement plastics (FRP) hatchery that has reduced the cost of installing a hatchery substantially, making it available as demonstration units at different places.

Wealth from Waste

Nambikkari Nagar fishermen near Marina beach in Chennai engaged in fishing along the coastline were motivated by the Swachh Bharat campaign to clean the fish waste that they to dump near the fish market on a daily basis. Kennit Raj volunteered to lead the campaign for cleanliness, but with previous experience he approached the Central Institute for Brackishwater Aquaculture (CIBA) for technical guidance.

In 2016 Kennit Raj mobilised a Nambikkari Fish Farmers Self.Help.Group (SHG) and started recycling fish waste at his own house. The Central Institute of Brackish Water Aquaculture of the Indian Agriculture Institute (ICAR-CIBA) came forward and sanctioned a Fish Waste Processing Unit in 2019. The unit is now recycling fish waste and producing Planktonplus and Hortiplus. The former is used to maintain a healthy plankton bloom in the aquaculture system and the latter is used as organic manure for agriculture/horticulture.

The SHG procures fish waste from nearby markets and processes them in their plant for making of Plankton and Horti plus products. In the first year of its operation, they were able to produce 2000 lt of Plankton and generate a turnover of Rs 16.80 lakhs and a net profit of Rs 4.56 lakh. In 2019-20 the profits earned by the SHG was RS 8.5 lakhs. They have trained 110 fishers in processing of fish waste and now aim to start a bigger plant on 1.8 ha of land to cater to larger market across the country.

©commons.wikimedia.org/Delwar Hossain

Collectivisation

Fishery, essentially, is a group production and entrepreneurial livelihood activity. The need for a group arises from the need to carry out a range of activities - providing labour for pond preparation prior to introducing fish seed, procurement and introduction of fish seed/spawn/fry to the pond, providing regular feed to fishes, monitor water quality, growth of fish and disease outbreaks, protection of fish from predators and others from being caught, harvesting, and sale/storage of fish. Government policies too prefer a group that can take water body on lease, and the fishery related equipment, net, boat etc too are provided to a group.

Presence of a group allows conducting fisheries as a perennial activity (as against a seasonal activity). As a group, the fishers are able tofocus on the cultivation of fish that can be harvested for more than one cycle during the year (e.g., pangasius fish). Moreover, the group can also go for backward and/or forward integration of fishery related activity, for example, rearing of fingerlings as part of backward integration, and sale of fish products (fish pickle) as part of forward integration. With range of diversity of fish species available it is possible to undertake composite fishery, that is, rearing and cultivation of different species of fish from the same pond, for example, rohu, catla, common carp, and silver carp in the same water body as these live at different depths of water.

In most cases (unless they belong to traditional/caste-based fish rearing community) fishery is carried out as a supplementary livelihood activity by small and marginal farmers. As stated in the beginning, only 7% of fishers are engaged in fisheries on a full-time basis. The majority works as part time or occasional fishers. The members of the small and marginal farmers collectives are thus involved in agriculture plus fishery and hence it is important that the work related to fisheries is divided and the group as a whole is able to gain from fisheries.

Despite the need for a group to conduct fisheries there are possibilities where fishery can be promoted for an individual farmer, generally in cases of integrated farming practices. In such farming practices, fishery is developed as part of, and in combination with, other livelihood activities: like agriculture with fishery; or poultry with fishery and so on (see Box: Fisheries in an Integrated Farming).

Fisheries in an Integrated Farming System

Wallamkupar Lyngdoh owns 4.94 acres of land in East Khasi Hill district of Meghalaya. Of his land, Lyngarh has converted 2.5 acres into an integrated farm that has three units: Horticulture, Animal Husbandry including Fisheries; and Vermicomposting unit.

Horticulture crops include cabbage, cauliflower, chilli, ginger, papaya, pineapple, lemon and orange. Due to heavy rainfall during monsoon months, he was able to take only one cycle of horticulture crops on his land. Sanctioned a polyhouse by government he installed the same on his land, he is now able to take horticulture crops through-out the year. The animal husbandry unit is central to the integrated farming practice of Lyngarh wherein he has installed a poultry unit, starting from 50 birds and later in to 100 birds; a goat rearing unit that comprise of 15 goats that are kept in a fence area for grazing; a pig breeding unit which has nine sows and one boar in which one sow gives at least one farrow per year; and a fishery unit that comprise of three fish ponds of 0.3 acres each with a production capacity of 600 kg of fish per year per pond. The Vermicompost unit has two beds of 6 x 4 x 2 ft size with an annual production capacity of 3000 kg of compost per year on an average.

The waste material from horticulture serves as raw material for vermicompost and as feed for poultry, goat and pigs. The droppings from the animal provide raw material for growth of zoo plankton for fisheries in the ponds. The waste from farm and non-consumablesare placed in vermicompost beds to serve as raw material for production of compost that is ploughed back in to the farm.

Lyngarh has an average annual turnover of 15 lakhs from his farm in which the largest contribution comes from horticulture followed by piggery. The benefit cost ratio of fisheries is 2.3 on his farm but it has the additional advantage of making water available for all the other activities round the year.

Value Chain of Fisheries

There is a strong value chain of fisheries that provides potential as stand-alone livelihood activity or as potential activities where the fishers can add on to their main activity of fish cultivation. As is evident in case of Dimbhe dam fishers and the Unnati SHG, they added rearing of fingerlings to their main fish cultivation activity which not only saved costs but also ensured a better quality of stocking of fish in the dam.

In the case of Bahedi (see Box Bahedi: Hub of Fish Seed Production), even when the initiative was to produce fish seeds, it led to growth of associated businesses around this activity – fish fry/fingerling rearing centres, transportation, oxygen suppliers, polythene bag suppliers, fish feed suppliers and so on. The associated activities along the value chain can be integrated by the main group as part of their own activities or these can be promoted as separate business enterprises as is exemplified in case of Nambakkri SHG that started the business of converting fish waste in to fish fed and as organic manure for horticulture (see Box Waste to Wealth).

Bahedi: Hub for Fish Seed Production

Bahedi block is located in Darbhanga district of Bihar. The district was deficient in fish seed and used to import 90% of its requirement from Bengal. Vipin Kumar, realising the potential for demand for fish seed, established a fish hatchery on three acres of his land. With close technical guidance from the Fisheries Department his hatchery was operational from 2001 and in the very first year he was able to produce 80-90 lakh fish spawn and 25-30 lakh of fish seed, yet the demand supply gap remained in the district and the area for fish hatchery was further increased to 15 acres later.

Gradually other hatcheries came up in the district which also led to the growth of fish fry and fingerling rearing centres. At present, there are ten hatcheries and twelve fry and fingerling production centres in the district that supplies fish seed, fish fry and fingerling to fishers of 24 district of Bihar. With Bahedi becoming the hub of fish seed production, the associated businesses of fish nets, oxygen cylinders, fish feed, polythene, fish medicines, and transporters have also grown and mushroomed around the district as associated businesses.

Fishery, Water and Climate Change

Water is the primary requirement to conduct fisheries. In all cases this water is harvested and stored during rainy months that suffices till the commencement of the next fish cycle period. However, there are two factors that have been impacting the ability to conduct fisheries within this scenario: one is the timing of rain and the second the quantity of water.

For fishery to be profitable, fish rearing should start so that fish is available in the market during the peak demand season which is generally during winters. This implies that the fish seed/fry/fingerling should be introduced in the water body just before the onset of monsoon to give it sufficient time to grow and gain weight to get a better price in the market. Delays in rain postpone the introduction of the fish seed in time for the fish to be ready for the market. The uncertainty and delay in rain is the resultant factor of climatic changes that are impacting most parts of the country.

Secondly, climatic change has led to changes in the pattern of rainfall in the country, i.e. the frequency and incidence of extreme weather events – long dry spells and/or excessive rainfall over a short period of time. Former leads to scarcity of water and latter flooding at micro level. In both cases the mortality of fish increases, leading to loss of fish stock and eventually in loss of revenue for the fishers.

The need to develop adaptive capacities based on local climatic factors has emerged as a challenge for the promotion of small-scale fisheries in large parts of the country. Fisher groups and the technical institutions need to collaborate closely to ensure the sustainability and profitability of fisheries as a livelihood activity.

©pixahive.com/spchoudhary

Women

Forty four percent of fishers are women. Women are engaged in fisheries in many ways: rearing of fish, making and repairing of nets, preparing fish feed, sale of fish, making different products of fish (e.g. fish pickle), and as fisher to ply the boat and net in ponds. The Unnati SHG is an all women group. Dimbhe dam fisher cooperative has eleven women members in the beginning that increased to 214 at a later stage.

There is a number of examples where women have successfully conducted fisheries and managed fish rearing on a large scale. Ensuring and drawing in women for training and exposure on fisheries has been a game changer for women to take up fisheries in a big way. Contrary to the common perception that women are generally involved in the sale of fish, they are equally involved at different stages of production, provided they have been trained along with the men in conduct of different operations related to fish rearing.

Up-Scaling

There are 3,200 major and medium dams in the country. In addition, there are minor dams and irrigation reservoirs that present the potential for fisheries that can be undertaken by the dam affected communities which in fifty percent of the cases are tribals. Mostly, the discussion evolves around the command area of the dam and not enough discussion is taking place around the fisheries and their rights for communities that are located in the periphery of the reservoir. The example of Dimbhe dam indicates the potential for involvement of tribal communities living on the periphery of the reservoir: that they can be mobilised, trained and handheld to engage in fisheries in a profitable and sustainable manner. Government policies that discriminate positively in their favour will be able to create an enabling environment for these communities to engage in fisheries that moves away from catch fisheries to culture fisheries.

Fisheries is scale agnostic. The examples of Dimbhe, Unnati and Lyngarha indicates that fisheries are amenable for adaption at different scales and in different conditions. The trick is to identify the appropriate fishery practice suitable to the beneficiary (ies) and the particular geographywhere it is aimed to be located.

Up-scaling in fisheries also includes moving up and down the value chain, like in case of Bahedi, for production of fish seed, or by the Cooperative at Dimbhe dam and as exemplified by Nambikkai SHG, to recycle fish waste into organic manure and feed. Secondly, up-scaling can also be looked at as a movement towards production of high-end fish, like in case of the Cooperative at Dimbhe dam where they went in for production of ornamental fish, namely the goldfish and angel fish.

Women are engaged in fisheries in many ways: rearing of fish, making and repairing of nets, preparing fish feed, sale of fish, making different products of fish, and as fisher to ply the boat and net in ponds. Dimbhe dam fisher cooperative has eleven women members in the beginning that increased to 214 at a later stage.

Good Practices

(a) Convergence and Collaboration

Converging with Department of Water Resources and Revenue enables fishers to demarcate their jurisdiction for fisheries; with *Mahatma Gandhi NREGS* they can look for additional resources for digging of ponds, making of landing spaces; with NRLM and the Department of Cooperatives for the formation and development of the collectives and their linkages with financial institutions; and with the Department of Fisheries linkages with different schemes are possible for the fishers. Convergence, as a strategic component of the initiative, has the advantage of creating an enabling environment and also in initiating/growth in fisheries as a production-cum-entrepreneurial activity.

Collaboration with technical resource agencies, like CIFE, CIFA and CIBA, are the key to linkages with environmentally appropriate and scientifically sound practices in fisheries. With these institutions being in the business of R&D in fisheries, the possibilities of gaining from new technology and practices becomes possible.

(b) Nutritional Needs of Local Population

Fishing rights on water bodies located on common lands have the provision for making fish catch available for the local population so that they can also address their nutritional needs. This aspect is generally fulfilled by allowing open fishing rights to the members of local village(s) where the water body is located. Dimbhe dam fishers' cooperative followed this practice by making 25% of the harvest available to the local community through local vendors. In other places, open fishing days are declared once the fisher collective has harvested fish for their own need.

(c) Involvement of Women

Unnati group comprised only of women, Dimbhe fisher's cooperative had women members (and a women President at one point of time), Nambikkai Nagar SHG had women members to work on processing of fish waste to produce organic manure and feed. Women are generally involved in repairing of net, fish feed and rearing of fish fingerlings. Possibilities of increasing involvement of women through training and capacity building has the dual advantage of earning through wages, immediately, and also by participating in profits earned by the collective at a later date.

(d) Integration with other livelihood activities

Dimbhe fisher's cooperative planted seeds of tag/dhencha to provide for fish feed that also worked to enrich the soil for draw-down cultivation. Lyngarha established a system of integrated farming with fisheries that consumed poultry dropping as fish feed. Such integration with other livelihood activities has a multiplier impact as they not only add value to fisheries, but they also enhance the returns from other livelihood activities and establish ecologically benign practice at the same time.

©publicdomainpictures.net/Jean Beaufort

© Shutterstock/ PRASANNAPIX

Livestock: Secondary to Significant Source of Income

Small livestock husbandry is the poor households bank. Does it offer opportunities to develop it which will further build the resilience of these households? What are the different types of strategies that need to be built in for such interventions? How can veterinary, technical and market services be made available to small livestock owners at low coast and on site? Do integrated value chains help small farmers? Do farmers retain their autonomy when they are part of the integrated value chain? These are some of the issues that are addressed in this chapter that focuses on goats and poultry from the perspective of landless and small and marginal farmers.

Livestock is the source of nutritious food in the form of milk, egg and meat. It also provides, skin, fibre, and manure as sources of income. One of the main characteristics of livestock husbandry is its easy mobility, the ability to withstand changing weather conditions, and generateyear-round employment and income earning opportunities. Livestock husbandry is a commercial activity requiring large capital investments. At the same time it is a source of livelihood for small and marginal farmers and landless households. Most of them are, however, scattered in the rural countryside, with small herd/flock size, under/poorly served with technical and veterinary services, low productivity, poor market connectivity and hence operate at sub-optimal levels of income and production.

Within the livestock sector, small animals, namely goats and poultry, are popular and widespread among the landless and small and marginal farmers. The income from this livestock is treated as a secondary source of income, and in most cases as a means of easily disposal of wealth because of the high liquidity potential of these animals. For the households, small livestock also serves as insurance substitute, as it can be easily sold during times of distress, both in case of crop failures and in cases of illness or marriage in the family.

Women have a major role in the rearing of small livestock-goats and poultry. They have the responsibility to feed, care, health, breed, and management of the livestock including its sale. Interventions that aim at improving the quality and productivity of small livestock will thus have a direct impact on the abilities of women to manage and gain from small livestock husbandry.

In small livestock husbandry, there is a need to address structural constraints in rearing of small animals, namely, small herd size, genetic erosion due to indiscriminate breeding, high morbidity and mortality on account of low priority to preventive health care and poor diagnostic services, and poor credit, insurance and marketing facilities forcing the animal rearers to sell at low rates. This is possible through programmes that are designed specifically for the needs of the small livestock owners and which are able to provide low cost at site technical services. The case of strengthening goat rearing as secondary livelihood option undertaken in AKRSP (I) narrates the strategies that were employed to make goat rearing a profitable and sustainable livelihood options for the small holders.

Within the livestock value chain, there are integrated value chains where the farmers can sell directly to companies based on the contracts between famersand these companies. There are inclusive value chains which are based on exploring ways in which small farmers can participate so that they can increase their efficiency and/or extract higher value from the chain. The present chapter presents the case of Integrated Poultry Farming by Sugana Poultry Farms in which the value chain of poultry has been integrated with small farmers through a systemic integration of supplies and purchase of produce.

Strengthening Goat Rearing as a Livelihood Option

Jhirniya block, Khargone district, Madhya Pradesh
Implementing Agency: AKRSP[1]
Supported by: Pro Poor Livestock Policy Programme[2]

Context

The Goat is a multi-functional animal which makes a significant contribution in the economy and nutrition of the rural households of the country. Goats are hardy, easy-to-maintain, multi-utility animals that can convert low-value vegetation, tree leaves, and crop residue into high value meat, milk, hide, manure and fibre.

As an enterprise it is estimated that 33 million households (13.4% of the total) are engaged in goat rearing and that 76% of the goats are owned by the landless, and small and marginal farmers. Amongst these household goat rearing is a secondary livelihood activity wherein women have the primarily responsibility for the care, nutrition and management of goats.

India ranks second, behind China, in terms of population of goats in the country. The 20th Livestock Census estimated the goat population in the country at 148.88 million (2019) indicating an increase of 10% over the previous census. The goat industry in India has registered a growth rate of 5% despite the fact that 45% of the stock is slaughtered and the mortality rate of goats is between 5-10%. Goat rearing as an important livelihood option for communities in semi-arid and arid region is evident by the fact that amongst the states the highest goat population is Rajasthan followed by West Bengal, Uttar Pradesh, Bihar and Madhya Pradesh.

Jhirniya is a tribal block of Khargone district that is completely rural in character. There were 35,801 households in the block in 2011 housing a population of

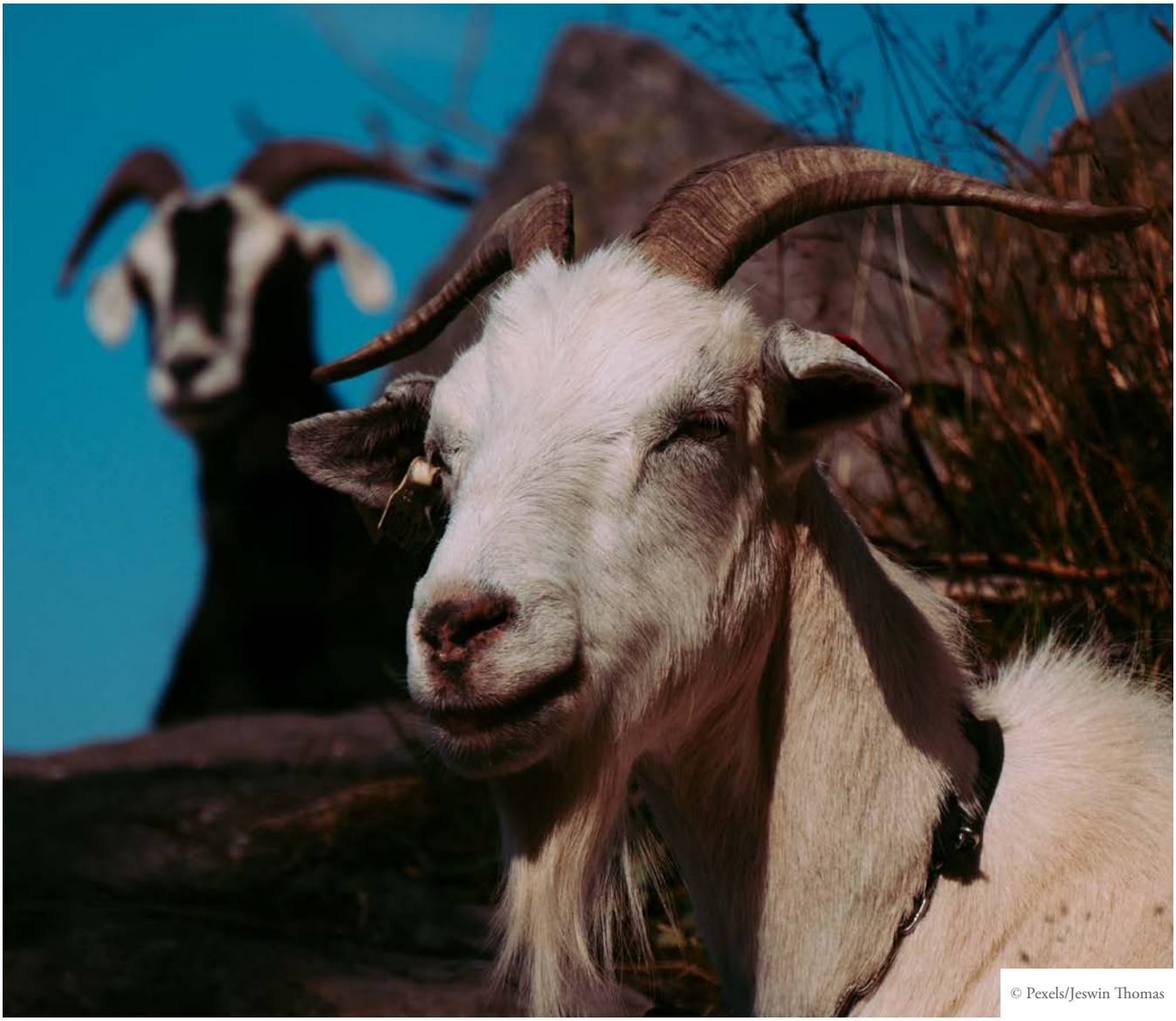
[1]Aga Khan Rural Support Programme (India)
[2]Pro Poor Policy Programme a Joint initiative of NDDB and FAO

2.01 lakhs. The population was predominantly tribal (80%) belonging to Bhil, Barela, and Korku tribal groups. With a literacy level of 31%, the block was identified as one of the poorest blocks of the state.

Almost 40% of the total workforce is engaged as cultivators and 36% as agriculture labour. With 75% of the farmers being small and marginal landholders with average size of their holding of 0.91 ha, migration to nearby districts in search of employment is high. Inadequacies in irrigation facilities impact low productivity in agriculture which creates food and nutritional insecurities amongst these households.

Goat rearing has been a traditional supplementary occupation in the region mainly because it has low input requirement and high liquidity. It is a preferred secondary source of income of most households and has the scope for further improvement by increasing the productivity in goat rearing by increasing the knowledge base of the community, reducing kid and adult goat mortality, improving local indigenous breed and market realization. The project was thus implemented with the objective to demonstrate an integrated approach to strengthen goat-based livelihoods in a selected cluster of 10 villages in Jhirniya block.

Goat rearing has been a traditional supplementary occupation in the region mainly because it has low input requirement and high liquidity.



© Pexels/Jeswin Thomas

Strategy and Implementation

The base line study of 12 villages (including 2 control villages) indicated that 42% of the households engage in goat rearing as a secondary occupation. Amongst these, 55% have a herd size of more than four goats and their main reason for rearing goats is that it provides cash during times of emergencies, and also has the potential to provide regular cash income. The main income from goat comes from the selling of adult males or kids and from sale of goat dropping.

The main issues identified by the survey reported that households engage in natural indiscriminate breeding practices that impacts the progeny and thus the productivity of goats. Feeding practices include open grazing of 4-6 hours per day, and fodder collected from shrubs, trees and crop residue. Supplementary feeding was undertaken by 70% of the households, but mostly it was locally available grains. In more than 50% of the households, there was no separate house made for goats and the mortality among the goats was 20-30% every year.

The data from the baseline survey was used for the design and intervention strategies and for the project as follows.

Strategy	Implementation	Description
Adoption of improved goat management practices Making goat rearing organised and systematic in the villages	Community capacity building through intensive training and use of locally relevant information and communication methods to improve community knowledge base related to goat rearing.	Conduct of hamlet level and village meetings, wall writings, dissemination through posters, and one-to-one interaction with Pashu Skahis, conduct of Bakri Pathshala, and disseminating through mobile phones were some of the methods adopted to orient goat rearers to adopt improved goat management practices. Preventive health care, improved feeding practices, hay making, use of Azolla, housing for goats, breed improvement, productivity enhancement, and marketing formed the key thematic areas around which messaging was undertaken.
Convergence with on-going government programmes Source supplies and technical inputs and to develop linkages of Pashu Sakhis	Convergence with state Animal Husbandry Department (AHD) for sourcing supplies of medicines, vaccines and mineral mixtures and with other schemes of the department.	The project involved members of AHD from the initial stages of the project by sharing the findings of the baseline survey. The block level officials of AHD attended meeting at the village level and gave inputs during training and information dissemination on improved goat rearing practices. AHD supplied de-wormers, vaccines for ET and PPR, and mineral mixture. The request for supplies were written by PashuSakhis so that the supplies would continue beyond the project period.
Formation of Goat Rearer's Groups (GRG) GRG to elicit participation of villagers in decision making related to goat rearing	GRGs to be formed in each village to facilitate provisions of preventive and primary health care for goats. GRG's will establish a village level market and will ensure sustainability of processes.	Hamlet level meetings were followed with group formation and payment of membership fees, selection of office bearers, training of GRG representatives and developing system for goat marketing. 34% of the goat rearing households became members of GRG. Initially, the membership of GRG was entirely of males which impacted the low adoption rate as the women had the main responsibility for care, nutrition and management of goat. This anomaly was later rectified with higher involvement of women participation in GRGs.

Breed improvement Long term productivity enhancement in goat rearing	Enhance the breed of goats by introduction of Berari bucks, formation of Breeder's Association, and identification of improved bucks with characteristics of Berari breed.	Project was located in tract where the animals' showed characteristics of Berari, an indigenous breed of goat in the region. In addition to raising awareness on the characteristics of Berari breed, the project distributed Berari breed bucks among households identified by GRGs with the agreement that they will have the responsibility for upkeep and maintenance of bucks and that they will provide buck services to other goat-rearing households. Berari Breeder Association was formed with representatives from each GRG with the aim to maintain breed purity and to contribute towards revival of the breed in the area.
Capacity building of PashuSakhis A cadre of para vets in the villages	Creating a cadre of Pashu Sakhi as women para-vets, selected and trained for basic health care and preventive care of goats.	A five-day training was provided to Pashu Sakhis that included care, feed and fodder management of goats, breed improvement, disease identification and management, and preventive and clinical interventions required for goats. PashuSakhis would charge for the medicine that they provided but their advice was free The services of Pashu Sakhi were paid for by the goat-rearing and the increase in number of households towards the end of the project was testimony to the efficacy of their services in the villages. Pashu Skahis were also trained to conduct Bakri Pathshala to conduct sessions with group of goat rearers on improved management practices of goats through sharing of experience with them. SHG of Pashu Sakhis was formed and a one-time grant of INR 30,000 was provided to enable members to start a micro-enterprise.

Impact

The major impact has been in the decrease in mortality rates among goats- both kids and adult goats. The rates have decreased from the prevailing 20-30% to 6% in project villages. This has been a combined effort of improved goat management practices that included regularity in vaccinations, early identification of diseases and their management, better feeding practices, and improved care through construction of low-cost shelter for goats.

Pashu Skahis have gained the confidence of goat rearers and have become regular service providers to their goats. The Sakhis have been able to earn an additional income in the range of INR 500 to INR 2,000 per month and have been instrumental in increasing the vaccination rates in the villages.

The market for goats is getting organised with availability of a weighing scale with goat rearers and with GRGs declaring a standard rate for selling goat by weight in the local markets. The meeting between goat traders and goat rearers has created a dialogue between the two key stakeholders and improved possibilities of negotiations amongst them.

©pexels.com/Artem Beliaikin

Poultry: Contract Farming Integration Model

Tamil Nadu
Implementing Agency: Sugana Poultry Farm
Supported by: Various Agencies Limited

Context

Poultry in India has grown at 8-10% per annum and stands as fifth largest producer of eggs and eighteenth largest producer of broiler meat in the world. With increasing income, growing urbanisation, changes in dietary preferences, it is estimated that the demand for livestock products will increase further and is likely to double by 2023. With poultry accounting for the largest share of livestock meat product in the country at 36%, the growth in poultry is likely to be significant.

The organised poultry contributes 70% of the total output and the unorganised sector contribute the remaining share of 30%. The prominence of the organised sector has happened due to a shift in the structure and operations in poultry. For a long time, poultry was a backyard venture that faced challenges of size, extension, marketing, technology, and disease control. This discouraged many of the small and marginal farmers to adopt poultry rearing as a serious profitable and sustainable business opportunity.

Numerous initiatives by the government and private sector players led to vertical integration of broiler farms with rural poultry farmers through contract farming arrangements. Behind this integration was the realisation that poultry plays a predominant role in defining the livelihoods of small farmers: source of supplementary income; overcoming cash shortage during times of stress arising from uncertainty in agriculture; and requiring simple equipment for feeding, watering and sheltering in small units. Through the contractual relationship, the farmers (mostly small holders) are provided with quality inputs, e.g., day old chicks, feed, health and veterinary service, technical guidance, management skills, credit and marketing facilities for disposal of live broilers in the market. The farmers were remunerated with a growing charge for the birds at the end of each such cycle. Such an integration protected the farmer from the volatility of the market and ensured an uninterrupted supply of raw material.

One of the noteworthy integrators in poultry have been the Sugana Poultry Farms that designed and implemented innovative method of contract farming and vertical integration starting from Coimbatore district and then expanding to other districts of Tamil Nadu. The efforts of Sugna have been credited to transform poultry business from a backyard activity to a major industry where a large number of small farmers have become entrepreneurs along with the company.

Poultry in India stands as fifth largest producer of eggs and eighteenth largest producer of broiler meat in the world. With increasing income, growing urbanisation, changes in dietary preferences, it is estimated that the demand for livestock products will increase by 2023.

Strategy and Implementation

Sugana started the system of contract farming from Udumalpet village in Coimbatore district of Tamil Nadu. The idea and concept of contract farming originated when they responded to inability of poultry farmers to pay off their loans as the prices of birds in the market had crashed. Being part of egg trading business, Sugana had close contacts with small farmers and set about designing a system which would create win-win situations for small farmers and the company, where both benefit from each other's growth and business. The strategy as it evolved over a period of time is detailed below.

Strategy	Implementation	Description
From independent to contract farmer Create an eco-system to attract independent poultry farmer to become a contract farmer	Situation assessment by Sugana identified the critical areas for independent poultry farmer as: lack of working capital and technical knowhow; and risks arising from price fluctuation in the market and interruptions in supply of inputs.	Sugana provides Day Old Chick, feed, veterinary and technical care, and marketing assistance to the farmer. This assured them of the 90% of the cost in farming poultry. The working capital thus became the responsibility of the integrator. The services were made available to the farmer at their doorstep which had advantages of both, the convenience and lowering of costs.
Increasing the farmer base Increase the number of contract farmers and the average size of their farm	The growth in number of farmers and the size of their farm would decrease cost of servicing these farms for Sugana. Contacting and working with small farmers to enter into contract farming became the main instrumentality for increasing poultry business for Sugana and the farmers.	Most independent farmers had a stock of 8 to 10 coloured birds. The contribution of these birds in total household income is meagre as these were mostly for household consumption. Mortality amongst the birds was a major factor that constrained farmers in optimising their income from poultry. Sugana helped the farmers in setting up of broiler farms and gradually handheld them to increase the size of their flock. Over a period of time the average size of these farms became 3500 chicks. Small farms are closely managed by family labour and are thus more? cost effective than large poultry farms that are dependent on wage labour that impacts cost as well as quality in growth.
Decreasing risks in poultry Assured input supplies and marketing for the farmer	Mortality, low growth, volatility of market prices, and interruptions in input supplies were the main risks identified by the small poultry farmers. Sugana designed a comprehensive package to deal with these risks.	Sugana provided input supplies to the farmer thereby ensuring quality and decreasing cost for the farmer. Sugana became the platform where the farmer can dispose their poultry products. Assured prices enabled the elimination of price volatility of the market.
Scientific Poultry Management Practices How to ensure consistent quality in produce	Technological and scientific advancement in broiler farming were made available to the contract farmer by standardising the process of growing chicks. Each contract farmer was trained in these standards and over a period of time these have become industry standards in poultry.	The process of growing chicks was standardised. A SoP was prepared, and all farmers were trained in this SoP. Quality control checks and adherence to the SoP was undertaken by the Sugana team on a regular basis. Farmers could sell their chick on 42nd day if they conformed to the SoP processes. The sale price of chick was based on weight of the chick which brought efficiency in FCR (Feed Conversion Ratio) within the growing system.

Enabling farmer growth

Farmers demand to scale up their unit so that their stakes are further strengthened in the business

Farmers recognising the assured returns from poultry were interested in growing their poultry business in terms of scale. This required capital and technical guidance that was facilitated by Sugana.

Sugana entered in to MoUs with banks and facilitated their farmer members to access loans for investments in increasing their capacity to hold more birds.

Sugana team helped the farmers to establish their poultry farm by providing technical guidance in design and implementation.

Sugana had adopted the strategy for backward and forward integration to reduce costs, bring quality and assurances in supplies and markets. They have set up hatcheries and a network of parent and grandparent farm so that they are able to ensure regularity in supply of day-old chicks to the contract farmers. Similarly, they have also set up feed mill plants that supply quality feed to the contract farmers at their doorstep. As the next step,Sugana has set up a network to directly procure maize and soy, key poultry feeds, from the farmers through the contract farming model

Impact

With an average flock size of 3,500 birds, the income accrual to the farmer every 42 days is between INR 15-25,000 implying an annual income of INR 80-150,000. The contribution of poultry in household income has thus become significant and has made small farmers invest time and money into it as an organised livelihood activity.

Youth have been attracted by the returns that the poultry offers. There has been participation of the youth in setting up small poultry farms by accessing loans from banks and entering in to contract farming with the integrators.

With cost of growing poultry going down, the price of poultry products too has decreased. This has made poultry affordable to a larger population which has further fed in to increasing demand for poultry products in the market.

Learning from Case Studies

Removing constraints of unorganised rearing

Unorganised (non-commercial) livestock husbandry faced multiple constraints: poor feed, low productive breed, under-served veterinary care, and lack of credit insurance and market support. The cases presented above have sought to address each of these and have contributed in making small holder livestock more systematic and organised so that they are able to take advantage of higher productivity and prices from the market.

The cases have broken the myth that just because it is small it cannot be profitable by bringing in systemic changes in rearing practices at the household level.The goat rearing example led to changes in feed practices, in construction of shelter for goats, regularity in vaccination and early identification of diseases, making long term improvements in the breeding of goats. Similarly, in case of Sugana, the farmers adopted the SoP for rearing of birds for which they were supported by the technical staff of the company. In both cases, the households adopted a much more organised rearing practices and have demonstrated their preference of moving away from a mind-set of holding livestock for emergencies towards the preference where these can be a regular source of income.

For small farmers, organised livestock husbandry is not only a secondary source of income, it is also an income that serves as insurance against uncertainties in agriculture. The advantage of livestock is given under both conditions: if the crops are good, the additional income from livestock is used for making investments in agriculture/livestock and in improved well-being of the family. If there is a crop failure, the income from livestock compensates for the loss and the family is able to at least maintain and ensure livelihood and even food security.

End-to-End Integration of livestock rearing

The interventions by AKRSP(I) and Sugana were not focussed on part of the value chain. These interventions aimed at end-to-end integration in rearing of livestock: breed, feed, care, health, disease identification and management, and credit and market linkages. The integration has been possible by regular and intensive training of the livestock owners, their regular monitoring to ensure adaption of improved feed and care practices, creating a cadre of para vets that are able to provide regular and on-site services, and linkages with governmentschemes and technical services, and brining standardisation in pricing in the market (through weighing scale rather than estimates of weights).

The main learning from the two cases has been that significant impacts are possible when the interventions are planned for the entire set of rearing practices of livestock owners. Conductinga baseline and mappingrearing and sale practices becomes critical in designing specific interventions that need to be addressed through capacity building inputs and in making investments in the eco-system for care and management of livestock at the household level.

Importance of Para Vets

Developing a cadre of PashuSkahis by AKRSP(I) and similar services provided by technical staff of Sugana has ensured trained and quality services to the erstwhile under/unserved livestock holders. In the case of PashuSakhi, the para vet was from the same village and hence available to the household for her services 24x7x365. Three facets of the cadre of para vets have significance for their sustainability: one, the services of para vets are charged from the animal rearer, including for the cost of medicines which were developed by the para vet as an alternative source of employment for these women; and second, the para vet have been upgraded and trained to conduct Bakri Pathshala. Latter has been critical in further establishing the credibility of the PashuSakhi as informed source on goat rearing in the village. Thirdly, the para vets scope their supplies from the government departments and hence are able to develop a working relationship with them. The government veterinary services rely on them to organise and conduct vaccination camps and thus ensure a higher coverage of animals making an impact on lowering morbidity and mortality of animals.

Integration through contract farming

The model developed by Sugana in case of integration of poultry allows each production unit to retain its autonomy and gives them the freedom to target their income by following the SoP developed for them. The quality in inputs is assured as the supplier of inputs is the buyer of produce from the farmer. The growth in business of famers is facilitated by the main supplier/buyer, that is Sugana. Each farmer within the network is thus able to optimise their production to the level that suits the availability of physical capital with them.

The critical elements that work in favour of the small and marginal farmers in contract farming are the clarity in understanding of SoP by the farmers and the adherence of the farmer and the integrator to the terms of the contract. Sugana has also experienced many times that farmers chose to sell to other integrators or even in local markets but they tend to come back to the company as the latter strictly adheres to the terms of contract which are transparent and fair to the farmer. The development of technical capacity among the farmers and the close monitoring of the observance of the SoPare important factors that ensured profitable returns from the mutual contractual obligations.

Women

Women are central to rearing of small animals in the households. They have the responsibility to arrange for the feed, care, and management of the anils till it is sold. However, generally the women have not been part of the various training programmes so far. Even AKRSP(I) realised this mid-way in to project implementation and had to re-orient their training to focus on women for higher adoption rates.

Building capacities in women has a dual advantage: one, it improves their knowledge and skill base in rearing of the animals; and secondly it empowers them as they are able to deal with diseases, management and sale of the animals on their own without being dependent on other members of the household.

The design of programmes for livestock husbandry of small animals should have a string focus on developing/enhancing capacities of women which not only makes them an informed source of animal rearing within the household but also empowers them to bring equality in gender relations at the household level.

Up-scaling

The fertile ground for upscaling of goat rearing and poultry is evident from the fact that Sugana has upscaled its model to eleven states in the country. AKRSP(I) too has been able to develop similar interventions for other parts of Madhya Pradesh and Bihar. The possibilities of up-scaling of goat rearing exists in arid and semi-arid regions of the country and of poultry almost universally. As the economic status of households is improving, there is a definite shift in favour of animal products. The demand for these products is on the rise not only in urban but also in rural areas. Small livestock owners face a market with increasing demand and with improved productivity and market linkages they can generate a regular source of income through the sale of animals and animal products.

Good Practices

(a) Focus on Preventive Health

Vaccinations in case of goats and poultry are important to reduce morbidity and mortality in kids and even adults. Higher mortality rates were a major cause for low productivity in goats and poultry. In boththe cases, the vaccination regime has to be strictly followed as per schedule to gain advantages of low morbidity and mortality. Both AKRSP(I) and Suganaspecifically focussed on preventive health and with the help of PashuSkahis ensure that these schedules are followed and adhered to by the households. The resultant decrease in mortality rates in project villages of AKRPS(I) is a demonstration of how a focus on preventive health of goats can make a significant difference in maintaining the productivity of goat for rearing.

(b) Making small livestock rearing systematic

Developing calendars for feed, vaccination schedules, monitoring of animal by weight, preparing and feeding improved feed (Azolla in case of goats) and have enabled the households to move away from only open grazing practice to better and systematic feeding of animals. In case of Sugana the SoP prepared by them included feed and care practice that ensured achieving weights at pre-determined intervals by the bird/chick. Such schedules enable the households to set periodic targets that were measurable, and they could also monitor the efficacy of the feed and the conversion of feed to fat.

(c) Bringing scale in backyard livestock rearing

In both cases there was an attempt to bring scale to the herd/flock size so that it is large enough to provide regular income to the family. Sugana helped the farmers to link with banks and government schemes to be able to increase the number of birds, and in case of goat rearing the households were encouraged to have the minimum herd size of at least 4-5 goats per households to make a significant contribution to household income.

(d) Making Collectives

Developing collectives of goat rearers and breeders and of poultry farmers has multiple advantages: extension through demonstration and sharing of good practices, conduct of training and information dissemination, linkages with government schemes, accessing subsidy and credit from banks and other financial institutions, operate in the market as a collective and thus gain higher rates for their produce. There are instances where FPOs of goat rearers have also been formed (e.g., Savitri Bai Phule Goat Farming Producer Company Limited) to gain from the collective strength of being part of similar livelihoods.

© istockphoto/ Deepak Sethi

Non-Farm Livelihoods: Skill-Organise-Enterprise

What are the options for non-farm employment for the youth and women in rural areas? Can these groups be organised to start enterprises or provide services on a regular basis? Where are the avenues for such employment? Can women be drawn in and organised to run the enterprises on a for profit mode? The case studies presented here not only provide answers to these questions but also seek to profile the design principles that emerge that can be used for designing similar initiatives in other geo-cultural areas.

70th round of NSSO in 2013-14 reported that the landless in the rural areas of the country comprise 7.15% of the population. Additionally, 80% of the households that own land, own less than one ha. Even in such cases, the NSS data indicates that the average size of landholding has decreased from 1.01 ha in 1992 to 0.552 in 2013. These data indicate that there is a sizeable population in rural areas that is landless or virtually landless and has the same characteristics as the landless family as far as employment seeking behaviour is concerned.

Increased farm mechanisation and increased population makes it difficult for the landless families to find livelihood security by working as agriculture labour alone. Faced with lack of /low availability of employment, these families undertake distress migration and are subject to exploitation in wages and conditions of employment. Women in such cases face even greater vulnerabilities.

The challenge is to identify and develop avenues for non-farm livelihood options for the group that faces under- and unemployment regularly, seasonally or cyclically. The cases presented in the chapter deal with how these issues were addressed in promotion of cadre/group of service providers and in starting of micro enterprises as source of non-farm employment in rural areas.

Roof Rainwater Harvesting

Rajasthan
Implementing Agency: Barefoot College
Supported by: Various Sources

Context

Availability of safe and potable drinking water throughout the year has been a challenge in arid areas and in areas where the ground water is saline. Even in areas that are affected with decreasing availability of water from surface water sources like ponds, rivers and tanks; areas that experience decreasing seasonal rainfall; and areas with high grade of toxic mineral contamination in groundwater and bacterial presence in surface water sources also face a shortage of drinking water during the year.

The roof rainwater harvesting structure is a low-cost technique that links roofs via a network of pipes so that any rainwater falling on the surface is channelled into a central cistern, which is typically built underground. The stored water can be subject to treatment if required and is used during dry months as drinking water and in some cases for other domestic purposes as well.

Strategy and Implementation

The development and implementation of Roof rainwater harvesting systems has been undertaken by the Barefoot College that was started in 1972 with the conviction that solutions to rural problems lie within the community. The college addresses problems of drinking water, education for girls, health and sanitation, rural unemployment, income generation, electricity and power, as well as social awareness and the conservation of ecological systems in rural communities.

The process for installing a roof rainwater structure typically is initiated through a written request submitted by the Panchayat or the local authority. Common property land and buildings are preferred. In case of land that belongs to a private owner, the title of the land is transferred to the village so that becomes common property.

The development and implementation of Roof rainwater harvesting systems has been undertaken by the Barefoot College that was started in 1972 with the conviction that solutions to rural problems lie within the community.

Strategy	Implementation	Description
Baseline Information Information related to availability of water and water sources in the community are mapped	Baseline information can be collected by a team formed for this purpose or teachers/students and young women/men from the community.	The baseline includes gathering information on existing water resources in the village; the seasonal availability of water; their maintenance patterns; quality of water; and demand for drinking water.
Community Participation and Responsibility Develop a platform for participation of community/users group to bring quality in to construction and to determine distribution of stored water	A formal anddedicated community collective with the responsibility of ensuring proper execution of the system and its post-construction maintenance.	A Village Water Committee (VWC) is formed comprising of an equal number of men and women. The committee finalises the site for construction of the water harvesting tank and opens a bank account. The Barefoot Technicians design and execute the construction and are monitored by the Committee. Post construction, the system and the structure are handed over to the committee. VWC members are responsible for inviting tenders for the purchase of construction materials, approving the design of the system developed by the barefoot architects and finally giving a written guarantee of the longevity and durability of the system.
Barefoot Rainwater Harvest Technicians Training of technicians is carried out by the Barefoot College in their campus	Barefoot college conducts trainings for men and women as technicians for Barefoot Roof rainwater harvesting Technicians and as Barefoot Managers.	Training is conducted on campus of the Barefoot College that also has an in-house roof rainwater system installed. Training includes understanding and use of the basic data to design the harvesting system based on the assessment of the annual rainfall data, estimate of the roof surface available, type of roof and the gradient available, and type of vegetation available near the roof. For the construction of underground water storage tank, the ability to assess the type of soil and presence of rock; location of tank, estimates of length of pipes; selection and estimate quantity of material for construction are covered during the training of Technicians. Barefoot Managers are also trained to allot work, measure work, maintain muster rolls and labour cards, disburse wages and keep financial and record of material brought and used.
Resources for the structure and the system The resources required for the system includes cost of labour and material to install the structure in to place	Cost for installation and maintenance of roof rainwater harvesting structure including the underground tank, and the cost of maintenance of the system have to be resourced for installation.	Barefoot College was given the task of installation of the roof rainwater structure system in school by the Government of India and the cost of labour and material was part of this project. Additionally, 10% of the cost is contributed by the community as well as the costs of maintenance post-installation.

Installation and functioning of the roof rainwater harvesting system has reported multiple impacts: increased attendance of children who would (especially girls) otherwise been entrusted the task of collecting water from a distant source; children can spend more time on reading/writing and other activities in the school; availability of fresh drinking water during dry periods reducing incidences of water borne diseases; improved hygiene practices especially among children; and lived-in environment education for children.

The Barefoot College has constructed more than 1,600 roof rainwater harvesting tanks in government schools and community buildings that have benefitted more than two million persons in rural areas across different states in the country.

All Women Construction Team

Ernakulam district, Kerala
Implementing Agency: Kudumbshree
Supported by: HUDCO[1]

Context

The construction sector accounts for one third of the job creation in the country during the past two decades. Riding on the construction boom, the sector enables the un- and under-employed persons to escape from the farm sector towards non-farm employment avenues. However, the demand in construction industry is moving in favour of the skilled labour and it is women who are often left out in accessing these skilled jobs mainly because they have not been trained and organised in use of modern technology and skills required in the modern construction industry.

Kudumbshree decided to pilot an all-women construction team comprising of women supervisors, masons, plumbers and electricians in the construction sector. The group focussed on women in the age group of 18 to 45 years and they were to be linked with different training avenues and imparted hands-on experience to enable them to emerge as independent units within the construction industry.

Strategy and Implementation

Kudumbshree entered into agreement with HUDCO (Housing and Urban Development Corporation Ltd) to provide training as part of its CSR focussing on inclusion of women belonging to the socially and economically disadvantaged communities. The curriculum for the training on special services like plumbing, electricity, facility management, cost effective technology, and hazard resistant technology was prepared by Laurie Baker Centre for Habitat Studies. Specific training agreements with other private sector companies were executed as follows:

(i) Jyothi Jeeva Poorna Trust: the training was provided on masonry, construction techniques, Plumbing, electrification, facility management.

(ii) KITCO provided training on project management, consultancy and site supervision

(iii) Cost Ford imparted hands on training by placing trained women under the supervision of engineers

(iv) Berger Paints provided training to women in painting.

©commons.wikimedia.org/Jonathan Wilkins

[1]Housing and Urban Development Corporation Limited

Impact

The first unit of the all women construction team was set up in Ernakulum district. The unit was assigned the task of constructing 87 houses as part of Tribal Rehabilitation Housing Scheme which they completed successfully. The team has received work orders for the construction of park, renovation of canteen, and making of kitchen interiors.

The groups concept has been replicated across the state and 535 women have been trained that are organised in 61 all women construction units.

The success of painting work undertaken by women encouraged Kudumbshree and women to set up a separate unit for this activity that over a period of time would end up specialising as painters within the construction industry.

Kudumbshree is trying to get these groups accredited as construction groups of government so that they can compete for government orders without tender process.

Hollow Brick Making Unit

Mary Giri, Palakkad district, Kerala
Implementing Agency: Kudumbashree
Supported by: Kudumbshree

Context

With construction activity picking up in rural areas, the demand for bricks and associated material too has arisen. Burnt clay bricks have been traditionally used for construction of buildings and similar structures. However, Hollow Bricks as alternative to burnt clay bricks has developed and has proven its utility in the construction of small and large structures. These bricks have become popular as building material, as these are cost effective, fire resistant, thermal insulated, small dead load, have ahigher durability and enable higher speed of construction as they are larger in size than the traditional burnt clay bricks.

Raw material for hollow bricks includes Portland cement, sand and stone chips and water. Amongst these, the cement is the highest priced material per unit weight of the concrete block. Machines required are a mixer, a block making unit and a vibrating unit which can either be mechanical or automatic.

The manufacturing process of hollow bricks comprises five stages that includes proportioning and mixing wherein aggregates of cement and water is mixed. The next stage is compacting to fill the air pockets. This stage uses a vibrating machine to enable the material to settle down evenly in the brick. Curing is done in shade so that the blocks are hardened through moisturisation for 21 days. The last stage is drying as the concrete shrinks with loss of moisture and which should be undertaken before the brick is used for any construction work.

Strategy and Implementation

Palakkad district Kudumbshree mission identified the Kairali Neighbourhood Group (NHG) as a potential group to start a hollow brick production unit. Trained in the production process, the group was provided with an amount of INR 3.5 lakhs for capital investment. The group launched the hollow bricks with the brand name of Kudumbshree and publicised it through the network of similar groups in Kudumbshree.

Kairali NHG did not use any chemical for hollow bricks but relied on getting the right proportion of cement and mineral for making the brick rigid through the process of curing. The group makes bricks of two sizes: 8x12x6 and 8x12x4 inches. The production is low during monsoon as there is too much humidity for the bricks to dry and hence summers are spent in making larger number of bricks that are then sold through the monsoon and in the early stages of post-monsoon period.

Impact

The unit produces 1,000 hollow bricks on an average per day in single shift of 8 hours. Each member is able to earn INR 450-500 per day. The success of the Hollow Brick unit of Kairali NHG prompted the government to identify another 56 such units providing employment to 289 women on a regular basis. The bricks are being proposed to be used in the construction of houses under different housing schemes and also in other construction work undertaken under *Mahatma Gandhi NREGS* e.g., Anganwadi Centres.

Paver Brick Making Unit

Mandir Hasaud Cluster, Raipur district, Chhattisgarh
Implementing Agency: SPMRM[2]
Supported by: SPMPRM

Context

Absence of supplementary income generation activity for women often forces them to undertake manual labour at low wage rates. Their vulnerability further increases as the terms of labour are skewed and often exploitative in terms of hours of work, type of work, assessment of work, wage rates, and absence of any form of decent work conditions. The women from landless families face these vulnerabilities as they do not have any alternative source of livelihood or employment.

SHGs of women present a potential that can be organised into productive business ventures that are owned and controlled by them. Based on their location, such business ventures can be identified and women can be trained in the different aspects of these businesses. One such business was identified by Shyama Prasad Mukherjee Rurban Mission in the Mandir Hassud cluster near Raipur in Chhattisgarh. The business was for making of paver blocks from fly ash.

Paver blocks are a type of brick made with concrete, but instead of being used in the wall they are used for external flooring and for road/pavement work. These bricks generally have one smooth surface and one rough and are made to suit heavy duty applications and hence are able to support loads and resists shearing and braking forces. Fly ash is the ash of coal and fly ash bricks are made from the fly ash collected as a waste product and used in building construction material.

Fly ash, cement, gypsum, sand, lime and water are the basic raw materials required for the manufacturing of the fly ash bricks and pavers. The bricks and the pavers are sun dried and require mixer, moulder, presser for their production. Both fully automatic and mechanical machines are available for the making of the bricks and pavers and these ideally should be installed near a water source as water is required for curing of the moulded brick/paver.

Strategy and Implementation

SPMRM identified Brick and Paver production as a viable economic activity based in the persistent demand for bricks on account of construction work going on in the new Raipur area and the possibility of using the fly ash bricks in the housing programmes of the government. The specific strategies adopted for the implementation are given below.

SPMRM identified Brick and Paver production as a viable economic activity based in the persistent demand for bricks on account of construction work going on in the new Raipur area and the possibility of using the fly ash bricks in the housing programmes of the government.

[2]Shyama Prasad Mukherjee Rurban Mission

Strategy	Implementation	Description
Mobilisation and Organisation Setting up an organisation that will take the responsibility and ownership of manufacturing of pavers and bricks	Chhattisgarh SRLM- Bihaan took upon the responsibility of mobilising women SHGs into formation of an appropriate organisation to take up manufacturing and sale of fly ash brick and paver making unit.	30 women SHGs in the Mandi Hassud cluster were organised as Village Organisation comprising of 345 members. Annapurna Village Organisation Paver Unit was formed to undertake production and sale of paver and bricks made from fly ash.
Capacity Building Training of women in technical aspect of paver and brick production and in management of unit as a profitable and sustainable enterprise	Women need to be provided training in the production of bricks and on managing brick and paver production unit as an enterprise. Latter also included working in the market to procure fly ash and other raw materials, storage, and pricing to sell the finished product.	Rural Engineering Service provided the technical knowhow and other training were provided through SRLM. Women also visited similar units in the area to assess how the unit works and the type of rigour required in setting up and manging the unit. Since the women were familiar with construction work it was easier for them to gain technical skills necessary for production of bricks and pavers.
Financing Finances are required for Capital as well as to meet the running cost of the unit	Funds were available with SPMRM and NRLM to establish the unit.	SPMRM provided INR 27.08 lakhs from Critical Gap Fund and INR 56.05 lakhs from Convergence Funds.
Convergence SPMRM as the nodal agency convergence for implementation of the unit was undertaken in convergence with multiple agencies	Convergence was in terms of financial resources as well as in providing technical and administrative facilitation by other stakeholder agencies.	Financial and Organisational convergence of SPMRM and SRLM made it possible to pool financial and human resources for setting up the production unit. Rural Engineering Service, Raipur was the technical agency to design the production shed and in technical inputs for procurement of material and machinery for the unit. RES also assisted the VO to secure market for its finished products and helped them in developing their production and marketing lines. Gram Panchayat Mandir Hassud and Janpad Panchayat Arang were instrumental in making place and administrative approvals available to the Annapurna VO.

Women members have adopted the principle where they prefer employment to the women members who are economically weak. The unit works in two shifts and a women member earns Rs 200 per shift on an average. The unit has the capacity to produce 4,000 fly ash bricks and 2,500 paver bricks per day. Members have used these bricks for their own construction as well as for repair of their dwellings.

Paver blocks are being used under *Mahatma Gandhi NREGS* for paved roads, and bricks for construction of houses under PM Awaas Yojana. Nearby Panchayats and private entities have also started placing their orders with the unit which is gradually making its place within the market for bricks and pavers in the area.

Learning from Case Studies

Designing Non-Farm Livelihoods

The design propositions for non-farm livelihoods that emerge from the case studies presented in the chapter are based on prioritising the potential target group; the scope and potential for non-farm employment; development of cadre of skilled persons; and focusing on establishing micro-enterprises.

(i) Tapping in to the under and unemployed for Non-Farm Enterprise

The challenge of providing profitable non-farm employment to the families in rural areas has been faced by many agencies in the past. Using their labour and upgrading their skills is a potential that has been well tapped in the case studies presented in this chapter. In most cases, the persons seek and find employment mostly in the constructions sector. They are familiar with the construction processes and thus introducing products and services around this sector has a comfort factor for these households. Moreover, with increased skills, these persons are able to seek specific skilled employment that pays more and have greater job stability.

(ii) Products and Service as part of Non-Farm Livelihoods

Non-farm employment extends to both, the production and service sectors. In the cases presented, the avenues of non-farm employment were services in case of the all-women construction team and roof rainwater harvesting structures; and production in case of hollow bricks and fly ash pavers and bricks. Scoping non-farm livelihoods thus needs not be restricted or limited to identifying either of the two sectors.

(iii) Developing and Organising Cadre of Trained Persons

Skilling and organising are the two basic components that infuse to create a winning combination. In all the four cases, training was given on technical work that the person/ groupis expected to perform. And post training, the workforce was organised to seek employment as a unit and not left to generate their respective employments. This is a significant departure as it allows the group and individuals to get longer duration employment and they can execute bigger contracts as a group. Further, as a group, there is a tendency to look after each other without compromising on the completion of the contracted task.

(iv) Establishing Micro Production Units

The aim was not to produce very large quantities of units, rather hasthe attempt in the case studies been on establishing micro production units. The advantage in formation of such units is that these demand less space and lower capital cost for starting theiroperations. The resources for these are manageable from administrative and financial institutions. For the latter, micro units present lower risks and thus have a higher likelihood of securing loans. As micro units they do not appear as major competitors to established units and thus do not have to bear the brunt of bullying by the established players in the market.

Collaborating with Private Sector

Establishing an enterprise in the private sector domain necessitates that it learns the management skills of operating from the persons and organisations that have been operating in the sector for a long time. The development of an all women construction team by linking them with private companies engaged in different aspects of construction has been beneficial as women not only learned the technical skills but also the managerial skills required to manage such enterprises. These linkages have the added advantage of developing specialised groups within the team, as in case of Berger paint that further developed groups that focuses on undertake painting jobs only. Similarly, groups around other aspects of construction industry can emerge e.g., plumbing group, electrician group, group of masons and so on. Being part of the larger collective, these groups are already networked and hence can generate businesses for each other over a wider scope.

Women

Build capacities and women shall do it. The case studies exemplify instances where women have overcome the gender barriers and have successfully broken the glass ceilings scripting pathways for other women to follow. The mantra is increased access, impart skill, enhance capacity, and women will accomplish.

Good Practices

(a) Focusing on modern technological options

Skilling on modern and emerging technologies was adopted in all the four cases. This is a significant factor for the sustainability of such services and enterprises as they can take advantage of the change and even become pioneers in introducing new technological options, e.g., construction of houses under housing schemes from hollow/fly ash bricks. The market advantage when trained in modern technology and practices lie with the enterprises/groups as they appear as better skilled resources by the community/customers.

(b) Focusing on sectors that have high employment opportunities

The cases presented have focussed essentially on the sector that has been growing fast and also generating largest number of jobs for people coming from rural areas. Further, with a wide array of skills required in this sector, the possibilities for securing employment are also high. Secondly, most women from landless families have experience of working as labour in the construction sector. As such they were on familiar grounds and it was not difficult for them to learn technical skills and emerge as trained-skilled resource demanding higher wages.

(c) Developing enterprise and services around revenue generating models

The focus is on revenue generation and not just employment creation. This is important for the enterprises from the sustainability point of view. This factor builds in the stakes of each of the member of the enterprise to identify and secure jobs for themselves and for the group as their ability to find continued employment is based on their ability to generate revenue for the enterprise.

©flickr.com

Green Enterprise: Finding Solutions to Environmental Problems

Can entrepreneurial ability be harnessed as a livelihood activity? Are there possibilities for green enterprises in the rural area of the country? Will green enterprise lie within the production domain or are there possibilities of developing green technicians who are able to generate their own service industry? Does green enterprise require a minimum scale, or are there other options for organising green enterprises as collective effort of similar producers? The case studies presented dwell into each of these questions and aim to suggest possible solutions to these issues and dimensions that are faced for promotion of green businesses.

At the very outset, the distinction between Green Jobs, Greening of Enterprises and Green Enterprise needs to be clarified: Green Jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency Greening of Enterprises focuses on the production process, and the promotion of green enterprises in the production of environmental goods and services. Though there is no stated definition of green enterprise similar to the other two, yet a workable definition of Green Enterprise will be an entrepreneurship activity that consciously addresses an environmental and/or a social problem and need. The net result of green enterprises is the positive effect on the environment along with the system of financial sustainability.

The key principles around which a business cn be assessed as 'green' is, if it is adhering to one or all the four principles of Refuse, Reduce, Reuse and Recycle. Refuse refers to stop consuming the product/service that cause harm to the environment and impact the productive ability of the eco-system in the long term. Reduce implies the use of fewer resources for the same; Reuse indicates the adoption of practices where the same product can be used for different other purpose before it can be disposed off permanently. Recycle is the process in which the product changes its form and the changed form can be used for different purpose and thus has business proposition for its use.

Generally, green enterprises have a high risk (this is one reason why business does not enter into this domain) and may have a longer gestation of payback period. Nevertheless, entrepreneurial ability lies primarily in the identification of the environmental and social needs and building the enterprise around it so that the community and the customer both are able to appreciate the positive externalities of the initiative. User charges/price become acceptable and a revenue generation model is built into the enterprise that contributes towards sustaining financial stability and continuity.

Three case studies are presented in this chapter: the first one is related to a green enterprise centred around collection and disposal of plastic waste in villages; the second is capitalising on the opportunity that arose as the use of plastic bags was banned; and the third details the manner in which vermicompost can become an entrepreneurial activity for a large number of farmer-producers.

Haritha Karma Sena for Plastic Waste Disposal

Karulayi village, Nilambur taluk, Mallapuram district in Kerala
Implementing Agency: Gram Panchayat
Supported by: Kudumbshree

Context

As villages become ODF (Open Defection Free), the need for safe collection and disposal of solid waste has assumed greater importance. Littering of domestic refuse in the streets and surrounding areas is likely to accumulate and pose threats to both human and animal health and the aesthetics of the settlement. Domestic waste generated in rural households is predominantly organic and biodegradable. The other waste, that is non-biodegradable, includes plastics and other rejects like glass, metal scraps and so on.

Article 243 (G) provides that Panchayats can be entrusted with the implementation of schemes and programmes in relations to matters listed in the Eleventh Schedule. Entry 23 in the Eleventh Schedule pertains to Health and sanitation, including hospitals, primary health centres and dispensaries. The Swachh Bharat Mission (SBM) requires that every GP puts a functional waste management system in place.

The Kerala state government launched the Mission Haritha Keralam as a public-centric Mission, implemented under the stewardship of local self-governing bodies to set up hygienic waste management system for effective waste disposal, along with soil and water conservation. The state government established Haritha Sahays Sthapanams (Technical Support Agency) to provide technical assistance and training to the members of Haritha Karma Sena (HKS).

HKS is a trained team of entrepreneurs that provides technical services and solutions on waste management projects to institutes of local self-government, that is, Panchayats or municipal bodies in Kerala. HKS is responsible to collect, transport, process, dispose, and manage waste in collaboration with respective Panchayats.

The main responsibilities of HKS are:

(a) Publicity and awareness among households and giving them proper instructions and guidance in the management of composting devices, and making raw material available for source level composting;

(b) Collecting of non-biodegradables on a calendar basis;

(c) Attending to issues reported by households and shops regarding source level waste treatment;

(d) Providing services in the overall waste management scheme as per MoU with the Panchayat.

Strategy

Haritha Karma Sena in Karulayi village is located in Nilambur taluk of Mallapuram district of Kerala. The village compromises 6,000 households spread in 15 wards that include members of scheduled tribe as well.

Strategy	Implementation	Description
Role of Gram Panchayat GPs have the mandated responsibility for establishing a functioning waste management system	GP Karulayi resolved to make the village a waste free Panchayat by (a) decomposing the bio-degradable waste; (b) minimising the use of plastic; (c) making people aware of the hazardous effects of plastics; and (d) collecting the plastic and sending it for recycling or safe disposal.	GP Karulayi decided to establish the system of waste collection within their Panchayat and make the Panchayat plastic free. GP identified persons who are to be trained as Green Technicians and established the system of waste collection and amount of user fees to be collected from households and shops. Waste is sent to the agency in the presence of Panchayat Secretary/concerned official with the quantity in terms of weight is endorsed by them. Review meeting is held with all the Ward members every two month on the issue to monitor the system and its efficacy within the Panchayat.
Setting up system of Waste Collection and Disposal Setting team of technicians and supervisors to manage the waste collection and disposal system	System developed by GP included collection of waste from the household/ shops, for which user fees will be paid by the household, and the non-biodegradable and plastic waste will be sent to a plastic recycling agency. A team of two Green Technicians of HKS are nominated for visiting 250 households. There is one Green Supervisor to manage team of 5-6 Green Technicians and have the specific responsibility to collect user fees, enter records of waste collected and generate reports for submission to GP.	At Karulayi in the first phase the plastic material that can be sold again was collected and later in the second stage bags were given to households and the entire waste was collected that was segregated and then sent to recycling unit. Agreement with Green Worm Eco Solutions was done for processing of non-biodegradable waste. Monthly amount of INR 20 was collected from households and INR 50 from smaller shops and INR 100 from big shops as user fees. Bags were given to households and shops for storing the waste that was collected by Green Technicians. Waste is collected from shops on a monthly basis and from shops on a weekly basis. Collected waste is segregated in an open space by Green Technicians and sent to the recycling/disposal units.
Training of Green Technician and Green Supervisor Haritha Sahays Sthapanams have been designated by state government to provide training to HKS	3-day residential training is provided that includes both theoretical and practical sessions with visits to waste collection and disposal sites.	Fifteen persons from Kudumbshree groups were identified for training as Green Technicians and Green Supervisors for the village. The training was provided by Haritha Sahays Sthapanams which was also available for regular technical support and guidance during the course of implementation.

Household's Participation Publicity and awareness about the system and maintaining transparencyin functioning	GP and HKS undertook the measures to inform and develop mechanisms for participation of households in the waste collection and disposal system.	**Publicity and awareness:** Special notices were issued by the GP and distributed to the households. Publicity was undertaken to spread the message to all the households. **Transparency:** A User Card is provided to all households. The card records the user fees paid by them along with the date and quantity of waste collected. The card is with the custody of the households/shops and they are aware of the waste collected from them at all times. Separate registers are kept for weighing the amount of different category of waste.
Pooling of Funds Funds required to set-up and make the system functional and sustainable	HKS is able to recover its running cost through the user charges that it collects from the households and shops.	User fees along with the waste management fund from Swachchata Mission was pooled for managing the waste management system. For the disposal of rejects e.g., glass, umbrella, bags, foot wears etc) INR 27,000 is paid from Panchayat funds to the Company.

Kirulayi Haritha Karma Sena sent 43 tonnes of waste to the company in two years. Out of this, 36,000 kgs were waste of rejects and 65,00 kg were recyclable plastics. There has been a behaviour change among the households as they have minimised usage of plastics and think twice before throwing away re-usable plastics.

The story of Karulayi has attracted members of other Panchayats to learn how the system works and how it can be replicated in their own Panchayats.

©flickr.com/Milada

Cloth Bag Making Campaign

Kannur district in Kerala
Implementing Agency: District Administration
Supported by: Kudumbshree

Context

To control the use of plastic, the state governments have issued orders that ban the use of such bags within the state. Kerala state government, too, had issued these orders under their Hartiha Keralam initiative. The district administrations were made responsible to implement these orders and ensure a complete ban of plastic bags.

The banning of plastic bags led to the need for an alternative material that is environment friendly, bio-degradable and amenable to function as a bag. The district administration of Kannur identified it as an opportunity for the promotion of cloth bags in the district. The social capital developed by Kudumbshree was used to identify and develop cloth bag makers in the district. The entire exercise was carried out in a campaign mode that led to Kannur becoming plastic free in a five-month period.

Strategy and Its Implementation

Kannur district is a coastal town with a population of 22.51 lakhs spread in 132 villages, nine Municipal Councils and one Municipal Corporation. The campaign for making cloth bags was launched on November 1, 2014 during the celebration of Kerala day. The plan was to phase out plastic carry bags and cutlery and make Kannur a plastic free district.A number of activities was undertaken as part of the campaign, the most notable amongst them being making cloth bags available to households and private establishments as a viable alternative to plastic carry bags. The strategies carried for achieving this are detailed below.

Strategy	Implementation	Description
Campaign Coordination District Administration took the initiative for making of cloth bags to replace plastic bags in the district.	The district administration was sensitive to the fact that until and unless there is a viable alternative available for the shops and people ban on plastic bags will not be effective. The District Collector, as head of administration in the district, is best placed to bring coordination among different agencies and departments, was thus the nodal person for this campaign.	Coordination was brought in between the Department of Local Self Governments to ensure that the ban on plastic bags is effectively implemented. Kudumbshree coordination entailed the production of adequate numbers of cloth bags to effectively replace the plastic bags.
Identification of cloth bag makers Tap in to existing skills and enterprises so that adequate number of cloth bags can be produced for the district	Kudumbshree was entrusted with the responsibility to identify and generate a list of women who had been making/ have the skill set to make cloth bags in the district.	Kudumbashree identified 50 apparel units and individual tailors inthe district who have the capacity to make cloth bags in large numbers.
Demand Estimation for Cloth Bags For the campaign it was necessary to estimate the number of cloth bags that would be required that will be set as the target for the campaign	Since plastic bags were imported in the district, there was no definite way of knowing how much bags would be required to replace them. Business establishments of all kinds- producers, wholesalers and retailers- were the primary buyers of plastic bags and hence an estimate of their requirement was made.	Estimates from the 50 Supermarkets in the district that banned plastic bags;and requirements of private institutions e.g. Kerala State Handloom Development Cooperation; and the likely surge in demand during the oncoming festivals like Onam, Vishu and Christmas were collated. Kudumbshree estimated that around 15 lakhs bags will be immediately required in Kannur district as a consequence of banning plastic bags in the district.

Cloth Bag Making Campaign Making large quantity of bags and making them available to the shops and private institutions	There was a need for different sizes of cloth, with different strengths and texture. Further, a common platform was needed where such orders can be placed so that over a period the market is saturated with cloth bags of different sizes, shapes and material.	A three-day cloth making campaign was organised at Kannur town under the leadership of Kudumbshree Kannur District Mission. 150 micropreneurs showcased the different models of cloth bags that they were making starting from INR five onwards. The campaign enabled a platform for placing orders to makers of cloth bags in the district.

Kannur district was declared a Plastic Free Zone in April 2015 after the five month campaign carried out by the district administration. The district was assessed to have successfully implemented the two laws: one, to ban the use of plastic carry bags; and the second, a ban on usage of plastic disposal cutlery at public functions and weddings.

A notable change in the district has been the changed behaviour of people where they have started bringing their old cloth bags to shops and thus save money for purchase of cloth bags every time.

Manufacture and Sale of Vermicompost

Guntur district, Andhra Pradesh
Implementing Agency: Nilagiri Foundation
Supported by: NABARD-GIZ

Context

Over years, the excessive use of agriculture inputs, namely chemical fertilisers, insecticides and pesticides have resulted in severe land and environmental degradation in India. Farmers have found that their dependencies on these chemical inputs have increased and they are forced to increase the dosages to maintain the same level of production on their farm. This has a significant impact on their earnings and the fertility of their soil in the long run.

Use and deployment of organic fertilisers and manure has decreased, and with increasing farm mechanisation, the availability of manure from and within the farm, too, has decreased over a period of time. Farmers who want to convert to an organic mode of agricultural practices find insufficiencies in the availability of organic compost both in terms of quantity and its timely availability.

Vermicomposting is the production of compost through rearing/using earthworms who consume the biomass and excrete it in digested form known as vermicompost. This compost invigorates soil health and soil productivity and reduces the cost of cultivation. Due to its high nutrient content, there is a growing demand for vermicompost by farmers in different agro-climatic zones.

Despite gaining in popularity and demand, there are instances of individual farmers producing vermicompost to fulfil their own requirements. As a commercial venture, vermi composting has not gained momentum due to: low levels of awareness on the use of composting technology as most farmers spread cow dung in their fields without following the norms of spreading the compost; lack of standard operating procedures in production of vermicompost; limitations of resources impacting the ability of farmers to scale vermicomposting at commercial levels; and the limited promotion of vermicompost to ensure sustainable markets as the distribution and retail network for vermicompost as a product are weak. Other constraints relate to the availability of suitable varieties of earthworms; and the lack of quality testing facilities for the produced vermicompost impacting lack of standardisation and certification within the sector.

Strategy and Implementation

The objective is to create a viable vermicompost production enterprise at the village level and organise the producers of vermicompost as a Farmer Interest Group (FIG) which can collectively address the challenges and constraints faced in developing vermicompost as a commercial venture. The strategies and their implementation are based on the model that has been developed by Nilagiri Foundation (NF) in Guntur district in 22 villages spread over seven blocks covering 250 farmers engaged in production of chili, turmeric, vegetables and other cash crops.

To create a viable vermicompost production enterprise at the village level and organise the producers of vermicompost as a Farmer Interest Group (FIG) which can collectively address the challenges and constraints faced in developing vermicompost as a commercial venture.

Strategy	Implementation	Description
Mobilisation and Organisation Development FIG and FPO were formed for development and management of vermicompost commercial enterprise	Adoption of a cluster development approach that will enable development of backward and forward linkages and minimise overhead and monitoring costs.	Formation, mobilisation and training of FIGs for vermicomposting. Training and facilitating FIGs to obtain benefits under PMKVY and RKVY. Selecting entrepreneurs within the FIGs willing to run vermicomposting units on commercial basis. FIG members have the responsibility of supplying cow dung and other raw material to the producer-farmer. NF mobilised 50 FIG units with an annual production capacity of 4,500 tonnes per annum. An FPO was set up to develop the backward and forward linkages for promotion of vermicomposting with the FIGs. The FPO is the organisational node that engages with financial institutions and operates in the market on behalf of the member FIGs.
Establishing Vermicompost Production Units Farmers individually or collectively set up vermicomposting units	Training of farmers in making vermicomposting pits, providing them with earthworms and monitoring them in undertaking production of vermicompost.	50 FIGs undertook the production of vermicompost on their lands. FPO had a buy back agreement with the FIGs of the vermicompost produced by them.
Create Supply Chain Management Backward and forward linkages are provided by the FPO	To introduce standardisation at a commercial level in vermicompost and to create a support eco-system FPO set up its own lab and created a monitoring system to ensure developed SOPs are being adhered to.	Bio-manure processing, testing lab, farmyard facilities, weighing bridge, and packaging material have been set up as support agri-business units. The FPO has the responsibility of collecting, aggregating, transportation, branding, sales and marketing of vermicompost.
Leverage Financial Support Financial resources are required at different stages by the FIGs and the FPO. These resources can be leveraged from government, banks and other financial institutions.	FIGs require assistance in setting up the vermicomposting units both in terms of capital cost and working capital cost till the revenue stream is stabilised. FPO requirement of financial resources include capital cost for quality control, storage etc, setting the organisation and the working capital cost of setting up its operations and reaching a level where it can generate revenue from its own profits.	Assistance from government is available under various schemes for the promotion of organic farming: National Mission for Sustainable Agriculture; Mission for Integrated Development of Horticulture; National Food Security Mission; PKVY and RKVY. Small Farmers Agribusiness Consortium supports FPO by extending loan guarantee and equity capital schemes. NABARD and NABKISAN support FPOs for providing financial resources for their working capital and capital cost requirements. The aggregate revenue of the FPO set up by NF is INR 2.02 crs per annum wherein the cost benefit ratio of individual farmer is INR 1.33 with annual earnings in the range of 1 to INR 1.25 lakhs.

Multiple impacts have been assessed at the farmer and village level with setting the units of vermicomposting. At the farm level significant amounts of agro-bio waste have been used as raw material for the production of vermicompost. This has not only improved the sanitation of the village but has also set in a circular economy and an appreciation of waste as a possible source of income by the farmer. Women and youth have come forward in learning the technology and practices associated with the manufacturing and use vermicompost as an agriculture input. This has enabled a definitive move towards organic farming in a big way among the member of the FIGs.

Integrated with animal husbandry, vermicomposting has a multiplier impact on the farm and at the household level by decreasing their expenditures andmaking quality produce available that has better nutrition and potential for niche pricing in the market. Soil health of the farms has improved over time and has strengthened the farmers' resilience in adapting to climatic change.

Learning from Case Studies

Opportunity originates from perspective

Opportunities for identifying and initiating a green enterprise rest on the environmental sensitivity and perspective of the initiating agency/person. For example, in case of Kaluyari it was the GP that identified and took up the issue, in case of Kannur it was the District Collector who initiated the process, and in case of vermicomposting it was the Nilagiri Foundation who realised the commercial potential of an ecologically benign product. Further, the distinctive quality of the green enterprise, namely, that it should not add to environmental woes by solving another environmental problem, were followed in all the three cases. For example, if the vermicompost units starts selling their product in plastic bags it will be defeating its purpose of a green enterprise; or if the Kaluyari waste disposal starts burning plastic as a method of disposal it will add to the pollution within the very ecosystem from which it has removed the plastic.

The trick for the development of green enterprise seems to lie in sketching its value chain and applying the 4 Rs at each stage to ensure that it retains its green character throughout the value chain.

Behaviour changes through market

Developing the habit of segregating waste at the source and changing from plastic to cloth bags essentially involves changes in existing behaviour in a large population. Sustainability of such changed behaviour works best when it is brought in through market forces.Though regulation, fines and bans do help, they by themselves seldom achieve a complete changeover. Even in the vermicomposting example, by making vermicompost available in the market, at competitive prices, the farmers had an additional choice that they can opt for, when deciding to buy a fertiliser for their fields. Their decision will be primarily economic but if it adds value to the fertility of their soil it is an additional externality that will impact their buying behaviour.

Principles for Designing Green Enterprise

The four design principles that are observable in the three case studies presented in this chapter for designing and making a green enterprise operational are: Individual Convenience; Earning Profits; Polluter Pays; and Alignment of individual-collective preferences. Convenience is for the users/consumers. If the product/service is available with the same level of convenience as before, the consumers/users will adopt it quicker, as they simply have to replace the existing product/service without any additional effort. Secondly, being part of the market at competitive prices, there is pressure on the supplier to maintain the availability and quality of the service/product. As stakes of profits are built in, the possibilities for sustainability of the service is higher.

The third principle,that Polluter Pays, is firmed up if the green service or the product is competitively priced and carries incentives for consumption (e.g., tax benefits, price benefits, subsidies etc). Persons who do not choose to use the service/product pay higher for the other alternative and are thus penalised for their consumption preferences thereby establishing the principle of polluter pays as part of the ecological-economic system.The fourth principle, society prefers a cleaner, hygienic and less polluting ecosystem, and so do individuals. However, individual consumption patterns often do not align with these individual and societal preferences. Green enterprises create opportunities for alignment of these preferences and add a net value to environment.

Start-up Cost

For Green Enterprises to be sustainably profitable takes time. Being low on profits (else these would have been taken up by mainstream businesses) they do not attract funds including bank loans. In the initial stages they are dependent on the angel investing or provisioning of subsidy or grant from the government. Further, the idea of the enterprise takes time to be rooted and adopted by the consumers (e.g., user fees from households for garbage collection) and leading to a high pay-back period.

Given these scenarios, it is important that the business plan for green enterprise is realistic and cost overruns, especially

©flickr.com/Ramakrishna Math and Ramakrishna Mission Belur Math

of working capital, are built in so that these costs are well covered. Further, it might not be possible for the enterprise to be fully funded from grant or loan but a hybrid financing model including grant-loan-equity (financial and sweat) be built in to allow smooth functioning till the enterprise stand on its own feet.

Convergence

Financial, administrative, managerial and human resource convergence need to be facilitated for the green enterprise to take firm roots. For example, making of cloth bags in Kannur was made possible as the administrative machinery at the district level converged with SRLM (Kudumbshree) to gain advantage of the network of SHGs and their skills. Similarly, vermicomposting as a viable commercial enterprise could take shape as the facilitating agency was able to converge with government schemes to access grants and subsidy for the farmers, with NABARD to seek funds for the FPO and establishing the value chain, and with Small Farmer Agribusiness Consortium to get loan and equity support for the business. In case of Kaluyari the waste collection and disposal system would not have been possible without the active involvement and convergence between Kudumbshree, GP, and Swachhata Mission. The responsibility for ensuring this convergence has been of the facilitating agency by aligning the institutional interests with the interests of the enterprise.

Women

At the cost of reinforcing the gender stereotype, Green Enterprise have found increased participation from women for provisioning of labour/work in all the three cases: waste collection and disposal system, cloth making and production of vermicompost. Whether the women have leader-manager roles in management of the green enterprises is not validated in the case studies. The FPO formed to ensure the value chain of vermicompost did not ensure presence of women at the managerial levels. Neither is there evidence of this in the cloth bag manufacturing and waste disposal system.

Women gaining control over enterprises through leadership-managerial roles is very important for the green nature of the enterprise as these are developing opportunities for them to grow and experience managerial roles. Together, these will enhance access and control of women over natural resources and the market related to the ecological regeneration.

Up-Scaling

Based on an enterprise model it is easier to up-scale green enterprises. The case of the waste disposal mechanism of Waynad district in Kerala demonstrated how the system can be upscaled for the district that has been an attractive source for tourist destination (see Box: Clean Destination Programme: Up Scaling Waste Management).

Clean Destination Programme: Up Scaling Waste Management

Areas with high concentration of places of tourist interest attract large number of persons which in turn poses serious problems of waste disposal. Waste in such areas comprise of food packets, camping equipment, general garbage, plastic and polythene packages which not only impact the aesthetics of the area but also pose serious environmental problems.

Waynad district in Kerala is located on the tip of the Deccan Plateau and includes parts of Western Ghats. The district comprises forests and hills that have led to the creation of a number of trekking points in the area. Tea environs, islands, caves, wildlife sanctuary, bio-sphere reserves, lakes, dam sites in the countryside and museums, temples, mosques, church, and waterfalls are spread within the district attracting tourists of all faiths and interests. The challenge is to develop and maintain a waste management system that not only caters to the waste disposal of the local inhabitants but also of the waste generated by tourists at each of these sites.

Harthika Karma Sena was setup in the district with the collaboration between Department of Local Self Government, Haritha Kerala Mission, Swachhata Mission, Clean Kerala Company with Kudumbshree. A total of 199 members were trained as Green Technicians and Green Supervisors, and a plastic shredding unit was set up at Meenangadi; and one Material Collection Facility and Resource Recovery Facility has been set up at Padinjarathara and Meenangadi respectively.

A system of user fees collection from households and shops has been established and is based on the quantity of waste produced, the intervals of waste collection have been determined andfixed. The plastic waste collected is transported to the plastic shredding unit and the shredded plastic is used for tarring of roads.

The possibility for up-scaling of the waste management model is possible in all the 2.5 lakh GPs and more than 4,000 urban local bodies in the country. The example of Waynad further exemplifies that the use of plastic waste collected in tarring of roads brings in the element of waste recycling thereby making positive impact on lowering cost and removing pollutants from the environment. Similar up-scaling is possible in vermicomposting enterprises and cloth bag campaigns as the demand for vermicomposting is increasing amongst farmers and as the law related to banning of plastic takes root in different parts of the country.

Good Practices

(a) Environmental sensitivity

Environmental sensitivity, especially to be able to identify trends and causes for resource degradation, has been the basis for identifying the environmental issue leading to development of a revenue generating enterprise model around it. The good practice assumes greater importance as the process of addressing the core issue too has been 'green' and has further deepened the cause of ecological restoration.

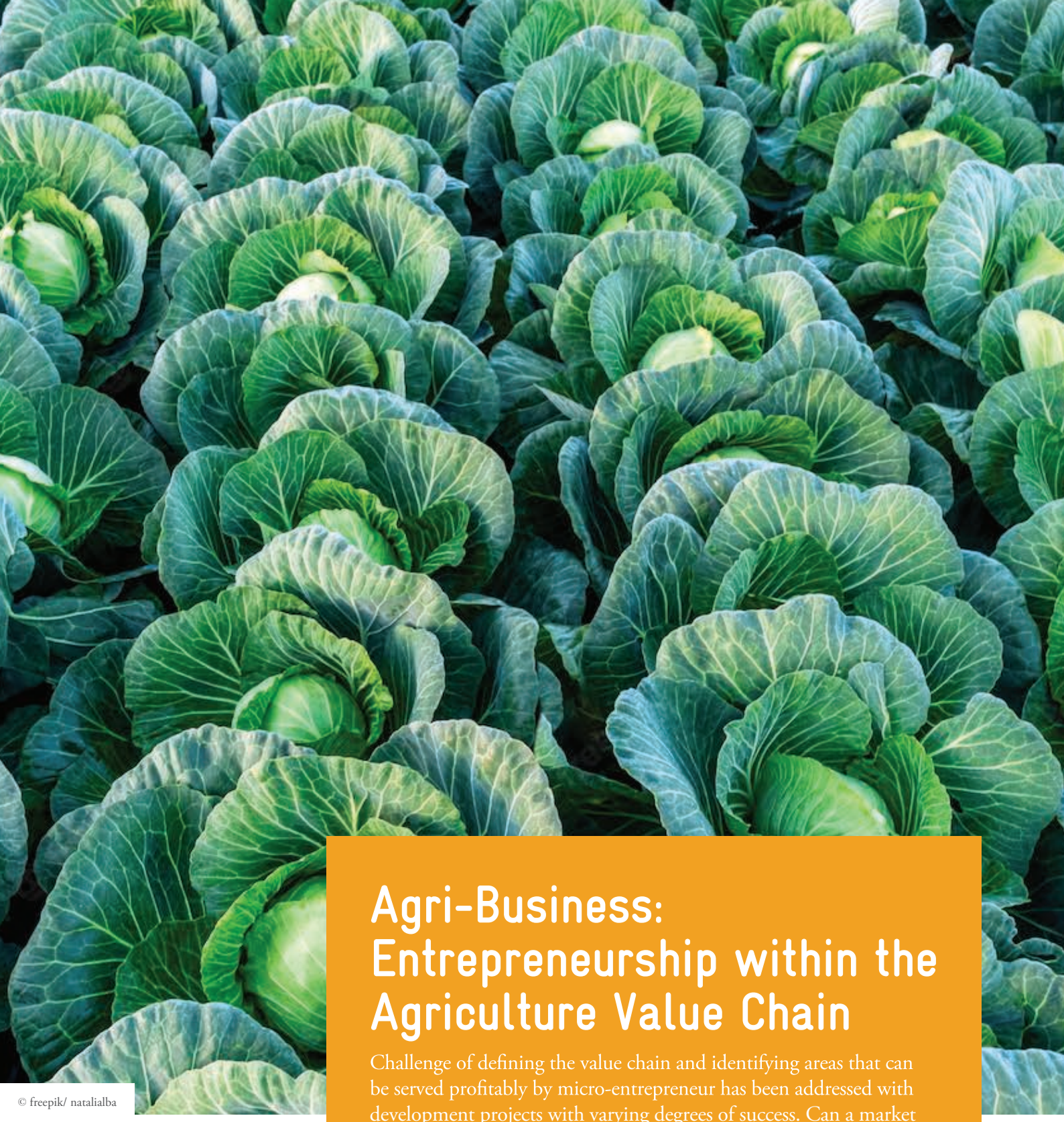
(b) Aligning with constitutional mandate of local self-governments

To maintain cleanliness and hygiene is the mandate of institutions of local self-governance under the constitution and the state laws framed thereby. Developing an enterprise-based model that fulfils this mandate finds immediate support from these institutions and they pro-actively come forward to support such initiatives.

(c) Differential pricing

The example of a waste disposal system and the cloth bag making campaign underlined the need for differential pricing of the service/product so that it is acceptable for households with different economic profiles. This makes the service affordable and thus establishes itself as a solution to the imminent environmental problem.

©flickr.com/Mizzou CAFNR



© freepik/ natalialba

Agri-Business: Entrepreneurship within the Agriculture Value Chain

Challenge of defining the value chain and identifying areas that can be served profitably by micro-entrepreneur has been addressed with development projects with varying degrees of success. Can a market be created in agriculture inputs by micro-entrepreneurs? Can a common property resource, like water, be subject to paid for resource as part of the enterprise model? What are the different activities FPOs have to undertake to enable higher returns for the farmers? These are some of the questions that are faced by intervening agencies as they design projects for agriculture development and livelihood enhancement.

The World Bank defines value chainsas the full range of value adding activities required to move a product or service through different phases of production, including the procurement of raw materials and other inputs. The concept of agricultural value chains has been further developed to include actors along the central chain of production and delivering goods thereby including the horizontal linkages such as finance, extension, and other aspects of enabling environment. The agricultural value chain concept has been used by intervening agencies to assess the ability of farmers to access markets, allowing them to develop a broader range of interventions along the vertical and horizontal chain.

Micro enterprises have the advantage of starting at small scale and thus require low capital for start-up. The inherent strength of these enterprises is their ability to tailor their product to the needs of the consumer and hence offer customised, as opposed to universal, solutions to the user/consumer. In case of agri-business, which is largely dominated by corporate suppliers in markets designed and developed to fulfil the demands of the large farmers, the scope for micro-enterprises lies in their ability to cater to the needs of small farmers. Convenience, efficiency and effectiveness are the key values that small farmers would demand from these enterprises as part of their business transaction.

The three case studies presented in this section aim at detailing the manner in which micro-enterprise have been developed as part of the agricultural value chain specifically for the needs of small farmers to create a win-win situation for both, the entrepreneur and the farmer. The cases of the Water User Association (I) and the Seed Bank (II) relate to enterprises developed as part of the input value chain. The case of Krishijeevan FPO in Maharashtra (III) demonstrates how a membership-based organisation can employ multiple strategies to intervene in an end-to-end value chain for farmers and make impact on productivity, quality, and crop yields.

Irrigation through Water User's Association

Jharkhand
Implementing Agency: JOHAR[1]
Supported by: World Bank

Context

Inadequacies in irrigation infrastructure and water constraints arising from climatic uncertainties have been limiting factors for small and marginal farmers to move towards high value crop cultivation. The advantages of favourable agroclimatic conditions, to a certain extent, have been harnessed by augmenting irrigation facilities with small and gravity-based irrigation systems, like the lift irrigation and reservoirs of check dams or ponds. However, the need for appropriate irrigation systems like pumpsets, pipes, sprinklers, drip irrigation systems, etc. remainsin order to increase the irrigation potential and improve water use efficiency. This need is exacerbated because efficient irrigation systems are closely linked to energy consumption and therefore incur additional costs for their installation and continued use.

JOHAR is working with tribal communities in Jharkhand to pioneer community/ group-led irrigation systems for small and marginal farmers in rainfed, drought-prone and upland tribal areas of the state. The system is based on bringing water to the fields and promotes community/group ownership of irrigation infrastructure and equipment including its operation and maintenance.

Strategy and Implementation

JOHAR followed an iterative approach for the development of micro irrigation for small and marginal farmers in Jharkhand. Reflection and learning at each stage contributed towards the development of the intervention. With initial pilots, the project was able to develop/comprehensive strategy for the implementation of the project in subsequent villages. The components of these strategies are given below.

JOHAR is working with tribal communities in Jharkhand to pioneer Community/ group-led irrigation systems for small and marginal farmers in rainfed, drought-prone and upland tribal areas of the state.

[1]harkhand Opportunities for Harnessing Rural Growth

Strategy	Implementation	Description
Forming producer group Formation of high value crop producer group	The Producer Group is the user of irrigation infrastructure and equipment. As a group they collectively plan and operate the equipment and gain from assured availability and adequacy of water for their fields.	Mobilising women farmers in a village to collectively engage and plan for agriculture development of their fields. Inputs from the project were in the form of giving options to experiment with, and later adopting high value crops. The members of the Producer Group, generally 25-30 members, were trained to identify possible sites for installation of small lift-irrigation and gravity-based systems. This was followed by thepreparation of a technical feasibility study of plausible sites which were eventually finalised in consultation with the group.
Formation of Water User Group Identification of water users from and amongst the Producer Group	Water User Group (WUG) directs beneficiaries of the intervention. There could be more than one WUG from the same Producer Group (PG) depending on the irrigation potential and homogeneity of the PG.	Water User Group of 15-20 members from and amongst the Producer Group was formed based on the irrigation patch identified and targeted by the latter. Para Engineers developed by the project and technical specialists in irrigation prepared DPR of the project for the WUG.
Development of cadre of Para Engineers Cadre of locally technically trained persons for support at each site	Trained persons from and within the community/group who would play a leading role during installation of the irrigation infrastructure and for management and maintenance of the irrigation equipment.	Members from WUG were selected and trained by the project on institutional aspects, sharing of common property resources, efficient utilisation of water, conflict management, and management and maintenance of irrigation infrastructure and equipment. The trained persons were designated as Para Engineers who would also provide similar inputs to other members of the community.
Vendor selection and Management Build capacity for vendor selection and management to impart sustainability to the process	Jharkhand lacked capacities for the installation andoperationalisation of multi-season irrigation systems and projects. There was need to provide capacity and handholding inputs to the Para Engineers and the WUG so as to protect the vendor selection and management process from elite capture.	Training the Para Engineers on community procurement processes, vendor selection, and vendor management were provided. These inputs also included negotiations for installation of equipment, e.g., pump sets and solar panels as part of the vendor management process.
Command Area Planning and Irrigation Systems Operations End to end planning for crops and irrigation	Planning for crop, irrigation and operations of irrigation system by the WUG	WUG and PG collectively participated in crop selection and irrigation scheduling to plan irrigation infrastructure during each cropping season. This created shared learning opportunities and collectively addressing constraints in the management, operation and maintenance of the irrigation infrastructure and equipment.
Enterprise Development Developing revenue generating model around the irrigation system and equipment	The conception of WUG and the Technical Service Provider was on revenue generating approach. This would have also contributed towards sustainability in operations and	Charges were collected by the WUG based on water usage. The levy of the charges was left to the PG and WUG. The charges so collected were used for the upkeep and maintenance of the irrigation infrastructure and equipment.

	maintenance of equipment, as well as creating an opportunity of creating enterprise around irrigation and water usage.	Project trained Technical Service Provider (TSP) for overall operational procedures and management of irrigation infrastructure. Post installation the TSP were entrusted the manage day-to-day operations and collection of irrigation fees at the village level for their services.
Convergence with schemes and departments Coordination with departments and schemes for technical and resource convergence	JOHAR created linkages and coordination with departments at the district and block level to access and leverage resources, subsidies, and technical inputs for selection of technology and registered vendors.	Convergence with Agriculture Department for micro-irrigation systems in the command area under PMKSY; with Jharkhand Energy Development Agency for solar pumps; with Horticulture department for accessing seed and horticulture kits. Convergence allowed knowledge exchange between the project and government officials and helped in reduction of structural overdesign, and associated capital costs.
Innovations Follow an iterative approach to innovate and find solutions on field	JOHAR piloted innovations in design, management and operations to bring efficiency and effectiveness in project management and impacts.	**Automated Software for DPR preparation** Specific software allowed on line DPR preparation and approval system that was based on automated real time calculations. On line up-dation and transfer of data further facilitated real time informed decision making in the management of water. **Geo Tagged Surveys** Location of water sources and pumphouses through geo-fencing of command area enabled GIS based planning. **Solar Solutions** Cycle mounted solar pumps (0.5 HP) were used to help small and marginal farmers to irrigate up to 0.5 acres with a discharge of 2-3 litres per second.

Impact

The JOHAR project has commissioned 106 micro irrigation projects at the village level. Among these 80% operate through solar power and the remaining through diesel or electricity power sources. 70% of the water sources are through seepage wells that replenish their yield through sub-surface discharge. The remaining 30% of water sources are developed through check dams and other embankments across seasonal streams.

Guidelines with specifications and designs for engineering structures, for mobilisation and training of WUGs, and agriculture extension material has been developed that enables replication of the model in other villages at a faster pace.

Beneficiary farmers have been able to move towards high value crops which has enhanced their food security and potential for higher income from their farms. Being women centric, the programme has been able to give confidence to women in taking decisions for their lands and also gaining in technical knowledge related to planning for crops and irrigation.

©flickr.com/Hamish John Appleby

Micro Enterprise: Village Seed Bank

Vidisha and Guna district, Madhya Pradesh
Implementing Agency: TATA-ICRISAT[2]
Supported by: ADB[3]

Context

Traditionally, farmers have practised selective breeding and collected enough seeds to meet their planting requirements for the next crop cycle. They were well versed with the process of seed production, sorting, storage and using it for subsequent years. With the introduction of hybrid seeds the decentralised seed production and distribution practice has been replaced with increasing dependence of the farmers on external sources to replenish their seed requirement every year. The erstwhile informal and decentralised seed industry has been replaced by centralised seed markets.

The organised seed markets are often not able to meet the increasing demand of farmers for hybrid seeds. Without sufficient knowledge, farmers end up buying spurious seeds that cause loss of income and trust on the productive capacity of hybrid seeds. The concept of a 'seed village/bank' has gained ground to restore self-sufficiency in production and distribution of quality seeds at the village level. The intervention designed and implemented by Tata-ICRISAT for the development of seed banks as part of a watershed project at Vidisha and Guna in Madhya Pradesh to ensure availability of quality high yielding varieties seeds by creating income earning opportunities for Self-Help Groups (SHGs) is an example of successful case in this context.

Strategy and Implementation

The strategy for the development of micro enterprises seed bank was facilitated by the watershed project team. The project initially targeted one SHG at Shahpur (Lakshmi SHG) under Lalatora watershed in Vidisha district. The strategic interventions and their descriptions are as follows:

Strategy	Implementation	Description
Seed Procurement Procuring high yielding seed from the farmers at the village level	Identification of different varieties of seeds used by farmers, visiting their fields, and monitoring the growth of their produce at harvest.	Lakshmi SHG, comprising of eleven women members, identified farmers in their village who had sown breeder seed of high yielding variety of chickpea provided by the project. Upon harvest they approached the farmers and offered to buy their produce with a premium of Re 1 / INR 2 per kg over the prevailing market price. The group procured 300 kg of chickpea seed of the varieties, namely, ICCC 37, ICCV 10 ICCV 2, and Kak 2 from the farmers.

[2]The International Crop Research Institute for Semi-Arid and Tropics
[3]Asian Development Bank

Determining quality of seed Seeds should have consistent good quality for the farmer	Making different lots of seeds based on their quality so that good quality seeds can be provided to the farmers and gain market credibility for their product.	20 seeds from each lot were dibbled in the moistened soil spread around the water pot. If more than 16 seeds germinated the seed was considered of good quality.
Seed Storage Ensuring safe protection of seed to be available for the next cropping cycle	Storing seed in a scientifically defined safe place so that there are no physical and any other damage to the seed.	Lakshmi SHG did not have a safe storage place for the seeds that were collected. They kept their seed in a government warehouse at INR 20 per bag with an additional charge of INR 10 per bag for transportation. Seeds were graded for each lot under the guidance of the project team.
Seed Treatment Seed treatment to maintain and strengthen the health of the seed	Treating seed so that it is not affected by disease or pest at the germination and during early stage of plant growth.	With guidance of the project staff the seed was treated with thiram 2.5 g per kg of seed.
Seed Distribution Determine sale price of seed	Sale of seed and determination of the price of the seed to the farmers.	Cost of seed per kg to the group was INR 17.70. The price of seed in the market was between INR 17-18 per kg. Group decided to sell its seed at INR 21 per kg and they guaranteed quality, reliability and availability at farmer's doorstep. Lakshmi SHG sold their entire stock of seed and earned a profit of INR 990 in the first year.

Impact

Lakshmi SHG was able to increase their procurement of the seeds each year and within five years they were procuring and selling 1,600 kg of chickpea seed. The success of Lakshmi SHG prompted other SHGs in neighbouring villages to also createseed micro enterprises. The earning of these SHGs increased and all of them reported an increase in the individual contribution of savings from INR 10 to INR 50 per month. The SHGs have added other seeds to their business, namely, coriander, soy and sorghum.

The learnings from the intervention at Guna and Vidisha were adopted by APRLP and scaled up in three of the watershed projects implemented in Andhra Pradesh. These projects found that village seed banks assure timely supply of quality seeds and create scope for farmer's participatory varietal selection. The cautionary aspects of the intervention identified include proper seed storage facilities at the village level, technical backstopping to ensure quality aspects and change in variety and breeder seed every four years.

Making Safe Storage

Shrikrishna, an all-male SHG that started the business of seed banks, found the storage cost too high and decided to develop their own indigenous storage structure. A 6x2x4 feet bin was constructed by mixing soil and wheat straw (to absorb excess moisture)and was mounted over a raised wooden platform. The bottom of the bin was treated with used engine oil to prevent the moisture from entering the bin.

FPO: Value Chain Development of Tomato Crop

JunnarTehsil, Pune district, Maharashtra
Implementing Agency: KrishijeevanAgro Farmer Producer Company Limited
Supported by: SFAC[4] and Department of Agriculture

Context

Tomato is a major crop of Junnar and Ambegaon tehsil of Pune district. 25,000 ha areunder tomato cultivation and more than 50% of the farmers cultivate tomatoes during kharif and rabi season. Major traders from all over the country come for business to the market at Narayangaon.

The main challenges identified by the by the Krishijeevan Agro Farmer Producer Company included insufficient agro-processing units, high production cost, limited storage capabilities and inadequate marketing facilities. The company found scope in enhancement of productivity by using advanced technology, decrease in cost by collective farming and common purchasing and extending the involvement of the farmers for the whole tomato growing season. The company adopted multiple strategies to increase productivity, income and returns from tomato cultivation.

Strategy

The company decided to focus on 200 ha and work with 500 farmers. Starting from soil testing and providing plant protection, the company also provided the drip material for irrigation and mulching films for retaining the soil moisture. Training, exposure visits to other areas, and visits by scientists to reduce disease incidence and ensuring zero crop failure were also undertaken by the Company for the farmers. The strategic components of the intervention are detailed below.

Strategy	Implementation	Description
Soil Testing Assess soil quality to determine fertiliser dosages	Company undertook testing of soil to determine suitability for tomato cultivation	Soil test reports were used to make recommendations for fertilisers and micro-nutrients so that the farmers apply rational dosages. The impact is likely to be inincreased yields and a reduction in cost of inputs.
Capacity Building Training and capacity enhancement support to farmers	Adoption of Good Agriculture Practices and increases in post-harvest returns.	Farmers were provided with formal training sessions, exposure visits, and consultations with scientist at different stages of the tomato growth cycle. The Company appointed technical staff to provide handholding and mentoring support to the farmers during the entire production and marketing cycle.
Crop Demonstration Conducting pilots and innovations for replication	Earmarked plots of land to carry out innovative and new practices which can be showcased to other farmers in the region.	10 acres plot were used for demonstration of new varieties and inputs during the season. The demonstration enabled the company for management of fertigation and preventions.
Mulching Trapping humidity in soil for increased yield and quality of fruit	Increase water efficiency to reduce cost and improve productivity.	Mulch was used to cover soil surface and create congenial condition for growth. 100 ha were covered by mulching.
Pest Management Use of sticky traps for pest management	Introducing non-chemical pest management to enhance value of production.	Use of sticky traps instead of pesticides provided an easy method for estimating pest population densities. Use of traps reduced costs, improved plant quality of crop and an early warning of pest presence before plant damage.

[4]Small Farmer Agri-Business Consortium

Custom Hiring Centre Opportunity to enable farmers to take advantage of mechanisation	Company purchased farm machines that can be hired by member farmers so that they can employ the same on their farms at reduced rates.	With increasing cost of labour, farmers prefer to hire farm machinery and equipment to conduct various agriculture operations. The Company purchased tractors and equipment for farmers so that they can avail the advantages of farm mechanisation.
Pack House Field level produce collection centre	To avoid farmers going in for distress sale of tomato company to set up pack houses to procure the produce on field and at site.	4 pack houses were constructed for farmers who are unable to reach the collection centre or are far from market. Pack houses can collect the produce of such farmers at the field level.
Grading and Packing Unit Post-harvest interventions to get a better price of the produce in the market	Introduce standardisation in produce and enable farmers with better quality to command higher price company started grading and packaging of tomatoes.	Collection centre was constructed by FPO that undertook sorting and grading of the produce as these get higher prices in the market. The Company also purchased plastic crates for ease of transportation and a refrigerated van for procurement of tomatoes, to keep them in better condition.

Impact

The productivity of tomato increased from 20 tonnes per ha to 25-30 tonnes per hectares. Increase in market realisation of the produce led to increase in incremental benefit ranging from 20 to 25,000 per ha for the farmers.

The farmers have adopted global GAP in tomato in the area and are using machinery and equipment from the custom hiring centre on a regular basis. The stress of uncertain returns has decreased significantly with assured rates of produce, better determinants of quality, and timely availability of subsidy.

©pxhere.com

Learning from Case Studies

Enterprise in value chain of agriculture

Broadly, the value chain in agriculture has two aspects: Supply to Farm (S2F) and Produce to Product (P2P). As part of S2F the value chain includes different inputs that are employed by the farmer on his/her field based on the package of practices that they have opted to follow. These include seeds, water, fertilisers, pesticides and so on. P2P is based on the manner in which the farm produce is converted and sold as a product, even packing and selling it as a packet of weight forms converts the erstwhile produce into a product. Identification of enterprises within these value chain demands reimagining of the product and its market, especially as part of S2F.

Seed and water are the basic requirements for agriculture. In case of seeds the selective breeding practised by farmers traditionally have gradually been replaced by purchase of seeds developed and sold by corporates. Small and marginal farmers have found the latter seeds, though high yielding, to impact a major part of their costs. And if the quality of seeds is poor it implies loss of production and income. The enterprise developed around locally procured, graded, packed and sale of seed thus has a ready market which can, and has been, developed as an enterprise as demonstrated by the SHGs at Vidisha and Guna in Madhya Pradesh.

Water too has been developed as a product by WUGs in Jharkhand under JOHAR. The demonstration in Jharkhand has the dual advantage that the water user/customer is also part of the group that controls and determines the price that they will have to pay as water users, thus retaining the common property characteristic of water and yet making it a paid-for input for the farmer when it is used for private purpose.

In both the cases the critical inputs were technical capacity building and developing the market based on local conditions and needs. The other factors that favoured these enterprises were their small size (low capital requirement), in-built stakes of the supplier and the user (different than the buyer and the seller), and customised product (as compared to universal product). The intervening agency in both the cases had re-imagined the product (selective breeding of seed and not just seed) and the market (pay as per use in case of water). The size of the enterprise is important as it makes a significant contribution to the total family income, contributing to their resilience, and being less technology oriented,it is essentially labour centric and thus has the ability to provide sustainable employment to the labour. With no entry and exit barriers, the micro-enterprises in agri-value chain offer potential for being developed through systematic skilling and credit inputs for setting up the business.

Extension Service as a Micro-enterprise

Micro enterprises within agriculture have been developed related to products and with respect to provisions of agri services as well (see Box Women as Agri-Business Service Providers). The model of CRPs developed under NRLM have the potential of developing some of these CRPs to provide agri-extension services and/or specific service inputs (like Pashu Sakhis) with more training and handholding inputs. In the case of Santosha and Jyothi, the two CRPs, they had demonstrated leadership and initiatives for being further mentored to develop as Extension Service Providers to other farmers.

Micro-enterprises have been developed around a range of agriculture related activities., e.g., seed treatment, banking and insurance services, weather advisory and market related services etc. In each case, the service provider has been trained and mentored to develop themselves to work as paid service provider.

Micro-enterprises have been developed around a range of agriculture related activities., e.g., seed treatment, banking and insurance services, weather advisory and market related services etc.

Woman as Agri-business Service Provider

Extension Service Provider

Santoshaand Jyothi,residents of Medak and Mehboobnagardistricts respectively, were selected as Community Resource Person (CRP) and to work as demonstration farmers with the responsibility of generating demonstrable evidence of sustainable agriculture practices.

On her farm,Santosha has demonstrated the utilisation of available resources like seed, natural fertilisers, water, sunlight, crop management, conservation of soil moisture, renewable natural resources and maintenance of biodiversity. As an Extension Service Provider (being a CRP), she has adopted three villages and conducts FFS classes from 7 to 10 am on a regular basis. For her training, she used to produce botanical extracts, pheromone traps, liquid manures, neem cakes, compost and similar other products for demonstration. She soon found a market for these products and started a shop to sell these products which became popular as she was training other women farmers on their use. Soon enough she also started selling agriculture equipment like de-weeders, and wet grinders from her shop as well.

Jyothi has studied up to Class Xth and, in addition to being the CRP, she is also trained in digital video technology and works as technology communicator through video films. Trained by Digital Green, she shoots videos of sustainable agriculture and crop management practices and sends the raw footage to expert editors. Once the videos are finalised, she organises shows for farmers, the five villages adopted by her, using a battery-operated Pico projector.

FPO and their role in returns from agriculture

For Agri-businesses to be able to provide benefits toa large number of farmers, especially, the small and marginal farmers, they require an organised and systematic effort. Farmer Interest Groups (FIGFs) coming together to form Farmer Producer Organisation (FPO) provide such a platform and opportunity of intervening at scale and making significant and systemic impacts at the farmer level. The example of KrishijeevanAgro Farmer Producer Company is a demonstration where the farmer-company planned and implemented a range of initiatives to address the constraints faced by farmers in a comprehensive manner. The company-initiatedsoil assessments so that inputs for each farmer can be customised to enable them to optimise their costs. The promotion of water efficient practices, like mulching, and use of integrated pest management technologies further added value to farmers in not only saving costs but also in improving the quality of their produce. The establishment of packing houses, standardisation of produce through sorting and grading, and the use of refrigerated trucks for procurement have eliminated uncertainties and risks in the sale of tomatoes, as they perish quickly and often cause hardship to farmers.With 3,400 MT of procurement by the company, it has emerged as a major player in the tomato market in the area, so much that it has been able to provide a higher procurement price of INR 19-20 per kg to the farmer as against the relatable price of INR 15-17 per kg in the market.

It needs to be pointed out, however, that presence of a company by itself will not lead to improvements. It needs a realistic assessment of the challenges and a plan to address them. The FPO will facilitate wider coverage and scale to operations.The plan and its implementation will introduce changes and improvements in earnings and returns from agriculture.

Women

The mantra for women to develop themselves as service providers and as micro-entrepreneur have been training, handholding and mentoring. As individuals (Santosha and Jyothi) as collective (Laxmi SHG) women have ably demonstrated their capacities to perform as entrepreneurs. As the numbers of educated women is increasing in rural areas, their propensity and willingness to seek and gain from training and running an enterprise is gaining in popularity amongst them.

Collectives of women, as SHG, have been the main instrument in developing their enterprises. This also enables them to form similar collectives over a cluster of villages. Being part of the network is good for business as it allows them to optimise their operations and gain through mutual exchange of business.

Up-Scaling

The model of seed banks has been upscaled in Andhra Pradesh under the Indira Kranthi Patham programme. The model of micro enterprises around water has been upscaled within JOHAR for 106 sites.

The possibilities and potential for up-scaling of micro enterprises as part of agri-value chains lie in the variety they offer and the spread of these activities over a large geographical area. The upscaling can be in terms of variety within the same crop and/or including other crops within their enterprise, as demonstrated by Laxmi SHG who have now added coriander and sorghum to their seed portfolio.

Upscaling of micro-enterprises would require (a) capacity development and handholding modules for entrepreneurs; (b) mentoring in marketing until the enterprise is able to gain the trust of their customers; (c) technical backup to the entrepreneurs so that they are able to address the needs of their client group; (d) operational autonomy to the entrepreneurs to determine their scale of operations; and (e) creating a network of entrepreneurs that support and work with each other to further their respective and collective business interests.

Good Practices

(a) Developing the enterprise model around the needs of small and marginal farmers

Small and marginal farmers need customised solutions which, if provided from corporate market forces, will be costly to identify and administer. Micro enterprises formed around the needs of small and marginal farmers, like the seed, water or poultry, create a win-win situation by providing additional income opportunities to entrepreneurs and provide on-site solution to the farmer. The examples presented in this chapter have essentially identified enterprises around the needs of small and marginal farmers.

(b) Capacity, capacity and capacity building

Enterprise development has been an iterative process of capacity building on part of the intervening agency. Capacity buildingincluded technical, managerial and marketing aspects along with handholding and mentoring support so that the entrepreneursgain confidence and learn through experience. Upscaling of these models would be possible only when the training manuals are developed through live experiences of the entrepreneurs which will not only enhance their relevance and but also make training an effective instrumentality during expansion.

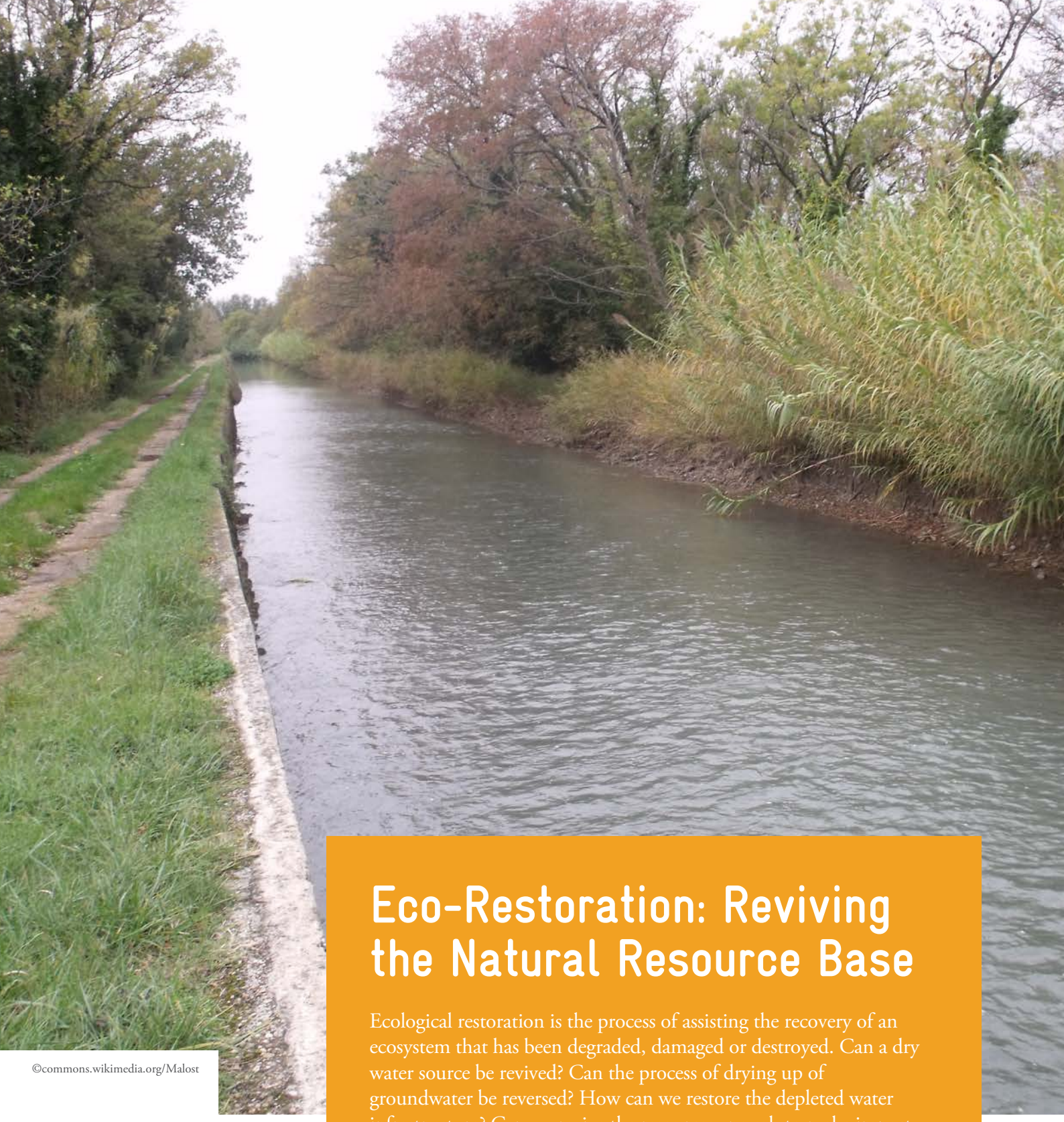
(c) Multiple Inputs for the enterprise

Capacity, capital, credit and collectivisation have been the multiple inputs that have been provided by the intervening agencies for establishment and growth of micro-enterprises. It is important to develop a comprehensive and integrated package for interventions for the development of micro-enterprises as part of the agri-value chain.

(d) Multiple strategies to generate significant impact

The strategic intervention of Krishijeevan FPO for tomato cultivators has been multi-dimensional and addressed the challenges faced by these farmers holistically and comprehensively. Testing of soil, improving the package of practices, addressing risks and uncertainties in post-harvest operations and processes have enabled tomato farmers to gain higher returns from their produce. A membership-based organisation has the advantage of working at multiple ends to bring substantial change in farming practices that is? demonstrated by Krishijeevan FPO.

The model of seed banks has been upscaled in Andhra Pradesh under the Indira Kranthi Patham programme. The model of micro enterprises around water has been upscaled within JOHAR for 106 sites.



©commons.wikimedia.org/Malost

Eco-Restoration: Reviving the Natural Resource Base

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. Can a dry water source be revived? Can the process of drying up of groundwater be reversed? How can we restore the depleted water infrastructure? Can we revive the resources enough to make impact on the livelihoods of people? These and similar questions are faced by development agencies in their work in water stressed and drought prone areas. The cases included in the chapter present examples of how the eco-restoration initiatives were identified and implemented for revival of water and pasture lands in the country.

Human action has often disturbed the ecosystem to an extent that has left it degraded and or destroyed its components so much that is unable to provide ecological services sustainably. Ecological restoration aims to repair the damages caused by human action and seeks to return the ecosystem to an earlier state or another state where it can continue to provide its services. Ecological restoration is thus different from conservation which mainly aims at preventing further loss to the ecosystem.

Agriculture and allied livelihoods rely heavily on the resources and services available within the ecological system where they are located. Water, soil, organic matter, biodiversity, vegetative cover, and a host of matter serve to enhance the productivity of land and animals that land based livelihoods entail. Over time, due to disruptions in eco-systems there has been a depletion of resources and thereby a decrease in the quality and abundance of services that were available to agro-based livelihoods. Water, which has been a major factor, has faced challenges in terms of encroachment, neglect and poor maintenance of the source and its distribution network, over-exploitation of the resource leading to increased frequency in drying, and disturbances in the recharge mechanisms due to various anthropogenic activities.

Pastures have been playing a critical role in maintaining animals and herds for farmers and household dependent on animal husbandry for their livelihoods. Pasture lands face pressures from agriculture as it expands and look for additional land; from increased population of animals which are more than the carrying capacity of these lands; and from depletion of vegetative cover that exposes these lands to soil erosion decreasing their productive and regenerative capacity.

Agriculture intensification demands larger quantities of water, uncontrolled use of water resources and pasture lands, poor operation and maintenance of water bodies. This has created situations of increased water stress and drought like conditions in different parts of the country. Drying of rivers, a falling ground water table leading to drying of springs and decreasing irrigation potential of irrigation tanks have emerged as immediate problems for agro-based communities. In most cases, the situation can be reversed through a scientific and well-developed plan for the revival of water sources that will not only rejuvenate the source but also has a great impact on farm-based livelihoods.

The case studies presented here narrate four such examples where the groundwater table has been restored leading to the revival of springs; therevival of rivers through integrated water, soil and moisture conservation planning; the rejuvenation of pasture lands through comprehensive soil and moisture conservation intervention along with plating of trees and grasses to provide fodder for the animals; and the revival of irrigation tanks through repair and maintenance of the irrigation infrastructure. In all four cases, the *Mahatma Gandhi NREGS* was the main instrumentality forrevival and these efforts were implemented in close coordinationand collaboration with technical resource institutions and in convergence with other line departments.

Dhara Vikas: Revival of Traditional Spring

Sikkim
Implementing Agency: Department of Rural Development
Supported by: *Mahatma Gandhi NREGS*

Context

Changes in land use, demography and climatic factors have had its impact on the Himalayan ecosystem. Changes in precipitation patterns have exacerbated the availability of water for drinking and irrigation in these areas. 80% of the rural households in Sikkim, which is part of the mountain ecosystem, depend on springs for drinking water and irrigation. Over the years, these traditional water sources have either dried up, their discharge has declined or they are seasonally inactive, leading to a problem of water insecurity over a large area impacting many households in the state.

In 2008 Sikkim government developed the concept of Spring Shed Development, later named as Dhara Vikas, with the aim to enhance the water availability in drought prone areas by reviving springs, streams and lakes in the state. The programme was resourced under *Mahatma Gandhi NREGA* adopting a convergence approach with other line departments, technical resource agencies, and civil society organisations. The overall intent of the programme was to increase the availability of water for domestic purposes and to rejuvenate water dependent livelihoods by assuring adequate and timely availability of water for irrigation.

In 2008 Sikkim government developed the concept of Spring Shed Development, later named as Dhara Vikas, with the aim to enhance the water availability in drought prone areas by reviving springs, streams and lakes in the state.

Strategy and Implementation

The choice of MGNREGS as the main strategic pathway for implementation had the dual advantage of routing all works through the Gram Panchayats which in turn ensures active involvement of local leadership in planning, implementation and maintenance of the structures developed under the programme.

Strategy	Implementation	Description
Development of Springshed development plan Springshed, different than the traditional watershed, required assessment of rechargeable area of the spring	Launched as Dhara Vikas the development approach incorporated principles of geohydrology, watershed, and GIS to conceptualise and design the initiative.	Village Spring Atlas was prepared by using GIS platform. The data base provided information on the location, GPD coordinates, land tenure, catchment status, dependency, discharge of 700 springs in Sikkim. The data was used to prepare spring shed development plan with details of recharge area and treatment methods.
Convergence and Technical Collaboration Experimental in nature and innovative in execution Dhara Vikas necessitated close collaboration among technical resource agencies	of works at the GP level and technical collaboration with expert agencies.	were set up to function as a GP cluster support office with adequate placement of human resources. Gram Vikas Kosh (GVK) functioned as administrative and technical support service centre for the programme at the GP level and led to planning, execution and monitoring of converged activities at the point of delivery. Technical collaboration was undertaken from IIT Guwahati, BARC, GB Pant Institute of Himalayan Environment and Development, CGWB, ACWADAM, WWF-India, People's Science Institute, Arghyam, ATREE and GIZ. Each of these agencies gave inputs at different stages of the project in planning, execution and assessment of impacts.
Development of Para Geohydrologist Trained and committed personnel were required who will be at the cutting edge of implementation	Para Geohydrologists were to be trained and placed in Gramin Vikas Kendra so that they can work over a cluster of Gram Panchayats.	More than 20 training programmes were organised in collaboration with the State Institute of Rural Development (SIRD) and NGOs to build capacity of the existing functionaries. This led to development of seven master trainers as para-hydrogeologist resource persons. Para geohydrologist engaged directly with the community in profiling the socio-economic and governance system of springs along with the mapping of micro hydrogeological cycle to feed into development of spring revival plan. Leading the execution of spring treatment plan the role of the para geohydrologist included the development as well as implementation of spring shed management and governance protocols.

Phased Implementation

Phased implementation plan was developed so that the same can be implemented at all springs

The components defined for undertaking all works related to revival of spring included mapping of springs and spring sheds; setting data monitoring systems; understanding socio-economic governance systems of springs; hydrogeological mapping and its layout; classification of spring, identifying mountain aquifer and demarcating recharge area; preparing spring management and governance protocols; and impact assessment.

The first phase was the stage of planning wherein comprehensive mapping of spring shed was done at the macro and micro level. This was followed by mapping of socio economic and governance system of each spring.

Hydrogeological mapping of selected spring and demarcating of recharge area is developed at this stage which also entails extensive consultations and participation of, and from, the community.

Execution of works is focussed on development of rainwater recharge structures above each spring in 5 ha of land. These included staggered contour trenches, percolation pits etc. Care was taken to ensure implementation of these structures on lands that was not affected by landslides.

Impact assessment and management, and governance protocols of the spring developed in the planning and execution stage are put in to practice once the works start nearing their completion. Special care is taken to assess discharge of the spring during lean season. Discharge is compared with baseline data and the perception of users is also recorded.

Impact

Dhara Vikas has led to ground water recharge by increasing percolation rates and checking surface runoff. Beneficiaries reported an increase of 10 to 15% in the quantity of water collected from springsfor domestic purposes throughout the year.

A study conducted by the Indian Institute of Science in 2013 found an increased irrigation that has motivated farmers to cultivate new crops including beans, radish, cauliflower, cabbage and chilly, paddy and tomatoes. Many perennial garden fruits, such as guava, banana, orange and litchi, have been cultivated following this initiative. The report also indicates an average of 15% increase in crop yield and a 25% increase in the cultivation of irrigated crops such as paddy, tomato and vegetables.

Dhara Vikas has brought 400 hectares of land under springshed development, resulting in an annualground water recharge of 90 crore litres. This has led to a revival of 40 springs and four lakes in 20 drought-prone GPs. Horticulture plantation in the springshed catchment has been takenupresulting in plantation of saplings of bananas, guavas andoranges in coordination with the Horticulture Department.

The initiative of revival of springs has helped in disaster risk reduction by reducing landslides and damages to farmer's fields downstream.

Experiences of Dhara Vikas led to the inclusion of springshed development as one of permissible works under *Mahatma Gandhi NREGS* in 2012, thereby paving the way for up-scalingthe initiative across the larger Himalayan landscape. This prompted teams from WWF Nepal, the Bhutan Government andthe Arunachal Pradesh Government to visit Sikkim to learn more about the spring revival initiative with a view to replicate similar initiatives in their respective areas.

River Revival: Rejuvenating Surface Water Sources

Fathepur district, Uttar Pradesh
Implementing Agency: Irrigation Department
Supported by: *Mahatma Gandhi NREGS*

Context

Neglect, lack of maintenance, encroachment, changes in land use patterns, over drawing of water have resulted in many rivulets drying up for a long period of time, leading to situations of water insecurities in such areas. Inhabitants facingthe water crisis opt for migration as their coping livelihood strategy, relegating the rivulet to further neglect. The need for revival and rejuvenating rivulets has been a major area of concerned in water stressed areas.

Fatehpur district is situated between Ganga and Yamuna. A remote sensing report of the district concluded that six blocks of the district were critical and seven other semi-critical in terms of groundwater availability. Further, four of the six blocks were in a dark zone, implying that the groundwater level could not be replenished in these areas.With the drying up of the drainage system of the two small rivers SasurKhederi I and II, the district administration decided to address the drainage system, the catchment area of the watercourse and the desiltation of lake Thithaura, which was/is? the source of SasurKhederi II rivulet. An integrated water and soil conservation project was conceived for the revival of SasurKhederi II along the entire course of the rivulet including its origin at Thithaura.

Strategy and Implementation

Sasur Khederi II flows for 40 kms before it drains on the left bank of Yamuna river, as one if its tributaries. The work for the revival of the river started in 2013 when it was completely dried up and was completed in the FY 2013-14 under *Mahatma Gandhi NREGS*.

Strategy	Implementation	Description
Development of Integrated Water and Soil Conservation Plan Revival of rivulet entails renovation and restoration works that can be accomplished with a plan that integrates water and soil moisture conservation works	Sasur Khederi II runs through 42 villages with its origin in the lake at village Thithaura. The integration of the plan was not only in terms of different activities but also over the diverse geography and population that the rivulet serves as it runs through its course.	**The integrated plan included:** • Restoring the original shape and flow of the rivulet • Reviving and restoring the lake at Thithaura as the source of rivulet • Desiltingthe lake and ensuring water retention by installing a gated check dam • Protection of adjoining villages from waterlogging • Prevention of further desiltation through a protective vegetative cover along the bank of the river The plan was to fund the rejuvenation under *Mahatma Gandhi NREGS* with a labour: material ratio of 75:25.
Convergence and Collaboration Resource, technical, administrative and managerial facilitation was deemed necessary for the implementation of the project	Coordination at senior level brought in ease of convergence in activities at the field implementation level. Inter-departmental Expert Committee was formed at the senior level to oversee, steer, and facilitate the implementation of the project.	Lower Ganga Canal Division of the Irrigation Department was designated as the nodal agency for the implementation of the project. Inter-departmental expert committee of senior officers of Department of Revenue, Irrigation, Social Forestry, Rural Development, and Panchayati Raj was formed to ensure convergence, coordination and collaboration among the different departments at all levels. Inter departmental committee modified the plan to cover the breadth one-third of the rivulet that ranged between 5 to 38 meters at different places. Later systematic and scientific reviews were made after the spell of rains to gauge the locations which required more deepening and widening.

Mission Mode The aim was to cover the entire stretch of the river in a short period of time	Activities under the project were taken in a mission mode where in participation of the community and departments are coordinated to complete all activities and ensure impact at the field level.	At GP level all Pradhans were involved and informed about the project. Their participation was to mobilise the community and to motivate the labour to register themselves at the worksite so that a steady stream of work can be ensured. BDOs organised village level meetings to inform the community about the project and their role in ensuring its success. Meetings and discussions with college principals, social workers, media and persons from trade and industry were organised and their cooperation pooled in for disseminating the objectives of the project.
Operational Strategy and Plan Work over a large stretch of rivulet was to be started simultaneously so that works at each worksite are synced and are competed i=during the same period	The work on the rivulet was divided into small stretches of one kilometre each and was allotted to a team comprising Secretary, Rozgar Sewak and Technical Assistant. At every stretch of one kilometre, worksite facilities viz. drinking water, crèche, shade etc. were ensured. About 1,86,400 cubic meters of soil was excavated during the process of the work on the watercourse of the rivulet.	The entire stretch of the rivulet was divided in to one kilometre each. At each stretch a team comprising of Secretary, Rozgar Sewak and Technical Assistant was formed to engage workers, allot work, measure work, and supervise the quality of work. Worksite facilities were created comprising of drinking water, creche, shade etc for the workers. 96,900 person days of work was generated and excavation of 78,200 cubic metres of mud at source lake Thithaura by generating additional 38,000 person days.

Impact

1,34,900 person days of work were generated wherein 4,000 workers found employment continuously for two months. Their labour led to the revival of Thithaura lake and protection of the catchment area from water logging. The rivulet was revived, the entire watercourse was rejuvenated, and the flow of water was revived in the villages.

Farmers have been observed to move towards water intensive crops and the fear of getting marooned due to overflowing of the river has been put to rest. Instances of recharging of water aquifers have also been reported from the villages due to sufficient water in the catchment area of the river.

Pasture Land Development

Hastinapur village, Kotri Block, Bhilwara district, Rajasthan
Implementing Agency: Department of Rural Development
Supported by: GIZ

Context

With open grazing practised in all parts of the country, the quality of pasture lands assumes importance for livestock management as a productive and sustainable livelihood activity. These lands are part of the common property resources managed by communities through the institutions of Gram Panchayats. State governments have framed laws and regulations for the protection of pasture lands as part of essential land use and have earmarked a percentage of land to be left for pasture and grazing in each village.

Over a period of time, pastures have lost their vegetative cover due to poor maintenance and inadequacies in regenerative policies and programmes which has reduced availability of fodder on one hand and increased the pace of soil erosion on the other. The need for regeneration of pasture lands, both in account of increasing its green cover and to improve its regenerative capacity through soil and moisture conservation, has been felt at a number of places.

Hastinapur village in Kotri block of Bhilwara district was taken for greening of waste land and water conservation works up under *Mahatma Gandhi NREGS* so that enough fodder is generated for the livestock population of the village.

Strategy and Implementation

Hastinapur village comprises 44 households and has a livestock population of 300 animals. The pasture land in the village is 25 ha which was taken up for revival under *Mahatma Gandhi NREGS*.

Strategy	Implementation	Description
Inclusion of pasture land under *Mahatma Gandhi NREGS* Resourcing for undertaking development works for revival of pasture land	Identification of a patch of land that will be undertaken for revival.	25 ha of waste land was earmarked as pasture land and proposed to be taken up for pasture development under watershed programme under *Mahatma Gandhi NREGS*.
Protection of Pasture Land Protect the land from animal and anthropogenic activities	Marking the boundary and protecting the land from grazing by animals and from other activities	Fencing of the ditch cum bund along with live fencing of thorny cactus over the bund was undertaken.
Increasing soil moisture Measures to increase soil moisture and arrest soil erosion so that the productivity of land is restored		Making of contour and staggered trenching, construction of earthen pond along with catchment area treatment to channelise water in the ponds, field bunding and water harvesting measures were undertaken in the 25 ha of land.
Vegetative cover Plantation of trees and grasses on the pasture land	Determining the different trees and grasses that will be planted on pasture land to revive its ecological service.	Mix of trees and ponds was undertaken on the land. Babool, Kher, Ber, Khejadi and neem were planted. Among the grasses Apludamutica, Aristida funiculate, Aristida adscenionis, Cenchuscilias, Hetropogoncontortus as palatable and non-palatable grasses.

Maintenance and Rights over Pasture Land Post-implementation maintenance and mechanism for usufruct rights over the land and its produce	Post *Mahatma Gandhi NREGS* works determining the maintenance of the plantation and to determine the manner in which the produce from pasture lands will be utilised by the community.	A committee was formed for the maintenance of the pasture land. All the 44 households were members of the committee. The watch and guard responsibility were done on a voluntary basis to protect the plantations from stray animals. INR 50 per animal per annum was imposed for grazing animal in the pasture land. With 300 cattle in the village this yielded an income of INR 15,000 which was marked to be used as revolving fund for the maintenance of pasture land.

Impact

Most families worked under *Mahatma Gandhi NREGS* in the development of the pasture land and the majority of them had completed 100 days of work throughout the project.

There has been a significant increase in contribution of the pasture land in meeting the fodder requirements of the animals in the village. The fodder from the pasture land was 2.5 ton per hac in 2013-14 that increased to 9.5 ton per hac by 2015-16. The fodder was enough to feed 200 animals for a period of 2-3 months after the rainy season.

Carbon sequestration increased on two counts: one, through the increase in soil organic matter. The soil organic content was found to be 0.6-0.8% in pasture lands as compared to 0.2-0.3% in the control land in nearby area. Second, wood formation in tree biomass, which was aided by a survival rate of 80% of the trees that were planted in the pasture land.

Landscape hydrology has changed, which has led to an increase in the water table in nearby fields and increased water availability in nearby dug wells. Latter has further contributed in providing irrigation security to the farming households.

Harit Dhara: Repair and Rejuvenation of Irrigation Tanks

Udaipur, Rajasthan
Implementing Agency: Department of Rural Development
Supported by: *Mahatma Gandhi NREGS*

Context

For irrigation tanks to retain their ability to serve the population and livelihoods in their command area, regular operation and maintenance works are required. These works ensure the water retention capacity of the reservoirs and the ability of transferring water of the distribution network through canals and field channels. Over time,the deposition of silt and the wear and tear of the dam infrastructure and gates tend to reduce the irrigation potential of these tanks. One challenge often faced by government is to ensure regular operation and maintenance for irrigation tanks that are spread over a wide geography in the country.

Eighty four irrigation tanks in Udaipur district in Rajasthan were handed over by the Water Resource Department to Gram Panchayats. The latter on account of lack of funds were not able to undertake the periodic maintenance of these tanks and over a course of time the sluice gates, the dam walls, and the canal network were damaged which has led to reduced irrigation capacity of these tanks. Harit Dhara, an initiative under *Mahatma Gandhi NREGA* was formulated for the revival of these tanks and retore the irrigation potential of these areas.

Strategy and Implementation

Harit Dhara is a comprehensive programme aimed at reviving and, if possible, increasing the irrigation potential of irrigation tanks handed over to Gram Panchayats. The works include the repair of irrigation infrastructure (embankment, gates, distribution network) and construction of new canal of field channels to increase the area under irrigation.

Strategy	Implementation	Description
Defining Scope of Work Identifying the kinds of works that will be taken up under the project	The aim was to ensure 100% water utilisation for irrigation from tanks that have been transferred to Panchayat institutions.	The work was divided into two components: Tank Works and Distribution Works. Tank Works included repair and maintenance of repair and strengthening of earthen Sluice Gates; embankment; and repair and maintenance of waste-weir and outlet system. Distribution works included repair and maintenance of old canal works; desilting of canals; and construction of New Pakka Canal Works.
Technical Report of Each Work Site Technical report on O & M of each tank required for developing the DPR under HaritDhara	Needs of each tank site were different and hence technical assessment and DPR of each tank site was to be prepared separately.	Technical report of each worksite was prepared identifying repair and improvements: dam strengthening, sluice gate repair, strengthening or construction of distribution canals, etc. The DPR prepared incorporated repair and maintenance of old canals desilting of canals and construction new canals. The data related to the location (longitude, latitude) and capacity of command was collected and fed in to the district data base.
Convergence Technical and Administrative convergence for the preparation of the DPR and for implementation	Department of Rural Development and Panchayats do not have the technical capacity to prepare a DPR for repair and maintenance of irrigation tanks. As tanks belong to Gram Panchayat the involvement of Department of Panchayat during and after the completion of the project was essential.	Department of Rural Development worked in close coordination with Department of Water Resources in the development and implementation of the technical plan. Other departments that the project converged with included Department of Revenue, for markings on land in case of new canals, and Department of Panchayat, for enabling Gram Panchayats to take functional control of the tanks once they are repaired and rejuvenated.

Impact

The repair of tanks reduced the seepage of water; and the repair of canals increased the irrigation capacity of the tank. Further repair of sluice gates enabled improved regulation of water impacting irrigation efficiency. Where the irrigated area before the project was 1,966 ha it increased to 6,076 ha after the completion of works on all 84 tanks.

Kapil Dhara: A Scheme for Individual Beneficiary in Madhya Pradesh

Madhya Pradesh
Implementing Agency: Panchayat and Rural Development Department
Supported by: *Mahatma Gandhi NREGS*

Context

Kapil Dharais an individual household beneficiary scheme launched by government of Madhya Pradesh. It is a sub-scheme under *Mahatma Gandhi NREGS* which was launched by government along with the launch of *Mahatma Gandhi NREGA* during 2007. Madhya Pradesh has very undulating terrain with more than 50% of Basalt and Granite rock strata combined which offers very low percolation of water to underground at aquifer level. 90% of the rainfall south-west monsoon season (mid-June to September) in the state. This results the farming households more dependent on ground water as a source of irrigation. Basalt being a hard rock makes the digging of ground for water near to the farms very difficult and costly affair for the farming community. The cost of well digging is even more for small and marginal farmers residing in rural and tribal areas. With the objective tomake the irrigation facilities available during Rabi and Zayed season, improve the quality of farmers' livelihood,and make agriculture production cost effective, this scheme is supporting the farmers with a minimum landholding of one hectare. Later with the new *Mahatma Gandhi NREGA* guidelines in 2003, the limit was revised to 1 Acre (0.4 Ha) of landholding. This is one of the permissible activities in forest for the forest dwellers residing in the forest villages.

Strategy and Implementation

Following the *Mahatma Gandhi NREGS* guidelines, the ratio of cost of wage labour to cost of material for well construction is to be maintained as 60:40 during the complete life cycle of work.

Eligibility criterion:

- Farmers with landholding of maximum 2.5 Acre or less are eligible under this scheme.
- The land holders who have access to irrigation will not get the benefit of this scheme.
- There is no bar landholding for Baiga, Bhariya, Shariya communities and other forest dwellers who has the land Patta as per Forest Rights act, 2006.
- Widow, separated or women headed households
- SC and ST Households
- Any nomadic tribes
- Below poverty line households
- PVTGs
- Any tribe which is declared by government
- Beneficiaries of Indira Awas Yojana
- Beneficiaries of land reforms
- Small and marginal farmers (Defined as per Kisan Karj Rahat Scheme, 2008)
- Other forest dwellers who got patta land as per the Forest Rights Act 2006 (2007 para 2).

The beneficiaries will be selected on priority basis, which is as follows:

- First: Women headed households
- Second: (1) ST households residing in tribal areas (2) SC and ST Households residing in other areas
- Third: Other households as mentioned above

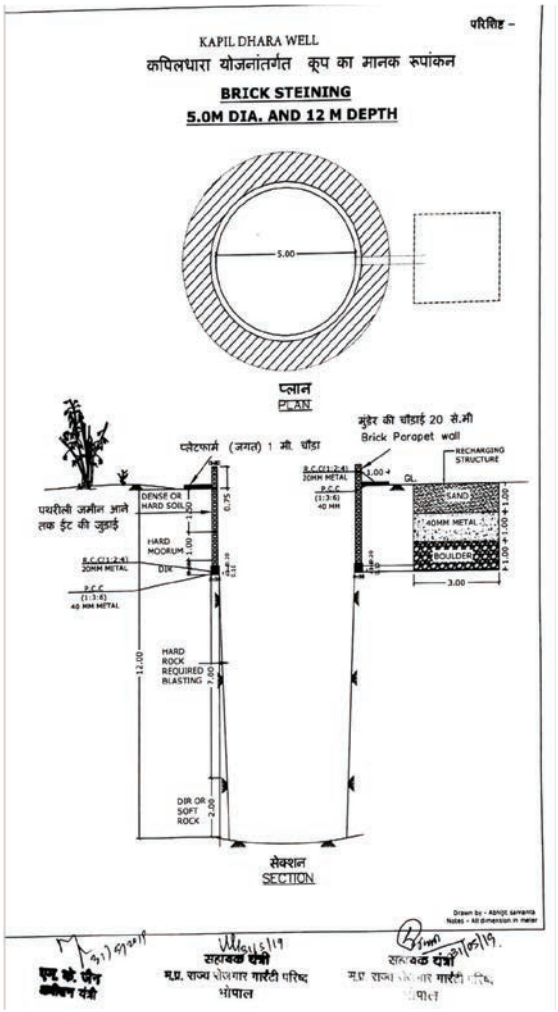
The maximum cost of Kapil Dhara well (minimum 12m deep) with farm pond (of minimum 400 cubic m. capacity) is estimated as INR2.3 Lakhs which is done in four phases as shown in table below:

Phase*	Construction	Cost Estimate (INR)	Labour Cost (INR)	Material/Machine Cost (INR)
First	Complete digging of Farm Pond and 6m deepboring of well	60,000	50,000	10,000
Second	Well boring of 12 m	60,000	40,000	20,000
Third	Pitching of Farm Pond and the well bunding at farm pond level	60,000	15,000	45,000
Fourth	Parapet and Jagat of well competition and linking of Farm Pond to well	50,000	10,000	40,000
	Total	**2,30,000**	**1,15,000**	**1,15,000**

*As per government order dated 01-11-2016

The decision of site selection and appropriate size of farm pond will always reside with the beneficiary. To avail the benefits of this scheme, the demand is to be raised by the farmer with job card during Gram Sabha and get it sanctioned under Shelf Of Work (SOW) during the financial year planning of a GP. The site selection and technical verification is to be done by Sub-engineer or technical officer. The labour cost to the farmers is paid as per the muster roll on weekly basis and the amount will be paid after the completion of the work under *Mahatma Gandhi NREGS*. For material cost payment, the SHG or GP will be considered as the vendor who has to fill a format to get the payment. Gram Rozgaar Shayak is responsible for overseeing the process and clicking of geo tagged pictures during the different phases of the construction and present it to the Chief Executive Officer of Janpad Panchayat (CEO JP) for approvals for payment release. Muster rolls will be issued for payment of labour and the cost of material will be deposited directly in beneficiary's account.

Apart from this, a household can club other activities like check-dam to ensure recharging of well and availability of water for longer duration of time under the *Mahatma Gandhi NREGS*.



Impact

The scheme is benefiting the farmers to address the uncertainty of availability of water for irrigation during delays of monsoon and the non-monsoon period. This has resulted in an increase in agriculture production for the farmer residing in the remotest forest areas of the state. With significant percentage of areas in the state under the forest department jurisdiction and lots of difficulties in setting up of irrigation facilities, this is serving its purpose to extend support to the tribal communities for irrigation. Under this scheme all the benefits are reaching the farmer directly. The extra cost burden for digging of well in Granite hard rock strata is reduced and a farmer can avail a benefit of total INR2.3 Lakhs which will cover both the material and the labour cost. With the construction of farm pond, the reaching of ground water is also happening.

Learning from Case Studies

Scientific and Comprehensive Plan

The cases presented demonstrate the importance of adopting a scientific and comprehensive approach for the identification of restoration activities and the development of a comprehensive plan for ecological restoration of the resource.

In all the four cases the restoration of ecological resources has been developed within the context of local ecology, be it Sasur Khedi II river or the springs of Sikkim or pasture land at Bhilwara. The restoration approach and identification of activities have followed a thorough scientific and technical assessment. Involvement of technical expert agencies, like BARC and IIT Guwahati under Dhara Vikas, and Department of Forest in pasture land development at Bhilwara and use of remote sensing data for river revival, and Department of Water Resources in Harit Dhara have been critical in providing inputs that have proven to be relevant and useful for the restoration of the resource.

The restoration plans have been comprehensive and integrated multiple approaches enabling a complete revival of the resource base. For example, in case of Dhara Vikas, the spring shed approach created biotic and abiotic spring recharge structures, in case of Harit Dhara the restoration plan focussed in improved embankment of dams, repair of sluice gates, desilting of reservoir and canals, and repair of canals to rejuvenate the potential of the irrigation infrastructure that was created, and in case of river revival the de-silting of the river was accompanied with soil and moisture conservation works along its embankment.

The role of technical agencies in each of the projects presented in the chapter were not limited to providing inputs for planning only. Their engagement continued during implementation, training, and impact assessment. The involvement of technical agencies during the entire project cycle increases their respective stakes within the project and also lends credibility to the plan and its implementation.

Role of Gram Panchayats

Two factors stand out in the cases presented: one is the use of *Mahatma Gandhi NREGS* as the umbrella within which the programme was developed and the involvement of Gram Panchayat in execution of works. The former enabled financing of the restoration plan through use of local labour, and the second was instrumental in creating the mechanisms for community participation and involvement of local leadership. Both these factors were important for the identification of the need for restoration, the plan for revival, and the operation and maintenance plan post-restoration.

With Gram Panchayats as the institution mandated for the functional control of the resource, the spring or the irrigation infrastructure or the pasture land, locating the restoration plan with the Panchayats thus contributed towards the sustainability of the rejuvenated resource. For example, in Hastinapur the Gram Panchayat facilitated formation of the committee for the maintenance of pasture land and enabled the committee to levy user charges for each animal that enters the land for grazing. Similarly, the Gram Panchayats had the leadership role in ensuring governance of each of the springs hat were revived under Dhara Vikas programme.

The COVID-19 lockdown provided opportunities to harness labour of in-migrants to their native villages for restoration of resources (see Box: Eco-Restoration During COVID-19 Lockdown). In both the cases the intervening NGOs used the labour of the in-migrants to revive the river or pyne as voluntary labour and with some support for food that was the immediate need of these families.

Involvement of technical expert agencies, like BARC and IIT Guwahati under Dhara Vikas, and Department of Forest in pasture land development at Bhilwara and use of remote sensing data for river revival, and Department of Water Resources in Harit Dhara have been critical in providing inputs that have proven to be relevant and useful for the restoration of the resource.

Eco-Restoration During COIVID 19 Lockdown

River Revival in Bundelkhand

Bundelkhand region is prone to frequent droughts which has prompted a large population in the area to migrate on a regular basis. 90% of the population of Bhanwarpur village, Naraini block, of Banda district migrates to cities in search of employment. With lockdown, during the COVID-19 pandemic, the incoming migrants had lost their livelihoods in the cities and were faced with an uncertain future at home. Determined not to return to the cities, the incoming migrants resolved to address the problem of irrigation of their fields.

Dharar, perennial river flowing through Bhanwarpur, had dried up due to construction of large number of check dams on the main river and was filled with silt and watercress due to neglect for a long time. Revival of river implied availability of water that the migrant families can be used for oncoming agriculture season that will enable them to overcome the food and livelihood crisis being faced by them.

Parmarth and Vidhyadham Samiti, the local civil society organisations, came together to provide dry ration to distressed families in lieu to their voluntary labour for reviving Dharar river. 184 persons worked for four days to clean and clear the river for one kilometre. The news reached the Block Development Officer who visited the area and linked the villager's offorts with the *Mahatma Gandhi NREGA* programme. The Dharar river found a new lease of life and was rejuvenated to provide water for irrigation to the fields of Bhanwarpur farmers.

Rejuvenating Ponds and Pynes in Bihar

A pyne is a small canal that brings water to small holder farmers in rural areas of Bihar. Sumrain Pyne is part of a 52-village model for sustainable water that is being set up in Rohu block of Nawada district of Bihar.

As the migrants returning on account of COVID-19 lockdown reached their native village they were worried for the lack of food security for their families. Janhit Vikas Samiti organised four voluntary labour camps for the returning migrants to work on the cleaning, clearing and revival of the pyne. From May 15, 40 volunteers started working on the pyne for which they were provided dry ration for 20 days by the organisation. The initiative also gave an opportunity to engage with communities in water literacy, water conservation, and the importance and mechanisms for harvesting and recharging of groundwater in the villages. With the success of these camps, more such camps were organised at Baghir, Dumri, and Sur pyne by Janhit Vikas Samiti.

©freepik/hiv_360

The examples of the four cases presented and the efforts during COVID-19 lockdown demonstrate the labour-centricity of these programmes and the advantage that Gram Panchayats and Civil Society organisations offer in initiating such works. Even in the case of Sasur Khederi II river revival, the Gram Panchayats along the course of the river were involved not only for motivating labour to register for works but also to monitor the implementation of works in their areas being conducted under *Mahatma Gandhi NREGS*.

Mission Mode Implementation

Implementation of restoration works follow a mission approach: completion of the execution of the plan within a time frame. Completion within a fixed time is important for the revival to take place according to the climatic cycles and also to ensure that the fruits of restoration are available to the people in the shortest possible time as each of the resources impact their ability to conduct their livelihoods.

Thus, the operational plan of restoration works has to be approached and developed in a mission mode and communicated accordingly so that the availability of financial resources for the plan is ensured for the entire duration of implementation. The latter is critical as the works are labour centric and the payment of their wages will be regular and smooth thus ensuring their continued engagement with these works.

Women

Traditionally the primary user of the resource rejuvenated through the eco-restoration works- drinking water, fodder for the animals, watering of agriculture fields- have been women, but their involvement in the project have been as labour under *Mahatma Gandhi NREGS*. The examples described in the chapter have neither involved the agency of women for planning and implementation, nor as agents of change in post-restoration scenarios. The possibility of women's collectives taking charge of the use of resource, once it has been restored, would have contributed in ensuring the sustainability by regulating the use pattern within the carrying capacities of the resource.

Up-Scaling

Depletion of ground water resources, drying up of rivers, damaged and depleted irrigation infrastructure (pyne, canals and so on), degraded pasturelands, erosion of top soil, drying of lake/tanks, seasonality in availability of water from wells and springs, decreasing biodiversity, etc are resources that face ecological stress due to numerous factors related to climate and human activities. Each of these resources provides ecological services to humans to enable them to conduct their livelihood activities. Depletion of these resources has a direct impact on the ability of human population to be productively employed and ensure their respective livelihood security.

The examples of Dhara Vikas and Harit Dhara indicate the manner in which pilots have been scaled up to a larger eco system and formalised in to programmatic interventions at the state level. In case of Dhar Vikas it has led to inclusion of spring shed development as an eligible activity within the framework of *Mahatma Gandhi NREGA*. The need for creating demonstrative models of eco-restoration that have asignificant impact on the restoration of the resource and thus on the livelihood, demand a systematic approach in their conception, planning, implementation and impact assessment before they can be held as demonstrative examples for replication and up-scaling at a wider and similar ecosystem.

Good Practices

(a) *Mahatma Gandhi NREGA* as the main instrumentality

Mahatma Gandhi NREGS offers unlimited possibilities for financing eco-restoration works through the use of labour. Ensuring labour centricity in its design, *Mahatma Gandhi NREGA* has proven to be scale agnostic–from eco restoration of 25 ha of pasture land or one spring to restoration of 40 kms of river. Further, the use of labour allows its replication in other parts as exemplified in sporing shed development of Dhara Vikas and restoration of irrigation infrastructure under Harit Dhara.

(b) Focus on restoration

The main focus of the project was eco-restoration as distinct from conservation (reduce extraction or exploitation of resource) or protection (stop using the resource). Restoration offers increased possibilities for participation from the community and user groups as it does not entail restrictions on their usage. In fact, it offers the possibility of continuing (if not increasing) the current use pattern of the resource post restoration.

(c) Inputs from Technical Resource Agencies

Being contextual, the eco-restoration plan needs to be rooted in the local ecology and environmental endowment. Scientific assessment of the local context and consequent inputs from technical resource agencies are critical to hedge risks and make informed decisions. The projects presented in this chapter compile the inputs from multiple technical agencies to develop a comprehensive and integrated plan for resource restoration in varied geo-ecological contexts and for different types of resources.

The possibility of women's collectives taking charge of the use of resource, once it has been restored, would have contributed in ensuring the sustainability by regulating the use pattern within the carrying capacities of the resource.

© Pexels/ Anna

Agroecology: Sustainable Farming Practices for Farmers

Can agriculture provide livelihood security to the small farmers? How can farmers bring balance between costs and income from agriculture? How can agriculture contribute to the well-being of the farmer and the consumer? Is agriculture only about productivity or is there scope for quality and nutrition of produce? Can farmers be producers of knowledge or do they always have to depend on extension to gain knowledge and skills? These are some of the questions faced by small farmers that the present chapter seeks to address through the cases of agroecology that have been implemented in the country.

Small farmers face increasing costs of inputs including seeds, fertilisers, water and pesticides. With almost static prices of their produce, they face the prospects of decreasing returns from agriculture. Increased dependency of the farmers on input markets have eroded their autonomy in decision making and disempowered them, as it does not recognise their experience and knowledge of farming. The negative impact of use of agrochemicals on the productivity of their land, health of soil and their personal well-being, too, have been significant. There has been a nascent, and now more vocal, demand from farmers to have an alternative paradigm of farming that is distinct from the mono-cropped, input intensive agriculture that has been so far propagated as the idea of green revolution.

Agroecology presents an alternative paradigm in agriculture, especially for small farmers as it is farmer centric wherein it deals with the resources available on farm and their usage for increasing productivity. FAO defines agroecology as a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It is, thus, transdisciplinary in scope and content seeking to optimise interactions between plants, humans and environment with the social realities of equality in food systems which allows people to exercise their choice of what they eat, how and where it is produced.

Agroecology thus also creates a link between the producer and consumer. The inherent linkage of the farm and plate and the choices associated with it are embedded in the principles of agroecology which also sets in to motion a circular economy where waste/residue is the raw material for another process. The case studies in this chapter exemplify the manner in which agroecological practices were introduced in India and institutionalised through increased use of organic bio-supplements and co-creation of solutions.

Living Soil: Impact in Agriculture and Health

Kedia Village, Jamui District, Bihar
Implementing Agency: Greenpeace India
Supported by: Greenpeace India

Context

Farmers in India had historically practised sustainable agricultural practices which was disrupted by the indiscriminate use of chemical fertilisers, leading to situations where there are multi-nutrient deficiencies in soil, destabilising the food production system. Chemical-based agriculture has led to a long-term decrease in fertility of soil demanding increased dosage of fertilisers and pesticides that has adverse impact on earnings from agriculture and health of people who work on farms.

The Living Soils team of Greenpeace India engaged with over 6,000 farmers in 24 blocks of Bihar and found that the health of farmland is steadily deteriorating, trapping farmers in a vicious circle of increased dosage and increased cost of cultivation just to main the same levels of production from their lands. The Living Soils team piloted organic agriculture practices in Kedia village located in Jamui district of Bihar.

The women of Kedia village reported boils and blisters on their hands and suffered from whacking cough while weeding the chemical sprayed fields in their village. The food cooked at home was made from produce that was sprayed with chemical and fertilisers which led to increased frequency of illness in the families.

Strategy and Its Implementation

Living Soil campaign aimed at reducing the dependence of farmers on agrochemicals and restoring soil healthe by using biomass-based organic supplements and enhance agrobiodiversity in the village.

Living Soil campaign aimed at reducing the dependence of farmers on agrochemicals and restoring soil healthe by using biomass-based organic supplements and enhance agrobiodiversity in the village.

Strategy	Implementation	Description
Raising awareness Making users aware on the ill effects of using agrochemicals	Extensive consultations with farmers, including women farmers, were undertaken to make them aware of the impact of agrochemicals on their fields and health.	The perspective of reducing dependence on agrochemicals and bringing soil back to life by rejuvenating soil health and biodiversity by using biomass-based organic supplements was repeatedly discussed,which led to a revival of traditional knowledge and wisdom in the community.
Co-creating knowledge and solutions Local Knowledge to spearhead the revival	Consultations with farmers, government officials, civil society and other key stakeholders were held to identify and explore possible solutions.	Existing knowledge of making and using bio-fertilisers and bio-pesticides was revived. The manner of producing these organic supplements was revived and piloted by farmers in their fields. These fields were visited, and the impacts were noted and discussed among farmers.
Accessing Government schemes Act as a bridge between community and government schemes	Schemes of the government, including vermicomposting, cattle sheds, *Mahatma Gandhi NREGS*, Swachch Bharat Mission, Jaivik Krishi Yojana were accessed by the community at Kedia. The model was thus kept financially independent by resourcing schemes for installation of plants and equipment.	250 vermi-beds, 22 biogas plants, 40 wells, 15 cement animal sheds, and 20 ecosan toilets (to separate human excreta and urine at source) have been constructed in the village. The Department of Agriculture provided 50% on the total input cost to set up these assets.
Developing circular systems Ensuring sustainability of raw material, use and benefits	Circular systems were identified and developed that were important to ensure that output from one system is fed as raw material in to the other. This not only created a closely linked chain but also developed interlinked stakes in each such activity.	Women collect cow dung that is fed in biogas units (made from using Sintex water tanks) and the gas is supplied to kitchens in the village. Dung left at the bottom of the biogas plant is fed into vermi-beds located next to the plant. Earthworms in vermi-beds convert dung into rich organic manure. Cow urine collected from cement cattle sheds is used to make biopesticides like amritpani, beejamrit and brahmastra.

Impact

Women report that they do not suffer from boils and blisters and the use of biogas in kitchen has reduced their exposure to smoke from chullahs. With cattle sheds the collection of cow dung and urine has become easier and the flow of dung-urine during monsoon months has stopped that has improved the general sanitary conditions of the village.

There has been reduced expenditure on chemical fertilisers. At least two bags of DAP were purchased at INR 1,200 per bag which is not required as the farming moved towards organic practices.

Kedia has been recognised as the first organic village of Bihar and started attracting farmers and civil society representatives from other areas to visit and understand the processes of transitioning from a chemical based to bio natural based farming at the farmer level.

Sustainable Agriculture: Food Security, Nutrition, and Income of Tribal Smallholder Farmers

Sundergarh District, Odisha
Implementing Agency: CIRTD[1]
Supported by: Action Aid India

Context

Ninety percent of land owners in Sundergarh district of Odisha have less than 2 ha of land with an average farm size of 0.9 ha, holding 75% of the total land holding in the district. Traditionally, these tribal landowners were fulfilling their food and nutritional needs through farming and collection of food from forests. Collection and sale of Non-timber Forest Products (NTFPs) were both a major source of employment and income to these households. However, with depletion of forests and increased pressure on agriculture to contribute to food security led to an increased (and often irrational) dosage of agro-chemicals, which with increased expenditure has reduced the earnings from farming in the long run. With long-term decline in productivity due to over use of chemicals, the smallholders find themselves insecure in terms of quality of diet and nutrition. The erstwhile self-provisioning of food, that was a strong safety net as insurance against uncertainties in income and employment, has weakened and these farmers increasingly face the prospect of hunger and under-nutrition.

CIRTD covered more than 1,000 smallholder tribal farmers in Sundergarh district to support them to adopt locally appropriate, low cost, sustainable farming practices to improve food and nutritional security and increased income.

Strategy and Its Implementation

A multi layered strategy was designed and implemented with farmers and built on local knowledge and innovation. The specific strategic components are detailed below.

Strategy	Implementation	Description
Use of bacteria culture Enable farmers to move away from agrochemical-based farming	Use of bacteria culture prepared from cow dung, cow urine, and molasses and use of bio-pesticides prepared from bitter leaves such as neem, pangamic and custard apple.	Meetings were held with farmers to promote use of bio-fertilisers and bio-pesticides together with on-field demonstrations and training to enable farmers to understand the environmental and economic impact of use of chemical inputs.
Developing Seed Saviours Create self-reliance in availability of quality seed to farmers	Select farmers were identified as Seed Saviours and provided with training on seed production so that local seed is available.	Farmers collected local drought resilient varieties of seeds from and within the communities. Practice of seed exchange was revived. Seed Saviours created seed banks in the villages to make seeds available to the farmers locally. Support to store seeds was provided so that the seeds remain safe and retain their quality.
Intensive and mixed cropping practices Cropping practices made diverse and intensive	System of crop intensification and mixed cropping was introduced in the villages.	Systems of root intensification, line sowing, mixed farming, millet cultivation were piloted on small plots owned by farmers. 5 farmers as Krishi Mitra from each of the 25 villages were identified and trained to grow indigenous millets, pulses and oil seeds and vegetables in a? System of Crop Intensification. They engaged with more than 1,000 farmers on agroecological techniques through training, demo-shows, exposure visits and best practices.

[1]Centre for Integrated Rural and Tribal Development, Sundergarh

Pooling resources from government subsidy Use government subsidy to improve availability of agriculture equipment at the farm level	Subsidy from government schemes was pooled to purchase drudgery reducing equipment for farm labour.	Cycle-weeder, wheel-hoe, cono-weeder, millet weeder for soil loosening and weeding, and markers for setting lines for sowing and transplanting. Farmers collectively started using the equipment so that more numbers can benefit from them. Nominal user fees were charged and collected by Farmers' Club for repair and maintenance of the equipment.
Learning, disseminating and innovating Farmer Field schools were set up for creating learning and disseminating space	Institutional mechanism to learn and share and to develop collectives of farmers was undertaken through the establishment of Farmer Field Schools and Farmers' Club.	Farmer to farmer exchange was organised to create opportunities by observing and learning from each other. Meetings with scientists and with farmers representatives/organisation were organised.

Impact

The farmers own the technique of low-cost methods of ecological farming with applications of locally available inputs like indigenous seeds, which the farmers are preserving and exchanging among themselves. Around 80 varieties of paddy, eight types of pulses, four varieties of millets and 48 types of vegetable and tuber seeds are being exchanged amongst farmers.

Increase in productivity of indigenous variety of rice was estimated to be between 50-60%, increase upto three times in production of ragi, and increase up to 36 quintals per hectare in case of mustard was verified by Government's Agriculture Science Centre at the district level. Farmers have reported that the increases have been sufficient not only to meet their food and nutritional requirements, but they have disposable surplus with which they are able to earn cash income.

Women farmers have found drudgery reducing equipment to have positive impact on their well-being, and have formed their collective which is engaging with the government, demanding market space at the local market in GP and the Municipal government at Sundergarh.

©Sahaj Samrudha

Sahaj Samudra: From Production to Plate

Karnataka
Implementing Agency: Sahaj Samudra
Supported by: Various Agencies

Context

Traditional seeds have been reproduced and handed down for generations as part of the seed heritage in the country. These seeds are rich in flavour, taste, quality, nutritional benefits and resistance to diseases and pest attacks. In this system, the farmer was the seed producer, preserver and user.

The practice of industrial monocropping farming had led to the destruction of the wide variety of this gene pool and has introduced seeds that are driven/determined by market over which farmers have little control. The erstwhile system of seed exchange that used to maintain and enrich the quality of seed has been replaced by the market. The company is the producer and supplier of seed and the farmeris the buyer/user of the seed.

Sahaj Samudra, an organic farmer's association in Karnataka, initiated the processes for safeguarding agro-biodiversity by building sustainable villages and ensuring food futures through the consumption of organically produced foods. The aim was to make farming productive, protect the environment, preserve traditional knowledge, revive the landraces, and making farmers self-reliant by using lesser inputs. Given the large proportion of small and marginal farmers, the organisation targeted working with the disadvantaged group of small and marginal farmers, Dalits, tribal and landless women farmers in the semi-arid regions of the state.

Sahaj Samudra started their initiative by focussing on paddy that was the main crop in the region. Later they also included millets, vegetables and tubers as part of their programme. The strategic details narrated below focus on the revival of millets in Karnataka.

Karnataka has the highest proportion of drought prone area in the country. Dry lands comprise 79% of the total arable area of the state. Millet used to be a major crop in these areas,which has been lost due to the introduction of high yielding varieties that demand water and input intensive farming practices, a shift from millet cultivation to maize and sunflower cropping patterns, changing food habits of the buyers, lack of market support, and lack of value addition to millets as a cereal.

Strategy and its Implementation

The main aim of millet revival for Sahaj Samudra was to popularise millet based multi-cropping system in the rainfed area of the state.

Strategy	Implementation	Description
Develop Community Seed Banks Preserving, reviving and making traditional variety of seed available locally	A series of meetings with farmers was conducted to identify constraints and challenges in millet farming as well as the ways of reviving millet as part of their cropping system. Farmers with knowledge and availability of traditional seed were selected as seed growers.	Seed growers were encouraged to make their own selection of traditional varieties, conserve it and multiply the seed of other traditional varieties. Seed growers were encouraged to sell these seeds to other farmers, and maintain seed diversity plots where both, open pollinated and self-pollinated varieties were produced. On-farm conservationof seed diversity restores biodiversity and helps preserve variety in their natural habitat and allows the community to exercise their preference in selecting particular varieties.
On-farm research and standardisation of agriculture practices Farmer-centric collaborative research for development of methodologies to improve performances	Learning and innovating space that is guided by the needs of the farmers and the need for the revival of millets.	Participatory research with farmers, scientists, conservationists, breeders, and innovators is conducted on a regular basis. These research leads to further development of local genetic resources and development of standard protocols for farming for different varieties of millets.

Facilitate procurement, marketing and sale of organically produced products Creating niche in selling of organic products in the market	In the absence of an exclusive market for organic products the famers end up selling them in the common market, making it difficult for them to gain premium pricing for the high quality of their product.	Sahaj Samrudha Organic Producer Company has been formed, that sells different products under the common brand name of Smarudha Organics. The produce is procured directly from the producer and sold through the network outlets of the company. Value added products of millets, namely flour, cakes, biscuits, chakli and papads are processed by the company and sold through its outlets.
Producer-consumer programmes Make consumer aware on the health and nutrition benefits of millet consumption	To popularise traditional crop varieties, consumer-producer awareness programmes are organised to highlight the nutritional and medicinal value of traditional cereals.	Conduct and organise seed and food festivals, preparing awareness material for consumers e.g., millet calendar and posters, preparing booklets with recipes of millet preparation.

Impact

Villages of Kundagol taluk have re-introdcued millet multi-cropping system that has revived food security of small and marginal farmers. Haniumanahalli village of the taluka has been declared as Millet Village by the state government.

Sahaj Samudra has conserved 68 traditional varieties of millet and networked 300 farmers cultivating millet varieties in more than 300 acres. The farmers are facing increasing demand for millets from the consumers as millets are making their way back on the food table of rural and urban consumers.

©Sahaj Samrudha

Learning from Case Studies

Farmer centric solutions

The cases presented have farmers in their core of analysis and in seeking solutions. Kedia, the organic village, the sustainable farming practice in Sundergarh, and the Shaja Samudhra initiatives have kept the issues of farmers in the centre and have created mechanisms in which the farmers participated and co-created solutions for their needs and to address their respective challenges. The system of a Farmer Field School and on-farm participatory research are methodologies that have enabled the formation of participatory learning spaces.

A direct consequence of co-creation mechanisms is the importance and space that is provided to traditional knowledge and wisdom. On one hand this empowers the farmer, as s/he is recognised as the producer and consumer of knowledge, and on the other it makes the possible solution context specific and hence has a high adoption rate. Further the continued knowledge that these forums facilitate makes them dynamic with an inherent growth in their knowledge base. For example, with excessive or deficit rainfall, the field schools will make an immediate assessment of how different varieties responded to the variations in rainfall. Such observations and consequent analysis add to the knowledge base and make it relevant for the local region.

Self-reliance in making of bio-supplements

The projects not only propagated use of bio-supplements but they also encouraged the community of farmers to make their own bio-supplements from material collected locally and prepared from their own labour. In Jharkhand the Jharkhand State Livelihood Promotion Society (JSLPS) has trained SHGs in production of such bio-supplements and create a market for such products (See Box: Drav jeevamrit: Organic Fertiliser Gaining popularity in Jharkhand)

At Kedia, Sundergarh and in the field of Shahaj Samruddha the farmers are trained to develop their own bio-fertilisers and bio-pesticides based on the availability of local material. Thus, the knowledge of the product and its use is embedded in the knowledge base of farmers, which reduces their dependence and cost on the chemically and market dependent products. This adds to the advantage of sustainability of use of bio-supplements in the long run as both availability and usage is within control of the farmer.

Drava jeevamrit: Organic Fertiliser Gaining in Popularity in Jharkhand

Drava jeevamrit is an organic fertiliser made by mixing cow dung, jaggery, gram flour, cow urine, soil extracted from the mound of white ants, and banyan tree-roots. The use of the organic fertiliser increases the availability of nitrogen, iron and phosphorous in soil. Though mainly used for paddy it is equally suited for other crops to provide phosphorous nutrition throughout the growth cycle of the crop and as a starter does of nitrogen and low sulphur. The general dosage of Drav jeevamrit is 1,000 lts for one acre of land, and it has been found to increases the fertility of soil and also acts as bactericidal and growth hormone for crops.

The Department of Rural Development in collaboration with JSLPS has trained 350 master trainers to further train SHGs in the making of Drav jeevamrit and other organic manures like Ghan jeevamrit, Nimastra etc. The initiative has dual aim: (1) To raise awareness of and demand for organic fertilisers; and (2) To initiate the production of organic fertilisers at the local level so that women can start a production and sales centres around these fertilisers. JSLPS has developed 8,700 women as users of Drav jeevamrit and the initiative has led to setting up of ten stores selling organic fertilisers across the state.

The system of a Farmer Field School and on-farm participatory research are methodologies that have enabled the formation of participatory learning spaces.

©Gaon Connection

Circular systems

Organic farming practices are based on circular systems of usage: the organic waste and crop residue forms part of the farm yard manure and is used for generating organic compost or as fodder for the animals; animal waste is reintroduced as manure, seed is identified, conserved and preserved from on-farm production; animal and farm waste is used for making of bio-supplements for soil and crop and so on. The circular systems not only maintain the health of the ecosystem but also contribute in enriching the quality of soil, seed and thus the produce.

Setting up circular systems has a major impact on reducing expenditure as these do not entail costs that are to be paid in cash. For the small farmer, cost reduction is an important factor as it increases their net earnings from agriculture.

Women

Women play a key role in demanding, adopting and promoting organic practices. This has been evident in case of Kedia where women bore the brunt of chemical farming. Even in case of Sundergarh experiment, it was women who spearheaded the adoption of sustainable farming practices on farms.

A note of caution needs to be inserted here: organic package of practices increases the work for women on farms. For example, the making of bio-supplements is an additional work that the women have to undertake – collection of cow dung, collection of cow urine, mixing and preparing the supplement and so on. Most of this work is unpaid and undertaken and executed by women. Promoting organic packaging should have the component of gender division of work amongst small holder farmers and should engage with men to create a dialogue on bringing equality in performance and burden of work amongst men and women in the households.

Up-scaling

There is an inherent preference of the small farmers for organic practices as these households employ their own labour work on their own lands and thus have a closer relationship with their land. Further, with large areas in the country dependent on rainfed farming, organic farming practices promote an increased use of in-situ soil moisture, the use of varieties that require less water, and hence have a larger opportunity for replication and up-scaling in other parts of the country.

Sahaj Samrudha example of working on paddy, vegetables and tubers demonstrates how the movement to revive traditional varieties in different crops has the potential to spread in other geographies and in other crops as well.

Good Practices

(i) Co-creation of knowledge and practices

The farmer as the producer of knowledge has been the critical factor in all three case studies. This has helped in developing solutions that are specific to farmers needs and based on locally available material and knowledge. These processes, however, did not negate the usefulness of scientists and technical experts who also participated as holders of knowledge that further facilitated in analysis and introducing innovation to the farmers.

(ii) Producer-consumer linkage

The link between producer and consumer is an integral part of agroecological principles. This link was made formal in case of Sahaj Samudhra as they not only created a niche market for their organic produce but also took initiatives to educate the consumer in the nutritional benefits of the produce.

© freepik

Climate Risk Management: Systemic, Inclusive and Contextual

Climate emergencies pose the questions: how can people adopt in short-run and what will be mitigation solutions to the current and emergent climate problems? What are the changes we need to bring about in current public investment programmes to enable them to create adaptive solutions to diverse geographies and communities? How can we bring in traditional knowledge and wisdom in designing resilient structures that are adaptive and make them climate proof? Are there tools available that provide historical and predictive data by community to plan for climate adaptation? These are some of the questions that the present chapter seeks to answer through the case studies that have been documented here.

With average temperatures predicted to rise between 2.4-4.4°C by the end of the century, the climate crisis has become acute in India. The rise in temperatures will be accompanied by occurrences of extreme heat events like heatwaves, longer and frequent droughts, longer dry spells, uncertainties in onset of monsoon, and heavy and irregular rainfall patterns. However, climate chage affects humans and impacts the functioning of the ecosystems and the services that they provide. Climate risk management, thus, has tobe multifaceted and have the in-built ability to build resilience of human societies and ecosystem at the same time.

The challenge of addressing climate change with adaptation lies at three levels:

- How to bring changes in the existing programmes that are able to provide climate resilient solutions (with *Mahatma Gandhi NREGS* being one such programme with universal and comprehensive outreach in the country)?
- What is the perspective with which public policies and programmes have to approach the issues of natural resources management for natural resource-dependent livelihoods?
- How can climate information be made available in real time to communities and technocrats for designing resilient structures in field? This chapter aims to capture demonstrations around these issues and seek to narrate the set of strategies and perspectives that were adopted in developing such solutions.

Mahatma Gandhi NREGA and Climate Risk Management

West Singhbhum district, Jharkhand
Implementing Agency: Department of Rural Development
Supported by: *Mahatma Gandhi NREGS*

Context

Mahatma Gandhi NREGS is a flagship programme of the government that entitles all rural households 100 days of guaranteed wage employment as unskilled labour for building different types of rural infrastructure. Since its inception, the objective of the scheme has expanded to include durability and sustainability of rural infrastructure, strengthening rural institutions and skilling of rural labour force.

The beneficiaries of *Mahatma Gandhi NREGS* belong to the most velnerable groups that are, and will be, affected by climatec changes. Social protection programmes, like *Mahatma Gandhi NREGS,* support households and communities to cope with poverty and help them to absorb effects of climate risks, adapt to climate impacts, and develop their ability to address climatic stresses. The pathways for absorption and adaptation, that would enable improved planning and design of structure and works under *Mahatma Gandhi NREGS* however, have not

The study of *Mahatma Gandhi NREGS* of soace west Singhbhum district of Jharkhand in the context of drought and climate change perspective has developed the pathways and highlights the aspects that, when brought in to focus, will enhance the role of the scheme in developing and strengthening these pathways. been formally defined or stated.

Strategy and Implementation

The assessment of change is based on the context, the mechanism, and the outcome framework.

(a) Context refers to the contextual factors that shape responses to *Mahatma Gandhi NREGS* interventions. These are household's exposure and sensitivity to onset of the hazard, which in this case is drought in West Singhbhum district.

(b) Mechanisms are the programmatic instruments that enable households to change their livelihood capitals which in case of *Mahatma Gandhi NREGS* include: 100 days of guaranteed wages (and in drought hit areas additional 50 days); creation of individual or public assets to support long term livelihood strategies; institutional strengthening by participating in Gram Sabhas, access to formal banking by linking wage payments to banks, and strengthening producer groups and other community collectives; and skill upgradation for self-employment or improved wage employment.

(c) Resilience outcomes are the ability of social, economic and ecological systems to deal with change by absorbing, adapting and transforming in response to climate hazard.

Jharkhand government responded to the prevailing drought conditions in West Singhbhum and undertook specific measures for increasing the absorptive and adaptive capacity of households through *Mahatma Gandhi NREGS.* The specific strategic interventions planned and implemented are as follows.

***Mahatma Gandhi NREGS* is a flagship programme of the government that entitles all rural households 100 days of guaranteed wage employment as unskilled labour for building different types of rural infrastructure**

Strategy	Implementation	Description
Formation of Climate Facilitation Team Project Facilitation for increased coverage and action	Aim of the Cluster Facilitation Team (CFT) is to increase the number of days rural households work, reduce delays in the payment of wages, and improve the quality of works under *Mahatma Gandhi NREGS*.	In West Singhbhum CFT is drawn from SHG. CFT was trained to deliver the four results: 75 working days to all SC and ST households; increase women participation to 50%; ensure wages are paid within 14 days; prepare integrated watershed plans in GPs.
Asset Creation Selection of assets for drought proofing	Drought catalysed the state government to focus on reducing farmer's vulnerability to the effects of drought and water stress.	*Mahatma Gandhi NREGS* focussed on creating individual assets and using integrated watershed management principles to plan for water structures. Specific focus on building farm ponds was taken up so that the farmers can move to a two-crop regime. De-silting of existing ponds, digging of individual dug wells supplemented structure to harvest and store surface water.
Institutional Strengthening Increased participation and institutional linkages	Increase participation of communities in decision making processes of *Mahatma Gandhi NREGS* at the village and GP level.	CFTs worked intensively with the community to increase their understanding of *Mahatma Gandhi NREGS* and its processes. Participation, especially of women, was targeted to be increased in Gram Sabha for identification, planning and design of works and structures under *Mahatma Gandhi NREGS*. CFTs assisted households to access banking services and thus worked for their financial inclusion.

Impact

Combination and layering of guaranteed wages, institutional strengthening and investment in private infrastructure helped build absorptive and adaptive resilience in the district.

Investments in physical capital of farm ponds and dug wells directly improved the accessibility and availability of natural capital, namely water, of the households that were enabled to have greater crop diversity and improved agriculture production. The latter two had a direct impact on increased income of the households. One-fourth of households reported that they were able to absorb the impact of drought.

Eco System Based Approach in Watershed Management: Journey in systemic resilience

Bhojdari and Purushwadi villages, Ahmednagar district, Maharashtra
Implementing Agency: WOTR[1]
Supported by: *Mahatma Gandhi NREGS*

Context

Integrated watershed development includes measures for soil and moisture conservation in a ridge to valley approach with afforestation, water harvesting, water management, micro irrigation and increased ground water level with the main purpose of increasing the agriculture production and securing agriculture-related livelihoods. An ecosystem-based approach in watershed development brings the needs of the eco-system in the centre of planning by adding components of upstream-downstream needs of humans and local biodiversity. Water is managed through water stewardship management, which manages the demand side through annual water budgets, crop choices, water conservation and water sharing technologies. The aim is thus to achieve broader benefits through crop diversity, local agro-biodiversity, a package of practices for climate resilient agriculture and nature-based solutions along with the enhancement in agricultural production and agriculture related livelihoods.

Ecosystem based Adaptation (EbA)has developed as a systematic approach that focuses on increasing people's adaptive capacity through sustainable use, conservation, and restoration of eco-systems, biodiversity and ecosystem-based services. The approach includes inclusive governance and improved coordination between policies and programmes that contribute towards sustainable development. The rationale rests in the essential services provided by the ecosystem in terms of soil formation, water provisions, water quality, pollination, biological pest control for agriculture related livelihoods. Climate change negatively impacts ecosystem health and its ability to provide these services. Firming up these ecosystems creates buffers against climatic hazards like droughts and extreme rainfall events imparting resilience to agriculture related livelihoods.

WOTR has implemented watershed projects in Ahmednagar district that were based on the principles of the ecosystem-based adaptation approach, to build systemic resilience of the ecosystem and the people. The case study presented here emanates from the experience gained in two of the villages covered by the organisation, namely Bhojdari and Purushawadi.

Strategy and Implementation

Bhojdari village lies in a semi-arid rain shadow area of western ghats mountain range, prone to droughts with an average rainfall of 550 mm. The village is inhabited by a population comprising of tribal and non-tribal social groups and is vulnerable to climatic risks that include unseasonal and high intensity rainfall, delayed onset of monsoon, and droughts. Purushawadi located in the Akole block receives average rainfall of 1,850 mm per year. It is surrounded by forests and houses predominantly tribal population. The village also faces unseasonal and extreme rainfall, frost and heatwaves.

©WOTR/Mohan Dhuldhar

[1]Watershed Organisation Trust, Pune, Maharashtra

Strategy	Implementation	Description
Soil and Moisture Conservation Identification and implementation of conservation measures over thelandscape	Soil and Moisture Conservation (SMC) from ridge to valley, based on the respective eco-system, land classification, needs of up-stream down-stream humans, flora and fauna, biodiversity, and maintaining People's Bio-diversity Register	SWC measures were implemented at landscape scale to restore, sustain and protect eco-system services. SWC measures included contour trenches, stone and farm bunds, drainage line treatment, and reforestation. Collaboration between GP and Forest Department ensured implementation of SWC on both village commons and forest land. The Village Development Committee administered the fund to maintain the SWC structures.
Community driven water management Employing water stewardship approach for planning and management of water	The Water Stewardship approach that includes understating of aquifers, community plans for water harvesting, annual water budgeting to assess demand for water, crop choice according to the eco-system, water conservation technologies, and water sharing.	Water Stewardship involved mobilising and informing farmers on principles of sustainable water management, and water use for crop productivity, and capacities to manage water resources. Water budgeting was undertaken to ensure better cropping plans. Installation of real time weather stations and building capacities to avail of weather advisory services were undertaken by the project.
Sustainable Agricultural Practices Instituting an ecological based approach to farming	Along with enhancing agriculture production the broader benefits through crop diversity and rotation, local agro-biodiversity, PoP for climate resilient agriculture, soil health and nature-based solutions.	Crop diversification with use of indigenous crop varieties was implemented as buffer against extreme weather events, diseases and pests. System of Crop Intensification was adopted for various crops- rice, millet, pulses and wheat. Application of sustainable agro-forestry led to re-introduction of tree varieties that provided fodder, fuelwood and fruits. Secured land rights made it possible to plant trees on private lands. Through women SHGs kitchen gardens were promoted to increase availability of vegetables for improved nutrition and for supplementary income.
Community Based Management Developing community institutions and mechanisms for planning, implementation and sustainability of benefits	Community Based Management by GP and relevant committees, namely, the Joint Forest Management Committee, Village Development Committee, and Bio-diversity Management Committee	Different community committees were set up to mange natural resources in the village. Village Development Committee was set up as sub committee of GP to manage project funds that in the long run increased the capacity of GP on fund management. Village Water Management Team was responsible for all water sources and the management of water for all purposes in the village. Bio-Diversity Management Committee established a People's Biodiversity Registers that later on promoted eco-tourism at Purushwadi that was managed by Village rural Tourism Committee. In all committees, 40% of membership was mandated for women along with representation of different social groups in the village.

Impact

The area of degraded land in Bhojdari reduced by 27% while improving the soil quality in favour of scrub forest. The promotion of organic fertilisers and bio-pesticides further enhanced soil quality on agriculture lands.

Improved soil moisture was observed which enabled cultivation of additional crops post monsoon in both villages.

Crop adequacy measures through water budgeting and water stewardship approach were reinforced through real time weather stations that supported capacity building in communities to avail of weather advisory services, thereby helping to making famers' agriculture system more resilient.

Promotion of climate resilient sustainable agriculture practices helped in the conservation of local agro-biodiversity. The reintroduction of indigenous varieties (Pearl millet) acted as a buffer against extreme weather events (drought) as these were the crops that not only survived but thrived. A system of Crop Intensification applied on wheat, paddy and millets led to an increase in yields, a reduced need for water and input costs for the farmer. At Purushwadi, farmers reported anincrease of upto 50% by adopting the System of Rice Intensification (SRI) in their fields.

Sustainable agroforestry led to the reintroduction of indigenous tree varieties. Additional fodder, fuelwood and fruits were available as eucalyptus was replaced with local tree species.

There was an increase of 38% in the income of households, implying that agriculture was not only made climate resilient it was also made more profitable due to greater diversity of cash crops, improved yields, lower input costs,and improved market access.

CRISP-M: Climate Information for Drought Proofing

Barwani District, Madhya Pradesh
Implementing Agency: IIED-MPCST[2]
Supported by: ICRG Programme[3]

Context

To ensure resilience of vulnerable communities, and sustainability of benefits in the long run, the MGNREGS aims to take in to account the impact of climate change in the planning and design of its works. The Master Circular (2020) specifically states that the planning and design of *Mahatma Gandhi NREGS* works should take into account the historical and projected climate change data, especially related to the incidence of droughts and floods, and the vulnerability assessment at the district, block or GP level.

Incorporation of the Ministry of Rural Development's (MoRD) guidelines face multiple challenges:

(a) Climate information is not communicated in a format that the households can understand;

(b) The households are not able to use the data to interpret, analyse and use it for *Mahatma Gandhi NREGS* planning and decision-making;

(c) The additional 50 days of wage employment provided under *Mahatma Gandhi NREGS*, by way of risk coverage in times of severe drought, suffers from time lag between the actual drought conditions and the formal declaration of drought by government;

(d) The assets created under *Mahatma Gandhi NREGS* are not able to build absorptive and/or adoptive resilience capacity in households because either the assets were not optimally designed as per needs of landscape and community needs or the choice of assets was not as per the local conditions or the assets were located where the vulnerable communities were not able to seek benefits; and

(e) Limited involvement of community, and especially women, in planning and ensuring that their asset preferences are included in *Mahatma Gandhi NREGS* plans.

[2]International Institute for Environment and Development and Madhya Pradesh Council of Science and Technology
[3]Infrastructure for Climate Resilient Growth Programme of Foreign Commonwealth and Development Office (FCDO)

The Climate Resilience Information System and Planning tool for *Mahatma Gandhi NREGS* (CRISP-M) has been developed to overcome the above challenges through web and mobile phone-based GIS aided applications to support planning, implementation and monitoring of *Mahatma Gandhi NREGS* works within the larger framework of climate variabilities. CRISP-M performs three key functions:

(a) A drought monitoring and reporting system to support early action on provision of additional wage employment;

(b) Climate risk-informed planning of the integrated natural resource management of assets under *Mahatma Gandhi NREGS* to strengthen climate resilience; and

(c) Create transparency and accountability by remote-sensing based monitoring and crowdsourcing data on assets and beneficiaries.

Strategy and Implementation

The CRISP-M tool was piloted in 18 GPs of Niwali block of Barwani district in Madhya Pradesh. The aim of the pilot was to understand ways in which a climate risk-informed GIS plan could be combined with community-level processes to ensure effective location-specific and needs-based planning, decision making and monitoring. The key strategies adopted by the project are given below.

Strategy	Implementation	Description
Bringing resource institutions and government to share data and expertise Multiple agencies exist to generate/use climate data	Autonomous government institutions exist within the institutional landscape that have the responsibility to generate, share and manage data related to climate. The multiple expertise needs to be brought together to develop a tool that could be used by decision makers for designing climatic resilient structures.	India Meteorological Department (IMD), Indian Institute of Technology Madras (IITM),Indian Institute for Forest Management (IIFM), Madhya Pradesh Council of Science and Technology (MPCST), NIH (National Institute of Hydrology) and representatives of state and central government have been collecting and using climate data in their respective fields. Project brought these institutions to share, generate and manage climate data along with the decision-makers in government and community to take advantage of advances being made in GIS and remote sensing technologies.
Setting Triggers for Early Warning for Drought Governments should be able to declare drought in time to arrest distress migration	2016 Manual for Drought Management of the Government of India (GoI) indicates that only drought of severe nature will qualify for relief funds including additional 50 days of employment under *Mahatma Gandhi NREGS*. States do not have systems in place to monitor drought parameters and declare drought in time.	Development of a system that acquires data on all parameters related to drought and update it in real time every 24-48 hours. Usage of drought and impact parameters to predict hydrological, meteorological and agriculture drought, establishing thresholds to trigger alerts to *Mahatma Gandhi NREGS* Functionaries and community. Enabling state governments to use the reports and data generated through CRISP-M to initiate drought declaration process.
GIS assisted tool to plan for climatic assisted assets GIS tool that assimilates information from multiple parameters and gives scenarios on future climatic projections	Designing climate compatible structures requires information on land use, soil type, drainage, geo-morphology, slop, ground water conditions etc. Making this information available to the persons responsible for the planning and design at the community and technical level within *Mahatma Gandhi NREGS*.	Integrating GIS layers of different set of information on a resolution that offers a clear picture of ground situation. Layering GIS information with Soil and Water modelling based on climate forecasts which generates multiple scenarios on rainfall, ground water recharge and water yield. CRISP-M generates advisories of possible climate resilient strategies and types and designs of assets based on localised topographical and geomorphological factors.

Enabling community-based planning and monitoring

Strengthening and making community decision-making climate informed

The essence of *Mahatma Gandhi NREGS* lies in the participation of communities in identification, planning and design of works and structures. Technology should have ain-built mechanism that further strengthens community participation and empowers them with additional knowledge for climatic effective decision-making.

Developing a mobile based application on geo and bio-physical characteristics and potentials of climate risks to enable the community to carry out climate vulnerability assessment.

Enabling the community to raise their concerns regarding proposed plans and structures. Local experiences and indigenous knowledge within the community is used to further refine proposed structures and works.

Built in do-it-yourself water balance tool to enable the community to plan for long term drought proofing within their landscape.

Impact

Co-development of an early warning system of drought has helped lay down data requirements and their up-dation for efficient and effective decision making at the level of state governments. The data generators and managers were brought to the same table as decision-makers which enriched the process of tool development, leading to the identification of relevant parameters and indicators. The process of co-development created an understanding among agencies that the modules are not perfect. They need to be revisited and revised and thus space should be given to evolve them through data users feedback and provision for constant improvement.

The development of a communication strategy that is able to communicate climate information to different sets of users who not only have different needs but also a different level of understanding of the climate information. This will also entail developing the capacity of the user for the use of climate information.

Labour budgeting under *Mahatma Gandhi NREGS* can be planned more realistically through the use of the early warning tool and system developed for drought. This will be helpful for both the government and the households who can institute relief measures early as the drought is setting in to decrease the impact that such droughts cause on livelihoods of households and communities.

CRISP-M enables the integration of top-down approach of cause-effect relationships between climate change projections and their impact and risks. The bottom-up approach that focuses on who is most vulnerable and who is likely to be affected the most.

©Farmland Rain Water Harvesting Systems
Recharging Borewells through use of V Wire Technology

Development of Tank Cascade for Recharging Water

Vizianagaram district, Andhra Pradesh
Implementing Agency: District Planning Committee
Supported by: *Mahatma Gandhi NREGS*

Context

Changes in precipitation patterns have a direct impact on the manner in which hydrological structures are designed, planned and constructed. Increases in rainfall intensity, extreme rainfall events and changes in the pattern of rainy days have led to situations where water scarcity is not imminent but has become real. The issues are two-fold: one, the need for planning to address overflow and capacity issues of irrigation structures where conserving flood water by way of storage will be critical; and second, irrigation methods that bring a greater degree of efficiency in water usage.

In Andhra Pradesh, tanks were irrigating 22% of the irrigated area in 1990-91 which decreased to 10% by 2011-12. The decrease was not only in terms of the percentage but in absolute terms as well. The decrease in effectiveness of tanks as a source of irrigation has been attributed to decrease in inflow due to inadequacies of rainfall; up-stream abstractions; deterioration of physical system e.g., breach in bund; improper condition of surplus system; decrease in storage capacity due to silting/encroachments; poor distribution system through canals; shift towards water intensive cropping pattern; and weak institutional system that impacted distribution and scheduling of water. Tanks in Andhra Pradesh have a long history of providing water for agriculture. Streams were dammed and water was conveyed from canal to tanks. As seasonality of water became prominent, the location and size of water holding structures gained importance.

At present, the Government of Andhra Pradesh has launched Neeru-Chettuas the sub-mission of the state's Water Conservation Mission. This water conservation component aims at preparing a plan for optimal use of water to prevent wastage of water into sea; and the water management component has the objective of bringing efficiency in water usage patterns. The sub-mission is geared to bring convergence among the department of Water Resources, Rural Development, Agriculture, Animal Husbandry, Horticulture, Fisheries, Rural and Urban Water Supply, Forest, and Revenue. Among the strategies adopted by Neeru-Chettuare the development of cascades to divert waterfrom surplus basin to deficit basin using GIS and satellite technologies.

Tank cascade is a water recycling and reuse system working through a network of small to large scale tanks. Each tank has a specific micro ecosystem that provides eco-system services like sedimentation, water purification, minimise evaporation, maintaining aquatic biodiversity and so on. The tank cascades are linked through a network of canals that are used to transfer surplus water to the tanks and, later, from the tanks to the agriculture fields.

Strategy and Implementation

River Champawati originates in the Eastern Ghats at 1,200 m altitude near Andra village and flows eastwards to drain in the Bay of Bengal near Konada village. The Champawati river basin has 3,260 tanks with 124 cascades and 124 sub-basins within the drainage area of 1,410 sq kms. The total command area of the river basin is 1,70,000 acres and has experienced climatic calamities in terms of floods, cyclones, and drought. The area is vulnerable to climatic uncertainties which has had adverse impacts on agriculture and other water intensive livelihoods like fisheries. Under the project the development of 65 cascade tanks in the sub-basin Garida and Tettangi was taken up.

The Government of Andhra Pradesh has launched Neeru-Chettuas the sub-mission of the state's Water Conservation Mission.

Strategy	Implementation	Description
Identification of Sub Basin(s) Focussing intervention in a defined area for maximising impact	The main criteria for identification of a sub-basin for revival included availability of tanks with a minimum of five ha water spread; presence of small and marginal famers in majority; scope for improvement in tank hydrology; willingness of the community to execute the works and maintain the system thereafter	Multi-stakeholder consultations with the community, the Departments of Irrigation, Panchayatand Rural Development, Groundwater, and the District Administration that led to the identification of Garida and Tettangi sub-basins. Data provided by Andhra Pradesh Space Application Centre along with the daily and monthly rainfall data of Gurla and Cheerupallumandal was collected and analysed in six climatological stations. The decreasing trend of rainfall of Cheepurupalli indicted that water bodies play a critical role in storing water and making it available during post-monsoon periods. Water balance study by the International Crops Research Institute for the Semi- and Tropics (CRISAT) in Tettangi and Garida on tank cascades revealed that there is water surplus in both the tank cascades and hence rehabilitation would be helpful to harvest surplus water.
Conjunctive Use of Water Use of surface water and ground water for irrigation and other livelihood purposes	Surface water included rainfall, run-off, drainage return flow, and spill water from up-stream that is distributed through canals or lifted from tanks. Groundwater included water from dug wells and borewells installed in the command areas.	GP level plans for Integrated Natural Resource Management using geo-spatial tools were developed. These plans were based on conjunctive use of surface and tank water to optimise water usage in the command area. Cascade tank exposure visits were undertaken for GP Presidents, farmers and field level functionaries from the command area of the tanks and sub-river basin.
Convergence with line departments To sync programmes of other departments with the cascade tank programme	Neeru-Chattu works on principles of convergence wherein each department has to plan for their schemes according to the tank revival plan.	The District Planning Committee took the lead and converged with the Departments of Water Resources, Agriculture, Horticulture, Fisheries Ground water, District Rural Development Agency (DRDA), and Revenue. Department of Forest planned along with the intervention so as to create a supporting eco-system around each tank and in the sub-river basin. The resources for cascade tank rehabilitation were sourced primarily from *Mahatma Gandhi NREGS*. This had the advantage of participation of the GP in the planning and execution of works for each tank.
Collectivisation of Farmers Community institutional structure to take part during execution and maintenance of the cascade system	Farmers being the main user group of tanks were mobilised and formed into collectives at the tank level and at the cascade level.	Farmer Field Schools were established at village level. These were federated as Farmer Federation at cascade level. Farmer Field Schools served as the tank level associations responsible for the up-keep of the tank and also move towards use of water conservative and water efficient irrigation practices. The Farmer Federation was established at the cascade level to act the agency to coordinate with other stakeholders and for developing the system for water management within the cascade.

Impact

6,500 families in the sub-river basin were directly impacted by the project with assured availability of water for irrigation both for the rabi season and during long dry spells in the kharif season. The production of the crops, especially paddy, increased, resulting in substantial gains for the small and marginal farmers in the area.

The linking of tanks within the cascade implied sustainable availability of water within the sub basin. This allowed year-round fisheries and the plantation around these tanks further improved the micro-climatic conditions, decreasing the silt load and rate of evaporation from the tank, thus increasing the scope of other livelihood activities.

Learning from Case studies

Systemic Changes

An outstanding feature of the examples in the case studies is that they focus on the systematic level and bring changes there. In case of *Mahatma Gandhi NREGS* in Jharkhand, the aim was to increase institutional participation and to place the focus on water harvesting and storage structures. The former enabled people to plan for labour deficit periods (induced by climatic factors) and to identify and articulate their demand for water storage structures. The results of these systemic changes were evident as the farmers gained in availability of water and started cultivating a second crop.

Under EbA in Maharashtra and the cascade tank initiative at Vizianagram, the approach was to locate the issue and the solution as part of, and within, the existing ecosystem. By design, the approach brought local issues and contextual solutions into planning and implementation. Even in CRISP-M the local weather and climatic data was used along with local GIS layered maps to identify and plan for climate resilient structures.

This systemic thinking and approach are critical for developing climate risk management strategies and action. The system, referred here, will be primarily the existing ecosystem and the potential it has for generating different ecosystem services that support livelihood activities in a sustainable manner.

Information as Climate Risk Management

Weather and climate information is essential to help communities to address adjustments in their livelihoods to short-term variabilities of weather or long-term climatic changes. A Climatic Information Service (CIS) includes tools, products, websites and bulletins in usable formats that provide weather and climate information and its dissemination of short-term (less than one day) weather as well as long term climate projection (more than 50 years).

Weather and climate data, trends and predictions are important to plan for climate resilient action. Climate modelling, which a tool like CRISP-M offers, further adds value in taking a long-term perspective in design to make structures climate proof in their design and execution. Though developend for *Mahatma Gandhi NREGS* specifically, CRSIP-M tool offers prtential uses in other projectised adaptive interventions as well: fisheries, afforestation, agriculture, animal husbandry. The tool is neutral to the sub-sector as it allows the user to interpret data based on their requirement and entails a mandatory participation of the community/livelihood user group to make it contextual both geographically and socially.

Incorporating CIS as part of climate risk management strategies thus has the advantage of making interventions temporally dynamic and spatially climatically robust. The need will be to train technical personnel and communities in use and in interpretation of CIS data and associated services.

Climate modelling, which a tool like CRISP-M offers, further adds value in taking a long-term perspective in design to make structures climate proof in their design and execution.

©IIED/Climate Resilience Information System and Planning Tool for Mahatma Gandhi National Rural Employment Guarantee Scheme

Technological Inputs

Taking advantage of technological inputs is crucial for restoration and adaptation of natural resources. There are technological developments that have the capacity to improve availability and abundance of natural resources in different climatic conditions (see Box: V-Wire Technology for Ground Water Recharge).

The existence of multiple technological options implies increased possibilities of using these different technologies in tandem to make significant impacts at the field and community levels. However, it needs to be pointed out that engineering solutions may make way for restoration, but climate resilient practices are what will impart sustainability to solutions.

V-Wire Technology for Ground Water Recharge

Fast depleting ground water and water levels in aquifers is having an adverse impact on livelihoods that are heavily dependent on water. The aquifers can be recharged but with indiscriminate digging of bore wells, extraction of ground water is higher than its replenishment. Changing trends in rainfall patterns, accompanied with extreme rainfall events, is increasing the challenge of creating a system that regularly and adequately recharges aquifers and replenish ground water table.

V-Wire injection Well Technology taps in to run off water and uses it for recharging of ground water source. Developed by Farmland Rain Water Harvesting System, partnership firm, the technology recuperates dried bore well in a short time fare by capturing surface run-off to increase the rate of recharge.

The system consists of the following

(a) Silt trap

(b) Recharge pit (5-6m) with 20% filtration media of crushed stone, gravel, coarse sand and activated coal

(c) Recharge bore (20-60m) at the bottom of the recharge pit

(d) V wire filter unit

The rain water is led through a water channel in to the silt trap. As silt settles, the overflow water is led in to injection well through a horizontal connected pipe passing through V wire filter. The water accumulates below the filtration media in a designed storage well and creates a water column. The attached percolator pipe attached to the non-clogging V-wire screen placed by boring through the permeable strata at depths of 150-200 ft. below ground level. The water is filtered as it passes through the permeable strata by gravity and reaches dry joints, cracks, weathered zone and recharges the ground water source/aquifers.

The V-Wire technology has been effective in recharging bore well having water table up to 1,000 ft recharged to half their level. The additional advantage of the technology is that is reduces loss of top soil, surface run off and reduces hardness, salinity and dissolved solids in ground water source.

Women

Women are more vulnerable to effects of climate change then men. Being more dependent on natural resources for their livelihoods; and limited with social, economic and political barriers that limit their access and hence their coping capacities, women loose more than men as a result of climate variabilities. It thus becomes important to identify gender-sensitive strategies that respond to the stresses and emergencies caused by climatic changes.

At the same time women are also actors and agents of change in ensuring adaptation. Their lived-in experience and body of knowledge has value in developing mitigation, adaptation and disaster reduction strategies. The gender role that has been entrusted to them in households and communities places them in position of stewards of natural and household resources where they can not only contribute to, but also lead, in rolling out adaptation strategies in sync with changing environmental realities.

The examples narrated in this chapter do not carve a specific role on women, nor do they take up the specific impact of climate change on women. This gender neutrality affects long-term interests of women and adversely impacts their ability to bring transformational changes in gender relations and in improving the distribution of work, and the burden of work between genders. There is a strong need to develop demonstrated examples that are based on, and address, gender needs emerging from climate changes, so similar processes can be instituted in other climate stresses geo-cultural regions for finding contextual solutions.

Up-scaling

Processes to implement ecosystem-based approaches have a high potential for being upscaled in different regions in India. The increasing number of climate hotspots in the country demands a larger number of contextual strategies for climate adaptation and mitigation in natural resource dependent strategies. The manner in which the Ecosystem based watershed approach has been embedded into watershed guidelines in Maharashtra provides an example for the manner in which such demonstration can be upscaled at the state level. In case of *Mahatma Gandhi NREGS* in Jharkhand, the state government upscaled the process of formation of CFT and replication of farm ponds as part of individual assets under the programme in the state. Similarly, the success of cascade tanks at Vizianagram enables Andhra Pradesh government to build the restoration of such tanks as part of Neeru-Chhettu programme in the state.

Good Practices

(a) Focus on inclusive Governance

The examples covered in the chapter have had a string focus on inclusive governance. The CFT at Jharkhand, the EbA approach in Maharashtra and the Cascade tank revival at Vizianagram have focussed on the inclusion of communities and their participation in decision-making processes during identification, planning, implementation and in ensuring sustainability of the processes and structures. The recognition that the quality of governance is an integral part of the ecosystem is critical in developing systems and solutions that will be effective and climatic resilient.

(b) Mix of traditional and modern knowledge

A Cascade tank is a traditional mechanism of storing surplus water which is then used during dry periods. As a drought proofing technology, it has been developed overtime through the use of local wisdom and knowledge. Similarly, the identification and uses of indigenous seeds, trees, grasses are based on traditional knowledge which is then coupled with modern practices of crop intensification systems to develop climate resilient solutions for the farmers. The examples narrated in this chapter have marked spaces and opportunities for using both, the traditional and modern knowledge for developing climate resilient mechanisms and structures.

(c) Contextual solutions

The blueprint in finding climate adaptive solutions is in the process, and not the product. The contextual and relevant product emerges, once these processes are adhered to. And these processes entail active involvement of local communities, their experiences, knowledge along with generating information that predict climatic changes and assessment of different available technological options which then prove their resilience in the context and with the affected communities.

Processes to implement ecosystem-based approaches have a high potential for being upscaled in different regions in India. The increasing number of climate hotspots in the country demands a larger number of contextual strategies for climate adaptation and mitigation in natural resource dependent strategies.

© Shutterstock/ panuwat phimpha

ICT: Overcoming the Digital Divide in Agriculture

As agriculture moves away from subsistence farming towards sustainable livelihood closely linked to market, it demands information in real time so that farmers can take decisions best suited for their field and crops. Are there apps that support the decision making of farmers? Are there helplines that can link and ensure service provision within a stipulated time frame? Are these applications standard or can these be customised? Can women be the user of this technology? Has the efficacy of the apps been proved or it still in a stage of ideation? These and similar questions face thought leaders while designing development interventions. The cases presented narrate examples of how ICT was used to bring qualitative changes in farming practices and quantitatively in productivity and income.

Agriculture in India faces multiple challenges that are both structural and systemic in nature. Small land holdings, low productivity, information asymmetry, climatic variabilities, multiple intermediaries, long value chains and poor access to institutional financial and market support impact agricultural performance and the income of farmers. The farmers, especially the small land holder, need support in receiving information in time to be able to take decisions that can bring improvement in their production and ability to earn higher return of their produce. Information and Communication Technology (ICT) can play a positive role as Decision Support System (DSS) to the farmers by updating them with new information about agricultural practices, availability of inputs like seeds, varieties, fertilisers etc., real time information on weather, and prices of the produce and so on.

ICT are forms of technology that are used to transmit, process, store, retrieve, create, display, share and exchange information through electronic means which include internet, wireless networks, cell phones, computer, video conferencing, social networking and other media applications. With this potential, ICT can circulate adequate, customised, timely, and comprehensive information to farmers suited to their context of agro-climatic zone, soil type, crop, size of landholding, and various other parameters.

However, technology has a cost, and this cost often creates a digital and technological divide with the smaller farmers unable to bear the cost toaccess the technology and hence being unable to access the benefits that it could have provided. Development interventions started taking account of this facet and have developed mechanisms and the manner in which the benefits of ICT can be ensured for the smaller farmer and to other economically marginalised households. The four cases presented in the chapter give examples of how the technology was adapted to the customised needs to the small farmers in different geo-cultural regions. Each of these examples on one hand highlights the usefulness of ICT for agriculture including animal husbandry and on the other hand demonstrates how the technology can provide multiple supports to the farmers to enable them to make decisions for the adoption of agriculture practices and inaccessing financial and market institutions. The cases indicate how width of the technology divide can be narrowed through a pro-active pro-poor orientation of the intervention.

PoP App: Just-in-Time Information to Women Farmers

Odisha and Jharkhand
Implementing Agency: Trickle Up
Supported by: Tata Communications

Context

Women belonging to ultra-poor families own and have access to few assets, therefore depending on uncertain sources of income, relying on wages earned from daily labour, and being subject to multiple exclusionary factors, hence are not able to benefit from government programmes. To support agriculture activities of such women, Trickle Up, an NGO, partnered with Tata Communications to provide just in time information on crop choice, planting techniques, care, harvest, and marketing of produce to women belonging to ultra-poor households. The applications were developed for mobile usage and were uploaded on smart phones provided to 1,000 women participating in Odisha and Jharkhand SRLMs.

The PoP App developed by the project was aimed at the adoption of improved agriculture practices and one that can complement the work of frontline staff. Making informed decisions in terms of crop choice, adoption of rational and improved farming practices and linkage with formal institutions and government were the intended outcomes of the project intervention.

Strategy and Implementation

The strategic considerations for the project were rooted in the justifications that led to the need for the technological intervention in the first place. Later issues of building capacities for use of smart phones and PoP App became prominent along with dealing with practical issues of hardware maintenance and dealing with constraints of connectivity and electric supply. The strategic decisions taken by the project are given below.

Trickle Up, an NGO, partnered with Tata Communications to provide just in time information on crop choice, planting techniques, care, harvest, and marketing of produce to women belonging to ultra-poor households.

Strategy	Implementation	Description
Role of Technology Determine the rationale for technology component under the programme	Despite intensive training, coaching and mentoring, there was a lack of full adherence to the developed PoPs. Use of inappropriate quantities and/or types of inputs, errors in transplanting, inability to report and control disease outbreak, inadequate spacing of plants were some of the reasons identified for poor outcomes.	With limited education and literacy, participants struggled to effectively record information for future use. Most members relied on coaching staff for providing them with the information. But as the coaching team also came from the same community, the issue of timely intervention was amplified. TheJust in time training method that is able to provide information when it is desired or required by the member was the main justification for technological intervention in the programme.
ICT Component and Application Defining the technology component of the application	The project needed to define the technology and the apps that will be required and how will it be made functional so that the ultra-poor women can become competent in their usage. Initially the PoP App was prepared for chilli peppers, tomatoes, brinjal, bitter gourd, beans, spinach, potatoes, onions, eggplant, pumpkin, and mushrooms.	Three-fold technology was provided: • Providing smartphone to the ultra-poor women including training in its use and care. • Development of customised PoP application to support cultivation and management of basic finance • Access to other apps, text and voice-based messages to support linkages. The PoP app provides instructions through automated calculations for inputs, ploughing, transplanting, weeding, fertilising, pest control and other care requirements. The automated calendar provides reminder at each stage of cultivation. Visual cues, photos and voice overs in local language provide detailed guidance to the participating women. Participants can enter expenses at each stage and with amount of income earned an overall assessment of profits is ascertained that allows making projections for investments for them.
Addressing Literacy and Numeracy Constraints Women faced the constraint of functional literacy and numeracy skills	Two-third of the participants lacked functional literacy. One challenge was to design the app and training module that takes full advantage of the technology and adapt it for users not skilled in literacy and numeracy.	Design features included the making of key information images with instructional visual cues and voice overs in local language and dialect. The money manager part of the app helped the user to count and record income by swiping images of different denominations of rupee notes. Electronic images of sticks used by farmers for measurement were used for calculating land size and thus enabling adequate dosage of nutrients and pesticides.
Connectivity and Electricity Supply Issues How to deal with challenges in connectivity and electric supply faced by members	Targeting communities in remote locations has the limitations of connectivity and electricity supply.	Smart Sakhis identified high connectivity locations to perform batch updates for participants on their area. Trickle Up is partnering with mobile network providers to expand connectivity and provide pro-poor data and voice calling plans. To overcome electric supply limitations solar charging hubs were provided in areas with acute electricity shortage.

Hardware maintenance How to address the issue of breakage and malfunctioning of smartphones	During the course of implementation, 70 phones were replaced indicating need for hardware maintenance	Need for sturdy handsets that can withstand fluctuating electric supply, high temperatures, and rough conditions of rural life. Initiating rural mobile repair hubs has been one of the off-shoots of the intervention that is being launched by Trickle Up.

Impact

Owning and effectively using a mobile phone was a big confidence builder for women and gained them social standing amongst their peers.

The evaluation of the project found that 80% of the women participants were using the PoP App to support their cultivation and experienced improved yields and income. Just in time information has become a reference point for the women farmers and has brought discipline into their farming practices. Women who owned smartphones have linked them to their bank accounts and thus receiving updates in real time.

Availability of information in the non-written form has ensured an even spread of information and its follow-up among the participants. Instances have been recorded under the project where women have sent the photos of pest attacks well in time to receive appropriate control measures without loss of produce.

Field staff used the information entered by the participants to determine which of the participants require more support and hence were able to customise their intervention at the beneficiary level.

Modules on financial management were beneficial as they reinforced the value of replacing crops and diversifying into shorter cycle crops with higher market value. Each participant was able to mix and match these crops to suit their (unstated) target of earnings from their farm.

Participants registered their mobiles with government departments and started receiving alerts on the availability of seeds and other benefits that were distributed by different departments. With improved communication, their cost of transacting business with government departments reduced, gaining in terms of efficiency in response and follow up.

Micro-Warehousing

Bihar
Implementing Agency: Ergos
Supported by: Ergos

Context

Availability of adequate and safe spaces for storage of their produce has been a major constraint for small farmers in the country. The total storage capacity is 50% of the produce, of which 74% being in the public sector (Central or State Warehousing Corporations), is essentially used to store produce procured through the public distribution system. The small farmer seldom uses these facilities and instead resort to selling off their produce at lower prices. Additionally, the presence of multiple intermediaries increases their transaction cost for selling/storage adds to the constraints of small farmers being able to generate adequate returns from agriculture.

Ergos provides micro-warehousing facilities to small farmers enabling them to sell their stocked produce with real time price gain of their produce. Aware of current market trends, the farmers are able to set their price against the stock, which is graded and packed, and thus are able to sell at 20-30% higher prices ahead of the harvest. Ergos worked with maize farmers to provide them with micro warehousing facilities and other associated services through the use ofthe internet? and a mobile based app operationalised by them. A micro warehouse is a low-cost format that operates at thevillage level and helps the enterprise to deal directly with the farmer. The warehouse facility is provided to the farmer within a range of 3-4 kms from the farmer's location and helping them to discover a better price for their produce.

Strategy and Implementation

Maize is grown in all seasons in Bihar though 90% of the production is during kharif. 65% of the maize production comes from Seemanchal and Kosi region of the state. Maize is an important cereal crop for human consumption, but is used as fodder, and has wide ranging industrial uses. Survey of maize farmers identified three major areas that impact their ability to earn higher returns from their produce: one, limited space for price negotiation because of lack of adequate storage facilities and absence of minimum support price; second, high cost of credit, as in the absence of access to formal credit system there is an obligation on the farmer to buy/sell their produce from the input/produce suppliers/buyers who provide short term credit; and third, high transaction costs for sale of produce due to multiple intermediaries in the market chain of maize.

The strategies adopted by Ergos for their intervention in the maize market with small holder farmers are as follows.

Strategy	Implementation	Description
Identification of Warehouses Ergos need to identify network of credible warehouses	Ergos engages with warehouses that were approved by NABARD, Warehousing Development and Regulatory Authority or the State Agriculture Department.	A three-step process is followed for the identification of warehouse and registration of farmers with the same: • Due diligence of the warehouse thatincludes titleship, location, approach, flood and theft history, height from ground, distance from police and fire station, security arrangements and condition of warehouse structure. • Five-year lease is executed with selected warehouses and the agreement is notarised and registered at the local Registrar office. • With Know Your Costumer (KYC) farmers can open an account at Ergos and a Unique Identifier (UID) is created for each farmer in SAP.
Mobilising Farmers Mobilising and making the farmers aware of the services offered and gains from these services	A structured awareness programme on warehousing is undertaken to inform and educate the farmers.	The awareness programme is directed towards small farmers and covers the importance of storage, financial transactions, contracts and market solutions through video shows, road shows and conduct of midnight cafes.

Services to Farmers

What are the services the farmers get in return when they engage with Ergos on a formal basis

Ergos generates its revenue in return for the service it provides to the small holder farmers. It charges a commission per quintal at lower rates for the warehousing services, advance advisory and processing fees.

Village Champ

Village Champ is appointed by Ergos as one point of contact for the farmer for all its service requirements.

Warehousing produce

The produce of farmers deposited in the warehouse is checked and the receipt is issued to the farmer certifying weight, grade and quality. The receipt serves as a document to obtain credit from financial institution. Ergos facilitates loans at lower rates of interest as it has collateral stored in its warehouse.

Negotiating Price

Based on the data of produce,Ergosis able to negotiate a better price on behalf of the farmer. Linked with National Commodity & Derivatives Exchange Limited (NCDEX), Ergos connects rural warehouses to the national market and helps them to discover a better price for their produce. Farmers set the price and the quantity that they want to sell their produce. This willingness is communicated to Ergos that sets the process of sale into motion.

Portfolio Management

A software application captures all basic information of the farmer including business transaction between Ergos and the farmer.

Value added services

Ergos provides grading, cleaning, sorting and packaging services to its members. Using Enterprise Resource Planning (ERP) software and Ergoslive portal, it runs a web application that is also developed as mobile app to ensure minimum turnaround time to any service request posted by farmer.

Impact

The main challenge faced by Ergos for their model included convincing the small farmer to adopt warehousing practices; managing the operating cash flow for small warehouses; and customer engagement and trust building.

The micro warehousing ensured optimum capacity utilisation of the warehouse, low wastage and higher price realisation for the farmers. The farmers are at the core of value chain and are gradually realising the benefits and conveniences that are available through the e-negotiable warehouse receipts.

7,000 farmers have registered on the platform and are able to borrow from banks and non-banking financial company (e.g., Samunnati, IDBI). Distress sales of farmers have reduced and they have been able to tide over their immediate liquidity needs and selling their produce in the off-season.

© freepik

Pashudhan Sanjeevani 1962: Doorstep delivery of Veterinary Services

Madhya Pradesh
Implementing Agency: Department of Animal Husbandry
Supported by: Department of Animal Husbandry

Context

Madhya Pradesh has the third largest livestock population in the country, behind Uttar Pradesh and Rajasthan. With a livestock population of 4.06 Crores spread in a large area, the need to provide veterinary services has been a major challenge for the government. Based on the livestock census in 2019 there are 15,358 livestock animals per veterinary institutions in the state. This is a large number of livestock for institutions to serve, which becomes even more difficult on account of remoteness and distance between the farmer and the service provider.

The Government of Madhya Pradesh pioneered the Pashudhan Sanjeevani 1962, a helpline for providing veterinary services in the state. The helpline is the medium through which the farmer can register their requirement that is noted by a trained para vet placed in the call centre of the helpline. The helpline registers the request with relevant details and issues a ticket that is immediately forwarded to the nearest doctor and the system to provide service is set into motion. The helpline tracks the service provision and takes feedback once the service is delivered.

The service under the programme is provided by the government veterinary system that includes the Go Sewaks that have been trained and placed in different villages. The helpline is managed by an outsourced agency which is linked to the government service providers to disseminate information on a real time basis.

Strategy

Pashu Dhan Sanjeevani 1962 was implemented in Madhya Pradesh in all the 313 blocks of the state. An elaborate training programme was conducted for all the functionaries of the department, to orient and train them in the protocols that have been developed for the helpline. The strategic architecture of the initiative is detailed below.

The Government of Madhya Pradesh pioneered the Pashudhan Sanjeevani 1962, a helpline for providing veterinary services in the state. The helpline is the medium through which the farmer can register their requirement that is noted by a trained para vet placed in the call centre of the helpline.

Strategy	Implementation	Description
Link between livestock owner and veterinary service Ergos need to identify network of credible warehouses	Toll free number to be made available for a significant part of the day so that the farmers can contact for veterinary service through the helpline number.	1962 a toll-free number was provided that was available from 7 in the morning till 9 at night. Department of Animal Husbandry entered into MoU with Bharat Financial Inclusion Limited to run the veterinary helpline for the livestock owners in the state. The para vet receives the information at the call centre and assigns the call to a Veterinary Doctor who receives the information in real time over his phone along with illness details. The Cattle owner can also call the call centre for Artificial Insemination (AI) services.
Dispensing medical service/ advice Response time protocols to be determined based on the severity of the disease	Developing priorities based on the severity of the disease and the need for specialised service- Doctor, Assistant Veterinary Field Officer (AVFO) or para vet.	Diseases have been grouped in to four categories: Super L1 are diseases where the service has to be provided by Veterinary Doctor within 6 hours of receiving the information. L1 are the diseases where the service has to be provided within 24 hours by AVFO. For L2 advice over phone will be provided by the veterinary doctor posted at the call centre and for L3 diseases, the caller will be informed to the Go Sewak who will provide the advice and the treatment on payment of fees by the cattle owner.
Tracking service Tracking delivery of service/ advice to the farmer in real time	Once the call is registered and the ticket for the same issued to the doctor the response is tracked in real time to ensure that the service is delivered as per the stipulated time schedule determined under the Pashu Dhan Sanjeevani programme.	Once the service has been delivered, the doctor updates the ticket with disease and treatment details. For AI, the call centre contacts the farmer after 3 monthsfrom the date of AI to enquire on the success of the insemination. A live dashboard has been established to provide drill down data for every key indicator of the programme
Accountability for service Determining accountability for timely and quality of service delivered	Monitoring and escalating in cases where the services have not been delivered to ensure compliance and fix responsibilities for negligence.	A follow up call is made by the call centre to get information on quality of treatment and beneficiary satisfaction levels. In cases of Super L1 diseases if the ticket is not closed within 24 hours of it being raised the information is escalated to Director and after 48 hours to Principal Secretary of the Department.

Impact

Pashudhan Sanjeevani 1962 has helped 6.1 lakh farmers and have treated more than 7.63 lakh livestock. The service proved its relevance during the prolonged lockdown as a result of COVID-19 19. During this period the helpline responded to calls from 66,000 farmers and provided services to 68,306 livestock and saved the lives of 48,323 animals who were in critical conditions.

AGRIBUDDY: Connecting the Rural Ecosystem

Red Chilli Project, Khammam District, Telangana
Implementing Agency: Agribuddy
Supported by: Agribuddy

Context

Farmers face multiple challenges including non-availability of credit from formal institutions; irrational dosage of inputs leading to low grade produce and higher cost of cultivation; payment of higher commission charges to middlemen; and their inability to receive timely payment for their crops. In most cases the challenges exist and persists due to a weak extension system that is not able to provide a comprehensive and timely support to farmers.

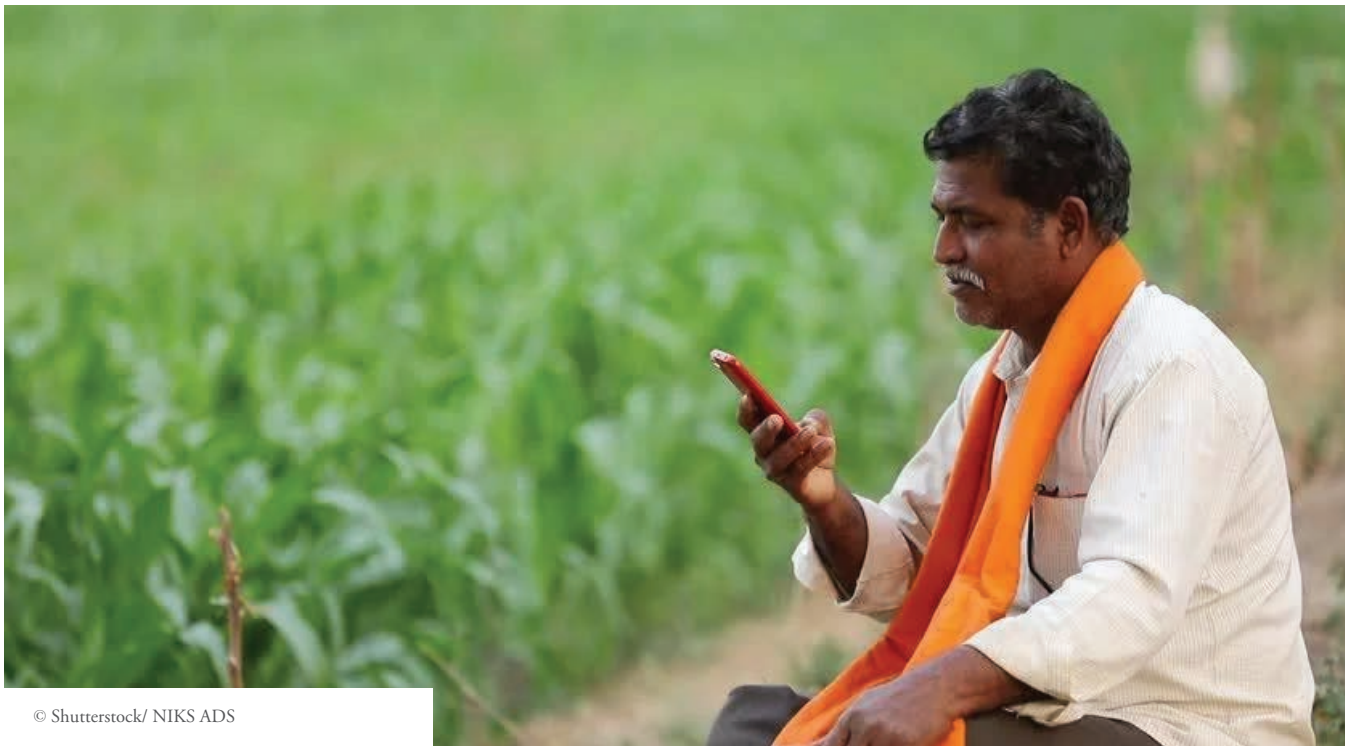
AGRIBUDDY is a digital platform that partners with farmers, service providers and agri-input suppliers to provide quality services by coordinating with players in the value chain for providing crop advisory, agri-inputs and market access for a fair price for farmer's produce. Through the BUDDY network it connects the unconnected farmers and integrates them in to a community of farmers by collecting and recording individual farmer data related to land, crop, yields, infrastructure availability, weather patterns and so on along with acting as conduit for expert input in agronomy, soil testing, fertilisers, seeds, market information, harvest and market connects.

Strategy and Implementation

The Red Chilli Project was designed to address the problems faced by farmers in Khammam district of Telangana.

Strategy	Implementation	Description
Identification of Farmers Identify and link the farmers to AGRIBUDDY and BUDDY network	The selection of farmers was based on their progressive attitude and their willingness to adopt the scientific package of practices, a good credit history, and the openness to take inputs from AGRIBUDDY ground representatives.	Project covered 292 farmers in 52 villages with an average farm size of 2.22 acres covering a total area of 649 acres.
Partnership with Service Providers Services in loans and crop insurance were required for the farmers	For crop loan Samunnati Financial Intermediation and Services Private Limited and for crop insurance partnership with Weather Risk Management Services Private Limited (WRMS) was finalised.	AGRIBUDDY physically collected documents for KYC as per Reserve Bank of India (RBI) guidelines and with automation in place it processed loan applications of 292 farmers in 2 weeks. Samunnati sanctioned a crop loan of INR 5 Crores for this group of farmers. Insurance was underwritten by HDFC ERGO. With automation of loan applications required documents were generated by AGRIBUDDY and the farmers were only required to sign the form. WRMS installed weather stations in every project village to give real time weather update of the farms that was helpful in substantiating insurance claims.
Partnership with Input Suppliers Cost effective and timely supply to farmers is critical so that they can apply these inputs in time	With details of farmers already automated AGRIBUDDY looked out for input supplier that were aggregators and can take and supply orders through an on-line platform	AGRIBUDDY partnered with BigHaat.com for input supplies on time with the planting schedule. Being an on-line platform tying up with BigHaat enabled them to place orders and reduce time for delivery to farmers.

Partnering for PoP Scientifically developed PoP became the benchmark against which the farmers can plan their schedule	AGRIBUDDY team and the farmers need to be on the same page so that the PoP can be implemented in its entirety.	Partnership with Telangana State Agriculture University and Red Chilli Research Station developed a PoP to grow red chilli in a scientific way. Field staff of AGRIBUDDY was trained in the PoP and conducted training of farmers in each village
Assessing Progress For farmer 'seeing is believing' works	Tracking each famer through the data developed and customised for them will enable them to see how well they have progressed at each stage of crop growth.	Field staff of AGRIBUDDY capture data of input delivery, application and production in the farm book of each farmer. This data is captured on the mobile app for analytics and processing.
Partnering with BUDDY Establishing communication amongst and between member farmers	BUDDY is the network of community of farmers. It parallels the farmer field school methodology in an evidence based -virtual/ physical mode of communication	Partnering with BUDDY, the AGRIBUDDY team monitors the field by meeting farmers and providing them with agronomy advice. Automated planting schedules, alerts and symptoms to look for are provided in local language to farmers at each stage of the crop growth. Farmers can record videos and send them to the AGRIBUDDY team for expert advice.
Market Connect How can automation and digital platform enable farmers to get a better return from their produce?	Online and real time information to farmers and reducing their transaction cost of selling their produce.	AGRIBUDDY has contracted to buy the crops from farmers. Every day they send the price to the farmer through SMS. Any farmer willing to sell their produce informs AGRIBUDDY which collects the crop, grades it and sorts it at the farm itself. AGRIBUDDY deducts the loan amount and repays Crop Loan immediately and remits the balance to the farmer instantly.



Impact

Real time communication with the AGRIBUDDY team for emergency responses has helped them to arrest pest attacks in the initial stages itself.

Farmers gain in income as AGRIBUDDY do not charge the 5% commission that is charged by middlemen. Instant payments are made against crop loan, reducing interest pay out amounts and the farmers gain instantly as they receive the amount without any delay.

Tracking the input supplied and applied has made farmers efficient in their resource usage and protect crops from extra dosage of fertilisers and pesticides.

Learning from Case Studies

Red Chilli Project, Khammam District, Telangana
Implementing Agency: Agribuddy
Supported by: Agribuddy

Affordability of Hardware and Software

Making hardware affordable to the user, as in case of Trickle Up, and making the application available at no cost in all the four examples enhanced the affordability and usage of the technology and the applications amongst the users. This is an important factor for overcoming the digital divide faced by small farmers and other economically weaker groups.

Supporting Multiple Decision-Making Systems

The applications developed were able to provide information to multiple decision-making system of the farmers: package of practices, input suppliers, credit availability, agronomic advises, price trends, buyers, warehouses and so on. It is this ability of the applications to be able to address multiple needs of the user that makes them attractive and cost effective for the farmers.

With automation of data, the linkages to other benefits become easier. As in case of AGRIBUDDY and Micro-warehousing, the data of the farmers was automated and their linkage with financial institutions or the government became easier for the service provider. This has a major impact on the reduction of transaction costs and time for the farmers and in submitting documents for different KYC requirements. Additionally, the decision-making domain is also defined by the user. Sending queries of pest attack (with photos) or seeking information on insurance claimsafter crop losses or on price trends of their produce makes the application live and dynamic for the user. Or as in case of Pashudhan Sanjeevani 1962, the symptoms explained by the farmer to the helpline becomes the basis for defining the priority for service provision. Such information, in the absence of the application, would have been available to the farmer at cost and/or may have been inaccessible due to their remoteness and lack of knowledge on where to seek such information.

Customisation is the Key

The ability to customise information for each beneficiary has been the hallmark of the application. Based on the type of land, soil, land holding, crop variety, weather and similar other parameters, the packages were customised so that each farmer finds relevant information for their use. ICT technology has the potential for this customisation that has been well exploited by the intervening agencies.

Making hardware affordable to the user, as in case of Trickle Up, and making the application available at no cost in all the four examples enhanced the affordability and usage of the technology and the applications amongst the users.

Women

Access of women to technology is low. The Trickle Up example underlines the need to provide the hardware directly into the hands of women so that they can become regular users of applications. The other examples were not sensitive to this reality and may have missed out on training and enabling women to gain from the benefits of the technology.

Trickle Up's linkage with women was possible as they linked their intervention with SRLMs. Whereas in case of AGRIBUDDY and Micro-warehousing the intervention was through the extension work of the intervening agency and hence they were not clued into the gender aspects of access to technology.

Up-Scaling

Up-scaling of ICT's through an increase in membership of the participants and across geographies and thematic areas is possible once the application has generated the proof of its concept. For example, the PoP application and the AGRIBUDDY can be, and has been, expanded to include other crops and hence provide benefits to a larger group of farmers. Similarly, the micro-warehousing concept is relevant to small farmers across the country cultivating different crops who can benefit from this concept and its implementation.

Up-scaling requires cost. This cost is for creating the network of users, suppliersand service providers. The agencies working on a revenue generation model may not reach the poorest as the price of their service may be exclusionary. In such cases it may be possible to have models based on shared cost which will enable the technical agencies to move into areas much faster and provide their services at lower costs.

Good Practices

(a) Overcoming language and literacy barriers

The four cases presented effectively demonstrate that the technology is amenable to, and has been adapted to, the local language as well as the dialect. This makes for effective communication and minimises transmission losses on account of language barriers between the expert and the farmer. Further, the use of visuals and audio enables communication across the barriers of literacy and numeracy. The manner in which the PoP App of Trickle Up used the pictures of money in the app for financial management is a case in point. Similarly, the users too were able to communicate effectively through the use of pictures of the problems faced by them.

(b) Two-way communication

The ICT was used to establish a two-way communication between the user and the intervening agency. The entire premise of developing the applications was that it enables sharing between the user, that is the farmer, and the expert or the service provider. The ability to establish this communication not only reduced the time and cost of transaction but also made additional linkages possible, e.g., with government, financial and market institutions.

(c) Support of Field Team

Supporting the dissemination of technology with presence of field team allows the user and the agency to deal with issues of adaptation in real time. For example, the issue of limitations of electricity in PoP application were addressed by the field team by providing solar charging hubs in areas where the problem was more acute. For farmers to gain trust over the technology required a constant dialogue to enable them to overcome their fears and develop a comfort level in the use of applications.

(d) Constant up-dation

The applications developed under the four examples were constantly updated. This allowed the projects to address issues that were articulated by the users and the observations of the field team. On one hand, it made the application more robust and on the other, it increased its usage and relevance for the farmers.

© Shutterstock/ Lamyai

Design Learning for Programming

Systems Thinking

Systems thinking is a holistic approach to analysis based on the way a system's constituting parts are inter-related (or inter-dependent) and the manner in which the system works over a period of time. Functionally, systems thinking entails the mapping of processes (as against sketching a state), drawing relationships between various parts of the system (establishing case and effect relationships), identifying areas of intervention (integration), and how the interventions impact the overall system (theory of change).

Projects for livelihood enhancements are located ina diverse geo-eco-cultural milieu, representing nuanced complexities of their contexts that give rise to multiple vulnerabilities which demand attention. Systems thinking defines the approach to project design holistically, taking into account the value-chain and sub-systems associated with it. Two examples that capture the essence of systems thinking in design and implementation from the case studies are worth mentioning here: the EbA approach for watershed management implemented by WOTR in Maharashtra (Chapter X); and the promotion of agro-biodiversity through revival of traditional seeds by Sahaj Samudra in Karnataka (Chapter X).

(a) **EbA** approach is driven by system thinking wherein the basis for watershed development is built on revival, restoration and strengthening of eco-system-based services. The pathways to achieve this included: conservation and restoration of natural resources through soil and moisture conservation works; maintenance and strengthening of bio-diversity through afforestation; water stewardship to undertake water budgeting measures; adoption of sustainable agriculture practices to bring in agro- and crop diversity, and a community managed governance system embedded as part of GPs. The interventions were not only in restoration of eco-system services, but also in influencing their use and use patterns through appropriate governing mechanisms.

(b) **Sahaj Samudra** aims to increase agro-biodiversity across the entire value-chain of in millets: conserve, revive and popularise traditional seeds of millets (including seed exchange practices among farmers); make farmers self-reliant by promoting sustainable agricultural practices (to reduce cost and build quality in produce); develop farmers' collectives to act as aggregators of produce and thus access markets on a large scale; revive consumer's interest in traditional millets by educating them on their nutritional and health benefits and by informing them on the different ways in which the millets can be cooked as part of their nutritional diet.

System thinking thus goes beyond just provisioning (like construction of soil and moisture conservation works, or making availability of seeds) and towards establishing of systems that ensures continuity and sustainability of each component of the project (e.g., seed exchange in Sahaj Samudra and water stewardship in WOTR). The additional advantage of system thinking in design is that it makes replication easier as it replicates processes (as against provisioning/products) and thus allows expansion over larger areas effectively and efficiently.

The study strongly recommends the adoption of system thinking as part of design learning that emerges from the documentation of cases.

Convergence

Convergence among different programmes has been a conscious strategy adopted by projects aimed at livelihood enhancements. Notably in all the projects, convergence has been part of the implementation process and not as outcome of implementation. That is, the operational strategy has been to engage with different programmatic and departmental stakeholders for their involvement:

(a) **In the design of the programme:**
For example, in case of the Sasur Khederi II river revival in Uttar Pradesh an inter-departmental committee of the Departments of Irrigation, Revenue, Social Forestry, Rural Development and Panchayat Raj was formed to ensure convergence of resources, coordination of activities, and collaboration in design and implementation. Similarly, in case of the tank cascade revival in Andhra Pradesh, the District Planning Committee as the lead agency ensured convergence amongst the Departments of Water Resources, Agriculture, Horticulture, Fisheries, Ground Water, DRDA, Revenue, and Forest. In both these cases, the involvement of the departments was initiated at the design stage which enabled each of them to provide technical inputs for thedesign and ensure coordination within their department during implementation.

(b) **For pooling of resources:**
Government programmes and schemes provide resources (as material, subsidy, grants or loans) for specific purposes. For example, the provisioning of mini kits for horticulture, or subsidies for the purchase of pumps and pipes for irrigation, or money for the construction of dug wells under *Mahatma Gandhi NREGS*. For projects that aim for intervening holistically for livelihood enhancement, each of these schemes appears as potential resource that can be tapped into to provide specific resource for the

household/group. For example, in case of the Panch Phal programme in Rajasthan for development of pasture lands, the resources for afforestation that included land development, pit digging, stone wall fencing, plantation were accessed from *Mahatma Gandhi NREGS*; saplings for the plantation of trees (and later for gap filling) were provided by the National Horticulture Mission; funds for the installation of drip irrigation and bore wells were pooled from resources provided under the Finance Commission; and wages for care and maintenance of the pasture land for the next four years from *Mahatma Gandhi NREGS*.

(c) **For providing technical inputs:**

Convergence with technical institutions has enabled projects to find solutions to the challenges faced by them during the course of implementation. For example, during the implementation of Dhara Vikas in Sikkim, inputs from IIT Guwahati, BARC, CGWB, ACWADAM, and GM Pant Institute of Himalayan Environment and Development were sought for the development of appropriate interventions for the revival of springs in the mountainous region. Similarly, in case of fisheries at Dimbhe dam In Maharashtra, the Central Institute of Fisheries Education not only provided technical guidance on stocking of fish, but later trained the fishers on the technique of cage culture including providing resources for installation of cages in the reservoir.

(d) **For institutional linkages:**

Institutional linkages are possible through convergent efforts. For example, the accessibility of government programmes to SHGs or NHGs (under Kudumbshree) formed under DAY-NRLM is possible once the project converges institutionally with these programmes. For example, the convergence of *Mahatma Gandhi NREGS* with SHGs formed under SRLM enabled the promotion of fisheries as an alternative livelihood option for the women in Tangra village of Nadia district in West Bengal. Similarly, the Nano Orchard initiative of SRIJAN institutionally? linked the farmers trained by them to *Mahatma Gandhi NREGS* to get them the benefit under Nandan Phalodyan under which they were paid wages for each plant that survived in their orchard for three years.

The case studies highlight the multiple advantages of adopting convergence as part of the implementation strategy for projects intervening to generate holistic enhancements in livelihoods. The design issues that these projects need to address are: who to converge with (mapping of stakeholders for convergence); what should be the form of convergence (material, financial, technical); and at what stage of project cycle should convergence be part of implementation (design, implementation, trouble shooting).

3. Collectives

Case studies have demonstrated how different types of collectives, formed under the projects to promote and sustain livelihood activities with socially and economically marginalised groups, for both farm-based and non-farm-based livelihoods, have contributed in generating impacts at household and community level. The inherent advantages of working with collectives is that they enable providing scale to inputs e.g., in case of the Living Soil project to promote agroecological practices, or the promotion of fisheries under *Mahatma Gandhi NREGS* in Nadia district in West Bengal. The presence of collectives enables the project to ensure larger coverage thereby making provisions for inputs-material, technical, financial and human resource-efficient for the profect, and effective for the members of the collective. Similarly, collectives also create opportunities to scale outputs/produce by acting as an aggregator as exemplified in case of Sahaj Samudra, Krishi Jeevan Agro Farmer Produce Company Limited, sale of vermicompost developed by Nilagiri Foundation in Guntur in Andhra Pradesh, and fisheries at Dimbhe dam in Maharasthra through Fisher's cooperative developed by Shashwat Trust. In all these cases the produce/product of small households were aggregated and sold through the agency of the membership based collective.

Collectives create an opportunity for small holders to pool their resources and thus gain access to financial services (through SHGs), services and entitlements provided by government, and better market and price opportunities by extending the reach of the collective to formal markets. As there is generally social and economic homogeneity amongst the members of the collective, the benefits of the outreach are equally shared by them.

Design learning aspects of collectives relate to determining the:

(a) **Membership of the collective:**

As far as possible, there should be no entry barriers as these often lead to exclusion of the most marginalised amongst the target group. For example, the Committee to monitor and manage the pasture developed at Hastinapur village in Rajasthan made all the 44 households of the village members of the committee thereby democratising and universalising representation in the collective.

(b) **Role(s) that the collective is expected to perform:**

Generally, collectives start with a limited number of roles (e.g., SHG as thrift and credit) but gradually adding other roles to the collectives was they gain experience and maturity in functioning as a group (e.g., SHG undertaking fisheries, or seed bank, or SHGs coming together as Village Organisations at Mandir Hassud to start a Paver Brick manufacturing unit).

(c) **Organisational structure of the group:**

Informal structure like in case of SHG, or as Joint Liability Group in case of NHG under Kudumbshree; or as a formal group like the Fisher's Cooperative at Dimbhe dam site, or the Sahaj Samruddha Organic Producer Company. Often the projects opt for an informal structure of the group in the beginning and as their activities and businesses expand, they adopt formal structures to enable ease of operation and the ability to manage larger turnovers.

(d) **Institutional linkage for sustainability:**

Capacities of the collectives are built during the life cycle? of the project (technical as well as managerial), yet these need to be linked to institutions so that they are able to sustain their purpose well beyond the project period. The Village Development Committee formed under the EbA watershed approach was set as a sub-committee of the GP thereby ensuring its continued existence, an agenda for its functioning, and a larger institution to nurture and monitor its activities.

4. Para Workers

Para-professionals are trained and delegated to perform a particular aspect of a professional task, though they are not licensed to practise as a fully qualified professional. The different para-professionals mentioned in the documented cases includePashuSakhi, Para Engineers, Para hydrogeologist, Barefoot Technicians, Smart Sakhis, and Village Champs. The strategy of developing para-professionals has also been adopted under different programmes of the government like Village Resource Persons (VRP) under *Mahatma Gandhi NREGS* to conduct Social Audit of *Mahatma Gandhi NREGS* works in the GP; Krishi Mitra under Department of Agriculture, and Bank Sakhi under DAY-NRLM.

Para Workers are drawn from within the target group, they undergo a rigorous training that combines both, the theoretical and practical aspects of their work, and they are handheld and mentored when they perform their role in the community. Each of the projects has followed the process of involving the community and the local leaders for the identification of the para workers. Generally, the person who is recognised or has demonstrated higher levels of skills and understanding of the task expected to be performed is selected by the community. For example, in case of selection of Smart Sakhi the women who were quick learners to use smart phones were identified as Smart Sakhis and assigned the role of training other women on how to use the smart phone in their village.

The strategy of developing para workers provides multiple benefits for the projects: community-led extension services are available to the users as the para workers regularly visit them, providing relevant information (for each stage of the livelihood cycle); ensuring the reach of preventive services in-time (e.g., vaccination of goats); providing linkages with specialised service providers and thus reducing response time (communicating with veterinary doctor in case of illness or disease in animals); providing designated services (e.g., repair of irrigation equipment in case of Water User Association and artificial insemination in goats), and the critical linkage between the user and the government department. In case of para hydro geologists, developed under Dhara Vikas in Sikkim, they had the responsibility of mobilising the community for development of a spring shed revival plan, the formation of spring level groups for their maintenance after the implementation of works, and being the critical link between the community and the Gramin Vikas Kendra established under the project. Similarly, in case of Barefoot Technicians for roof rainwater harvesting, the conduct of baseline on water and the design of the harvesting system are developed by the trained technicians.

The project has further deepened the strategy of identifying para workers from and amongst the women in the community. The goat rearing project by AKRSP in MP, and irrigation through Water User's Association by JOHAR in Jharkhand, have consciously identified and trained women as para workers (Pashu Skahi and Para Engineer respectively). The strategy to train women as para workers has multiple benefits: as the tasks are mostly performed by women (care and management of small livestock, and managing water in fields), the access of trained para workers and the user is not impacted by socio-cultural constraints and the information and service is provided directly to the user. Secondly, the technical capacity is developed and enhanced amongst the users, hence it is always available to other users on a long-term basis. Thirdly, the performance of women para workers breaks the gender barriers and demonstrates that women, too, could be the sources of credible information, providers of service that generally have been performed by men, and increase their mobility within and between villages. This impacts social and economic empowerment of women and creates role models in the community which encourages other women to come

forward and enrol for similar roles. Fourthly, the project gains from insights and perspectives shared by women para workers and enables them to design appropriate and relevant interventions in information dissemination, extension, and service delivery.

Employing para workers as part of the project design contributes significantly towards the adoption of improved practices (feed and care, organic practices in agriculture, etc); maintenance of structures and systems created as part of the project (roof rain water harvesting system); linkage with the government beyond the project period; and sustainability of benefits to the target group.

The challenges related to development of a cadre of para workers that have to be addressed in the design of projects are:

(a) Are para workers volunteers or should they be paid by the project? Experience indicates that in case of the former, there are frequent dropouts and there is a gradual decline in motivation of the para workers. In case of latter, the issue is the continued payment after the project is completed. To overcome this challenge, projects have attempted to develop para workers as partially paid service providers during the course of project implementation (PashuSkahi) and have additionally developed their capacity to run their service as an entrepreneurial activity.

(b) The design question of the capacity development for para workers is: What are the tasks that the para worker should perform and what are the tasks that s/he should be prohibited to perform as per law and other regulations? For example,in case of para vet (Pashu Sakhi), the Veterinary Council of India Act 1984 lays down the guidelines for the provision of veterinary services in the country. Such regulations need to be taken into account while designing the role of para workers at the community level.

(c) Grading of para workers so that the community is aware of their competency levels and to generate opportunities for the growth of para workers who are high performers and those who have a better understanding and higher skill level. This aspect has not been built into the projects, though DAY-NRLM through its development strategy for Community Resource Persons has instituted a graded system that allows CRPs to move up the ladder and upgrade their own skills/add new skills.

5. Gender transformation and not just Women Empowerment

The cases covered under the study have had a major focus on women, both as an agent of change, and as the beneficiary of the project. The projects that impact livelihoods directly e.g., horticulture, agribusiness, green enterprise, small livestock, fisheries, non-farm livelihoods strongly based their intervention on both these two aspects. However, in case of projects related to climate risk management and agroecology there does not seem to be a centricity of women, except in case of the Living Soil project of Greenpeace. Landscape restoration and revival projects alsofall short in the involvement of women as part of the project implementation and impact.

Projects have followed the women empowerment framework to design the project interventions: target women, build their capacities, handhold them during implementation, and mentor them to enable higher competencies. The result areas that have emerged relate to increased social, political and economic empowerment of women that is reflected in their increased accessibilities to income and political institutions (Gram Sabha and Government), and their recognition as sources of information and service provision. There has been education and psychological empowerment thus leading to increased knowledge and skills, increase in confidence, and self-worth of women. The strategies, though effective, fall short on doing enough to develop women as leader-manager of institutions like FPOs or Livelihood/User Groups.

In terms of design learning for ERADA, the proposed framework for the engagement of women needs to be driven by SDG 5: Achieve Gender Equality and Empower All Women and Girls. The central thrust of the SDG is Gender Equality which entails considerations of factors that go beyond empowerment, address the socio-eco-political milieu and are founded on tenets of patriarchy.They are impacting the distribution of work, roles and responsibilities amongst different genders, imposing restrictions in mobility and hence hindering inclusion in a range of activities within households and community. ERADA needs to take a holistic view of gender relations and work with a vision of transforming gender relations (within the livelihood spaces at least) and adopt processes and measures that will promote gender equality in target communities.

The proposition of adopting gender transformative approaches necessarily implies a paradigm shift from women-centricity in programmes towards gender-centricity in perspective, design, and programmatic processes. Operational strategies that focus both on gender mainstreaming (gender situation analysis and

incorporation of gender concerns in all stages of project cycle); and gender transformation (developing agency of women, engagement with men on masculinity and gender distribution of work, and creating eco-systemsto support gender equality within the community) will need to be contextualised and implemented to achieve pre-determined gender indicators (as distinct from indicators of women empowerment).

6. Technical interventions

Questions that project designs have to address are whether and how much of Information and Communication Technology they should employ as part of the project. Low levels of literacy (education gap), low access to information technology (technology divide), and low levels of usage (capacity gap) have been the major constraining factors that have impacted the use of digital and other forms of information technologies as part of livelihoods projects.

The models for the use of ICT for livelihood enhancements documented in the study indicate possibilities of technology multipliers if these are used sensitively and strategically:

(a) Making technology available to the target group in itself can be the part of the project, as demonstrated by the model developed by Trickle Up under its PoP App initiative with SRLM in Jharkhand. The project ensured that the women will own and use smartphones as part of the project intervention itself.

(b) Use of pictures, audio and video to overcome low levels of literacy has been made possible by the use ofa multi-media approach to disseminate information and establish a two-way communication with the target groups (PoP App, the AGRIBUDDY). This has also enabled the project to overcome the language constraints and use of local dialects between the target group, and the service provider and project functionaries.

(c) Capacity development of the user (AGRIBUDDY and Ergos) as well as the service provider (Pashudhan Sanjeevani 1962) as part of the project intervention has been instrumental in ensuring increased use of the applications and digital services by the users.

(d) Developing a cadre that can provide responses to the users: extension staff in case of PoP Just in Time and AGRIBUDDY. The presence of this cadre ensures thereduction in response time and the provision of service and information as and when it is required and demanded.

(e) Possibilities of value-added services like in case of Ergos and AGRIBUDDY. As the basic information of the user is already digitised, accessing other services becomes easier as the same information can be automatically retrieved from the existing data base. This has a positive impact on decreasing transaction costs for the user and also the service provider.

(f) Employment of GIS and remote sensing data has been demonstrated to provide information to the farmers on the availability of natural resources and on climatic trends, to enable them to make informed decisions. The example of CRISP-M to make available meteorological information understandable to the farmers to drought proof their ecosystem is a case in point.

The cases documented in the study indicate that the design question for ICT is not as much on whether and how much to use, but rather on how to make it user friendly, how toprovide multiple services, and how to develop capacities of service providers (extension and technical) to respond to the issues raised by the users in real time. The design learning focuses on both, the capacity of the technology, and the capacity to use the technology.

7. Panchayats

Panchayats offer multiple design benefits for projects targeting livelihood enhancements:

(a) GPs offer the institutional platform that facilitates convergence between different schemes, both at village and at household level. This has been demonstrated for projects that aimed at landscape improvement like the implementation of the Ecosystem based approach for watershed management of WOTR in Maharashtra, or the Eco-restoration projects aimed at reviving the natural resource base like in case of Pasture land development at Hastinapur village in Rajasthan, or for promotion of horticulture as an alternative livelihood option to reduce dependencies on forests as implemented by CDC in the buffer zone of Kanha national park. In these cases, GPs have facilitated convergence with the project interventions, by enabling the pooling of funds under *Mahatma Gandhi NREGA*, by selecting beneficiaries for accessing mini kits and other subsidies from Departments of Agriculture and Horticulture, and by accessing subsidised for cooking gas under PMUY.

(b) GPs have provided leadership in the implementation of projects that go beyond the boundaries of one Panchayat. For example, in case of the Sasur Khederi II

river revivalin Uttar Pradesh, GPs not only facilitated funds under *Mahatma Gandhi NREGA* but they also ensured the availability of labour by mobilising the community in their respective villages to register themselves at worksite so that a steady stream of work was ensured. Similarly, forthe tank cascade revival in Vizianagram district in Andhra Pradesh, the Zila Panchayat played a critical role in the identification of Garida and Tettangi sub-basins that formed part of the tanks revival plan.

(c) GPs have been able to provide the platforms that have ensured institutional sustainability to community-based collectives. This has been demonstrated under EbA for watershed management implemented by WOTR. The project formed a Village Development Committee that was set up as a sub-committee of the GPs and was made responsible for the implementation and management of the project which in turn increased the capacity of the GPs on fund management.

(d) GPs offer possibilities for the development of alternative livelihoods that in turn fulfil their constitutional mandate as well. The GP at Karulayi, in Kerala, did this by forming the Harith Karma Sena to collect, segregate and ensure the safe disposal of plastic waste from their Panchayat. This has created a pool of Green Technicians, established a paid-for waste management system, brought convergence in the pooling of resources from Swachch Bharat Mission and the GP's own funds, and also enabled the GP to fulfil its responsibility.

(e) GPs have provided administrative facilitation in identification, making sites available for the establishment of a brick paver unit at Mandir Hasud under SPMRM in Chhattisgarh; and by endorsing the members of Unnati SHG, in Nadiad district in West Bengal, for fisheries by making 5 katthas of land available on lease for starting a cat fish production unit. Such facilitation has also been effected in the ear marking of land for pasture development under Panch Phal and for restoration of irrigation infrastructures under Harti Dhara in Rajasthan.

The universal and uniform role of panchayats across states make them a critical institutional factor that needs to be considered in the design of livelihood intervention projects. The strategy in such projects will have to define their role at each stage of project cycle; their capacity needs (especially in the context of emerging challenges posed by climate risk management, eco-restoration of natural resource base, and in broad basing of agroecological interventions.

There are two design issues that have not been considered in the projects so far:

- One, to incorporate project interventions as part of the Gram Panchayat Development Plan (GPDP) that will ensure involvement of Panchayats at an early stage in project implementation; enable the project to institutionalise its activities; and bring the project in to the realm of public accountability mechanisms through social audit processes.
- Second, to bring linkages between para- professionals and workers developed under the project as potential trained human resource that can be employed by GPs in future. This will provide an institutional linkage to para workers and will thus add on to ensure the sustainability of their service on a long-term basis.

8. Recognising traditional knowledge

Climate risk management, Eco-restoration of natural resources, Agroecology and Green enterprises have a strong base that uses traditional information and local knowledge to identify and implement specific project interventions. For example, PanchPahal to revive pastures in Rajasthan, Dhara Vikas for the revival of springs in Sikkim, the intervention of Sahaj Samudra in Karnataka or CITRD in Odisha have consciously tapped in to local knowledge of trees, grasses, local and traditional varieties of crops, methods of spring management etc. for the development of project interventions. The traditional knowledge, often undocumented, has been brought into the project folds through regular, and intensive interactions with communities in early stages of the project.

Incorporation of local knowledge has the advantage of making the intervention relevant thus creating a potential for high adoption (as in case of CIRTD and Sahaj Samudra), revival of local biodiversity (as in case of Panch Phal and Greening of Hillocks in Anantpur), recognition and revival of traditional practices (use of bio-supplements by CIRTD, and system of tank cascade in Andhra Pradesh and ahar-pyne in Bihar for storing and distributing water), and enhancing climate resilience of farm-based livelihoods (seed exchange system through village seed bank under TATA-ICRISAT initiative in MP, or restoring soil health under the Living Soil programme of Greenpeace India in Bihar).

A major design learning that emerges from the cases documented for ERADA is to start the process by incorporating traditional knowledge in the early stages of project implementation, namely at the stage of project design itself. This will allow space and time for the project to verify the information and consider other project activities (like capacity building and information dissemination) early in the framework of project implementation.

The universal and uniform role of panchayats across states make them a critical institutional factor that needs to be considered in the design of livelihood intervention projects.

Notes

Notes

Notes

Notes

ERADA

Enhancing Rural Resilience Through Appropriate Development Actions

FOR A GOLDEN TOMORROW

Deutsche Gesellschaft für
Internationale Zusammenarbeit
(GIZ) GmbH

A2/18 Safdarjung Enclave
New Delhi-110029 India

T: +91-11-49495353
E: info@giz.de
www.giz.de/india