

Millets Mainstreaming in India, Asian and African Countries

A Compendium of Inspiring Stories from Field





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A Compendium of Inspiring Stories from Field

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MESSAGE

Millets, also called “Sri Anna”, are nutritious super foods with immense health benefits. Millets are climate resilient, drought resistant, and water efficient crops. India is the largest producer and a leading exporter of millets. At India’s request, the United Nations General Assembly has declared 2023 as the International Year of Millets (IYM). The Hon’ble Prime Minister Shri Narendra Modiji has shared his vision of making IYM 2023 a peoples’ movement, and India a global hub for millets. Mainstreaming millets is important as these grains have immense potential to generate livelihoods, increase farmers’ incomes, and ensure food and nutrition security not only in India but across the globe.

NITI Aayog, in collaboration with the World Food Programme (WFP), India, launched the ‘Mapping and Exchange of Good Practices’ initiative for mainstreaming millets in Asia and Africa on 19 July, 2022 with the objective of catalysing transformational changes in the nutritional status of the country. A web portal was unveiled to invite entries in three categories, namely–millet value chain, millet mainstreaming, and millet recipes. Various stakeholders from the Government, industry, startups, Non-Government Organisations (NGOs), Farmers Producers Organisations (FPOs), Self Help Groups (SHGs), and Primary Agriculture Cooperative Societies (PACS), participated in the initiative and submitted interesting case studies.

I would like to thank the jury, which consisted of experts from diverse fields such as agriculture, food technology, nutrition policy and academia for reviewing and providing their comments on each case study. Their invaluable support enabled us to prepare a comprehensive compendium highlighting the best practice in mainstreaming millets. Wider dissemination of this compendium will help States develop appropriate strategies to establish a strong value chain. I believe that these inspiring studies from the field will encourage communities across the world to take-up millets as an alternative crop for sustainable food security for the planet in the years to come.

Suman Bery





प्रो. रमेश चन्द

सदस्य

Prof. Ramesh Chand

MEMBER



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FOREWORD

Millets are climate resilient and environment friendly crops. They contain better nutrition compared to other cereals. Because of these attributes millets have strong potential for sustaining and improving food and nutritional security. However, their productivity level and market realization are very low and need to be raised. This requires identification and adoption of best practices followed across India and abroad with proven potential to raise productivity and income from millets.

This MEGP compendium collates and analyzes best practices adopted by different Governments and organizations across Asia and Africa on various aspects related to millets. The compendium focuses on two main categories (1) Millet value chain (production, storage & transportation, processing, packaging & branding, distribution, and consumption) and (2) Mainstreaming dimensions (institutional commitment & coordination, multi-stakeholder partnership, sustainable & innovative financing, gender & inclusion, and enabling environment for safety nets inclusion). The different stories have highlighted key opportunities and barriers to realize millet mainstreaming. I appreciate various organizations and institutes who have contributed to rich body of knowledge on millets. The NITI team led by Dr Neelam Patel Senior Adviser and United Nation's World Food Programme carried out the entire efforts to invite, collect, verify and compile the inspiring stories and case studies on millets in the form of a compendium of inspiring case stories. They deserve appreciation for the hard work undertaken by them.

I hope the stories published in this compendium will serve as a repository to guide development agencies, civil society organizations, research agencies, policymakers and administrators for adopting good practices, developing millet-based projects, strengthening millet value chain, undertaking relevant research, and facilitating mainstreaming of millets globally. The main endeavor of this MEGP compendium is to help revive interest and support mainstreaming of millets not just for the International Year of Millets but beyond.

(Ramesh Chand)

Place: New Delhi

Date: November 09, 2023

बी. वी. आर. सुब्रह्मण्यम
B.V.R. Subrahmanyam
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MESSAGE

Agriculture is a highly climate sensitive sector prone to multiple risks which can destabilize food systems, leading to local and regional food insecurity. Smallholder farmers, who are vital to food security, are often the most vulnerable and impacted by increasing climate risks. Helping such farmers and agricultural value chains to cope with climate variability and adapt to climate change is a key priority globally. Climate change is also among the leading causes of rising global hunger. Crop diversification and the use of resilient crop varieties like millets are critical adaptation options to changing climate that safeguards farmers' income, improves food security and nutrition, increases the resilience of agri-food systems, and helps mitigate the risks associated with climate variability and market volatility.

Millets are cereals from the Poaceae grass family and are considered one of the oldest cultivated crops. Millets have health-beneficial phenolic compounds and are abundant in nutrients. They are, often considered a 'superfood' suitable for food and feed. Apart from their nutritional value, millet cultivation is less resource intensive, farmer friendly and climate resilient. Such grains can adapt to various climate stressors such as drought and heat and cold stress. If promoted, millets can help achieve socio-economic and environmental sustainability.

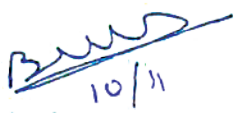
The Government of India has been diligently attempting to revitalize the supply and demand of millets in the country. India has also been leading the discourse on developing global awareness on millets, largely contributing towards the recognition of 2023 as the International Year of the Millets. The Government of India has pushed the envelope even further with the Union Budget 202324 highlighting support provided for post-harvest value addition, enhancing domestic consumption and branding millet products nationally and internationally. The Government is also enhancing research and awareness through the establishment of a proposed G20 Initiative on millets called 'Millets And OtHer Ancient GRains International ReSearch Initiative (MAHARISHI).

The Mapping and Exchange of Good practices (MEGP) initiative for millet mainstreaming is part of India's ongoing efforts, where NITI Aayog, Government of India has collaborated with the United Nations World Food Programme (WFP), India to document and share seventy-two case stories from across Asia and Africa. This compendium of good practices is a step to make it easier for governments and communities globally to comprehend what millet mainstreaming entails and trigger informed decisions if they wish to scale up/replicate any idea. It provides a co-learning platform and unlocks potential South-South Cooperation (SSC) & South-South & Triangular Cooperation (SSTC) pathways. The MEGP initiative offers a policy choice of mutual collaboration through study visits, expert deployment, demonstration sites, peer coaching networks, technology and/or knowledge transfer, and policy dialogues.

I appreciate the efforts taken by organizations at various levels who have shared their inspiring stories to motivate others and facilitate learning through this initiative. I hope it paves path towards bringing millets back in diets of people to benefit them and the planet in general.



एक कदम स्वच्छता की ओर


10/11
(B.V.R. Subrahmanyam)



MESSAGE

I wish to commend NITI Aayog and the United Nations World Food Programme (WFP) for developing a compendium of good examples from across the world on strengthening the millet value chain and promoting millet consumption. These case studies from organisations, institutions, and communities, offer insights and inspiration.

The importance of millet lies in its nutritional value, health benefits, contribution to food security, livelihoods, climate resilience, and sustainability. This compendium underlines that promoting the cultivation and consumption of millet through innovative practices can have a significant positive impact on agriculture, nutrition, and the environment. The examples provide opportunities for learning, replication and scale up.

WFP recognises the ongoing efforts by India and its vast potential in leading global efforts for reviving ancient grains including millet. At the Global Millet Conference in March 2023, India's Prime Minister stressed that millet will be particularly important for 25 million smallholder farmers. WFP is committed to supporting India in this journey.

Platforms such as this one - Mapping and Exchange of Good Practices - foster co-learning and support the collective endeavour of strengthening food systems to make them more equitable and sustainable.

I hope that the stories in this compendium will inspire organisations and communities to enhance their agricultural practices, food supply chains, dietary choices, and policy frameworks.

This initiative would not have been successful without the support of a wide range of partners, and we thank everyone for their engagement and contributions.

Elisabeth Faure
Representative and Country Director,
WFP India

Acknowledgement

This compendium on “Millets Mainstreaming in India, Asian and African Countries-A Compendium of Inspiring Stories from Field” is the outcome of NITI Aayog’s collaboration with the United Nations World Food Programme (WFP) to map and support exchange of best practices for millets mainstreaming in Asia and Africa. The initiative supports the documentation of good practices, lessons learnt and presents an opportunity of experience sharing amongst Asian and African developing countries.

The Mapping and Exchange of Good Practices (MEGP) Initiative received a total of 227 applications. We extend our sincere thanks to each applicant who showed enthusiasm in participating and supporting this initiative. Your participation played a major role in making this initiative a success. Documentation of these learnings will be useful for the policy makers and practitioners who are committed to strengthen the millet value chain and mainstream millets.

Our initiative was bestowed with an esteemed panel of Jury Members, without whom this initiative wouldn’t have been possible. We would like to extend our gratitude to Dr. Shobhana Pattanayak, Former Agriculture Secretary, GoI and India’s Presidential Candidate for IFAD, Dr. Chindi Vasudevappa, Former Vice Chancellor, National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Ms. Shubha Thakur, Joint Secretary (Crops and Oilseeds), Ministry of Agriculture & Farmers Welfare, Govt. of India, Dr. Sridevi Annapurna Singh, Director, CSIR-Central Food Technological Research Institute (CFTRI), Dr. R Hemalatha, Director, National Institute of Nutrition, ICMR and Chef Manjit Gill, President, Indian Federation of Culinary Associations who firstly consented to be a part of this initiative and took out time in evaluating these applications. Their support and guidance helped mold this initiative to what it is now. It was an honor to have the jury members on board for this initiative.

We would like to extend our appreciation to networks for their support in popularizing the “Map and Exchange Good Practices (MEGP) Initiative” and connecting us with many stakeholders across Asia and Africa. We also extend our appreciation to the WFP and NITI Aayog’s communications team for their inputs, which helped shape each case story to its current form. Lastly, the development of this compendium in digital format wouldn’t have been possible without the printing team. We extend our sincere thanks to the team for their patient coordination and support for molding the compendium into its current form.

Panel of Juries



Dr. Shobhana Pattanayak

Dr S K Pattanayak served in the Administrative Services under the Government of India. He superannuated as the Secretary to Government of India in the Department of Agriculture, Cooperation & Farmers Welfare, New Delhi, in September 2018. An accomplished policy-maker, planner and an inspiring leader, Dr Pattanayak, as an Administrator had handled a wide variety of assignments at the grassroots and national levels within India and internationally, being entrusted with increased responsibilities in a career of over thirty-six years. Dr. Pattanayak gained considerable experience in contributing to policy level interventions in international organizations like FAO, WFP and IFAD in varying capacities during his three-year tenure as Minister (Agriculture) with India's Embassy in Rome. He also served as India's Presidential Candidate for IFAD.



Dr. Chindi Vasudevappa

Dr. Chindi Vasudevappa is the Former Vice Chancellor, National Institute of Food Technology Entrepreneurship and Management (NIFTEM). An astute professional with years of experience in research, administration, and teaching, he has been responsible for the development of academic programs, different curriculums, and regulations as a professor. Dr Chindi holds doctorate in the field of fisheries science.



Ms. Shubha Thakur

Ms. Shubha Thakur is Joint Secretary (Crops and Oilseeds), Ministry of Agriculture & Farmers Welfare, Govt. of India. She has considerable experience as a policy maker, and administrator working with various Government departments.



Dr. Sridevi Annapurna Singh

Dr. Sridevi Annapurna Singh is Director, CSIR-CFTRI since 2021. In her career spanning over three decades, she has worked extensively on both basic and applied aspects of food science. She has made significant contributions towards unfolding protein structure-function-activity relationship, proteins and enzymes as food ingredients, nutraceuticals from traditional food and technologies for combating malnutrition. She has published over 50 research papers in peer-reviewed journals, and holds a total of 11 patents to her credit. Dr. Sridevi has been the Governing Council Member of National Agri Biotechnology Institute (Mohali), Member, Expert committee on Public Health and Nutrition, BIS sub-committee on Oils and Oilseeds, Interagency on Micronutrients (ICMR) and Board of Studies of Mysore University.



Dr. R Hemalatha, Director

Dr. R. Hemalatha is Director, National Institute of Nutrition, ICMR. Dr. Hemalatha's research interests encompass maternal, child health and nutrition. She has authored more than 200 peer-reviewed scientific papers, book chapters and regulatory reports. Dr. Hemalatha is presently the President of the Nutrition Society of India and Executive Council Member of the Federation of Asian Nutrition Societies (FANS). She is also an Expert Member of various task force committees of the Ministries such as National Technical Board on Nutrition and National Council of Nutrition of NITI Aayog, Steering Committee Member of the South Asian Policy Leadership for Nutrition and Growth (SAPLING), to name a few.



Chef Manjit Gill

Chef Manjit Gill is President, Indian Federation of Culinary Associations, and has over four decades of culinary experience behind him. Manjit Gill is a reputed professional in the Hospitality Industry held in the highest regard by its top gastronomic echelons. In addition to being intensely creative, Manjit is a dynamic leader and a teacher. In his present position, he continues to inspire his team and motivate a large number of culinary students to perform.

Project Team



Dr. Neelam Patel

Dr. Neelam Patel, Senior Adviser (Agriculture), NITI Aayog, holds a Ph.D. from ICAR-Indian Agricultural Research Institute, New Delhi (FAI Golden Jubilee Award) in agriculture. Dr. Neelam has worked extensively on precision farming technologies, natural farming, hi-tech horticulture, capacity building of different stakeholders, and women empowerment. She has brought several innovations in horticulture technology, water management, etc. at the Centre for Protected Cultivation Technology, and is a recipient of multiple awards and honours including Panjabrao Deshmukh Outstanding Woman Scientist Award in 2015 by ICAR among others. She is Fellow of National Academy of Agricultural Sciences, Indian Society of Agricultural Engineers, Indian Society of Soil and Water Conservation. Dr. Neelam has published more than 100 research papers, authored multiple books, and contributed to various reports, special projects, etc.



Dr. Saloni Bhutani

Dr. Saloni Bhutani, Young Professional (Agriculture), NITI Aayog has completed her PhD, M.Phil, MA in Economics from University of Hyderabad, and Bachelors in Economics from Hansraj College, Delhi University. She has presented several research papers in national and international conferences and published several newspaper and magazine articles, research papers and a book in the areas of urban economics, transport economics, and agriculture. She holds strong work experience in ground level policy implementation and has worked as a Senior Research Associate at the Administrative Staff College of India, and Research Analyst in a HUDCO Chair Program at University of Hyderabad in the past. At NITI, she focuses on tasks related to millet promotion.



Ms. Pradnya Paithankar

Working in one of the world's largest humanitarian organizations in the world, WFP, Ms. Pradnya Paithankar has experience of handling large scale projects in the space of nutrition, health, and food security. Pradnya is currently providing leadership to WFP India's efforts to bring the food and nutrition security to the forefront of climate action agenda. As Head of Programme Climate change and DRR, she is contributing to leverage WFP's expertise globally in the field of climate resilience and DRM to strategically support Government systems to design, monitor and implement approaches towards achievement of 2030 agenda.



Dr. Sudeshna Maya Sen

Dr. Sudeshna Maya Sen is working at World Food Programme as Programme Policy officer (Climate Resilient Food Systems) since 2022. She has over 8 years' experience working as a climate change adaptation researcher. Sudeshna holds a doctorate from TERI School of Advanced Studies and has previously worked with Government, research, and industry partners including TERI SAS, Government of Gujarat and Dr. Reddy's Foundation on climate adaptation projects across India.



Mr. Ambati Krishnamurthy

Mr. Ambati Krishnamurthy is working at United Nations World Food Programme as Programme Associate since 2019. He has over 24+ years of experience primarily in programme & administration. Prior to joining WFP, he has worked with UNDP, National AIDS Control Organisation, and Ministry of Agriculture and Farmers Welfare. Krishnamurthy also worked in the past with CARE India Chhattisgarh and DANIDA.

Abbreviations

| | |
|-------------|--|
| AAO | Assistant Agriculture Officer |
| ATMA | Agricultural Technology Management Agency |
| AWCs | Anganwadi Centers |
| AWW | Anganwadi Worker |
| BAO | Block Agriculture Officer |
| BCR | Benefit Cost Ratio |
| BoD | Board of Directors |
| CBOs | Community based Organizations |
| CDAO | Chief District Agriculture Officer |
| CHC | Custom Hiring Centre |
| CIG | Common Interest Groups (CIG) |
| CRP | Community Resource Persons |
| CSMC | Community Seed Management Centre |
| DAS | Days after Sowing |
| DAT | Days after Transplantation |
| DM | District Magistrate |
| ESA | Eastern and Southern Africa (ESA) |
| FA | Facilitating Agency |
| FAQ | Fair Average Quality |
| FPC | Farmers Producer Company |
| FPO | Farmers Producer Organization |
| FRA | Forest Rights Act |
| FSMS | Food Safety Management Systems |
| FYM | Farmyard Manure |
| GAP | Good Agricultural Practices |
| GP | Gram Panchayat |
| Ha | Hectares |
| HYV | High Yielding varieties |
| ICDS | Integrated Child Development Scheme |
| IEC | Information, Education & Communication |
| IIMR | Indian Institute of Millets Research |
| ISO | International Organization for Standardization |
| JLG | Joint Liability groups |
| KMS | Kharif Marketing Season |
| KVK | Krishi Vigyan Kendras |

| | |
|---------------|---|
| LAMPCS | Large-sized Adivasi Multipurpose Cooperative Society |
| LS | Line Sowing |
| LT | Line Transplanting |
| MDM | Mid-day Meals |
| MEGP | Mapping and Exchange of Good Practices |
| MPAS | Millet Procurement Automation System |
| MSME | Micro, Small & Medium Enterprises |
| MSP | Minimum Support Price |
| MT | Metric Tonne |
| NBPGR | National Bureau of Plant Genetic Resources |
| NFHS | National Family Health Survey |
| NGOs | Non-Governmental Organisations |
| NPOP | National Programme for Organic Production |
| NRLM | National Rural Livelihood Program |
| OMM | Odisha Millet Mission |
| OUAT | Odisha University of Agriculture and Technology |
| PACS | Primary Agricultural Credit Societies |
| PDS | Public Distribution Scheme |
| PKVY | Paramparagat Krishi Vikas Yojana |
| PMHPRC | Pearl Millet Hybrid Parents Research Consortium |
| PoPs | Package of Practices |
| PPP | Public Private Partnership |
| PS | Prabhari Shakti |
| PVT | Participatory Varietal Trial |
| PVTGs | Particularly Vulnerable Tribal Groups |
| Q | Quintal |
| RBD | Randomized Block Design |
| RKVY | Rashtriya Krishi Vikas Yojana |
| RMCS | Regulated Market Committees |
| SC | Scheduled Caste |
| SDG | Sustainable Development Goals |
| SHG | Self Help Group |
| SMI | System of Millets Intensification |
| SOP | Standard Operating Procedures |
| ST | Scheduled Tribe |
| TDCCOL | Tribal Development Co-operative Corporation of Odisha Limited |
| THR | Take Home Ration |
| ToT | Training of Trainers |
| WCA | West and Central Africa |
| WSHGs | Women Self-Help Groups |

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Introduction

**The Mapping & Exchange of Good Practices (MEGP)
Initiative for Millets Mainstreaming in Asian and
African Countries**

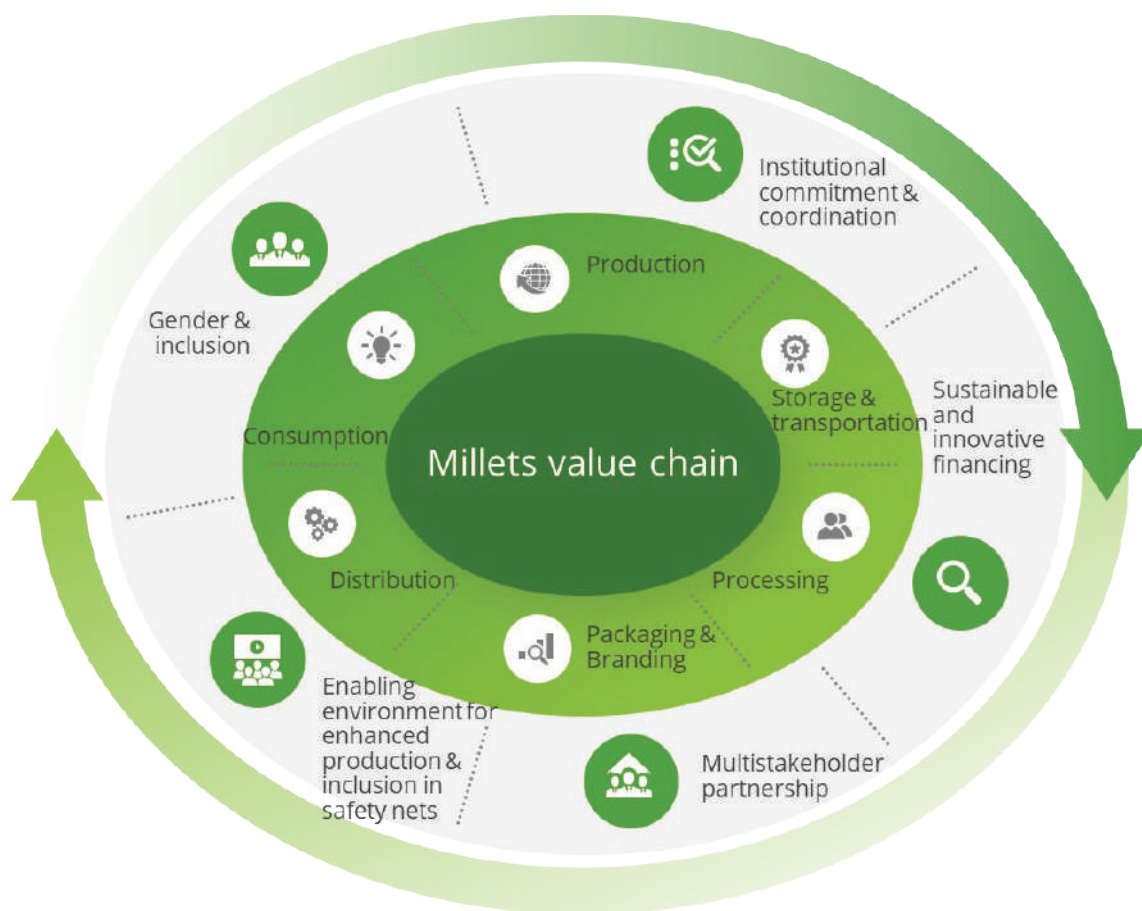
OVERVIEW OF THE MEGP INITIATIVE

Climate change is among the leading causes of rising global hunger. Crop diversification and the use of resilient crop varieties like **millet**s are critical adaptation options to changing climate for millions of farmers, particularly smallholders with limited access to farm insurance and credit facilities. Crop diversification safeguards farmers' incomes, improves food security and nutrition, increases the resilience of agri-food systems, and helps mitigate the risks associated with climate variability and market volatility.

Diversification to underutilized traditional crops like millets can not only help in sustainable agriculture production, but also ensure healthy lives, while promoting overall well-being. Millets are traditional crops that are returning to the modern food systems due to their high

nutritional content. Apart from having a high nutritional value, millets are easy to cultivate, less resource-intensive, farmer-friendly and climate-resilient. Such grains can adapt to various climate stressors such as drought, heat, and cold. Boosting millet production can ensure achievement of socio-economic as well as environmental sustainability.

Despite the vast potential of millets to expand dietary diversity, improve nutritional security and strengthen food systems, its cultivation and consumption have been witnessing a decline. Efforts need to be taken to combat the different supply (e.g., low profitability, lack of access to seeds, etc.) and demand side (e.g., changing consumer tastes and preferences, lower shelf life of milled grains etc.) challenges. Over the years, countries across the globe have adopted different existing and forgotten solutions to help combat such challenges to strengthen the millet value chain and support millet mainstreaming.



As the world's largest producer of millets, India has also been diligently attempting to revitalise the supply and demand of millets. India has been leading the discourse on developing global awareness on millets and has majorly contributed towards the recognition of the year 2023 as the International Year of the Millets by the United Nations. As a part of India's ongoing efforts, NITI Aayog, Government of India in collaboration with United Nations World Food Programme (WFP), India launched the MEGP, initiative which maps and supports exchange of best practices for millets mainstreaming in Asia and Africa. The initiative supports the documentation of good practices, lessons learnt and presents an opportunity of experience sharing within India and amongst Asian and African developing countries for inspiring such attempts at various levels. This compendium of good practices is targeted to make it easier for the governments globally to comprehend what millet mainstreaming entails and trigger informed decisions if they wish to initiate, validate, scale up/replicate any idea. It also helps unlock knowledge exchange and various South-South Cooperation (SSC) & South-South & Triangular Cooperation (SSTC) pathways and offers a policy choice of mutual collaboration through study visits, expert deployment, demonstration sites, peer coaching networks, technology and/or knowledge transfer, and policy dialogues.

The initiative invited stakeholders from government or non-government organizations, multilaterals or community level organizations such as FPOs/SHGs/PACS/Cooperatives and private sector/start-ups from across Asia and Africa to share their proven solutions with demonstrated results in field to submit their entries in two main categories as per the millets mainstreaming framework:

1. **Millet value chain** (production, storage & transportation, processing, packaging & branding, distribution, and consumption)

2. **Mainstreaming dimensions** (institutional commitment & coordination, multi-stakeholder partnership, sustainable & innovative financing, gender & inclusion, and enabling environment for safety nets inclusion).

An additional category on millet recipes to enhance the knowledge on the cooking method and develop diversified millet recipes was also a part of the MEGP call, however those entries have not been included in this compendium and a separate recipe book will be released soon by calling for more entries.

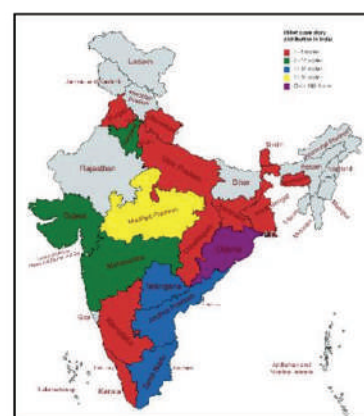
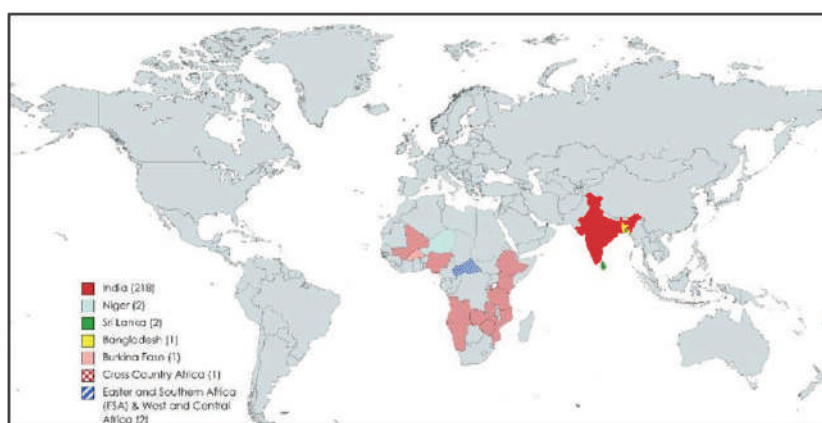
METHODOLOGY

Eligibility criteria and outreach strategy

Organizations and practitioners from African and Asian nations were encouraged to participate with case stories of demonstrable solutions from grassroots to the regional level. Solutions at conceptual stage were not eligible. The solutions and good practices had to respond to the demand and supply-side factors and address the decline of millet production. The MEGP encouraged submissions that captured experiences of organizations working on reviving forgotten practices, particularly traditional and indigenous community practices. The case stories could be submitted on the MEGP web portal, which was launched on 19th July 2022. Besides, the usual dissemination channels including NITI Aayog website, Twitter, Facebook and other portals, stakeholder consultations with various government and non-government organizations were also conducted between August–September 2022 as an outreach measure.

| In Partnership with and targeted to | Date | Stakeholders | Participants |
|--|-------------|---|--------------|
| States | 17-Aug-22 | Himachal Pradesh, Punjab, Haryana, Uttarakhand & Delhi | 24 |
| | 18-Aug-22 | North-Eastern states (Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Tripura & Meghalaya) & Sikkim | 12 |
| | 18-Aug-22 | Uttar Pradesh, Chhattisgarh, Odisha, West Bengal, Bihar & Jharkhand | 17 |
| | 19-Aug-22 | Andaman & Nicobar, Puducherry, Daman & Diu, Lakshadweep, Ladakh, Jammu & Kashmir | 7 |
| | 23-Aug-22 | Karnataka, Kerala, Tamilnadu, Andhra Pradesh & Telangana | 58 |
| | 25-Aug-22 | Madhya Pradesh, Rajasthan, Gujarat, Maharashtra & Goa | 15 |
| NRLM to target SHGs | 22-Aug-22 | All State level Rural Livelihood Missions (SRLMs) | 100 |
| MoFPI to target ODOP Millet initiatives | 23-Aug-22 | All one district one project millets districts | 47 |
| Invest India for start ups | 24-Aug-22 | All millet based Start ups | 5 |
| Revitalising Rainfed Agriculture Network (RRAN) for NGOs | 24-Aug-22 | NGOs engaged in reviving rainfed agriculture | 254 |
| ICRISAT for international case studies | 29 Aug-22 | For ICRISAT colleagues | 100 |
| Ministry of DARE to target KVKs | 16-sept -22 | All KVKs/ ATARI ICAR | 383 |
| NCUI | 21 sept 22 | For cooperatives | 66 |
| WFP HQ. | 26 sept 22 | For WFP colleagues | 13 |
| Total | | | 1101 |

A total of 227 case stories were submitted either online on MEGP portal or through email for evaluation. Around 9 applications were received from multiples countries across Asia and Africa, and the rest 218 were from India. Within in India, Odisha shared over 100 entries. Bulk of the entries were from millet value chain (147 entries), while 19 were from millet mainstreaming and 42 were from millet recipes. Maximum stories were from FPOs, the Government and NGOs.



Evaluation methodology

Evaluation of the applications were done by an esteemed panel of juries, with significant contributions in India in the field of millet value chain, mainstreaming, food security and climate change. The distinguished panel members drew experience of working in different sectors including government, academia, and UN agency.

Evaluation criteria

The applications were reviewed on the following evaluation parameters

- Innovation (novelty of the solution)
- Practicality (ability to address significant current or emerging need)
- Gender & inclusion (ability to reach the last mile, the most marginalized and the excluded, particularly women)
- Impact (potential to improve outcomes at scale)

Sustainability (potential for scale-up and alignment with the public/private systems) The criteria did not include scientific scrutiny, as such as these case stories were expected to highlight good efforts, anecdotal initial success and potential for further validation through replication and systematic assessments. The same has been highlighted in the editor's notes

Evaluation phases

Pre-screening: Pre-screening of all received applications was done by the project team based on sufficiency of information. About 178 stories were deemed sufficient, out of which 42 were millet recipes, rest 154 were from millet value chain and mainstreaming. These 154 stories were then scored on the five different parameters from 0 to 2 (0 – not yet, 1-partial, and 2 – yes). Around 117 entries that scored either 9 or 10 were shortlisted for the first jury review.

Evaluation by Juries: Based on the pre-screening, the jury members were presented 117 shortlisted value chain and mainstreaming stories for their inputs. The jury members suggested that each story is a unique learning from the field and should be included in the compendium, while avoiding duplication. The recipes that were received needed much more work in terms of detailing out nutritional values and were not ready for inclusion in the compendium at this stage. These valuable inputs enabled creation of a comprehensive but more concise and leaner document.

Finalization of stories: Based on the jury discussion, the project team again reviewed all the 117 case stories. Case stories were reviewed for the purpose of re-categorization. Duplicate entries shared by different partners of the same project were removed. Also, one entry representing one solution was kept in the compendium. If similar entries/stories were submitted from different villages/blocks/partners showcasing the same solution, they were included in the editor's note in the story. Out of 227 entries submitted, the final compendium comprises of 72 stories, out of which 58 stories are from millet value chain and 14 stories from millet mainstreaming respectively.

There are few stories which have overlapping themes of both millet value chain and mainstreaming. While all stories were valuable, we mentioned the names of similar stories acknowledging their efforts for ease of reading. Majority of the stories in the compendium have been shared by grassroot level organizations and are based on their field experiences. Hence, the compendium serves more as a guiding document to inspire field functionaries and communities to explore the potential of millets rather than a peer-reviewed scientific study. The compendium helps set the direction for future research to solidify the benefits claimed in the stories.



A. Millet Value Chain

Institution: Singhdev Farmer Producer Company

Summary: Minor millets are grown in the Kharif season by tribal farmers on rough hill slopes, less fertile land (*barra*), and along the edge of the forest. Small grain crops including kodo, kutki, kangni, savan ragi, and bajra are lifeline of tribal communities. Also, kodo and kutki do not get spoiled for many years. Singhdev Farmer Producer Company, Sidhi, through its efforts, strengthened the value chain for minor millets. The current case study focuses on all the aspects of millet value chain including production, storage, transportation, processing, packaging and branding.

Pitch: After selecting thirty-five villages of *Kusmi* and fourteen villages of *Sihawal*, a survey was conducted to understand the production, sale arrangement rate, etc. It was observed that area under cultivation for *kodo and kutki* reduced despite being less labor intensive and nutritious. The *Aajeevika* Mission team contacted the Agriculture Department, and Agriculture Technology Management Agency (ATMA) to increase the area under these millets. A meeting was held to discuss the cooperation of the Self-Help Group formed by the Livelihood Mission to grow *kodo & kutki*. Women were informed about the benefits of cultivation and use of *kodo & kutki* through village and cluster level meetings.

Problem analysis: The key problems were:

- i. Low yield of 1 to 2 quintals per acre from local variety
- ii. General reluctance to accept millets as a food choice
- iii. Obtaining a lower market price.

Solution: Minor millets are an excellent option to fulfil nutritional needs. The solution is focused on increasing awareness about the minor millets besides providing new seeds to increase production and motivating the women of self-help groups to form a producer Millets

Strengthening Value Chain of Minor Millets

Location: Sidhi, Madhya Pradesh, India



Mainstreaming in India, Asian and African Countries-A Compendium of Inspiring Stories from Field company for purchasing of *kodo & kutki* at a reasonable price.

Target population: The target population included Scheduled Tribe (ST) and Schedule Caste (SC) families in two blocks Kusumi and Sihawal of Sidhi District, who have been traditionally involved in growing minor millets. These families have the traditional knowledge and are interested in farming minor millets.

Results: Singhdev Farmer Producer Company, comprising of 249 women shareholders, was established to purchase *kodo & kutki* from Livelihood Mission in Block Kusmi. In the fiscal year 2020-21, the Producer Company established purchase centers in nine villages. WSHGs make purchases at the procurement centers. 570 quintals of *kodo & kutki* have been purchased so far. In addition, sesame, mustard seeds, and maize are purchased at these procurement hubs.

Potential for upscaling and replicability: To increase the area and production of *kodo & kutki* in development blocks, Sihawal and Kusmi by Aajeevika Mission, 12.40 quintals of *kodo* seeds were supplied to farmers in 20 villages under Agriculture Department ATMA Project. Additionally, training was provided for its planting and farmers were motivated to shift to line sowing from the broadcasting/ sprinkling method that was used in the past. As a result, production began to increase by 3 to 4 quintals per acre, increasing farmers' interest in growing *kodo & kutki*.

Drivers of change:

- *Kodo & kutki* were sold at established purchase center at a profit of Rs. 700-1000 per quintal in comparison to local markets benefitting farmers;



- ◉ At these procurement centers, purchases were made through electronic tokens and payments were made to bank accounts digitally within three days, bringing transparency and awareness among the people;
- ◉ Income of women farmers has increased.

Dilemma and barriers: Agriculture is gradually changing with time and the newer generation of farmers have partially or completely reduced the cultivation of coarse cereals and minor millet crops, leading to the loss and extinction of seed varieties. Low prices of *kodo & kutki* in the market is pushing farmers to shift to rice or kanaki cultivation, due to which consumption of *kodo & kutki* has also reduced in households.

Novelty and innovation of the solution:

The solution provided improved variety of seeds of kodo to farmers through convergence with the agriculture Department. Nine procurement centers have been opened with the help of Foundation for Development of Rural Value Chains (FDRVC). The new seeds and better cultivation practices like line sowing have increased yields, consequently improving farmer incomes.

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Integrated Approach for Enhancing Seed Yield and Quality in Kodo Millet

Location: Jabalpur, Madhya Pradesh, India



Institution: Directorate of Research Services, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh

Summary: Directorate of Research Services, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh has provided farmers the solution of practicing seed priming with twenty percent liquid *Pseudomonas fluorescens*, in combination with nutrient management, comprising of 100 kg Neem, 12.5 tons Farm Yard Manure (FYM) per ha, 50 kg Urea per hectare, 50 kg Single Super Phosphate (SSP) per hectare, 50 kg Muriate of Potash (MOP) per hectare with top dressing of urea at four weeks after transplanting with two percent Borax spray at flowering. The solution has led to a significant increase in field emergence, seed yield, overall seed quality and net monetary returns. The solution focuses on production aspect of millet value chain.

Pitch: The area under millets in India has witnessed a significant decline over the last five decades. The biggest reasons for poor adoption of millets by the cultivators is the low level of productivity of these crops and consequently poor economic returns. Being a minor millet, kodo millet cultivation is traditionally practiced in rainfed areas and is confined to marginal soils, resulting in large yield gaps. Soil and land related constraints such as poor soil organic matter content, low moisture retention, macro and micronutrients deficiencies, alkalinity and undulated topography in the millet growing region of India makes millet cultivation and nutrient management in millets challenging. Hence, efficient integrated nutrient management approaches are among key strategies to realize higher millet yields in rainfed regions. The institution has made to optimize nutrient management with emphasis on organics and seed treatment with plant growth promoting rhizobacteria. The solution has helped realize enhanced seed yield of kodo millet.

Problem analysis: Farmers in various districts of Jabalpur, such as Dindori, Mandla, Anuppur, Chhindwara, Shahdol, Umaria, Balaghat, etc.

were highly reluctant to cultivate kodo millet due to low seed yield/productivity. The integrated nutrient management approach addressed the problem with emphasis on organics and seed treatment with plant growth, promoting rhizobacteria, which further helped enhance seed yield in kodo millet.

Solution: The best practice involves seed priming with twenty percent liquid *Pseudomonas* fluorescence in combination with nutrient management, comprising of 125 kg Neem, 12.5 tons FYM per ha, 50 kg Urea, 50 kg SSP and 50 kg MOP per ha. Top dressing urea at 3-4 weeks after transplanting + 2 percent borax spray at flowering led to a significant increase in field emergence, yield, overall seed quality and net monetary returns. The integrated nutrient management approach emerges as a good potential to reduce the yield gap between the potential and actual millet yield. Most soils under millet growing areas have medium to low soil nitrogen availability. Nitrogen management increases yield and photosynthetic assimilation in plants. The application of organic amendments such as farmyard manure ensures supply of all major nutrients and micronutrients necessary for plant growth. FYM improves physical, chemical, and biological properties of the soil.

Improvement in the soil structure leads to a better environment for root development, improved soil water holding capacity and maintains good soil health, increasing phosphorous availability to plants. Designing a potassium management approach enhances crop stress tolerance and helps maintain good plant health. Micro-nutrient management approach through the application of Borax leads to maintenance of structural and functional integrity of biological membranes, movement of sugar or energy into growing parts of plants, and efficient pollination and seed set. Seed bio priming helped achieve better performance in germination, increase tillering, enhance seed vigour and tolerance against adverse environmental stress and disease infection. The integrated nutrient management approach in kodo millet helps

minimize inorganic fertilizer requirements, add soil organic matter, and improve yield and sustainability of the ecosystem.

Target population: 60,000 tribal farmers of the tribal districts, particularly Dindori, Mandla, Anuppur, Chhindwara, Shahdol, Umaria, Balaghat, and some parts of Jabalpur, will be benefitted through the implementation of this technology in terms of yield enhancement and increased monetary returns.

Results: The technology has been implemented by 2,000 farmers of the tribal districts of Dindori of Madhya Pradesh. The application of the technology has led to an enhancement of seed yield by 46.41 percent. An increase in the field emergence was observed by 6.12 percent, number of tillers by 15 percent, enhancement in seed quality by 10.22 percent, increase in seed germination and seed vigour by 28.39 percent over state recommended package of practices. The benefit cost ratio is 3.68:1 in comparison with 1.67:1 for the state recommended package of practices.

Potential for upscaling and replicability: The technology was adopted by the 2,000 kodo millet-growing farmers of the Dindori district of Madhya Pradesh. The upscaling has a potential in all kodo millet-growing tribal districts, namely Mandla, Anuppur, Chhindwara, Shahdol, Umaria, and Balaghat, where the uptake is not at a scale large enough to trigger the desired transformation in the potential yield. It is the target for the next phase.

Drivers of change: The factors that were crucial for the success of the practice include a well functional organizational support (funding support), well equipped bio fertilizer production centre, financial support from the Government, training and capacity building of farmers, environmental benefits of the innovation, cost effectiveness of the technology, results and high impact on the productivity.

Dilemma and barriers: Lack of availability of quality seeds to the farmers is a major barrier.

Quality seeds are not available to the farmers; hence it is necessary to make farmers self-sufficient in seeds by giving them training in the aspect of quality seed production technology. This initiative demands financial funding from the Government because using quality seed alone will enhance seed yield only by 10 to 20 percent.

Novelty and innovation of the solution: The novelty in the best practices developed includes (i) Application of nutrient management approach like use of borax spray at the flowering stage for increasing the boron content in plants, (ii) Adoption of bio priming of seed approach in the integrated nutrient management module for

improving seed germination, seed vigour, rapid crop cover, weed control, final plant stand and (iii) Technology is viable in long term.

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Editor's note: *The story is promising. Further results on nutritional enhancement of the treated samples can be studied. Similar initiative has been undertaken for little millets in Dindori by the Directorate of Research Services, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur.*

Institution: Directorate of Research Services, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh

Summary: *Sitahi kutki* is an early duration (60 days) little millet landrace suitable for rainfed areas and late sown conditions which can withstand problems of draught tolerance, moisture scarcity, resistance to major pest (shoot fly), grain smut and brown spot traits during all vegetative stages of crop, hence helping farmers get a stable yield. *Sitahi kutki's* medium tall height with thick culm overcomes the problem of lodging and can be grown even under hilly, undulated and debilitated soil condition. Achievements of the institution include increased area under cultivation, stable yield of 10-11 qtls/ha and income with good net monetary returns for the Baiga and Gond tribes of the area. The solution focuses on production aspect of the millet value chain.

Pitch: The area under millets cultivation in India has witnessed a significant decline over the last 4-5 decades. Low level of productivity of these crops and consequently poor economic returns as compared to other crops has discouraged Indian farmers from growing millets. Little millet cultivation is traditionally practiced in rainfed areas and is confined to marginal soils, resulting in large yield gaps. An increased area of 10,395 ha under *Sitahi kutki* and a stable yield of 10-11 quintals / ha in Dindori has helped ensure livelihood, food and nutrition security in the region.

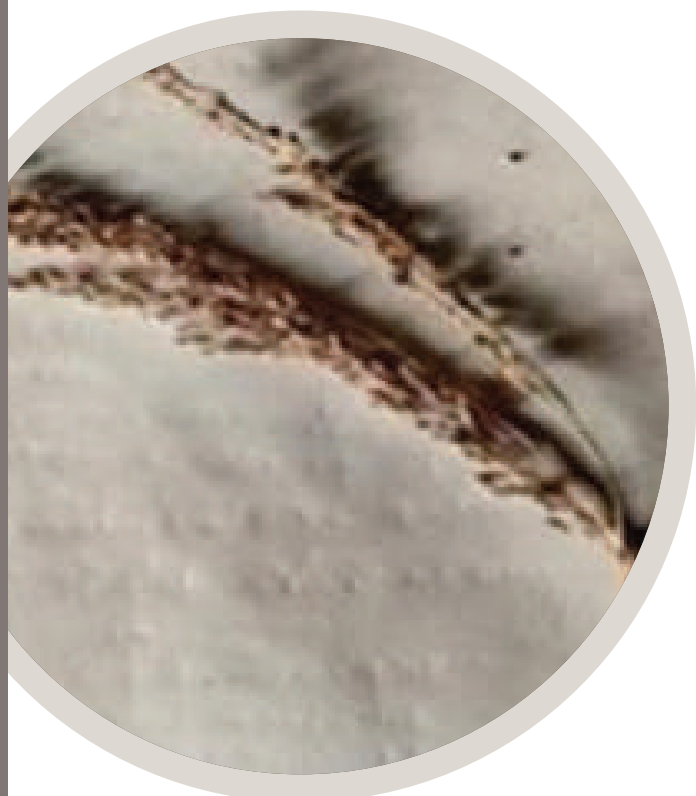
Problem analysis: The hilly and problematic tract of Dindori, namely Bajag, Karanjiya, Samnapur, Amarpur, Mehandwani, Shahpura, and Dindori, is dominated by the Baiga tribal community. Tribal farmers face the problems of livelihood, low nutrition, and food shortage along with low productivity of crops as they are cultivated in a highly undulated hilly topography and on soils devoid of organic matter with low moisture retention.

Increasing Area and Yield of *Sitahi Kutki*

Location: Dindori, Madhya Pradesh, India



Black grain



Pannicle

Solution: *Sitahi kutki* is an early duration little millet landrace for rainfed which can withstand with problem of moisture scarcity during all vegetative stages of crop. *Sitahi kutki's* medium tall height with thick culm, overcomes the problem of lodging and can be grown even under hilly, undulated and debilitated soil conditions. Promoting *Sitahi kutki* in the skeletal and undulated landscape of hilly areas of Dindori has provided stable yield of 10-11 qtls/ha.

Target population: ~ 60,000 tribal farmers of the tribal districts, particularly Dindori, Mandla, Anuppur, Chhindwara, Shahdol, Umaria, Balaghat, and some parts of Jabalpur can be benefited through the adoption of this practice in terms of yield enhancement and increased monetary returns.

Results: The farmers were motivated to cultivate millet. The total area of *Sitahi Kutki* in the Dindori district has increased to 10,395 ha and is still growing. The acreage during the period was even more than rice, til, and jagni. Now, the cultivation of kutki is a priority for the farmers. They are benefitting from the high yield of around 10-11 qtls/ha, resulting in higher monetary returns. The solution has enabled profits to the 1,567 tribal farmers of seven blocks and 54 villages of the problematic and hilly tract of Dindori where cultivation of other rabi crops is not possible.

Potential for upscaling and replicability: The upscaling potential is for all millet-growing tribal districts, namely Mandla, Anuppur, Chhindwara, Shahdol, Umaria, and Balaghat, where still diffusion does not occur at a scale large enough to trigger the desired transformation in the potential yield of little millet in the undulated land topography. This is the target area for the next phase.

Drivers of change: The factors that were crucial for the success of the practice were:

1. Organizational support (funding support)
2. Assured income to farmers

3. *Sitahi kutki's* resistance to insect, pest drought, stable yield in problematic soil and undulated topography
4. High demand of black grained *Sitahi kutki* in the local market of Madhya Pradesh
5. Training and capacity building of farmers
6. Cost effectiveness of the technology
7. Results and high impact on the productivity.

Dilemma and barriers: The key risks that were factored in during the implementation are:

1. Lack of availability of quality seeds to the farmers. It is necessary to make farmers self-sufficient in seed production by providing training. This requires financial funding from the Government in a project mode to develop an informal seed system of *Sitahi kutki* in farmers' participatory mode because using quality seed alone will enhance seed yield by 10-20%
2. Commercialization and *Standing crop* market linkage establishment for

Sitahi kutki is required, for which the University is preparing a Geographical Indication tag document for submission to the authority. This will establish the brand name of *Sitahi kutki* at the national level, and open new avenues of the market, thereby enhancing the income of tribal farmers cultivating this millet.

Novelty and innovation of the solution: The novelty in the best practices developed is the dissemination and diffusion of *Sitahi kutki*, a high yielding, drought tolerant, lodging resist, insect/pest resistant millet landrace, with proper agronomic package of practices in the problematic soil of undulated landscape of hilly tract of the Dindori.

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Editor's Note: *Further studies on nutritional contents of the crop can be undertaken. Similar initiative has been undertaken for little millets (Nagdaman Kutki) in Dindori by the Directorate of Research Services, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur*



Standing crop

Market Access for Local and Regional Millet

**Location: Pune, Maharashtra,
India**



Institution: AgroZee Organics Pvt. Ltd

Summary: Solution focuses on procurement of millets rice from Farmer Producer Organizations (FPOs), secondary processing at AgroZee Organics for increasing the bioavailability of millet-based products, distributing the product through various channels such as retail chains, wholesale shops, Anganwadi schools, local market, and individual buyers, and popularizing consumption by creating awareness among people to include millets in their daily diets. Hence, the solution focuses on processing, packaging, branding, distribution, and consumption of millet value chain.

Pitch: According to the National Family Health Survey (NFHS), 51 percent of Indian women between 15-49 years are anemic (iron deficient). Large proportion of deaths in India are attributed to lifestyle diseases e.g., diabetes. Hence, the solution designed and validated millet-based products for breakfast, snacks, and lunch to address malnutrition and lifestyle diseases. The innovative solution increased bioavailability in all products and some trials have been conducted with Mid-Day Meals Schemes (MDM) and Integrated Child Development Services (ICDS). The key impacts observed include increased hemoglobin level in pregnant and lactating mothers (from 9 g/ dL to 12 g/dL) and balanced sugar levels of 560 people in the region.

Problem analysis: Malnutrition and lifestyle diseases are critical problems in India. Statistics show that 52% of pregnant women and 59% adolescent girls are anaemic. Further, 35.5 % of children are stunted and 19.3% are wasted. Many farmers and industry workers are women who are nutritionally at risk despite earning an income. Low-income people also struggle to afford a diet with adequate nutrition and tend to have higher incidences of malnutrition. In India, deaths due to lifestyle diseases are increasing and so is the prevalence of non-communicable diseases.

Today, more than 77 million adults are living with diabetes.

Solution: The solution focuses on different aspects of the value chain. Firstly, it procures millet rice (biofortified bajra and small millets) from FPOs in the region, which is followed by value addition and secondary processing at AgroZee Organics into different products like multi-millet laddoo, multi-millet drumstick leaves chappati mix, wheat free cookies, multi-millet upma mix, and low glycemic index millet flour. Bioavailability studies have been conducted under the guidance of Harvest Plus to help in higher absorption of iron, calcium, zinc, thiamine, and riboflavin. The products are then distributed through various platforms like retail chains, wholesale shops, Anganwadis, local market, individual buyers, mobile marketing units, social media platform, exhibition cum sales, and promotion of millets in festivals. The initiative is also aimed at popularizing the consumption of millets through multiple campaigns like Right Now, Running Movement of Millet for Monday, One Millet Meal Per Day to control diabetes and by showcasing various regional and local millet recipes in millet festivals.

Target population: Adolescent girls, women, specially the pregnant and lactating women and persons with lifestyle diseases such as diabetes are the target population.

Results: The initiative has piloted a project "Millets for Malnutrition" in the rainfed area of Pune (Kaldari and Bahirwadi Village, Purandhar Tehsil) with 169 pregnant and lactating mothers as beneficiaries. Under the pilot, biofortified bajra and foxtail millet was promoted at these two villages with the help of a FPO which distributed high yield seeds and built awareness around better management practices. A health camp for women was conducted to identify anemic women who were pregnant and lactating mothers. They were then supplied with multiple biofortified products like multi-millet laddoo and cookies, Millets Mainstreaming



in India, Asian and African Countries-A Compendium of Inspiring Stories from Field Millets Mainstreaming in India, Asian and African Countries-A Compendium of Inspiring Stories from Field multi-millet drumstick leaves chapati mix, multi-millet upma mix, etc. These biofortified products were included in their daily diet for three months and the process was monitored by the local anganwadis. After three months, 141 mothers showed an increase in their hemoglobin levels from 9 g/Dl to 12 g/Dl.

Through this pilot, the value chain of millet in the area has been strengthened and the same model is being replicated in other parts of Maharashtra with the help of Ministry of Women & Child Development. A similar study was conducted with 210 diabetic patients, out of which 195 balanced their sugar levels with the biofortified millet products.

Potential for upscaling and replicability: The initiative has received support from Harvest Plus for scaling and has developed low-cost machinery for primary processing. Farmers are getting a good price of millet rice, and Agrozee Organics is getting quality millet rice at an affordable price for further adding value and increasing potential for upscaling. The innovative recipes developed have increased the shelf life, and absorption capacity of iron, calcium, zinc, and protein. It also has enhanced the taste and made the product easy and ready to cook, leading to increased customer satisfaction. The products are affordable and can be scaled to the last mile.

Drivers of change: The key drivers of change are 1) Collaboration with different institutes like Harvest Plus, Government Departments (e.g., Women and Child Development, Agriculture, Tribal Department), Hotel Management College, Home Science College and KVKs; 2) Biofortified millets (bajra); 3) Affordable pricing of products and improved shelf-life; 4) Customer satisfaction and good result; 5) Creating awareness among

the community through various platforms at festival, jatra, etc. and 6) Demonstration of various regional and local recipes.

Dilemma and barriers: The key bottlenecks were limited shelf life, lack of awareness, higher cost of product and limited availability at various locations. These challenges were addressed by taking various steps through the project, such as, (i) introducing vacuum packaging for grain and other ready-to-cook products for improved shelf life, (ii) promoting direct sales to the consumer to get customer feedback, providing guidance and suggesting products according to customers' requirement, (iv) reducing the price by minimizing the number of value chain actors by directly procuring millets from Food Producing Organizations, (v) initiating sale through e-commerce and social media platforms, (vi) opening more retail outlets for increased availability, etc. The changes have been able to address the bottlenecks with varying degrees of success.

Novelty and innovation of the solution: The millet-based products developed have higher absorption of iron, zinc, and calcium, thereby address malnutrition and lifestyle diseases. The products have low glycemic index and are ready to eat and cook, affordable and sustainable. The product processing has a copyright patent. The solution is built on a foundation of strong network, knowledge, skill, and education as Certified Farm Advisor from IIMR in millets from farmers to consumers.

Contact details: Mr. Mahesh Londhe. CEO
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Editor's Note: *This initiative has a good potential and solution to multiple problems. However, the scientific scrutiny of the nutritional gains claimed needs to be undertaken and methods need to be well explained. If they are proven scientifically, it will be a great addition to the body of knowledge.*

Institution: Joint Endeavour for Emancipation Training & Action of Women (JEETA)

Summary: JEETA is a local awareness initiative to promote millet consumption in all households. The NGO organizes awareness campaigns through market outreach in Mandis. The key focus of the initiative is production and consumption under the millet value chain.

Pitch: JEETA, a volunteer organization working in Pallahara block of Angul district of Odisha, conducts training and awareness programmes on the techniques of System of Millets Intensification (SMI), promoting millet cultivation, nutritive value and consumption of millets.

Problem analysis: Responsible factors for low and declining consumption of millets in the Angul region. Climate change has been one of the many factors discouraging farmers to work in agriculture on a large scale. Farmers' willingness to embrace millets was very low as they were unwilling to learn and adopt new practices. Village Gram Panchayat and Block level awareness programmes were required to change the mind-set of the farmers and sensitize them on new millet cultivation techniques, improved farm practices (e.g., making and applying organic fertilizers), nutritional value of millets and innovative millet recipes. The intervention enabled farmers to increase ragi and other millet productivity, earn higher returns and improve dietary diversity and millet consumption.

Solution: JEETA has nudged all families in village Jamudiha to start millet cultivation with an active member. JEETA has sensitized the local communities on new millet cultivation techniques like Systematic Millet intensification and preparation of organic fertilizers. Sushila Dehury, an active member, is involved in the food festivals organized by JEETA. She regularly cultivates ragi and has learnt different recipes of ragi. She started with easy recipes and has gradually attained expertise in the same. Further, JEETA also encouraged women

Ragi on my Plate

Location: Angul, Odisha, India





members of SHGs like Sabita from Saraswati SHG to include millets in their families' diet through regular follow ups and monitoring. The positive push from JEETA and improved health of their families encouraged the SHG members to prepare easy millets recipes and sell in the local *haat*. This led to increased demand for such products and encouraged farmers to take up millet cultivation again.

Target population: Target group were small and marginal farmers from tribal households having small land holdings and low awareness.

Results: All 37 families of Jamudiha village started millet cultivation using SMI. All these families learnt the process of preparation of organic fertilizers that is used in ragi cultivation. Small patches of land were cultivated, which gave small & marginal farmers good production. The trainings organized helped in developing awareness on the nutritional value of different types of millets which helped in increasing consumption. The households realized that the nutritional value of ragi is more in comparison to rice. One family of Jamudiha village started taking ragi in their daily food, observing which, all other families also started consuming ragi. Even children are now habituated to eating ragi in the village. Regular consumption of ragi has improved general community health. The initiative has helped in creating a source of income and has provided households access to healthy food.

Potential for upscaling and replicability: The NGO conducted awareness programmes and training sessions in 35 villages in 5 GPs of Pallahara Block. In Jamudiha village, 37 families have started to consume ragi regularly. The nudge mechanism has also led various other villages start cultivating and consuming ragi. A similar approach in other area can definitely ensure good results.

Drivers of change: To promote millet consumption among people, it was necessary to start millet cultivation again in the villages. JEETA's interventions helped in changing the



negative mindset of the people about millet being an unprofitable crop. People didn't like to consume millets and were not aware about their nutritional value. Hence, knowledge and awareness generated by JEETA served as key driver for farmers to adopt millet cultivation.

Dilemma and barriers: Irregular rainfall and wild animals destroying crops has decreased the communities' interest towards agriculture. The easy availability of rice through the Public Distribution System scheme at Rs. 1 per kg is also leading to decreased interest in cultivating millets as a means of livelihood, thereby leading to the migration of the younger generation to other locations for work. This has led to change in the food and agricultural practices, which consequently erodes traditional food knowledge and leads to loss of local varieties of millet seeds. Hence, restarting the practice of millet cultivation among the people and promoting traditional food practices are some of the biggest challenges.

Novelty and innovation of the solution:

In the tribal villages, there was a traditional practice of millet cultivation and consumption amongst the elderly. However, the younger

generation was not at all interested in the consumption of millets due to the ease of access to fast food. The initiative focused on regular interactions and conducting awareness campaigns with the help of elderly people to promote millet cultivation and consumption in the villages. Through regular awareness campaigns, the elderly members of the villages acted as catalysts and motivated their family members to promote consumption. The repeated awareness campaigns have been very fruitful and there has been an increase in the consumption of ragi in the community. The consumption amongst youngsters has also increased after increase in availability of different variety of recipes of their taste.

Contact details: Joint Endeavour for Emancipation Training & Action of women (JEETA), At/Po-Pallahara, Dist-Anugul. Email: jeetadeogarh94@gmail.com

Editor's note: *Similar initiative has been undertaken in Mayurbhanj, Odisha, India by Gram Swaraj where awareness programme was conducted wherein SHGs headed by Binodini SHG as nodal CBO, along with Anganwadi workers (AWWs), Sarapanchs, ward members, line department officials participated.*

Sustainable Enterprise on Ragi, Suan, Gurji, and Kodo Millet Processing and Business of Allied Products by FPO

Location: Bargarh, Odisha, India



Location: Bargarh, Odisha, India

Institution: Chira Sabuja Producer Company Ltd., Bijepur supported by Odisha Millet Mission

Summary: A NGO has been facilitating the on-field identification of farmers and area for production, procurement, processing and marketing of raw millets and its allied products.

Pitch: The Chirasabuja Former Producer Company has been set up under the aegis of the Agricultural Department of Bargarh District with an aim to rejuvenate the production and marketing of farmers' products in a sustainable way. As per the agreement of the organization, the contribution of shareholders and distribution of dividends has been decided the equal for each to increase millet based enterprise.

Problem analysis: The FPO functioning under the supervision of Mahasakti Foundation, Bargarh is two years old. The FPO has limited funds to invest, and it is not possible to set up a processing unit to scale up the business. The fund received from Chief District Agriculture Officer (CDAO) to set up different enterprises is very limited. The FPO can help farmers who cannot sell their surplus millets and other crops in Government supporting procurement process or Mandi. However, because of the scarcity of funds, the problem can't be solved leading to the farmers selling their produce in distress.

Solution: The FPO is managed by its Board of Directors (current strength is 10) and is led by the Managing Director (MD) who looks after the day-to-day activities of the FPO. As an independent entity to run its business by the shareholders, the FPO has signed an agreement with CDAO, Bargarh in April, 2022 for delivering the work of Agriculture in Bijepur Block under the scheme of OMM for next five years. The FPO has prepared its annual action plan and annual budget of OMM for the Bijepur Block. The FPO had procured ragi, bio-inputs and vegetables from farmers and sold them to designated agencies in local markets of block & district level.

The business of the FPO was carried out by its employees, Chief Executive Officer and Board of Directors. The creation of FPO also allows transparent fund flow and controls corruption at all levels, leading to increased efficiency in the system.

Target population: At present, 209 shareholders (124 male & 85 female farmers) are members of the FPO. Five Community Resource Persons are also engaged under the FPO for promotion of Odisha Millets Mission in Bijepur Block. In future, to increase the shareholders and fund of the FPO, necessary steps will be taken up by the chief functionaries of the FPO.

Results: The contingency and administrative expenditure of the FPO is borne by the Agriculture Department of Bargarh District under OMM budget. The FPO started its business in August 2021 and invested funds to purchase 2.5 quintal Ragi @ Rs. 30/-per kg. and then processed, packaged, and sold in powder form @Rs. 80/-per kg and raw Ragi @ Rs. 45/-per kg. in which total investment was Rs. 9,200/-and profit gained was Rs. 7,300/-. Similarly, the FPO purchased and sold bio-inputs and gained profit of Rs.12,000/-. The FPO received incentives from TDCCOL of Rs. 74,424/-for one procurement season of 2021-22. By end of March 2022, the FPO increased its fund value from Rs.1,27,000/-to Rs. 2,20,724/-. In 1 year of the business of FPO, it is observed that the market demand has increased for the millet products. The FPO is undertaking a cost-benefit analysis and is looking forward to enhance scope for business development.

Potential for upscaling and replicability: The FPO is engaged in production and marketing of farmers' products. There is immense potential for the FPO and its profits to grow. The area covered by the FPO can be increased so that the business increases and consequently income of the FPO also grows.

Drivers of change: The business of a FPO depends on the yearly planning and budgeting. The main factors for a sustainable business



are feasibility of the marketing of products, number of consumers and amount of funds required to take up the business. Awareness of the shareholders, participation & accountability of all stakeholders, advise of the general body and resolution of issues by the executive body or board of directors are the key drivers of change. The digital and accounting calculation of all expenditures must be correct and shared with its shareholders.

Dilemma and barriers: The natural calamities, loss of crops due to wild animals, etc. were the key challenges faced by the FPO. Similarly, lack of transparent fund flow and corruption can also be major barriers that need to be checked at all levels. Hence, the strategy for checking irregularities has to be ensured by the Chief Functionaries.

Novelty and innovation of the solution: The prime objective of the involvement of FPO and FA in the programme of OMM is to promote a special programme of millets for tribal areas of Odisha. Tribal areas often are not able to get the benefit of different existing Government programmes. Hence, the OMM scheme which is highly applicable in tribal areas has been leveraged by the FPO. The objective of the programme is that people in remote areas are able to avail benefit of Government incentives.

Contact details: Mrs. Saudamini Rana, Managing Director, Chira Sabuja Producer Company Ltd. Bijepur, Odisha.

Editor's Note: *It is an early-stage story by the FPO which has experiences and learnings to replicate in other areas. Continuation on the path undertaken will contribute to the overall success of millets story.*

Institution: Netaji Development Society

Summary: Bonda women farmers are taking lead in reviving the cultivation of native varieties of Finger Millet and Little Millet that are resilient to drought, salinity, extreme heat, pests, and diseases, need less water than paddy, and are richer in nutrition. The solution focuses on all aspects of the millet value chain.

Pitch: In Malkangiri district, over the years, climate-change has irrevocably affected subsistence living of tribal communities. The adverse impact of climate change is more pronounced among the *Bonda* community, one of the PVTGs in Khairput block of Malkangiri. Heavy rainfall washes away their fertile topsoil from the slopes. The advent of mono-cropping has influenced their traditional farming practices from millet focused mixed cropping systems to cereal centric cropping system. It has also influenced their diets, thereby altering their traditionally diverse food culture. OMM supported Bonda women-farmers by providing capacity-building programmes on improved agronomic practices, organic inputs preparation and application for soil enrichment and increasing crop production.

Problem analysis: In the Bondaghati, heavy rains often carry away the fertile top layer of soil. Due to regular application of inputs, farm lands have become less fertile and non-native seeds often fail to withstand the weather extremities. Crop failures impact the food and nutrition security of these farmers. The farmers of the *Bonda* tribe are addressing the issues of rising temperature, heavy rainfall, flash floods and landslides by reverting to cultivation of native millet varieties-finger (*ragi*), foxtail (*kakum* or *kangni*), proso (*chena*) and pearl (*bajra*) millets, as these millets are climate-resilient and ensure the community's food and nutritional security.

Solution: With the support of Odisha Millets Mission, local NGOs like Netaji Development Society has been promoting traditional millet farming in Khairput block. The initiative has helped conserve surface soil and there is less

Bonda Tribal Women in Odisha Battling Climate Change with Millet Farming

Location: Khairput, Malkangiri,
Odisha, India





erosion and siltation on the *Bonda* hills. Millet farming not only helps the *Bonda* women farmers, but also protects the agricultural lands of other communities dwelling on the valley bottom of Bonda hills. The awareness created by *Bonda* youth volunteers and local Non-Governmental Organisations (NGOs) about cultivating millets through improved farming techniques to meet nutritional and climatic challenges, and the institutional impetus given by the OMM, such as assured purchase and higher prices, is steadily yielding results.

Target population: The *Bonda* community comes under one of the particularly vulnerable tribal groups in Odisha. They belong to the Austro-Asiatic ethnic group and are believed to be a part of the first wave of migration out of Africa, which happened 60,000 years ago. Their lives are interwoven with the forest land they inhabit. For generations, the tribe has sustained itself by cultivating traditional crops. Millets are rich in nutrients, and their exclusion in diet can result in nutrition-deficiency among the indigenous-community. These crops can help enhance nutritional-security, resource-conservation, and soil health.

Results: Women farmers are reaping diverse benefits from their indigenous climate-smart crops like millets. Their farming practice has evolved in sync with nature; climate resilience is deeply interwoven with their ecosystem. OMM has reinforced their traditional farming system. Millets not only ensure the *Bondas'* food and nutritional security but also preserve biodiversity. They are also resilient to drought, salinity, extreme heat as well as pests and diseases. They can be cultivated on this region's undulating terrain. This initiative has promoted households' consumption of millets, improved productivity of millet crops, ensured minimum support price (MSP) for farmers, set up decentralized processing-facilities, and included millets in the state nutrition programme and the public distribution system. Odisha has seen a 215% increase in gross value of millet produced per farmer household between

2017-18 and 2018-19 and, a 120% increase in yield between 2016-17 and 2017-18. OMM initiative has promoted seed-sufficiency and promoted a culture of seed preservation for the next cropping season. Community managed seed centers have restored conservation and availability. Women farmers played a key role in seed identification, collection, selection, preservation, and storage of the local resilient varieties.

Potential for upscaling and replicability:

OMM has adopted a decentralized operational framework, comprising of financial and institutional support from the Government under various schemes and enabling policies, promotion of rural enterprise in the millet value chain, awareness campaigns for behavior change, efforts to support household consumption and the revival of indigenous food culture. In each block, a civil society is chosen as the facilitating agency to ensure the seamless working of supply chain processes from farm to the plate. Community-based organizations, primarily Farmer Producers Organizations (FPOs) and Women Self-Help Groups (WSHGs), also command power in the value chain, leading to improved rural livelihoods. The Government's Agricultural Technology Management Agency (ATMA), in each district, serves as the administrative head of the OMM at the district level, helping in monitoring the program on monthly basis and overseeing disbursement of funds to facilitating agencies.

Drivers of change: OMM has promoted active engagement of local women farmers, community leaders and community-based organizations since the beginning. Participatory capacity building programmes have helped farmers adopt improved agronomic practices under millet cultivation. Exposure visits have also promoted farmer-to-farmer learning. Identification of local millet landraces and promotion under the OMM has also enhanced farmers' resilience towards climate change.

Dilemma and barriers: Initially, it was challenging for the local civil society organizations to mobilize communities to adopt and increase their cropping area under traditional crops like millets. This is because millets were not considered as high value crops and held poor marketing opportunities at the community level. However, with comprehensive awareness building programmes, and sensitization campaigns on the benefits of millets and highlighting the procurement support available under OMM, farmers started growing millets in their farms. Incentive support to the farmers under OMM has also motivated many farmers to increase their millet cropping area.

Novelty and innovation of the solution: OMM is conserving agro-biodiversity in Malkangiri district. Millet has been revived from farm to plate while harmonizing farmers' traditional wisdom with modern technology.

The initiative has ensured access to a diverse food basket for the *Bonda* community and empowered them to grow organic nutritive food for enhanced nutrition security. Several mandis are set up in strategic community locations for procurement of finger millet.

This has not only addressed transport and logistics challenges faced by tribal farmers in remote locations, but also encouraged them to increase their crop coverage area under millet cultivation.

Contact details: Netaji Development Society, Khairput, Odisha

Editor's Note: *Editor's note: In Bargarh district, Mahashakti Foundation (FA) and Chirasabuja Producer Company Ltd. (FPO) and in Mayurbhanj district Center for Regional Education and Gram Swaraj (CREFTDA) under the Odisha Millets Mission (OMM), have been facilitating the identification of farmers and area for production of millets, procurement, processing and marketing of raw millets and its allied products.*

Ragi

Procurement by FPOs: A Farm-to-Fork Strategy

Location: 19 Districts of Odisha, India



Institution: 143 FPOs

Summary: FPO-an institution of the people, by the people and for the people, ensures distribution of the finger millet or ragi or mandiya (as locally known in Odisha) from people, back to people through procurement. The focus is mainly on procurement, but it also covers other aspects of millet value chain.

Pitch: Odisha Millets Mission is promoting millets and millets-based dishes in the State Nutrition Programs like-Integrated Child development Services (ICDS), Mid-day Meals (MDM) and Targeted Public Distribution System (TPDS), ensuring consumption of millets by all age groups. Empanelment of FPOs as agencies under Odisha Millet Mission for ragi procurement provides accessibility of Government procurement services to tribal farmers residing in remote villages and a fraction of profit to FPOs in the value-chain. It also ensures community-participation in making the process more inclusive and convenient for farmers. It cushions from selling the produce at low-price during distress-sale to local-traders.

Problem analysis: Cooperative Societies (LAMP/PCS/PACS) had very high workload and were expected to procure all commodities under different schemes of Government. Involvement of FPOs as procuring agencies ensured smooth operations for successfully procuring ragi, exactly how it was done for procuring paddy-the staple crop of the State. Since, ragi is mostly cultivated by tribal farmers in remote villages of hilly rainfed regions, there are logistic issues of reaching out farmers in such remote locations for procurement. FPOs supported by OMM filled up these gaps by creating awareness among people regarding ragi procurement. It provides temporary infrastructure and controls quality as per FAQ in procurement guidelines. FPOs also do farmer registration in M-PAS (Millets Procurement Automation System).

Solution: Community based organizations like FPOs involvement in ragi procurement increased outreach of the procurement initiative of the Government of Odisha. Promoting FPOs as an institution and an important player in the agriculture value chain resulted in higher ownership. It gives farmers more decision-making powers and helped strengthening agriculture-based supply chains and livelihoods. Additionally, being a people's institution, the income or profit generated by procurement business is distributed among all its shareholders (who are the same millet farmers) in the form of dividend. Therefore, procurement through FPOs not only ensures millet production and consumption but also has the below given triple impact on the farmers:

- ◉ Buy-back guarantee for farmers' produce at Minimum Support Price, ensuring their livelihood from millet cultivation
- ◉ Creates and strengthens farmer owned systems within Government programs
- ◉ Encourages millet production and increase in area coverage in every cumulative year

Target population: The focus is on farmers growing millet across the state of Odisha.

Results: In 2018-19, Government of Odisha started ragi procurement in 8 districts. In 2019-20, the Government targeted to procure 1 lakh quintal ragi from all 14 districts. In 2021-22, state procured 3.23 lakh quintal ragi from 14 districts, sold by 43000 farmers and procured by 59 FPOs. With the help of infrastructure provided to these FPOs from OMM, they made an earning of Rs. 82.17 cr in 2021-22.

Potential for upscaling and replicability: For this year, 76 FPOs have been selected and

prepared for procuring 6 lakh quintal of ragi from 15 districts. MSP for FY 2022-23 has also been increased from Rs. 33.77/-per kg to Rs. 35.78/-per kg.

Drivers of change: FPOs taking lead in awareness creation among people on ragi procurement process, farmer registration, MSP, quality parameters etc. are important drivers of change. "Running Rath", a local practice and relatable with people, can be used as an awareness creation method. OMM provides support infrastructure such as thresher, 2-deck cleaner cum grader and 3-deck cleaner cum grader, and ensures quality parameters for procurement. Community Hiring Centers, Bio-input Units and Community Seed Centers help improve production.

Dilemma and barriers: Since Odisha is primarily a rice producing state, paddy has always been the major focus of LAMPS and PACS. Since millet in Odisha is a Kharif (June-Sep) crop, it coincides with Paddy. With millet losing importance, it was difficult to promote production, let alone promote of consumption. FPO's involvement as procurement agencies ensured possibility of ragi procurement within the existing system of Government and gave a buy-back guarantee for the product. This encouraged an increase in millet farmers.

Novelty and innovation of the solution: FPOs played a critical role in procuring ragi, thereby strengthening the millet value chain. This intervention has supported more than 1.6 lakh millet farmers in the country and the number is increasing. It is also helping in reviving as well as conserving our food traditions. Selling the produce at low-price during distress-sale to local traders can be replicated in other areas.

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Seed Production and Promotion of Kantomera Ragi Landrace

Location: Gajapati, Odisha, India



Institution: Taptapani Farmers Producer Company Ltd. (TFPCL)

Summary: TFPCL with support of Odisha Millet Mission (OMM) started the promotion of many local landraces of ragi variety, including *Kantomera Ragi*. *Kantomera Ragi* is one of the most popular landrace varieties of ragi in the region because of its orange color, delicious taste, climate resilience and high yielding ability (14 qtl/ha). This variety is one of the most popular and has highest acceptance among farmers. Despite being a local variety, TFPCL is able to sell 8-10 quintals of seed to more than 1000 farmers every year. Hence, the solution focuses on production.

Pitch: With climate uncertainty, farmers often suffer crop damage, and Gajapati being a rainfed region, only a single crop is generally cultivated. Keeping this in mind, moving towards climate resilient seed varieties and availing good quality seeds becomes very important. For the past 3 years, TFPCL is involved in seed multiplication of one such millet variety, *Kantomera Ragi*, assuring farmers returns from the crop.

Problem analysis: Over a period of time, it has been observed that due to climate change, cyclones in the month of October and November have become very frequent. This being the harvesting season, farmers often face crop damage. *Kantomera Ragi* is a late duration variety seed that is resilient to climatic risks like cyclones. Farmers have observed that the variety often matures late and withstands cyclone. This variety provides assurance to farmers that despite climate change, families would have grain to eat and sustain.

Solution: The traditional culture of seed production is getting lost and getting good quality seed that is climate resilient (majorly landraces) is very difficult in current times. Therefore, seed multiplication of local varieties is very critical and TFPCL produces and sells about 8-10 qtls. per year of seed locally and in other districts.

Target population: Most affected population is often from the Scheduled Caste (SC) and Scheduled Tribe (ST) community.

Results: More than 1000 farmers are being benefited with the availability of climate resilient ragi seed variety. Given that the variety is high yielding, farmers are getting more than 14 quintals of yield per hectare.

Potential for upscaling and replicability: TFPCL has seen the increase in demand for the seed with every successive year. Therefore, the FPO is planning to increase the area under seed production and market this variety in other regions and increase sales.

Drivers of change: The uniqueness of the seed variety is that it is climate resilient, high yielding and has a unique orange color. These traits help in its marketability.

Dilemma and barriers: Cattle grazing is the most significant hurdle that the crop encounters. During the dry season, the local tribe frequently leaves their cattle for open grazing, putting the crop, particularly the *Kantomera Ragi* variety, at risk of grazing. The variety is at big risk of overgrazing by local livestock.

Novelty and Innovation of the solution: Most of the ragi value added products are dark brown in color, which often makes it less appealing for consumption. However, *Kantomera's* beautiful orange color enhances the color of the dish made with it.

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Promoting Minimum Support Price for Finger Millet and Little Millet

Location: Gajapati, Odisha, India



Institution: Maa Kureisini Farmers Producer Company Ltd.

Summary: Procurement of ragi through Minimum Support Price (MSP) has brought smiles on the faces of ragi farmers. Empanelment of FPO has ensured an assured market along with better price realization for the ragi farmers. The solution focusses on procurement dimension of the millet value chain.

Pitch: Finger millet (ragi) was once an underutilized crop cultivated by mostly marginalized farmers having very small landholdings. They would get a good yield on adoption of improved agronomic practices, but lacked assured market. Before OMM initiated ragi procurement, farmers used to sell their ragi in the open market, which fetched them lower price. Earlier farmers, didn't have the bargaining power, but now they are able to get MSP for ragi procurement. When the procurement started in Kharif marketing season (KMS) 2018-19, Large-sized Adivasi Multipurpose Cooperative Society Limited. (LAMPCS) were given the responsibility of farmers' registration; Regulated Market Committees (RMC) were entrusted for awareness on Fair Average Quality (FAQ) and MSP of ragi, and providing the necessary equipment support and infrastructure for conducting ragi procurement. Farmers exclusion from the procurement process was very common even after submission of all relevant documents. This exclusion led to distress sale and delayed payment from the traders. Involvement of FPOs changed the situation completely.

Problem analysis: There was no assured market for ragi. As a result, farmers used to grow ragi only for home consumption in small landholdings and very little ragi was being sold in the open market to the traders. Farmers didn't have the bargaining power, and they used to sell it for a very low price. The area under ragi was shrinking year on year. OMM started ragi procurement to give assured market and better price to farmers. Since LAMPCS are

also involved in paddy procurement, which happens parallelly with ragi procurement, they were overburdened, and many farmers, even after submission of relevant documents, were excluded from registration.

Solution: FPOs are community based organizations, with farmer representation from villages across the block and are led by farmers. FPOs trying to set up millet-based enterprises, with a holistic objective of welfare of millet farmers were entrusted with the responsibility of ragi procurement agency. The FPOs could better mobilize the farmer's registration process as they have their presence spread out across the block. Farmer exclusion could be minimized because of a focused approach. This resulted in reduction of distress sales. As FPO handled exclusively one task, it could better focus on processing the payments on a timely basis, thus avoiding the delayed payments.

Target population: Small and marginalized farmers who are the shareholders of Maa Kureisini Farmer Producer are striving to establish millet enterprise, and share the benefit by putting collective effort for augmenting farmers' income through this process.

Results: With the support of OMM, the FPO (Maa Kureisini Farmers Producer Company Ltd.) is acting as a role model at the block level for other Women Self Help Groups. During the year 2019-20, the FPO had sold 6 quintals of little millet @Rs. 60 per kg at different Pallishree melas. During 2020-21, the FPO also sold 12 quintals of little millet as seed @ Rs. 25per kg to the Department of Agriculture, Keonjhar for OMM. In 2nd phase during 2021-22, 2.5 quintals of little millet rice were sold by the FPO to NABARD @Rs. 80 per kg. Maa Kureisini Farmers producer company Ltd. has set up their infrastructure, manpower and even have their own fund and assets like thresher, tarpaulin, sieve, moisture meter, weighing machine for proper maintenance of standard measure quality provided by OMM. During 2020-21, the FPO procured 1876.54 quintals of ragi from 338 farmers and disbursed timely



payments to them. During 2021-22, the scale of FPO increased and it procured 3098.65 quintals from 526 number of farmers.

Potential for upscaling and replicability:

Empanelment of FPO can ensure an assured market along with better price realization for the ragi farmers in other areas as well. To replicate this model and reach larger groups, it is important for stakeholders to ease farmer registration facilitate sale through procurement process, and ensure quick payments and better price facilitation. FPOs need to work closely with the farming community to generate awareness about the marketing process and make it available to all farmers at the village level.

Drivers of change: Focusing on the task at hand, dividing the tasks to weekly targets, working as a team, regular and periodic review of the progress, planning for optimal utilization of the resources available at hand, always being ready for uncertain situations, sincerity and persistence in efforts are some of the practices essential for success of the enterprise.

Dilemma and barriers: Surplus generation due to delayed verification process, delayed arrival of trucks for loading of the procured stock at mandi point, technical issues related to procurement software, shortage of funds for labor payment, loss due to storage, etc. were some of the key challenges and risks involved during implementation. The strategies including regular follow up with TDCCOL and revenue department for verification and surplus generation, arrangement of temporary godown for keeping the stock for temporary period, follow up with TDCCOL technical team for sorting out the technical issues, proper fund management, timely bill and voucher

submission for reimbursement of the labor payment and following proper storage practices led to mitigating the risks to a great extent.

Novelty and innovation of the solution:

Representatives of the farmer collectives who themselves belong to small and marginalized groups can better understand the situation at the farmer and village level, and working with them for their income augmentation makes the solution unique.

Contact details: Maa Kureisini Farmers Producer Company Ltd., Ramagiri, Gajapati District, Odisha. Email: maakureisunipcltd2016@gmail.com

Editor's Note: *Similar initiative has been undertaken by Ujalla Farmers Producer Company Ltd., Guma in Gajapati District of Odisha. In Ganjam district, different CBOs, FA, FPOs, SHGs, and NGOs are helping ensure that all ragi surplus is sold at Minimum Support Prices under OMM including*

1. *Dharakote Farmer Producer Company Limited & SACAL,*
2. *PROGRESS (Peoples Radical Organization for General Reconstruction of Environment, Education and Social Sanitation) and PFPC (Panchanana Farmers Producer Company Limited),*
3. *International Noble work Development and Investigation Association (INDIA) and Pragatishila Farmers Producers Company Limited (PFPC), and*
4. *Amakheta Farmers Producer Company Limited and Voluntary Integration for Education and Welfare of Society (VIEWS)*

Institution: Mahedreswari Farmer Producer Company Ltd. (MFPCL)

Summary: MFPCL is doing seed multiplication of *Bherabi* and *Majula* ragi varieties in Rayagda block of Gajapati District. They are doing seed multiplication of more than 5 qtls of seed for three years and are selling within and outside the district. Owing to good germination of the seeds, even Odisha PVTG (Particularly Vulnerable Tribal Groups) Empowerment and Livelihoods Improvement Programme (OPELIP) department is buying seeds from MFPCL. The solution focuses on production of millets.

Pitch: The seed multiplication of local ragi varieties like *Bherabi* and *Majula* (some of the popular ragi varieties) has helped farmers increase the ragi cultivation area.

Problem analysis: The decline in ragi cultivation was due to unavailability of good quality seeds. Most High Yielding Varieties (HYV) often require extra inputs which was not possible under organic practice for most of the farmers. Since cultivation of ragi traditionally happens following organic practices, farmers' in the region were apprehensive to cultivate ragi using HYV seeds. The need for local seed varieties was thus pertinent for increasing the cultivable area for ragi.

Solution: The seed multiplication of local varieties with support from OMM is facilitating farmers to move towards millet cultivation and revival of millets in the region.

Target population: The Scheduled Tribe (ST) community was the primary cultivator of ragi. The solution supports ST farmers to avail good quality seeds of ragi and training on technology to revive ragi cultivation in their region.

Results: Due to seed availability of local climate resistant variety, an increase of 200 hectares in the area with 500 farmers was seen. More than 30 progressive farmers associated with MFPCL have started seed production and are creating additional income through the same.

Seed Multiplication of Bherabi and Majula Ragi

Location: Raygada, Gajapati,
Odisha, India





Potential for upscaling and replicability: In next 2 years, MFPCCL is planning to include 50 more farmers under seed multiplication and provide the required certification for the same. The increased quantity of seed would eventually lead to promotion of *Bherabi* and *Majula* variety in other districts and states as well.

Drivers of change: Since most of the HYV varieties often require extra input compared to local varieties, this results in increasing input cost. Therefore, farmers often prefer to adopt local land races/varieties available at their doorstep, which have been produced and marketed by local farmers, and supported under Odisha Millets Mission and local facilitating agencies.

Dilemma and barriers: Major risk factors are limited accessibility of the market support and agencies for the farmers. Secondly, farmers who were engaged in seed multiplication were also technically not so sound, which affected seed purity. Therefore, under Odisha Millets Mission, comprehensive on-field training programmes were organized for the farmers, disseminating essential and technical information to enhance their seed germination rate, crop growth and yield.

Novelty and innovation of the solution: This practice has helped farmers to avail good quality seeds of millets, a climate resilient and nutritious crop.

Contact details: Mahedreswari Farmer Producer Company Ltd. (MFPCCL), Raygada, Gajapati, Odisha, India



Institution: Dept. of Women and Child Development, Govt. of Odisha (Implementing Agency), Central Food Technological Research Institute (CSIR-CFTRI), Mysore (Technical Agency), District Mineral Foundation (DMF)-Keonjhar and Sundargarh (Funding Agency)

Summary: Ragi based laddoo in morning snacks for pre-school children under Integrated Child Development Scheme (ICDS) is provided in Keonjhar and Sundargarh districts under OMM. The scheme has been universalized since 2020 and has served 1,49,556 pre-school children in 7,066 Anganwadi Centers (AWCs). It has also created livelihood for 58 Women SHGs (WSHG) for value addition services. Other recipes made from ragi, sorghum, and little millet are also being provided to children under the scheme. The focus of the intervention is on processing, distribution and consumption.

Pitch: One of the objectives of the Odisha Millets Mission is to include millet-based snacks under ICDS. The cost of implementation did not fit into the existing cost norms of ICDS and support was sought from the DMF Keonjhar and Sundargarh in this regard. The programme on “Ragi Based Laddoo in Morning-Snacks for Pre-school Children under ICDS” has been universalized since August 2020 in Keonjhar and Sundargarh districts. These laddoos have greater acceptance from the community as they were an additional nutritional support during COVID. They were supplied to the houses of the children during COVID.

Problem analysis: Odisha Millets Mission (OMM), in its objective statement, declared inclusion of millet-based snacks under ICDS. Financing, technical and logistics support were critical requirements for scaling the programme, standardizing the process and strengthening the millet supply chain.

Solution: The solution included the following steps :

Inclusion of Millet Based items in Morning Snacks of Pre-school Children under ICDS

Location: Keonjhar and Sundargarh Districts, Odisha, India





- ◉ *Arrangement of ragi for millet inclusion in ICDS:* Raw ragi is sourced from procured ragi at MSP from farmers through engagement with TDCCOL.
- ◉ *Selection of WSHGs as cleaning, grading and destoning enterprise:* Process of WSHG selection through Eol process as suggested by the Department of Mission Shakti was followed. The budget under OMM was utilized for the establishment of cleaning, grading & destoning enterprises. These WSHGs are responsible to source ragi from TDCCOL/OSCSC, cleaning and storing it as per demand from the value addition units at block level and supplying desired quantities.
- ◉ *Selection of WSHGs as ragi laddoo mix preparation enterprise:* Empaneled WSHGs are nominated for value addition and preparation of ragi laddoo mix for supply to Anganwadi Center monthly.
- ◉ *Administration and management of programme:* A district level committee has been formed under the chairmanship of the Collector & DM for implementation of the programme including participants from all desired departments and programme secretariat under OMM, responsible for funding through DMF, approvals, review, day to day management, monitoring etc. Existing monitoring, system under ICDS helps in quality check of the product served.

Target population: The key population benefited include pre-school children and WSHGs. Specifically, 1) Pre-school children attending Anganwadi Center in Keonjhar District and Sundargarh District are the primary targeted beneficiaries under the programme for additional nutritional support in addition to the existing menu served at Anganwadi Center. Children are served 2 ragi ladoos of 22.04 grams and 4 ragi ladoos of 22.04 grams respectively.

2) Women Self-help Groups: 58 women SHGs are engaged as cleaning and processing enterprises, contributing to their livelihood and economic empowerment.

Results: During COVID situations, laddoo mix was supplied to children at doorstep as per monthly requirement and now it is served at Anganwadi Center. Raw ragi was procured at MSP from farmers through engagement with TDCCOL. The programme is being implemented in 7,066 Anganwadi Centres, covering 1,49,556 preschool children in 34 ICDS projects in Keonjhar and Sundargarh districts of Odisha since 2021. It was initially piloted in one block of Keonjhar, and has been gradually scaled in the entire district. Through learnings from the programme, Government of Odisha is planning to scale up the model of implementation for Ragi based Take Home Ration (THR under ICDS) for pregnant, lactating, normal and moderate children, and severely malnourished children in 15 districts of Odisha from 2023-24.

Potential for upscaling and replicability:

The millet inclusion programme in ICDS, ST & SC Development Department and other supplementary nutrition programmes can be explored for potential scale up with diversified millet recipes following implementation modalities of ICDS Laddoo programme. It is suitable to scale up the model to other locations with additional fund allocation from the State Government Women and Child Development Department. Government of Odisha has proposed to scale the programme with Take

Home Ration under ICDS in 15 mission districts of Odisha during 2023-24 with state support.

Drivers of change: With effective participation of District Administration and line departments along with technical support from Odisha Millets Mission, local Women Self-Help Groups (WSHGs) and facilitating agencies have achieved visible impacts. Comprehensive capacity building programmes for WSHGs have also facilitated quality outputs under the programme.

Dilemma and barriers: Ensuring hygienic practices and quality is a key challenge working with food items, as it is served to children. It is critical to ensure quality at all levels such as during procurement of ingredients, processing, storage conditions, preparation of laddoo, serving, etc. Timely supply of ragi as major raw material for implementation of the programme is critical. As the ragi is sourced from Government facilities, the process and approvals need utmost care for ensuring delivery of produce in time.

Novelty and innovation of the solution:

Inclusion of ragi based laddoo in ICDS scheme is a first of its kind programme implemented by the State Government. It contributes to nutrition and health outcomes, and food diversification in critical age for preschool children at Anganwadi Centers.

Contact details: Dept. of Women and Child Development, Govt. of Odisha. Email: wcdsec.or@nic.in

District Level Training to Trainers on Fair Average Quality (FAQ) for Maintaining Hygiene and Quality Standard for Ragi Procurement

Location: Gajapati, Odisha, India



Location: Kalahandi, Odisha, India

Institution: Tribal Development Co-operative Corporation of Odisha Ltd. (TDCCOL)

Summary: District level Training of Trainers to the staff of Facilitating Agencies, FPO members, LAMPCS/PACS staff, FCI staff on maintaining FAQ of ragi for procurement. The intervention focuses on procurement, storage and transportation.

Pitch: Odisha Millets Mission has been facilitating a Training of Trainers (ToTs) on FAQ (Fair and Average quality) of ragi with support of TDCCOL at the district level for the Facilitating Agencies, Farmer Producer Organizations (FPOs), LAMPCS/PACS, FCI, etc., covering agencies which are involved in the procurement-activities. These trainers then make farmers aware on FAQ through village meetings/training. Manual harvesting and threshing of ragi can cause mixing of unwanted particles in the ragi, leading to rejection of ragi in the procurement. These trainings have helped the farmers maintain FAQ of ragi and minimize the rejection rate.

Problem analysis: The small and marginal farmers in the area have been growing millet, focusing only on household consumption. With the introduction of Odisha Millets Mission (OMM), procurement of ragi on MSP has made ragi emerge as a high value crop. Still the issue was to maintain a standard and fair quality of ragi to make it saleable at the TDCCOL mandis. Due to poor quality, the ragi was rejected and the farmers had to return with their produce with no money in hand. Although there are multiple mandi points of ragi, distance is a big issue as tribal farmers have to travel long distances for reselling the produce.

Solution: Ensuring FAQ of ragi grains is an integral part of procurement. The farmer needs to maintain the FAQ i.e., dried, and matured grains of ragi with a uniform size, shape and color. After harvesting, the farmers clean and dry the ragi in the sunlight. The farmers segregate the grains following the FAQ

norms that are free from molds, obnoxious smell, mixture of deleterious substances and any other impurities. District level Training of Trainers (ToT) on maintaining the FAQ of ragi helps in dissemination of information at the village and block level. Meetings with farmers, PRI members and other stakeholders, training, and awareness campaigns are also conducted. These ToTs are conducted before the opening of registration for the procurement. Involvement of multiple stakeholders at various levels helps the farmers understand the possible solutions for maintaining quality and following due processes of procurement through the FPO meetings, village committee meetings, Panchayat meetings, etc.

Target population: The training program is designed for participation from the Facilitating Agencies, FPOs, PACS/LAMPCS, and farmers who have a nominal exposure to the processes of procurement. TDCCOL, which is the responsible agency to ensure quality and standards of grain in this process, is also involved in the ToT, resulting in a better understanding of what is demanded.

Results: Small and marginal farmers, traditionally, practice broadcasting method for cultivating ragi in the region. In the year 2021-22, during the kharif harvesting period, 11,545 farmers were registered under procurement processes from 88 GPs in the four blocks. In 2021-22, zero cases of rejections were reported on account of poor-quality grains. This was a result of the various capacity building programs organized for the stakeholders involved in the procurement process at different levels. In 2022-23, Kharif marketing seasons, 117 GPs from 8 blocks will also follow the same process and help in smooth functioning of procurement in Kalahandi.

Potential for upscaling and replicability: The initiative has given prime emphasis on ensuring multi-stakeholder (TDCCOL, facilitating agencies, FPOs, LAMPCS/PACS, Village-Members, WSHGs, etc.) engagement. This played a critical role in ensuring that the information reaches all



the farmers before the registration ends. In 2021, Kharif Season, all the farmers who had registered for procurement were aware of the standard fair and average quality of grains to be sold in the mandi. This has a very high potential for improving smooth functioning of procurement of ragi which will further play a major role in procurement of non-ragi millets under Odisha Millets Mission.

Drivers of change: Agencies like Department of Agriculture and Farmer Empowerment, Program Secretariat, Facilitating Agencies (FAs), Farmers Producers Organizations, FCI engage with farmers to bridge the gap of information and technical knowledge at the community level. It addressed the issues of procurement through ToTs of FPOs, FAs, LAMPCS/PACS etc. and has been benefiting farmers with community level discussions on issues and available solutions before the opening of registration process. It gives farmers time to process their harvest as per the FAQ standards. Training of stakeholders at various levels helps information reach through various means, leading to bigger outreach and adoption of practice.

Dilemma and barriers: The program engages with the small and marginal farmers who manually harvest and hull to produce marketable ragi. Low ragi production and lack of surety regarding sale at the procurement unit are major barriers. Also, reaching a bigger pool of farmers to promote the practices is difficult.

Novelty and innovation of the solution:

Ragi (of same quality) procured during kharif marketing seasons are further distributed in Public Distribution Systems. In some districts, it is also used as raw material for preparation of ragi ladoo and other recipes that are included in the supplementary food provided in the ICDS centers, and in the Mid-Day-Meal program running in the Government schools. Hence, the maintenance of FAQ becomes imperative for the success of the endeavor to include the millets in the diet of the poor and marginalized sections through the Government programs. No rejection has been reported during procurement in the year 2022-23. This has motivated farmers to cultivate ragi at a bigger-scale and ensure involvement in procurement season.

Contact details: Tribal Development Co-operative Corporation of Odisha Ltd. (TDCCOL). Email: admin@tdccorissa.org

Editor's note: *Such cases of capacity building of farmers on maintaining Fair Average Quality of ragi produce have been shared from Nuapada district by (1) Odisha Millets Mission (OMM) and Tribal Development Co-operative Corporation of Odisha Ltd. (TDCCOL) under Govt. of Odisha and (2) Sahabhagi Vikas Abhiyan (SVA), Facilitating Agency, Sinapali Block.*

Institution: Development Agency for Poor and Tribal Awakening (DAPTA), JanaSahajya, Sahabhagi Vikash Abhiyan (SVA), and The Human Development supported by Odisha Millet Mission

Summary: Participatory capacity building programs and introduction of improved agronomic practices and bio-inputs to enhance millet production and ensure better livelihood and nutrition levels. The focus is on the on-farm activities of the millet production system.

Pitch: Farmers in the region practice indigenous farming techniques and as a result get lower yields. To improve yield of millets, Systemic Millets Intensification (SMI), Line Sowing (LS) and Line Transplantation (LT) methods covering around 6,000 farmers and 12,000 hectares in the year 2021-2022 were introduced. Also, bio inputs (like *bijamruta*, *handikhata*, *jeebamruta*, *ghanajeebamruta*, *neemashtra*, etc.) which can be prepared with materials that are easily available in the surroundings were introduced. These methods not only decrease the input cost but also reduce the health risks caused by chemical fertilizers. Participatory training programs are conducted with an eco-friendly approach for better yield and nutrition outcomes.

Problem analysis: The small farmers in the region practice the broadcasting method to sow millets which requires more seed. With the introduction of the program, the farmers are trained in SMI, LS and LT methods of sowing. By adopting improved agronomic practices, the farmers have realized the difference in the seed requirement and the yield that they harvest.

Solution: Gram Panchayats (GPs) select some progressive/lead farmers and give them an exposure of the best practices. They are further provided ToTs to teach other farmers by sharing their experiences. The idea is to facilitate the change by the local resource and Agronomy Training on SMI/ LT/LS and Bio-input Units to Progressive peer learning rather than through an outsider. With smaller landholdings and erratic rainfall, the farmers find it riskier to

Agronomy Training on SMI/ LT/LS and Bio- input Units to Progressive Farmers and CRPs

Location: Keonjhar and Sundargarh
Districts, Odisha, India





adopt these practices. The yields of ragi, little millet, kodo, sorghum, pearl millet and foxtail millet through the practice of SMI/LT/LS are reported to be threefold in comparison to the yields obtained through traditional methods. In the field schools, emphasis is given to practices like the application of bio-inputs, timely weeding and log rolling, etc. Discussions like cost and benefit analysis, and crop cutting exercises have proved to be effective in the adoption of agronomic practices. The Community Resource Persons (CRPs) conduct a regular follow up and handholding work as a timely reminder and a way to communicate the issues. The approach

is to promote farmer-to-farmer learning, thereby developing local resources and support-systems.

Target population: The intervention targets a majority (90%) of small farmers.

Results: Kalahandi is one of the pilot districts of the OMM programme. Through broadcasting, the yield ranges from 4-5 quintals which requires 10-13 kg of seeds, while with the SMI method the yield ranges from 12-14 quintals/ hectare with 1.50 kg seed input. Through capacity-building programs and field schools, last year 6,713 farmers started practicing millet

farming in 12,847 hectares of the area, which is very likely to increase up to 11,500 farmers, covering approximately 24,000 ha in Kalahandi District.

Potential for upscaling and replicability: With every year passing under the project, more farmers are showing interest to cultivate millets at a bigger scale and become a part of OMM. The increasing number of farmers establishes the need for extension and replication of the model in other suitable areas. Since the inception of OMM in four blocks, farmers in non-intervention blocks are also realizing the benefits and demands for the extension of the program. OMM supports farmers in terms of capacity building, training, proper market, better MSP, and incentive. OMM has expanded the project to 8 blocks, adding 4 new blocks of Kalahandi. The area coverage and farmer numbers are expected to increase more in the coming years.

Drivers of change: Creation of local-level models helped farmers overcome the reluctance to adopt new techniques. With the identification of farmers who were the early adopters of the practices and selection of plots to demonstrate the change and benefits, the local models and resources were created. The CRPs were also introduced in the field to do regular demonstrations, follow-up, and record the issues and challenges faced by the farmers in adoption. It helps in faster recognition and finding resolutions for the problems not only in adoption but also in procurement and marketing. Fortnightly and monthly reviews are also conducted to share the planning, tracking, and reaching the community with solutions. Developing IEC materials in vernaculars and pictorials has also helped farmers understand techniques easily.

Dilemma and barriers: The age-old practice of broadcasting has been limited to household consumption. The acreage for millet cultivation was lesser as millets were a low yielding crop. Farmers were not willing to invest labor and time in following agronomic practices.

Novelty and innovation of the solution: Under OMM, the local partner NGOs in collaboration with the District Agriculture Officer, Block Agriculture Officer, FAs and CRPs working at different levels helped in the identification of issues at different levels. These issues in transportation, procurement and MSP were addressed under the program. The backup provided from time to time created an ecosystem that ultimately motivated the farmers to take up new agronomic practices. These capacity building programs include various village-level participatory and interactive sessions like sharing experiences of progressive farmers on cost and benefit reaped, benefits of bio-input application and its difference on food-intake and health, crop-cutting sessions with 100 farmers in field schools with one best practice field and three random fields, the demonstration by CRPs on preparing bio concoctions etc. The idea was based on a farmer-to-farmer learning approach. Besides improving production, OMM also supports backward and forward linkages like transportation, procurement, MSP and marketing of millets, making the program holistic and efficient.

Contact details: Development Agency for Poor and Tribal Awakening (DAPTA), Bhawanipatna, Kalahandi, At/-Near Old Cinema Hall, Bhawanipatna, India, 766001. Email-dapta@rediffmail.com

Editor's note: *Such ToT training is also being provided by JanaSahajya Organization, Lanjigarh Block, Kalahandi (FA) and Anchalika Agri Producer Company Ltd, Lanjigarh (FPO) in Lanjigarh block, Kalahandi, Odisha*

Establishment of Millet Tiffin Centres/ Kiosks for Reviving Millet Consumption

Location: Kalahandi, Odisha,
India



Institution: Maa Thakurani SHG promoted by Mission Shakti and Odisha Millets Mission (OMM)

Summary: Establishment of millet tiffin centre/ kiosk for improving consumption of millets through varieties of recipes and strengthening WSHGs by providing a source of income. The intervention focuses on millets consumption.

Pitch: A baseline survey undertaken indicated that the household level millet consumption has decreased drastically. Earlier, millets were the staple diet of tribal population in Kalahandi. However, prior to formulation of OMM, absence of recipe diversity, unavailability of channeled marketing system, lack of support from Government and Non-Governmental Organizations led to decreased consumption in tribal areas. OMM included millet tiffin centers as a special part in its program for increasing consumption. People are happy to eat healthy millets for its multiple health-benefits. Also, the footfall has been high in almost every established location providing a better income to SHGs to happily manage their household expenditures through these tiffin centers.

Problem analysis: In terms of millet consumption, tribal communities of Kalahandi know very limited recipes such as ragi porridge. Kalahandi is a land of diverse varieties of millets. In addition to ragi, other varieties of millets such as foxtail millet, kodo millet, pearl millet, sorghum, and barnyard are grown. However, lack of knowledge and awareness about recipes and nutritional benefits limited the consumption. Through millet tiffin centers, SHGs are generating awareness among people about the nutritional values of millets, therefore, people are also getting an idea about diverse food items which can be prepared from millets.

Solution: Increasing household consumption of millets is one major component under Odisha Millets Mission and establishment of kiosk/tiffin centers has been a very fruitful initiative. Under OMM, each tiffin center has a budget provision

of Rs. 30,000, which is provided to the SHG/FPO selected for its management. Selection is done as per the approved guidelines from Mission Shakti for SHG selection. SHGs are given training on different recipes, business development and other aspects by a trained resource person. Major focus is given to the SHGs with existing tiffin stalls or with experience of managing any kind of shop. These establishment of millet tiffin centers at village-level have resulted in improvement in millet consumption. In remote blocks like Lanjigarh, it's very difficult to find a normal tiffin center, hence the establishment of millet tiffin center not only provides good income to WSHGs, but also helps in providing variety of millet recipes to the local community. It also creates awareness in the locality and in a way helps in promoting millet-recipes such as ragi poori, ragi pakoras, ragi samosas, gurji kheer, etc.

Target population: Key targets are children and youth who prefer modern and attractive cuisines. The tiffin centers make an effort to provide food that is palatable to people, satisfies tastes of different age-groups and is made with millets. Malnourished children in the age group of six to eighteen who usually lack basic nutrition from their daily diets are also a major focus. Tribal regions of Kalahandi which have reported a series of droughts and high malnutrition rates in the past are the major focus areas under this tiffin centre program.

Results: The District level budget allocation permits provision for 10 tiffin centers per block. One tiffin center has been established at Lanjigarh block by Maa Thakurani SHG. The tiffin center has generated a minimum income in the range of Rs. 20,000 to 30,000 per month. The center has also created awareness among people about nutritional values of millets and ensured availability of diverse recipes.

Potential for upscaling and replicability: The initiative has a great potential in terms of providing a good source of income to WSHG and the model is replicable in other areas.



One such SHG has been provided additional support through a loan amount of Rs 3 lakhs by Kutia Kondh Development Agency and has converted the tiffin center into a small restaurant. It is in plan with Facilitating Agency JanaSahajya and Mission Shakti for providing additional financial support to Maa Thakurani SHG for improving the established tiffin center. It has also been discussed with ITDA for providing a stall to the SHG at Musanal.

Drivers of change: Timely monitoring and guidance by block level coordinators from Odisha Millets Mission as well as Mission Shakti have resulted in smooth functioning of these tiffin centers. It is very important to identify a location which will attract more consumers and result in more sales. Facilitation by block members work ensured a good location to WSHG. Training WSHGs on recipes and business development plan by programme secretariat has also been helpful. Earlier, it was planned for FPOs which were only one per block under Odisha Millets Mission. Involving SHGs for management made everything more convenient.

Dilemma and barriers: Finding a suitable location is always difficult for the establishment of kiosks. It required additional effort from SHGs as well as the block members to get involved in it. Support amount of Rs. 30,000/- is comparatively less for complete establishment of tiffin canteen and SHGs are usually encouraged to use funds available in their account for it. However, generally SHGs seem to be reluctant to invest

extra money for kiosks. This additional support was sought from other departments. Difference of opinion is quite a common barrier in terms of fund utilization and division of responsibilities between SHG members. Such barriers need to be regularly monitored and managed by block members.

Novelty and innovation of the solution: Establishment of millet tiffin centers provides nutritional benefits to the local consumers and improves household consumption of millets. Also, by involving women SHG members, the initiative has helped empower women. The collaboration between the Department of Agriculture and Mission Shakti has resulted in selecting SHGs for various schemes, which is a very innovative approach to engage a large set of women workforce and earn income through various means.

Contact details: Department of Mission Shakti, Lok Seva Bhawan, Sachivalaya Marg, Bhubaneswar, 751001. Email-missionshakti.od@gov.in

Editor's note: *Different CBOs, FA, FPOs, SHGs, and NGOs are promoting millet tiffin center/millet kiosks across Odisha under OMM.*

In Mayurbhanj district – (1) Baba Simreshwar SHG in Bangriposi

In Sundergarh district – (1) Subhashree SHG and Basudha Farmers FPO In Koraput district – (1) Dhan Foundation

Institution: JanaSahajya Organization, Lanjigarh Block, Kalahandi (FA) and Anchalika Agri Producer Company Ltd, Lanjigarh (FPO)

Summary: The FPO has led a community participation awareness program in which the farmers from the remotest locations can sell their ragi in mandi. The FPO also provides the facility of pick-up vehicles and spaces to store the grain. The solution focuses on storage and transportation for procurement.

Pitch: Due to poor transportation facilities, the farmers were bound to sell their produce at the local market. The price of ragi in

the local market is low and sometimes the farmers have to incur losses when prices fall. The pick-up-vehicle arranged by the FPO has increased the accessibility of the farmers to the market and mandis. This saves their labor, time, money and helps them realize better prices. The introduction of the pick-up vehicle encouraged-farmers to increase their area under millet-farming.

Problem analysis: One of the main objectives of OMM is to enhance farmers' income through the revival of millets. With surplus production, comes the requirement of a market. So, with a hope for a better price, the *Adivasis* in the region increased the acreage under millet cultivation. The poor road connectivity in the interior areas also compelled the farmers to sell the produce in the local market at lower and irregular rates. Sometimes these rates did not meet the cost of production for the farmers. The transportation cost for better price realization was unaffordable for the small and marginal farmers.

Solution: In 2021-22, from November end till the beginning of January, the FAs and FPO members intensively conducted awareness programs using leaflets/pamphlets in vernacular language to reach out to maximum farmers. The idea was to spread the word pertaining to the services provided by the FPO for handling and transporting millets.

Improved Procurement, Transportation and Storage of Finger Millet, Little Millet, Foxtail Millet, Sorghum, Pearl Millet and Kodo Millet through Community Participation

Location: Kalahandi, Odisha, India





In addition to this, FPO frequently organized meetings with farmers and prepared a record of the number of farmers who needed the pick-up vehicle, forming groups for transport, and listing the places for collection from farmers. Then all the ragi is collected at the seed centers or at a Community Resource Person (CRP)/farmer's place before sending it to mandi. TDCCOL provided a small vehicle that helps in covering small pockets in the interior areas in time. The PVTG communities in Lanjigarh like *Kutia-Kondh*, *Dangaria-Kandha*, *Taraja*, and *Bhumia* live in the remote Niyamgiri hill range. With the onset of OMM and the solution provided by FPO in the area, these bodies helped in bridging these gaps. The communities are motivated to augment the area under millets. Lanjigarh block reported approximately 12,000 quintals which is the highest production of millet in Kalahandi.

Target population: In the Lanjigarh block, there are 26 villages with 1500 marginal and small farmers under the OMM program. These farmers face difficulty in handling and transporting produce due to poor-connectivity and transport services. There are a total of 6 mandi points in Lanjigarh, yet the small farmers in the distant villages were not able to transport the products for procurement. The support provided by the local FAs and FPOs has helped the farmers in saving both cost and time. Because of these systems in place, OMM has reached the adjacent-areas of Niyamgiri and the dwelling tribal-groups.

Results: Lanjigarh block has been using these practices for the last 2 years and has reached thousands of their farmers. Till now, the initiative has benefited more than 6,000 farmers (35-40% are female farmers), covered 1,530 ha area and successfully procured 11,499.88 quintals of millets. Now farmers themselves contact FA/ FPO for access to the services they need. For the current year, this block has engaged almost 7,500 farmers which are going to be part of such support and initiatives simultaneously. In 2020-21, procurement target was 4,000 quintals, which increased for 2021-22 to 11,500

quintals and farmers earned approximately Rs. 4.9 Crore.

Potential for upscaling and replicability:

The farmers have benefitted from the support system developed by the FAs and FPOs. This year, 25 villages of 2 new GPs have been added under the program in the block. These examples will help the farmers in visualizing the aid they will get by being a part of the scheme and the support system it creates for them. The FAs are finding potential in the neighboring villages to involve farmers facing the same issue. The number of farmers impacted has increased from 3,357 in 2020-21 to 4,104 in 2022-23. The increase reflects that the farmers are willing to engage in millet cultivation at a larger-scale and are responsive to the need for collective-action. The simple solution has catalyzed the millets value chain.

Drivers of change: The coordination between the FA, FPO and farmers reflects the success of these practices. The strong record management system and the responsiveness of farmers to prepare and provide the required documents in time runs this system. Timely communication among all the stakeholders regarding any changes in the processes or any problems faced at the community level is the key to success. The storage facility provided by the FPOs to reduce the cost for the farmers has also played a crucial role in the time of procurement. Additionally, the pro-activeness of FAs in leveraging resources from different departments and quick responses from departments have been a reason for the success.

Dilemma and barriers: Mobilizing farmers for growing millets for income generation was initially a challenge. In case of paddy and other cash crops, the Government provides damage cover and MSP that works as a buffer for the cultivators. Whereas in case of millets, these crops are considered low value crops, thereby offering lower market rates. Initially, lack of support for procurement, transportation, other incentives were a barrier. In many villages where the primitive tribes reside, the language became another barrier.

Novelty and innovation of the solution:

The solution of providing handling and transportation support bridged the gap between production and procurement, resulting in better price realization for the tribal farmers in the difficult to reach areas. The issue of road connectivity was recognized in several blocks and FPOs, FAs, departments, and panchayat level functionaries. These bodies were also approached to support in organization of village-level meetings, involvement of PRIs, and documentation for starting the collection. FAs and FPOs also came forward with the intent to make the process cost-effective for the farmers. The pro-activeness of FAs resulted in engaging multiple stakeholders at multiple levels like liaising with TDCCOL for vehicle support to the service system.

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Adoption of Improved Package of Practices for Increasing Millet Production

Location: Khandhamal, Odisha, India



Institution: Social Welfare Agency and Training Institute (SWATI)

Summary: The story focusses on improving millet production through adoption of the practice of SMI, LT and LS with raising nursery beds for transplantation, seed treatment through Bijamruta for good germination and use of Handikhata & Jeevamruta to help farmers produce more with low investment. The package of practices is applicable for ragi, little millet, foxtail millet, pearl millet, sorghum, barnyard millet and kodo millet.

Pitch: Farmers have observed that quantity of production has increased with the adoption of new practices like SMI & LT. Raising nursery beds for millet cultivation was never practiced until OMM was introduced. Package of practices (PoP) such as use of Beejamruta, Jeevamruta and Handikhata for seed treatment to enhance soil health and improve production at a lower cost was also introduced. Millet production, after adopting such agronomic practices, has grown remarkably, thus, enhancing farmer livelihood.

Problem analysis: Earlier, while using broadcasting method, there was problem in weeding. Plants used to be comparatively small and unhealthy due to lack of passage for wind flow. Germination of seed also was affected due to lack of knowledge about seed treatment and storage. After the intervention of OMM, farmers learnt and adopted the process of SMI & LT as well as preparation and usage of Beejamruta, Handikhata and Jeevamruta.

Solution: The solution promoted the following practices: (1) Nursery Bed Raising-Raising of nursery beds was practiced only for paddy cultivation in the district. Now through OMM, farmers prepare them for millets as well. Almost 70 percent of the farmers raise nursery beds and have adopted SMI or LT successfully. (2) SMI and LT-The methods are easy to adopt for better millet yields, and its efficacy has been acknowledged by the local farmers. (3) Improved PoPs and Agronomic Practices-Improved use

of Handikhata, Compost Pit and Tarala Sara for soil nutrient and the use of Beejamtura, Jeebamruta and other organic pest repellent to manage the pest changed the farmers' mind-set away from chemical fertilizer towards organic method. Improved agronomic practices like summer ploughing, nursery bed, weeding, use of bio-input, and selection of healthy panicles for seeds are also being widely adopted by the farmers. (4) Custom Hiring Centre (CHC): Processing of millets is difficult, time consuming and laborious activity, particularly for women farmers. Now, women farmers are able to hire small agriculture implements from the CHC, which helps women farmers reduce their drudgery. By adopting organic package of practices, the cost of cultivation has been kept low while the yield has increased. Traditionally, millet fields weren't weeded; now weeding is being practiced up to three times for better yield. The availability of agriculture implements for hire at the CHCs also helps the small and marginal farmers.

Target population: The small and marginal farmers is the target group for this initiative.

Results: 70% farmers are preparing nursery beds and transplanting for better yield. The cost of cultivation has been reduced after using the PoPs. The CBOs are managing the Seed Centre to provide better quality seeds to the interested farmers and the revenue generated supports them in increasing their income levels. Similarly, the millet kiosks/ tiffin centers are also managed by the FPO members. The millet cultivation ratio has increased from 15 percent to 70 percent in the area. The average land size for millet has increased from 0.1 ha. to 0.6-0.8 ha/family. As of now, a total of 1455 farmers are involved in millet farming, covering 862 ha under millets cultivation.

Potential for upscaling and replicability: Millets are available throughout the year in the mandi as the farmers are cultivating the crop in both *Kharif* and *Rabi* season in some areas. If more processing units are established for different activities like cleaning, destoning, it



would help in upscaling the millet production. Currently, there is no MSP fixed for millets other than ragi, leading to the disinterest of farmers in growing non-ragi millet crops. If MSP is declared for other non-ragi millets as well, it would encourage farmers to cultivate other millets as well.

Drivers of change: Adoption of any new practice is not easy. The fear of uncertainty often prevents farmers from shifting from traditional practices and adopting new practices. Changing their practice of sowing from broadcasting method to SMI & LT was initially challenging. Similarly, convincing farmers to shift from readily available chemical fertilizers to bio-inputs was an arduous task. However, after realizing the advantages of bio-inputs, farmers' mind-set changed. Almost 90% prefer to use natural bio-inputs, which is easily prepared with locally available resources at minimum/low cost.

Dilemma and barriers: One of the key dilemmas faced by farmers with regards to millet cultivation is that, for other crops, there is instant price realization, whereas for millet crops, farmers have to wait for long, which makes farmers hesitant to shift to millets.

Culturally, millet is one of the staple foods of the tribal and hence, considered as poor peoples' food in many areas. Furthermore, as a result of modernization, the younger generation is drawn to other trendier food selections that are readily available in marketplaces.

Novelty and innovation of the solution: The PoPs are highly appreciated by the farmers as the ingredients are available locally and at low/no cost. The agronomic practices help the

farmers get higher yields while supporting soil fertility management. The crop is more climate adaptable than other crops, ensuring income and food security for small and marginal farmers.

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Editor's note: *Different CBOs, FA, FPOs, SHGs, and NGOs are promoting adoption of improved practices in millet cultivation like System of Millet Intensification (SMI), Line Transplantation (LT) and other agronomic practices like use of bio-inputs, weeding, setting up of CHCs and CSCs across Odisha under OMM.*

In Khandhamal district—(1) Jagruti (FA) and Pahadi Framers Producers Company Ltd. (FPO),

(2) NIRMAN, Kotagarh (FA) and PFPCL, Kothaguda (FPO) and (3) Shanti Maitree (FA) and Vikash Jyoti Farmers Producer Company Ltd. (FPO)

In Koraput district – (1) Professional Assistance for Development Action (PRADAN) (FA) and Koraput Nari Sakti Farmers Producer Company Limited (KNSFPCL) (FPO), (2) MS Swaminathan Research Foundation (MSSRF)

In Mayurbhang district – (1) Jashipur Farmers Producer Company Ltd. (JFPCL), (2) Center for Regional Education, Forest, and Tourism Development Agency (CREFTDA), Jashipur

In Tamil Nadu, Centre of Excellence in Millets, Tamil Nadu Agriculture University is promoting Systematic Finger Millet Intensification as well as Inter-cropping to improve yields and food security.

Institution: Dasery Producer Company Limited (DPCL) (Community Based Organization) and Saunta Gaunta Foundation (SGF) (FA)

Summary: Organic liquid manure enhances the resistance of plants against pest attacks, disease control and helps enrich soil. The intervention is on production dimension of the value chain.

Pitch: All the WSHG members of Gayatri SHG have been preparing organic manure i.e., Handikhata & Jeevamruta for more than last three years. It is eco-friendly, cheap, cost effective and can be made easily with locally available materials. The farmers are very happy as these bio-inputs have increased the productivity by upto 20 percent per hectare.

Problem analysis: For the last few decades, farmers have adopted a practice of using chemical fertilizers and insecticides for faster and better yields despite knowing the harmful effects of using such inputs. Capacity building of farmers for producing organic manure is a solution that is not only favorable to the farmers cultivating produce but also protects the health of the consumers.

Solution: It is challenging to raise farmers' awareness about the revival of the cowshed. It presents difficulties to restore the animals or cow sheds in the tribal areas of the Keonjhar district. Community realized the importance of bio-fertilizers and started the practice of collecting cow-dung. Communities, federations, FPOs, WSHGs, and even farmers have approved the use of organic manure since the formation of the Odisha Millets Mission (OMM). OMM was launched in Keonjhar in 2019 after cluster-level SHG identification, and it was decided that the strategy would be through FPO. OMM supported the manufacturing of organic manure by FPO.

Target population: The strategy mostly had a favorable impact on small and marginal farmers. The beneficiaries of vulnerable tribes in Odisha who are primarily women have used organic manure in their fields. Dasery Producer Company has benefitted many disadvantage people.

Promoting Organic Manure for Yield Enhancement of Millets

**Location: Keonjhar,
Odisha, India**





Results: The process started in 2019, and the Dasery Producer Company facilitated the preparation of large volumes of organic manure i.e., Handikhata, Jeevamruta, and Beejamruta for 18 Gram Panchayats of Jhumpura Block. The practice was initially adopted among the rural villages, but has now drastically increased. All the surrounding communities in the villages are also utilizing this service to use organic manure. The bio-inputs have increased the productivity by up to 20 percent per hectare. The WSHG members in the villages are now economically empowered and are earning an additional income of ~INR 5000-6000 per annum. There has also been a qualitative impact as the mindset of the farmers has changed and they are willing to adopt organic manure. This has also brought behavioral changes in the community and provided opportunity to work as collectives which drastically improved their social life.

Potential for upscaling and replicability: Although there is a limitation on potential of cowshed in Jhumpura block, the FPO, with its efforts managed to provide service to the smallest farmers and marginalized group of people in the remotest of the villages. As Keonjhar has the potential to cultivate cereals like millets, the FPO can be a boon for them in order to save time and utilize those in other different skill development activities and gain additional income source. However, a greater number of the WSHG (at least one WSHG per GP) should be involved in the process of organic manure preparation along with bringing materials to make the soil healthy and enhance yield.

Drivers of change: The most important factor for the success of the intervention has been the support of the local tribal communities and their adaptability to keep the livestock safe. The effort of the Community Cadres in the village to spread awareness among the farmers, supporting them to adopt the process has also played a major role in its success.

The support of the district administration and Odisha Millet Mission has helped resolve many

issues in the process of the promotion of organic manures.

Dilemma and barriers: The challenge of preparation and application of organic manure has been addressed by creating awareness through regular meetings by the Community Cadres in the villages. The traditional practice of cultivating millets organically was getting lost due to shift in priority of farmers to high yielding varieties requiring more chemical inputs. However, building capacity of women farmers, adoption and large-scale dissemination activities helped in convincing farmers about the advantages of organic farming and sustainable agriculture practices. The experiences from

the practices were also consolidated for wider dissemination.

Novelty and innovation of the solution: The practice/solution of use of organic manure is novel as it has helped farmers change their mind-set and shift to use of organic manure or compost, which is the need of the hour, given the climate risk. The current practice adds tremendous value to the local community and has the potential to increase the yield of the crops.

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Conservation and Multiplication of Land races of Finger Millet, Foxtail Millet and Little Millet

Location: Koraput, Odisha, India



Institution: Gupteswar Farmers' Producer Company Ltd. promoted by Koraput Farmers' Association (KFA)

Summary: Conservation of landraces of various millets is an important component to multiply seeds and protect the land from getting degraded. GFPCL is conserving land races/indigenous seed varieties by promoting community seed centers that provide local farmers with required input seeds for farming as well as training the farmers in improved agronomic practices to increase their yields.

Pitch: Gupteswar Farmers' Producer Company Ltd. has been working with its shareholders and other small and marginal farmers on promoting cultivation of millets and adoption of different agronomic practices. Many indigenous varieties of millets are disappearing; therefore, it is necessary to conserve the indigenous/traditional varieties through promoting seed centers.

Problem analysis: For a long time, different seed supply agencies/business entities have been motivating small and marginal farmers to go for improved or other seed replacements. They have preferred buying instead of conserving their traditional seeds for cultivation in the upcoming agriculture seasons. This has resulted in the community losing their traditional seeds and increased dependence on seed supply agencies for genuine seeds. Over a period, many indigenous varieties of seeds have been lost and its dangerous impact is now visible among the small and marginal land holders.

Solution: Gupteswar Farmers' Producer Company (GFPCL) came up with the solution of conservation of these landraces/indigenous seed varieties through community initiative. It started discussions with one of the Women SHGs of Manabar village named *Maa Tarini* SHG to get involved in the process of conservation of traditional varieties. The group agreed to work on the process and established one Community Seed Center (CSC) in a rented house in their

village. They collected around 10 local/traditional varieties of finger and little millets from the small and marginal farmers of different villages in their Panchayat and also from the Panchayats around. The group then managed the Centre and multiplied the seed varieties collected from different sources. The group was also actively involved in the Participatory Varietal Trial conducted by Koraput Farmers' Association in Mastiput Panchayat of Koraput Block as a part of the implementing process of Odisha Millet Mission (OMM) in Koraput Block. The group is now providing traditional/indigenous seeds to the farmers, and helping them multiply the seed and get back the equal quantity of seeds from the farmers during harvest.

Target population: The small and marginal land holders, specifically from the Tribal and Scheduled Caste categories, are benefiting from the Center. The CSC is supporting the farmers in availing seeds of their choice, which were once lost but are now being preserved at the Centre for cultivation.

Results: The group has preserved around 10 varieties of finger millets. The quantity is also large because they process and multiply the seeds in all the seasons. The farmers in their vicinity are getting traditional/indigenous seeds of their choice for cultivation. 80 percent of the villagers are getting seeds from the Center for kharif cultivation. Gradually, the group is also considering preserving other varieties from other places and save them for multiplication and distribution. Overall, the process has helped the farmers in protecting their land from getting degraded.

Potential for upscaling and replicability: Till date, KFA has promoted only 4 seed centers in the entire block. There is a need to establish one seed center each in all the 13 Panchayats of Koraput Block. As it is not an expensive venture, it can be scaled and replicated in all other parts of the district/state. The community members are also thinking of scaling it up to other Panchayats with the help of SHG groups.



Drivers of change: The key drivers of change are (1) active participation of the community members like the SHG members, village development committee members and other village institution members and (2) suitable policy changes for preservation of land races by Government department. Necessary support should be provided to village institution for preservation of the varieties in all crops.

Dilemma and barriers: The tribal farmers have the practice of cultivating a crop and keeping a small part of it for future use as seeds. They do not differentiate between seeds and grains. They need to be oriented properly to differentiate between seeds and grains. They should also be trained on seed management and multiplication.

Novelty and innovation of the solution: Getting genuine seeds and preserving the local traditional land races is a very big problem.

Preserving and conserving the landraces is perceived as a difficult process. The seed centers which are managed by SHG members are easy to run and smooth to manage. It is also cost effective as there is very less expense involved. That is CSC is considered as an innovative idea for establishment.

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Editor's Note: *In Koraput district, under OMM, Sabujima Farmers Producer Company (Community Based Organization) and Centre for Youth and Social Development (CYSD) (FA) together are also promoting preserving traditional landraces in CMSCs*

Institution: Jagarana Farmers Producer Company (FPO) and Centre for Youth and Social Development (CYSD) (FA)

Summary: A community-managed Custom Hiring Centre (CHC) makes agricultural tools more accessible to farmers while simultaneously helping and strengthening the business abilities of the community's small and marginal farmers. Modern agricultural tools and implements help in increasing agricultural efficiency and reduce the loss of natural resources.

Pitch: Before the intervention, the small and marginal farmers in Laxmipur Block of Koraput had limited knowledge and access to modern farm equipments like cycle weeders, weighing machines, threshers, etc. The CHC provided access to farm equipment, thereby helping poor farmers generate income. The intervention drastically brought down their drudgery and provided them a better life and income. It created an ecosystem for poor farmers to be self-dependent and emerge as individual entrepreneurs.

Problem analysis: The traditional method of cultivating millets and other crops by small and marginal farmers in the area was primarily aimed at household consumption and not generating an income. The introduction of modern farm practices changed the mind-set of the poor farmers, however accessing modern farm technologies and machinery was still a distant dream. The problem of "more drudgery less income" and inaccessibility of farm machinery continued. The CHC concentrated on making the proper equipment available to impoverished farmers at the right time and at a very low cost, which immediately assisted them in decreasing their drudgery and increasing their income through revenue production from renting the equipment.

Solution: Millets have been an underutilized cereal crop, mostly cultivated by marginalized communities in degraded lands. Along with making the farmers aware, easy access of the Custom Hiring Centre: Facilitating increase in

Custom Hiring Centre Facilitating Increase in Incomes for Marginalized Group of Tribals Growing Millets

Location: Koraput, Odisha, India





outcomes for Marginalized Group of Tribals Growing Millets farm mechanisms and machineries in the rural areas like Laxmipur was managed through establishment of Custom Hiring Centre. The CHCs helped reduce the drudgery of woman farmers, save time, ease the processing and generate income from lending the small equipment within the community itself. In the year 2019, for the establishment of the CHCs, cluster wise SHG identification was carried out, and it was agreed that the approach will be through Producer Company. After selection of a rental house in the village, a committee chaired by The District Collector was formed for its approval. The plan was made to establish CHCs in five Gram Panchayats namely Kutinga, Odiyapentha, Goudaguda, Toyaput and Kusumguda of Laxmipur block. An agreement was made between PD-ATMA and the Producer Company, after which the Odisha Millet Mission (OMM) provided the support of machineries to the CHCs. The equipments provided were cycle weeder, tarpouline, weighing machine, thresher, moisture meter and drum. Farmers could rent these implements at reduced cost which helped increase their agricultural efficiency by reducing labor costs, drudgery and time taken to carry out cumbersome agricultural activities like manual weeding.

Target population: The intervention brought about positive changes mainly among the woman farmers of the small and marginal strata. Women have been facing more drudgery than men and were among the most marginalized and excluded groups.

Results: The process started in 2019, and the CHCs were established in the month of September in five villages of five GPs in Laxmipur block. All the surrounding communities in the villages are also using the service of the CHCs. The success can be seen from the promotion of enterprises in the villages and generation of additional income of at least INR 5,000-8,000 during the harvesting season. The intervention has not only reduced the drudgery, but also improved the mind-set of the farmers to adopt

modern farming technologies. This has also brought behavioral changes in the community and provided opportunity to work as collectives which drastically improved their quality of life.

Potential for upscaling and replicability: Such interventions have a huge potential for upscaling in the near future. Not only Laxmipur, but many other blocks of Koraput have also started CHCs in the remotest villages and are able to provide service to the most marginalized group of tribals. As Koraput, Malkangiri, Nabarangur, and Rayagada have the potential to cultivate millets, the CHCs can be a boon for them and can help save time and utilize that time in other different skill development activities and gain additional income. Hence, more CHCs should be established (at least one CHC per GP) and new technologies should be introduced, replacing the old ones. The scaling up and replicability should happen along with improved servicing/maintenance of the equipment by building the capacity of the local community.

Drivers of change: The most important factor for the success of the intervention has been the support of the local tribal communities and their adaptability to modern technologies. The effort of the Community Cadres in the village to spread awareness among the farmers and supporting them to adopt new technologies and machineries has also played a major role in its success.

Dilemma and barriers: Major risk was involving SHGs and bringing their attention towards the CHCs, leaving their own major activities of cultivation, marketing, and group governance. As the machineries needed maintenance and repair, there was a risk of damage which has been addressed to some extent by involving the staff of CYSD and OMM, who have been helping the farmers to bring mechanics from

outside. This can be further improved by training the community members themselves on maintenance and repair of the machineries.

Novelty and innovation of the solution: The solution of CHCs is novel as it has changed the perception of labor. Previously, the tribal small and marginal farmers were doing more labor and getting less income as they were not aware about the use of modern practices as well as farm machineries. Use of modern implements reduces the labor costs and hence the cost of cultivation. CHCs have not only helped reduce the physical labor, but also given emphasis on saving time and utilizing it in other development activities. The current practice adds tremendous value to the local community and has the potential to not only increase the income of the farmers but change their mind-sets towards promotion of enterprises.

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Editor's note: *Different CBOs, FA, FPOs, SHGs, and NGOs are promoting CHCs across Odisha under OMM.*

In Mayurbhanj district – (1) Jashipur Farmers Producer Company Ltd. (JFPCL)

In Koraput district – (1) Sabujima Farmers Producer Company (Community Based Organization) and Centre for Youth and Social Development (CYSD) (FA), (2) Jaivik Sri Farmer Producer Company Ltd., (3) Gupteswar Farmers' Producer Company Ltd. and Koraput Farmers' Association (KFA). In Malkangiri district – (1) Guru Priya Farmer Producer Company Ltd.

In Rayagada district – (1) Maa Tarini SHG, Rayagada Farmers Producer Organization, Kalyansingpur and NIRMAN organization.

Enhancing Production of Finger Millet, Little Millet, Foxtail Millet and Sorghum, and Establishing Market Linkage through Procurement

Location: Koraput, Odisha, India



Institution: Sabujima Farmers Producer Company, Community Based Organization and Centre for Youth and Social Development (CYSD) (FA)

Summary: The improved Package of Practices (PoP) has helped enhance production of millet (thereby enhancing the income of the millet growers) and enabled community-level organizations to procure millets. Community-level organizations procure the same millets and engage women in production of various value-added products.

Pitch: Before the intervention, the millet was grown only for grower's household consumption purpose and a very meagre amount was sold through distress selling in Boipariguda. After the intervention, with the help of the improved PoP, millet production significantly increased, leading to its mass consumption and selling. The community-level organizations played a pivotal role in this.

More production means more procurement, and this procurement has helped the Government have millet in the PDS. As a nutrient-rich food, millet has carved its way into the urban kitchen.

Problem analysis: Although practice of millet cultivation has always been a part of the tribal farming systems in South Odisha, it was not as popular as paddy. While millets have been a part of the staple diet of tribal for centuries, the potential of the crop was being hampered because of low yield, use of chemical fertilizers, distress selling, and no value-addition was being done. Less production led to only household consumption, not commercialization. The most affected were the small, marginal and landless farmers who have very small land holdings and couldn't do much. With improved PoP, the production has increased significantly, which paved way for various opportunities like involvement of CBOs, MSP, etc. The grass-root level organizations worked on the implementation of the pre-designed roadmap

set by OMM, and millet production increased significantly.

Solution: One of the good initiatives of the OMM was the Minimum Support Price (MSP) and including every farmer starting from landless, small, marginal to medium and big farmers under the scheme. MSP was introduced by the Government for buying bulk produce from the farmers. But most farmers were unaware about it. Hence, the first step was to make community aware about the scheme through campaigns, leaflets, village meetings and support throughout the entire process. Awareness campaigns were led by the community resource persons with help from CYSD, starting from the farmer registration to selling of their produce. Categorization of farmers, their relevant documents and getting them registered were part of that initiative. Trainings covered for the community members included moisture check for the millets, their storage, various kinds of value addition, etc.

The procurement was done by TDCC in 2018-2019, but the local FPOs have become a part of it since 2019-2020.

Target population: The target population was the landless, small, marginal farmers and farmers who have land under the Forest Rights Act.

Results: Though most of the initiatives by the Government were meant for the last mile population, they hardly ever get glimpse of it due to lack of awareness. With the help of awareness campaigns and village meetings, the last mile population came to know about the scheme and participated in it. In 2018-19, only 336 farmers sold their produce and got benefitted the number later increased to 780 farmers in 2019-20, 1,231 farmers in 2020-21 and 2,307 farmers in 2021-22. The amount of produce procured from the farmers also increased from 2,200 quintals in 2018-19 to 20,489.76 quintals in 2021-22. In the process, the left out or the last mile population had their share in it and got benefitted from the



initiative. This has helped raise the confidence in most of the community members to not only devote themselves to follow the practice but also inspire others to take up the same. This has also helped millet secure a spot not only in the rural, but also in the urban market.

Potential for upscaling and replicability: The increasing procurement ratio over the years since the program's inception at Boipariguda shows that people are getting benefitted and acknowledged for their efforts for conserving millet all these years. This also inspires other farmers or community members to take up the practice. Fueled by the community's interest, CYSD is planning to expand the program's reach to the remotest Gram Panchayats in the block and focus primarily on the last mile populace there.

Drivers of change: In this case, the key drivers of change were the FA, the FPO and the farmers. The facilitating agency in this case is CYSD, which implemented the program on the ground level, starting from selecting the beneficiaries, registering them for selling their produce to facilitating the FPO for procuring their produce. Another important player would be the FPO, which procured the produce of the farmers and provided relevant help to ensure longevity of the produce by storing it in store houses, godowns while keeping the quality assured so that the farmers can get a good price. The most important factor in this case or any case is its beneficiaries. The farmers believed in the practice and adhered to the PoP, which led to more production and ultimately to more consumption and procurement.

Dilemma and barriers: While implementing an initiative, there's often a resistance from the community itself. The key is to start with a small batch of farmers and convince them about the outcome. While implementing, the community took their time to get adjusted with all the new practices that came along with it like

preparation and application of bio manures, following plantation techniques, weeding, and hoeing etc. The team overcame all the hurdles by conducting village meetings, showcasing videos depicting the practices, and documenting their whole process. This initiative was taken to convince them about the positive impacts of the practices. Another thing which scared the community was the documents required for getting MSP or for selling their produce. The FRA landowners and farmers who owned a meagre amount of land were at first hesitant, but with support from CYSD, they overcame all the challenges.

Novelty and innovation of the solution: The system helped eliminate the role of middlemen. With the introduction of Mandi and with support from CYSD and the concerned FPO, it's seen that people were more interested to sell their produce at a Mandi rather than to middlemen or through the barter system. This enhanced their income and helped them realize their potential through various training programs for value additions and business initiatives. The initiative also helped women farmers who are the invisible labour force for any kind of intervention. Women are now actively participating in the training and making their share by selling their produce at the Mandi. The innovative idea of making procurement the goal might sound odd at first but looking at the success rate and rise in confidence level from the farmer's perspective, it has been one of the key drivers for the success of the programs.

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Editor's note: *In Koraput, similar work on procurement awareness and facilitation is also being done by Koraput Nari Sakti Farmers Producer Company Limited (KNSFPCL) (FPO) and Professional Assistance for Development Action (PRADAN) (FA)*

Institution: Jaivik SRI Farmers Producer Company Limited (JSFPCL), Koraput supported by Odisha Millets Mission (OMM)

Summary: Jaivik SRI Farmers Producer Company, Limited (JSFPCL), Koraput with support from Odisha Millets Mission (OMM) addresses agrarian as well as nutritional challenges by promoting millet value chain with seed-to-seed approach, involving local communities in Koraput District. Under the approach, farmers are encouraged to produce quality indigenous seeds locally through seed village programmes and participatory varietal trials, which are then conserved in the community seed center so that they can be utilized for the next cropping season. Improved millet agronomic Package of Practices (PoP) is also promoted to improve yields. The intervention aims to enhance production of finger millet, foxtail millet, small millets (suan) and pearl millet.

Pitch: JSFPCL initiative focuses on addressing agrarian as well as nutritional challenges by promoting millet value chain with seed-to-seed approach involving local communities in Koraput District. There is a need to focus on dry lands to increase grain production and meet growing demand for food. Owing to low fertility and climate change, millets score highly over other grains like wheat and rice in terms of marginal growing conditions and high nutritional value. The conservation and revival of indigenous millet seeds can lead to enhanced productivity amidst climatic adversities for nutritional food security and income enhancement of small farms. It focuses on all aspects except branding and packaging of millet value chain.

Problem analysis: The initiative has attempted to solve the problem of lack of quality seeds of millets, which is one of the key factors for decrease in cultivation and consumption of millets. The indigenous varieties of millets which dominated the farming system in Koraput District are on the verge of disappearing due to promotion of rice and other cash crops. Thus, area of land under millet cultivation has been continuously declining. Furthermore, products

Development of a Holistic Millet Value Chain by Jaivik SRI FPC Ltd.

Location: Koraput, Odisha, India





such as rice and cash crops are sensitive to climate change and require additional irrigation and chemical inputs to maintain output, which is challenging and inconvenient for small and marginal farmers. The small farmers have found it very difficult to invest in inputs and meet their food requirements from their farm production.

Solution: Environmental degradation and climate change in dryland areas threatens food production, leading to food insecurity. JSFPCL has tried to address this problem through breeding of millet varieties to ensure food security. Community seed systems approach has been followed under which the farmers are encouraged to produce quality seeds and the seeds are conserved in the community seed center so that they can be utilized for the next cropping season. Indigenous varieties of millet seeds have been collected from different farmers and seed savers.

Seed production is done through seed village programmes and participatory varietal trials involving the farmers and the technical team. Improved Package of Practices (PoP) like System of Millet Intensification, use of organic nutrient and pest management measures have been followed to ensure production of quality seeds. Through seed selection, the pure seeds are collected and conserved properly in the community seed center. Different millets like finger millet, foxtail millet, little millet and pearl millet have been conserved and made available to farmers and different agencies.

The farmers and different agencies procure seeds from the community seed center which generates revenues for JSFPCL. The company has marketed around 90.3 metric tons of millet seeds.

Target population: The major target groups are the small and marginal farmers of Koraput District involved in millet production.

Results: The millet crops hold great potential for further breeding. Most of the millets collected and conserved by JSFPCL are from farmers' fields

and local landraces (farmer-selected “varieties”), with unique traits and properties that could be useful in other regions. JSFPCL has been able to reach out to more than 10,000 farmers directly and 20,000 farmers indirectly through other NGOs and agencies following community seed systems approach in production and marketing of millets. Around 6,000 farmers are involved in production of 4,000 metric tons of finger millets and 1,000 tons of foxtail and small millets in Koraput district every year. Around 1,823 farmers are involved in production of millet seeds. Different millet seeds are procured by the company and sold at different levels including farmers, NGOs, research institutes and different agencies working with farmers in Odisha as well as other millet producing states of India. The company has so far marketed 90.3 metric tons of millet seeds, generating revenue of Rs 29.35 lakhs.

Potential for upscaling and replicability: The solution has immense potential for scale up in the millet sector value chain and can also be replicated for other crops that are gradually disappearing. The millet seed production can be replicated in all rainfed farming systems as millets are climate resilient crops. Community managed seed centres can be the most practicable solution to address the crisis in seed sector which can be scaled up through the organized Farmer Producer Groups. The local landraces of millets can be revived, and research (followed with scientific validation) can be conducted on the purities of landraces with the support of research institutes and Krishi Vigyan Kendras so that millet seed chain can be strengthened for the future of food and nutrition security.

Drivers of change: The practice can be more successful through policy support and scientific validation involving the research institutions.

Research institutes can conduct field level trials on indigenous varieties of millets and claims can be established in production, resistance to

climatic adversities, nutrition content, etc. These claims can be validated so that the findings of lab can be replicated in the farmer’s field.

Dilemma and barriers: The major risks that emerged during the implementation was the mobilization of farmers for quality seed production as the farmers have difficulty distinguishing between seeds and grains.

They generally used to keep a part of the grains as seeds for the next cropping cycle. The technical team had to provide regular handholding support and ensure maintenance of purity of seeds. Selected farmers were also trained in seed selection and harvesting of seeds. It was also quite challenging to ensure proper management of the community seed centers. However, the involvement of the farmers during the time of implementation of the programme helped address the challenge.

Novelty and innovation of the solution: The seed-to-seed approach is itself innovative as the quality seeds further produce enhanced quality seeds. The involvement of farmers and demonstration in the farmers’ field has helped in community ownership of the programme. Local production of quality seeds could decrease costs and, as a result, (most likely) increase farmer adoption. In the seed sector, there is a general tendency of focusing on input supply and increased production.

The production of seeds has established that farmers have started seeing the importance of seed production for marketing. The solution has created market for indigenous seeds. The Farmer Producer Company has started to procure seeds from farmers and market seeds in bigger volume not only for farmers, but also to other agencies and seed enterprises. It has generated revenues for the FPO and the farmers.

Contact details: Jaivik SRI Farmers Producer Company Limited (JSFPCL), Koraput, Odisha, India.

Promoting Bio-Input Business for Ensuring Healthy Finger Millet and Little Millet Crop

Location: Malkangiri, Odisha, India



Institution: Saveri Setu Farmer Producer Company Ltd.

Summary: Preparation and sale of bio-input liquid manure and fertilizers to farmers for ensuring healthy crop and high productivity.

Pitch: Increased application of chemical fertilizers and insecticides by farmers to increase productivity has led to increased cost of cultivation and degradation of soil quality. To minimize the cost of cultivation, Saveri Setu FPC has prepared bio-inputs like Handikhata, Bijamruta, Jeevamrutha, Panchyagabya, Bramhastra for sale at a nominal price. Use of these bio-inputs will not only decrease cost of cultivation, but also improve soil quality.

Problem analysis: Farmers were obliged to use chemical inputs to reduce pest attack and increase crop productivity. This had a harmful impact on public and soil health. Overtime, use of chemical inputs has also led to increased cost of cultivation.

Solution: The FPO was trained in producing bio-inputs, which were bottled and stored for longer usage. The FPO educated the farmers about its application, utility, benefits, and impacts. The FPO also provided assurance that the bio-input is non-hazardous and would not decrease the productivity of the crops. It would also help farmers pursue natural or organic farming.

Target population: Around 5150 liters of bio-inputs has been supplied to more than 2000 farmers in 10 GPs of Mathili block so far.

Results: The application of bio-inputs increases productivity and reduces the cost of cultivation for farmers. Bio-inputs help in improving soil health, soil fertility, increasing genetic diversity, re-establishing ecological balance, and encouraging sustainable agriculture. The application of bio-inputs ends chemical pollution and toxic residues, and ensures that the food items produced are free of harmful chemicals.

Potential for upscaling and replicability:

Awareness on application of bio-inputs and its benefits will increase the demand for preparation of bio-inputs and more farmers will be able to avail the bio-inputs easily. Setting up separate units that can prepare the bio-inputs will help supply to larger markets.

Drivers of change: The mind-set of farmers and their practice of using fertilizers in the fields are the key elements that need to be worked on to increase usage of bio-inputs. The drivers for change are the FPOs themselves as they can convey the impact in a more relatable manner as compared to any third party stepping in to convince the farmers.

Dilemma and barriers: The farmers need to be sensitized, convinced, and made more aware of bio-inputs usage, which will consequently help increase productivity and reduce the cost of cultivation.

Novelty and innovation of the solution: In Mathili Block, there was no facility of selling different bio-input products like Handikhata, Neemastra, Jeevamrutha, etc., but with the support of Saveri Setu FPC, many farmers are showing interest to apply organic manure in place of chemicals.

Contact details: Saveri Setu Farmer Producer Company Ltd., Mathili Block, Malkangiri District.



Custom Hiring Center (CHC) and Barter System for Finger Millet, Sorghum and Little Millet — A Ray of Hope for *Bisoi* Block

Location: Mayurbhanj, Odisha, India



Institution: Babita SHG and Gram Swaraj (FA)

Summary: Custom Hiring Center (CHC) provides essential farm machinery and serves as a platform to provide livelihood support to the farmers.

Pitch: CHC managed by Babita SHG is a center which provides agricultural implements to farmers at an affordable rent. These all are essential implements needed for millet cultivation. The initiative also encourages women to cultivate millets. Farmers are already reaping the benefits by using the CHC's implements. The members of Babita WSHG act as a catalyst of CHC and encourage villagers to take part in millet mission initiatives aggressively. Three cluster based sub-centers benefitting 1200 farmers have been established near the millet cropping area and are being managed by WSHGs.

Problem analysis: Bisoi block of Mayurbhanj has 156 villages. Most of the farmers in the block belong to the tribal communities. Farming is carried out with the traditional methods and implements. Previously when the population was low, it was quite easy to practice farming with indigenous machineries as only small portions of land were cultivated. Over time, the population increased. As per the data of 2011, this block has a population density of 202 persons per sq. km. With increase in population, the demand for food also increased and people started to cultivate larger portions of land. Traditional machines led to increased drudgery of farmers. Based on the farmers' demand, it has been decided to procure farm implements for cultivation of non-local millets. Storing the machinery at village level has become difficult and activities like record keeping, maintaining day to day databases, etc. are all quite challenging for CHC members.

Solution: The CHC has made a provision of payment in kind for farmers facing difficulty to pay cash to encourage farmers to cultivate millets. Along with one nodal CHC, three cluster based sub centers have been established in

Bisoi block, which provide benefits to around 1200 farmers. Facilitating Agency Gram Swaraj conducted capacity building programme and training for SHG members who are engaged in CHC management under Odisha Millet Mission.

Annual business plans have been shared with them and handholding support has been given by the CRPs, which help CHC members to be visionary. There are some conflicts in rent fixation, but equipment wise, minimum price has been fixed through the CHC management committee which can support the poor farmers.

Target population: Targeted people are schedule caste, primitive tribes, and other small and marginal farmers belonging to Bisoi block.

Results: After establishment of CHC, farmers are availing farm implements for millet farming which are helping them adopt improved Package of Practices (PoP). The inclusion of a barter system instead of cash to rent equipment also helped in smooth recovery of rents. One beneficiary farmer of Kundra village of Luhakani GP, Bisoi said that *"Last year I saved my crop by providing irrigation through a diesel pump which is available in CHC in crucial periods"*. Similarly, another farmer from Babaijada village of Asana GP, Bisoi said *"I availed weeder, sprayer and water pump at minimum price at my doorstep last year which helped increase my production"*. After establishment of CHC, it has been observed that revenue generation has increased. Item-wise service charge for sprayer, pump, drum, cycle weeder etc. are different. In one season, one CHC makes an average profit of Rs. 5500.

Potential for upscaling and replicability: In the remote villages of Odisha, availability of cash is a prominent problem. Hence replacing that with the barter system in CHCs is a good option and is viable in all the locations. The model is replicable in tribal/rainfed areas where subsistence farming is practiced.

Millet Mainstreaming in India, Asian and African Countries-A Compendium of Inspiring Stories from Field.



Drivers of change: After knowing the benefits of farm implements, farmers are being motivated to cultivate more millet crops. Live field demonstration by CRPs, time to time field monitoring by FA staff, day to day database management by SHG key person with the support of CHC are the different mechanisms behind the success of this intervention. Local technicians also play a major role in this whole process. These implements not only support millet crops but are also helpful for other crops.

Dilemma and barriers: Some of the barriers faced are lack of farmer interest and trust, loss or breakdown of machinery, difficulty in paying rents in cash, and unavailability of local technician or local skill labor for operating machines. To tackle these barriers, during village meetings, volunteers were identified, and the facilitating agency trained them on how to operate and deal with machinery. Further, register maintained by the CHC management committee set terms and conditions for availing the farm implements on rental basis and anyone who would break the rule would be penalized.

Novelty and innovation of the solution:

Through this kind of intervention, SHG got a new livelihood support which empowers women socially as well as financially. Liquid cash availability is a big problem in remote Odisha villages. If farmers don't pay the rent of machinery on time, the system would fail. However, by innovatively integrating the traditional barter system into the CHC system, farmers often feel comfortable to hire the equipment on a rent basis. This is commonly practiced in remote villages for years. Under OMM, the barter system of the communities has been reinforced.

Contact details: Gram Swaraj, Near Budhikhamari Primary School, Bhanjpur, Baripada, Mayurbhanj, Odisha, PIN-757002.

Editor's note: *In Malkangiri district, Nari Shakti Panipariba Utpadanakari Mahila Smabaya Samiti Ltd. is also promoting CHCs with unique angle of barter as payment mechanism under OMM.*



Institution: Saraswati Mahila Mandal (SHG), Badsialinai Jashipur

Summary: A group of women SHG members is successfully generating income by managing a millet primary processing unit. The Saraswati Mahila Mandal, a women SHG Group consisting of ten members, is engaged in operating and managing a pulverizing unit for local farmers. These women provide a service of processing locally grown millets and other cereals into flour at a cost of Rs. 5/kg.

Pitch: The group was formed in the year 2001 with 12 women members belonging to the *Bathudi* community. The group was initiated purposefully for thrift and credit programs, which are still functional and running smoothly. The strong understanding between the SHG members, sense of ownership and leadership amongst the group made a strong foundation for the group's success. *Bathudi* communities are also traditionally organic farmers and saviors of ecology. Hence, when the Millet Mission reached them through CREFTDA in 2018, they were the first community to respond to it. They started cultivating and consuming millets.

Problem analysis: Traditionally, millets were processed manually by women in the tribal areas using wooden/stone grinders. Women in the small millet farming household in general spend about three to four hours to process 5-8 kg of grains of millets. This process involves considerable drudgery and physical efforts. This was one of the major reasons that in course of time led to decline in consumption of millets. Keeping this in mind, Millets Mission facilitated decentralized mechanized processing of millets.

Solution: Members of Saraswati Mahila Mandal applied to CDPO, Jashipur to provide the support to the business opportunity of mechanized processing of small millets. Once the application was received by the CDPO a joint field visit and verification was done by CDAO-cum-PD, ATMA, Representative of OMM, DSWO, Electrical Engineer, NESCO, Representative of OLM and Representative of FA for need

Strengthening Livelihood of Women SHG Members through Establishment of Finger Millet Processing Units

Location: Mayurbhanj, Odisha, India





assessment and feasibility of the enterprise. The team unanimously approved the proposal and disbursed the machine to the group in April, 2021. The WSHG consists of 10 members, who are engaged in operating and managing the pulverizing unit.

Target population: The targeted population belongs to schedule tribes and primitive tribes residing in remote locations. The intervention brought about positive changes mainly among the small and marginal women farmers. The intervention benefitted 200 farmers.

Results: The most important factor for the success of the intervention has been the support of the local tribal communities and their adaptability to modern technologies. The group is managing the unit and it has started earning an additional income for them. All members of the group are trained to operate the machine and they do it in rotations as decided by them. The unit earns for them in two ways. Firstly, they get flouring charges of Rs 5 per kg from every farmer including members. Secondly, after processing, the members for their own millet flour get additional Rs 20 per kg. In addition, the unit conducts flouring of other cereals which also generates income. On an average, the group processing charge of millets is Rs. 3000, charge for cereals is Rs. 7650 and labor expense is Rs. 3250. So, the net income of the group is Rs. 7700. Hence, altogether this processing unit generates substantial income for the group and its members.

Potential for upscaling and replicability: This unit is currently involved in the processing and marketing of ragi flour. It has also been involved in supplying ragi flour to Millet Tiffin Centre/Kiosk and has a tie-up with Jashipur for supply of grain and flour to Millets on Wheels. In the future, it is planned to establish 5 more WSHG managed pulverizer units in Jashipur block. Through this, 50 WSHG members will get support in enhancing their income.

Drivers of change: The group members appreciate the support provided by Facilitating

Agency, Millet Mission and Mission Shakti for establishment of the enterprise which were key drivers and hope for replication of such units in nearby areas.

Dilemma and barriers: The unit was first of its kind in the area. Majority of the women were not convinced that traditional crops like millets could be processed and sold at a good market price. Initially, they were skeptical, but the support of Odisha Millets Mission in participatory training, and capacity building of the SHG members resulted in development of a feasible business plan.

Novelty and innovation of the solution: Proper market linkage with high volume of

business will support the sustainability of their business. Ensuring supply chain management of raw material is also important. The solution is novel because it is fostering revival of additional practices of millet consumption and cultivation as well. It has also helped them learn and feel proud of their culture and tradition. The most important factor for the success of the intervention has been the support of the local tribal communities and their adaptability to modern technologies. It is not only inspiring and empowering the women communities but also those who are engaged in supporting or facilitating such solutions.

Contact details: Saraswati Mahila Mandal (SHG), Badsialinai Jashipur, Mayurbhanj, Odisha.



Millet Processing Factory as a Livelihood Option for Nuapada Millet Grower

Location: Nuapada, Odisha, India



Institution: Maa Sunadei Farmers' Producer Company Limited, Odisha Millet Mission, CDAO, Nuapada, Western Odisha Development Council and District Administration, Nuapada

Summary: A processing unit that establishes the example of value chain addition and enterprise generation, benefitting the FPC.

Pitch: Majority of people in Nuapada depend upon agriculture for their livelihood with OMM farmers majorly cultivating millets. However, it had been witnessed that the tribal population from Sunabeda plateau had shown less interest in millet cultivation because of uncertain reasons. To revive millet cultivation among the tribal families, the families have taken the role to set up the factory in the district. After establishment of the Processing Unit, farmers were interested to cultivate more millets like little millets which could be sold at a higher price than before.

Problem analysis: Nuapada is a major grower of minor millets cultivation in the district. Minor millets are grown in 7000 hectares in Nuapada District, out of which 3500 ha is under ragi, 3200 ha is under little millet and the rest 300 ha is under sorghum, kodo, foxtail, etc. There is an assured procurement process and MSP support for ragi but not for other millets. Lack of processing facilities is also considered to be one of the major reasons for the declining popularity of these grains among the growers, as the major load of processing falls on women. Approximately, 15,000 quintals of little millets are produced every year and sold at a very low price i.e., at Rs.15–20 per kg., whereas dehulled little millets are sold at Rs.100–130 per kg.

Solution: There is marketing and procurement support for ragi, but not for little millets, thereby, leading to distress selling by farmers. As little millets have been an underutilized crop, CDAO, Odisha Millet Mission, WODC, FPO and District Administration established a minor millet processing unit at Siletpani in Komna Block with a total project cost of Rs. 110.31 Lakh. The unit processes millets for commercial

and household consumption. Per kg charge is collected by the FPC from households for processing services like threshing, cleaning, grading, destoning and grinding. Under OMM, different events, food festivals and pilots are conducted, hence, an active demand for millets exists for sale to customers and preparation of different recipes. Processed grains are also required to fulfil the demand for millet-based kiosks and similar initiatives. OMM facilitates linkages with different partner organizations and service providers for this purpose.

Target population: The target population includes millet growing farmers of Nuapada district. The unit targets members of FPOs from all the five blocks of Nuapada who are going to form an apex company and own the project. The project will lead to little millets being cultivated in 600 ha. of land with machines being run for 8-10 months in a year.

Results: The Nuapada millets factory can run for 8-10 hours per day with a capacity to produce 40-50 quintals per day of little millet rice, 1200-1500 quintals per month and approximately 15,000 quintals per year. There is a possibility of price recovery to the tune of Rs. 15 crores every year out of little millets if dehulling is done properly ensuring aleuronic retention. The Nuapada millets factory is supplying little millets rice to two Blocks of Koraput and Malkangiri district to distribute little millet rice in Take Home Ration (THR) for Anganwadi children, pregnant and lactating women of the mentioned district for pilot projects undertaken by Odisha Millets Mission.

Potential for upscaling and replicability: This millet processing unit is an example for other districts growing minor millets to replicate the same model. The Nuapada millets factory can supply the little millet rice to the entire state and neighboring states if proper marketing is established. There is a scope for extended supply chain pan India.

Drivers of change: Scientific orientation, adoption of improved Packages of Practices



(PoP) and marketing support are the major drivers. Other drivers include value addition and processing, individual household consumption, putting little millets in the Public Distribution System (PDS), Massive Awareness and Publicity, Govt. Policy, etc.

Dilemma and barriers: During implementation, challenges like erratic and irregular rainfall pattern and long gestation period, is causing farmers to not adopt little millets. Improved Packages of Practices (PoP) like line transplanting or line sowing are not adopted fully, farmers only occasionally use organic manures, unscientific methods of harvesting, etc. The budget provision under Odisha Millet Mission is very less to set up a high-capacity processing unit. But after the support of the District Administration, WODC, the processing unit establishment has been successful.

Novelty and innovation of the solution: The Nuapada millets factory is supplying little millet rice to two Blocks of Koraput and Malkangiri district. They are distributing little millet rice in Take Home Ration (THR) for Anganwadi children, pregnant women and lactating women of the mentioned districts. The factory has the capacity to supply little millet rice to all districts of the State and can supply to the State Government under Public Distribution System (PDS) and Integrated Child Development Centre (ICDS). The technologies used for primary processing of little millets is unique wherein abrasion of millet grains is devoid, so that shelf-life of processed grains is increased.

Contact details: Maa Sunadei Farmers Producer Company Limited, Nuapada, Odisha



Institution: National Rainfed Area Authority (NRAA) and FAO India

Summary: Household level millet mixer developed through participatory machinery development approach to reduce drudgery of little millet dehulling in remote locations.

Pitch: Nuapada is one of the tribal hinterlands of Odisha. It is also one of the districts with high prevalence of malnutrition and is prone to droughts. Little millet is one of the traditional millet crops which used to be grown abundantly in the region. Due to market constraints, poor yield and high level of drudgery involved in processing, little millet cultivation has witnessed a significant decline. Development of technological solutions is serving remote locations not just in Nuapada, but also other little millet growing areas of Odisha. These solutions lower drudgery, are functional on single phase electricity, and are easy to use.

Problem analysis: Little millet is one of the key rainfed crops grown by tribal in the uplands of Nuapada. The shorter duration variety of 65 to 75 days is traditionally grown in Nuapada. It is widely considered as a cash crop, in addition to being a part of the traditional food basket. However, due to the high level of drudgery associated with dehulling of little millet combined with lack of options and proliferation of rice through PDS, there has been a marked reduction in the consumption of little millet. Using the traditional method of manual little millet dehulling, it took 4-5 hours of labor to dehull 1 kg of rice. In remote areas, setting up processing units is difficult where only single-phase connection is available. An attempt to find a localized solution for this initiative was explored as a part of the NRAA-FAO project initiative which was taken up in convergence with OMM.

Solution: During the inception meeting for the FAO-NRAA Project on “Landscape-based Integrated Rainfed Agriculture Systems for Dehuller Field Demonstration with WSHG Members Improved Income and Nutritional

Little Millet Dehuller Field Demonstration with WSHG Members

Location: Nuapada, Odisha, India





Security Through Convergence”, the issue of laborious little millet dehusking and associated fall in consumption was identified. In this regard, on a pilot basis, OMM developed a minor millet dehusking mixer which can dehusk 300 gm of little millet in 30 seconds. Including the cool down time for the machine, about 4 kg of little millet could be processed in an hour. Around 16 kg of dried and cleaned little millet procured from the FAO-NRAA project village was tested using the millet dehusking mixer for parameters such as broken grain, unhulled grain and successfully dehusked grain. Three Mission Shakti SHGs undertaking the bio-manure and sub-CHC enterprises in Samersingh and Silva GPs of Komna block were identified for the field demonstration, keeping up with OMM guidelines. 3 SHGs were identified in consultation with the OLM MBK. The approach is to have a package of activities to increase the viability of the enterprises, and in turn their sustainability beyond the project. Three recipe trainings for SHG members were conducted in Bhurukadhoda, Patperpali and Chhindpani. The demonstration of the millet mixer dehuskers was carried out.

Target population: Target population is the little millet growing households in the 4 blocks of Nuapada. This will specifically focus on the tribal households, women, and children. In addition, wherever possible, nutrition rehabilitation centres under the Government of Odisha shall also be targeted for the intervention as anaemia is one of the major nutrition related issues in the district.

Results: Intervention was made on a pilot basis. Results of the intervention have been very effective. Little millet dehusking, which would earlier be very taxing and would take 30 mins to one hour of physical labor, can be done within 10-15 mins without any physical exertion. This can be done with the use of single-phase electricity and without any huge infrastructure requirement. Dehusked grains were of good quality and households showed a lot of interest in consumption of little millet. This is a cost-

effective solution which has potential to revive the little millet consumption.

Potential for upscaling and replicability: The little millet mixer is a very cost-effective solution. Total cost of the mixer does not exceed Rs 5,000. It can provide enough dehulling services for 10 households in one hour. It also operates on single phase and can be handled by anyone. This eliminates the need for large scale units which needs space, investment and 3 phase power connection.

It is a low-cost solution which can be easily replicated through Odisha Millets Mission and other schemes. In addition, given the low cost of the intervention, each village or WSHG can also explore purchasing the mixer without Government subsidy. As OMM is also supporting market linkages through local kiosks, they can also earn money by supplying small quantities of dehulled millets to kiosks. This makes it an easily replicable and scalable technological intervention in all the little millet growing regions.

Drivers of change: FAO-OMM joint initiative focused on adoption of Free and Prior Informed Consent (FPIC) approach to the project execution. In this approach, consultation with the community and active consent is sought. Solutions are developed with active participation from all sections of the villages. In addition, community cadre and WSHGs of Mission Shakti Dept., community resource persons of Odisha Millets Mission, District and block level agriculture officials played a very active role in deliberations.

In addition, dehulled little millet could also be supplied to local millet kiosks for usage in different preparations. Such an active participation ensured that the solution developed was suitable to needs and is accepted by the community.

Dilemma and barriers: The millet mixer dehuller had to go through several iterations of design changes in order to make it efficient and user friendly. Trials were conducted in different geographies for different little millets. The feedback received during field trials and demonstrations were incorporated into the design.

Novelty and innovation of the solution: Instead of developing machinery from scratch, a technology currently available at a mass scale was modified to develop this technology. This not only kept the technology low-cost, but it already had well-developed features for ease of usability.

Contact details: FAO, UN House 55 Lodi Estate, Max Muller Marg, New Delhi, India and National Rainfed Area Authority (NRAA), Ministry of Agriculture and Farmers Welfare, Government of India. 3rd Floor, Directorate of Extension Krishi Vistar Bhawan, Dev Prakash Shastri Marg PUSA, New Delhi - 110012, Phone No.011-25842836. Email-nraapc2007@gmail.com

Editor's note: *Vikash Jyoti Farmers Producer Company Ltd. (FPO) from Khandamal district with the support of FA Shanti Maitree has similarly utilized thresher provided by OMM for ragi processing. The thresher saves time, labour and protects ragi from unwanted particles, thus, obtaining grains of FAQ standard.*

WSHG Collective Farming of Finger Millet

Location: Komana, Nuapada, Odisha, India



Institution: Maa Saraswati WSHG associated with FAO India and National Rainfed Area Authority (NRAA)

Summary: The WSHG Maa Saraswati of Bhurkadhoda village, Komna block, Nuapada, took 2 acres of land on lease for collective farming of ragi. They earned Rs 35,000 through the sale of seed to Komna block's Maa Sundei FPO and received Rs 5,000 as incentive from OMM for improved practices.

Pitch: The FAO-NRAA Project in convergence with OMM was implemented in 3 villages which were predominantly rainfed and without pre-existing OMM intervention. During the project period, it was observed that selected villages experienced frequent dry spells and were rain shadow areas. Despite this, majority of the cultivated land was under paddy (55%).

Millets only accounted for 13 Ha (1%) of the cultivated area. Leasing of underutilized uplands by labor-groups, WSHGs, JIGs, FPOs and other farmer-groups could be supported. Through convergence with OMM and other such programmes, the farmer groups could be provided with high-quality seeds in a timely manner, trained as per improved PoP, given access to critical irrigation infrastructure, and remunerative market linkages.

Problem analysis: Nuapada is one of the tribal hinterlands of Odisha. It is also a drought prone district with high prevalence of malnutrition. The FAO-NRAA project in convergence with OMM was to be implemented in 3 predominantly rainfed villages without pre-existing OMM intervention. It was observed that not only did the selected villages experience frequent dry spells but were also rain shadow areas. It was also observed that while some of the uplands were converted to midlands for paddy cultivation, some of the upland remained relatively underutilized and not very productive. For instance, ragi, horsegram, little millet (*gurji*) and kodo were grown in the uplands of these villages. However, minimal inputs and labor were put into these crops. During the production cycle, other crops such

as paddy, cotton and maize took precedence and there was a shortage of labor to tend to the upland crops.

Solution: A series of village meetings were held to explore solutions for the labor shortage and gauge the potential for establishing labour groups for ensuring PoP in various rainfed crops. During these discussions, the WSHG Maa Saraswati, Komna block, Nuapada, showed interest in taking up ragi cultivation collectively on 2 acres of land taken on lease. They followed the recommended PoP, such as nursery preparation, line transplantation, weeding and application of bio-manures and pest repellents. However, due to long dry spells and no access to irrigation, weeding and application of bio-inputs could be done only once. The 2 acres yielded around 12.5 quintals of ragi. While the SHG initially planned to sell the produce at the mandi collection point in Bhurkadhoda village, they sold 10 quintals of seed for Rs 35,000 to Komna block's Maa Sunadei FPO. The SHG also received Rs 5,000 as an incentive from OMM for improved practices. The remaining produce was distributed among members for household consumption. The remnant stalk of the ragi crop left on the land was consumed by small and large grazing ruminants during the rabi months.

Target population: The target population was the motivated members of women SHGs, Common Interest Groups and other farmer groups. Distribution of agricultural labor among group members allows for timely adherence to improved practices, which further leads to higher productivity and higher return on investment.

Results: Their field was one of the best performing ones in the project area. Collector & DM, Nuapada, visited the field and commended the SHG for their initiative. The CDAO also paid multiple visits to the field. The SHG made Rs 40,000 in total which was divided among their 10 members. Seeing this, two other SHGs in the village also showed interest in taking up collective farming in the coming seasons.



Potential for upscaling and replicability:

Farmer groups can take up collective farming provided they are ensured fair leasing costs, as well as access to good quality and timely inputs and market linkages. With such institutional support, it will be possible to scale up this model of collective farming.

Drivers of change: FAO-NRAA convergence project focused on adoption of Free and Prior Informed Consent (FPIC) approach to the project execution. In this approach, consultation with the community and active consent is sought. Solutions are developed with active participation from all sections of the villages. In addition, community cadre and WSHGs of Mission Shakti Department, community resource persons of Odisha Millets Mission, District and block level agriculture officials played a very active role in deliberations.

Dilemma and barriers: Inadequate involvement of all SHG members, for example, members from two families took on much of the work involved, while the other members were not as active. However, when it came to splitting the earnings, all members made their claims. Hence, the distribution of labor and profits were not even, discouraging the members who did most of the work. Moving forward, forming Common

Interest Groups (CIG) of active members may be a better idea. The CIG could be nested within SHGs or FPOs. The second issue faced by the SHG was that in the subsequent season of Kharif 2021, the lease amount for the same land was substantially hiked. Ensuring access to reasonably priced land is something that may be taken up by the Government.

Novelty and innovation of solution Collective farming through WSHGs is not a new concept, but the idea of engaging WSHGs through free and prior informed consent and taking up collective farming supporting crop diversification in uplands is novel. Also, this involved adoption of new production technology by women farmers, such as weeder, was never practiced before in case of millet crops. Quality of produce was good enough to be bought as seed which speaks about diligence in following up with the PoPs.

Contact details: FAO, UN House 55 Lodi Estate, Max Muller Marg, New Delhi, India and National Rainfed Area Authority (NRAA), Ministry of Agriculture and Farmers Welfare, Government of India. 3rd Floor, Directorate of Extension Krishi Vistar Bhawan, Dev Prakash Shastri Marg PUSA, New Delhi- 110012, Phone No: 011-25842836. Email-nraapc2007@gmail. com

Institution: Joint Endeavour for Emancipation Training and Action for Women (JEETA)

Summary: Identifying farmer's preferred varieties of ragi for a micro agro ecological zone through Participatory Varietal Trial (PVT) – the first step for crop production.

Pitch: Landraces are populations of plants that have been cultivated for many generations in a certain region, being shaped by biotic and abiotic stresses, crop management, seed handling, and eating preferences. However, the yields of these landraces are very low and are given least attention by researchers and academicians. Therefore, in Angul district, ragi disappeared 30 years ago. Odisha Millets Mission in partnership with District Mineral Funds (DMF) revived ragi cultivation in the district and introduced ragi varieties from other districts.

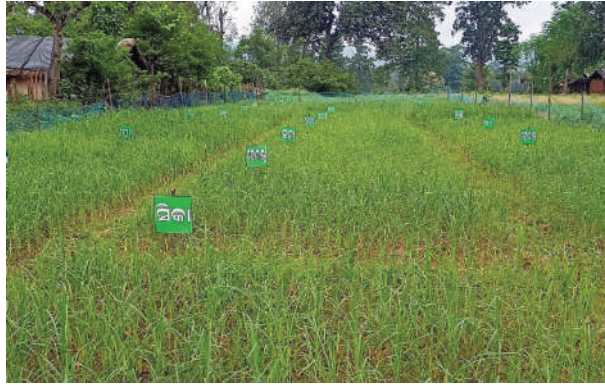
Problem analysis: Very few landraces of ragi were available in the district. OMM supported 20 ragi landraces for PVT. The major challenge was that the new generation or middle aged farming communities were not interested in cultivating millet as they did not perceive millets to be a high value crop. Therefore, OMM sensitized them about the importance of millets and its resilience towards climate change. OMM has worked with the farming communities to design the Participatory Varietal Trial (PVT) in their field.

Solution: In each block, planning meetings were conducted with farmers for the availability of local ragi-varieties, selection of plot, farmers, source of irrigation, layout and designing. The PVT trial was designed in Randomized Block Design (RBD) in three replications with Government recommended varieties as check. The minimum plot size per variety per replication was 25 sq. m. Distance between replication to replication was kept 100 cm and variety to variety in the replication was kept at 60 cm. Around 21 to 25 days' seedlings were uprooted and planted in rows of 20 x 10 cm. The plots were treated with 5-7 quintals dried Farmyard Manure (FYM) as basal dose and ploughed thoroughly. Equal

Participatory Varietal Trials – First Step Towards Improved Finger Millet Production

Location: Pallahara, Angul, Odisha, India





amount of Jeevamrutha was applied to each plot after first weeding (15 DAT) and after 30 and 45 DAT. Water was ensured during late vegetative, flowering period and milky stage. In each crop growth stage, farmers were involved and exposed to trial plots to understand the process. Farmers of different age groups and gender were invited from different villages for field visits. The block level agriculture staff was also invited. On the field day, a meeting was conducted near the trial plot to explain the purpose of the trial and process of farmer and scientist selection.

Target population: The target groups were small and consisted of marginal farming communities having cultivation experience and traditional knowledge. With their traditional agronomy backgrounds, farmers identified and selected their preferred ragi varieties from the trial during field day exercise which was conducted during physiological maturity stage. Simultaneously, the researcher also randomly collected sample plants for recording as per modern agronomic data in accordance with the All India Research Coordinated Project.

Both the data were compiled, and best varieties selected helped in finalizing the next step for seed production of selected varieties.

Results: OMM conducted PVT not only in 5 blocks in Angul district but also in 79 other blocks of 14 districts from 2018 to 2022. Around 86% of farmer selected varieties were traditional and 14% were Government notified varieties. Few of the traditional varieties were higher yielding than Government notified varieties. All the varieties were monitored both at vegetative and productive stages for adaptability to climate change. Selection of best varieties from the blocks was followed by quality seed production in the second year. 10 out of 15 districts selected seed production of traditional varieties going forward. Following seed production, a mass selection process was followed which is one of the breeding processes for new varieties. In the Pallalahada block, ten traditional varieties and one HYV were taken for

PVT in farmer's fields. After both the selection process, Karkati and Taya varieties were finally taken for seed production in 2022-23. Presently, 2.5 acres are cultivated under quality seed production in farmer's fields.

Potential for up scaling and replicability: The PVT can be conducted with other field crops like rice, maize, pulses, and oil seeds as well. The experience of OMM is now replicated in the Integrated Farming System project implemented by the Department of Agriculture, Government of Odisha. The PVT model of OMM has reached other states like Jharkhand, Chhattisgarh etc. for identification of farmer's preferred varieties. The selection process is easily understood not only by farming communities but also any agriculture worker. The seeds of selected varieties giving better yield for the micro agro-ecological areas and remaining varieties are kept in Crop Diversity Blocks (CDB) for future conservation.

Drivers of change: Farmers play a major role in these PVT, because they preserve and conserve these valuable germplasm of millets at their personal cost. The plant passport information of these varieties will enable them to register these varieties as farmers' varieties under the Protection of Plant Varieties and Farmers' Rights Act, 2001. The selected varieties help farmers grow on a large scale for better yield and marketing. The local Community Based Enterprisers will go for further multiplication with seed farmers to sell as truthful label seeds in the market. The organic input in the trial reduces cost of cultivation and enhances soil fertility. Involvement of Department of Agriculture, workers from grassroots and farmers during the trial creates a strong linkage for accessibility to other Government inputs. The agronomic data collected through AICRP is acceptable to research organizations for its legitimacy.

Dilemma and barriers: The key challenge was caring of the plot during nursery, tillering, flowering, and harvesting. Early nursery sown plants reduce the impact of disease and pest

infestation and climate variation. Long dry spells due to climate change is one of the major risk factors. OMM has introduced a critical irrigation component to reduce the risk. Designing the layout is also a challenge for the trials. The RBD must be properly done in the field for giving justice to equal subplot of each replication for each variety. Farmers' saved seeds collected from farming communities have more heterogeneity, therefore, monitoring of these varieties during physiological stages is most needed.

Labelling and other required materials for PVT trial should be arranged timely. Timely data collection and organizing field days are a major logistic challenge because of the unavailability of different age and gender groups.

Novelty and innovation of solution:

Conventional breeding failed to make a significant impact in vast farming areas characterized by diversity in soil, weather, crops, local farmers' needs, and farming practices. It still takes a long time (about 15 years) to develop and release a

new variety in developing countries. Farmers adopt only a few of the officially released varieties.

In spite of the above issues, the conventional approach remains as the main pathway for public and private-research organizations at national, regional and global levels. Participatory approach helps in integrating farmers' expertise, their indigenous technical knowledge, ecology and growing environment of the local varieties synergistically with appropriate scientific skill and knowledge.

Participatory approach need not be considered as an alternative method to the conventional approach of crop improvement. Both could complement each other to reach the benefits of scientific and indigenous knowledge to the farmers of diverse farming situations in the shortest possible period.

Contact details: Joint Endeavour for Emancipation Training & Action of women (JEETA), At/Po-Pallahara, Dist-Angul. Email: jeetadeogarh94@gmail.com

Institution: Jyoti SHG, Mahesdihi supported by Odisha Millets Mission and Mission Shakti

Summary: Millets are highly nutritious in nature. However, production alone does not ensure attainment of nutritional security.

The millets produced need to be cleaned and processed for consumption. Linking this opportunity with Women Self Help Groups helps attain nutritional security and financial empowerment.

Pitch: Millets are highly nutritious in nature. The millets produced need to be cleaned and processed for consumption. Millets, being small grains, have foreign materials like sand, husk, dust, etc. and are not suitable for direct human consumption. Jyoti SHG, Mahesdihi has set up a cleaning unit in 2020. The unit cleans ragi for the ICDS Ragi Ladoo Programme implemented in Sundergarh district. The process will help the public get cleaned millets for trying new millet recipes and getting habituated to millet consumption, ultimately leading to nutritional security and financial stability of WSHGs.

Problem analysis: Improper cleaning of millets leads to public disinterest in millet consumption. The inclusion of millets in ICDS for preschool children has made it imperative to supply cleaned ragi for consumption. The quantity of ragi to be supplied under this programme on an average was 150 quintals per month. Cleaning this quantity of ragi manually is difficult. This creates a problem for not only the targeted beneficiaries (preschool children) but also the general public. Hence, consumption of highly nutritious millets has reduced in the district.

Solution: Establishment of a mechanized cleaning unit becomes necessary. Linking this opportunity with Women Self Help Groups solves the problems of nutritional security and financial improvement. Keeping this in mind, a WSHG was selected by Mission Shakti in collaboration with Odisha Millets Mission to establish a cleaning unit in the district.

Establishment of Cleaning Unit for Ragi Processing

**Location: Sundergarh,
Odisha, India**





A 3 Deck Cleaner cum Grader with separate destoner with a capacity of 2-3 quintals per hour was provided to the WSHG. The WSHG now cleans ragi not only for Ragi Ladoo Programme but also extends its business for local FPOs, SHGs and farmers.

Target population: The target population of this intervention was initially the pre-school children. Cleaned ragi is supplied for an average of 63,000 pre-school children every month amounting to about 150 quintals of ragi. Gradually, even SHGs and FPOs started giving orders to the unit for cleaning of millets. The charges for cleaning ragi also were less compared to the manual labour required to clean. So, farmers cultivating millets are now easily able to clean their ragi. Given that the machinery provided is not engaged to its full potential, there is a scope for expansion of the business to various millet-based companies.

Results: This initiative helps in supplying cleaned ragi for the ICDS Ragi Ladoo Programme for pre-school children. The unit supplies ragi for about 63,000 children per month. Preparing new recipes became easy for the public as it is easier to get their millets cleaned. The initiative not only helps in improving consumption but also provides livelihood opportunities for WSHG members. The annual turnover of the WSHG is around Rs. 12 lakhs which has strengthened the SHG members financially. The members are now earning an average of Rs. 5000-Rs 7000 for a maximum of 15 days' work.

Potential for upscaling and replicability: Demand for millets is growing day by day as it is highly nutritious. To encourage consumption of millets, processing of these grains becomes necessary. The initiative is successful as the annual turnover and profit (Rs. 12 lakhs) exceeds the investment (Rs. 5 lakhs for machinery, Rs. 2.5 lakhs for 3 phase electricity and Rs. 1 lakh for storage and building) for establishment. The initiative not only provides financial stability to WSHG members but also drives improvement in consumption of millets. Provision of more such high-quality millets will help people shift



to millets more easily as there would not be any dearth in supply.

Drivers of change: The key drivers of change include (1) Interest and motivation of the members, (2) Market linkages (WSHGs, FPOs, Individual Farmers) and (3) Linkage with Government programmes (e.g., ICDS Ragi Ladoo Programme).

Dilemma and barriers: Transportation and distance were a problem for the initiative as it limits the outreach to the local community only. This problem can be solved by establishing more cleaning units. Day to day machinery maintenance is a costly and time-consuming affair. The WSHG members managing the unit

need to be trained for day-to-day machine maintenance.

Novelty and innovation of solution: Millets being super foods have got the attention of the public for their nutritional value. However, most people show disinterest in consumption due to its lengthy process of processing and value addition. Establishment of a cleaning unit makes processing millets easier and caters to the interest of millets consumption. It also becomes a source of financial stability for women involved in this process.

Contact details: Jyoti SHG, Mahesdihi (Collaboration of Odisha Millets Mission and Mission Shakti)



Creating Sustainable Business for FPOs by Promoting Traditional Millet Recipes

Location: Sundergarh, Odisha, India



Institution: Janavikash FPC Ltd., Kutra and Centre for Integrated Rural and Tribal Development (CIRTD)

Summary: Janavikash FPO under OMM, is a part of both production and value addition process. The FPO bagged the opportunity of serving a customizable menu to the customers using the most preferred variety of millets.

They even prepare packaged items like ragi powder, murukku, and rose cake.

Pitch: Janvikash FPO prepares food like hot cooked meals and dry snacks. The food van serves delicious hot cooked meals at the most affordable cost. They also provide millet grains in direct packages which can be processed and consumed, thereby driving a habit change as well. BOD members involved with FPO are mainly producers of millets. They understand the local demand and market of diversified locations.

Problem analysis: Consuming millet-based products provides better nutritional supplement. However, many people due to busy work schedules prefer not to cook and end up eating unhealthy food. Also, many individuals and students wanting to have millets cannot avail millet-based products due to unavailability in nearby areas. Even in restaurants, the items sold are very costly. Millet based packed or powdered products are not trusted by many customers due to possibility of adulteration, hence farmers are also impacted because of less demand for millets. During any event or occasion, procuring hot cooked items from any hotel is a problem.

Solution: Janvikash FPO took the opportunity to establish a food van which can provide different food items at multiple locations. The van can serve breakfast and lunches at marketplaces and near offices respectively. Evening stalls can be installed near any college where students can have millet-based food items like chicken pakora or noodles with tea. Also, dinner can be made accessible in the nearby residential

grains directly to the consumers maintaining the demand and supply gaps of millets without failure. Unprocessed grains have a larger market base in comparison to powdered products. The FPO could also provide local varieties of millet seeds during the season when it is in demand. As a FPO which works with farmers, they could customize the products based on different farmer needs who belong to diversified areas in the block.

Target population: The food served in these vans by the FPO has been curated to cater all age groups and categories of people including office goers, students, or families on an outing. The products are based on seasonality and availability, therefore guaranteeing the freshness of the product. As the van is moving, it does not differentiate the customer line and any person in the vicinity can afford it. It promises quality food to those who are not able to afford it at expensive restaurants.

Results: An increase in recipe development and acceptability of millet-based products has been observed because of the initiative. Local people are aware about the benefits of millets and the variety of millets. The major catering area of Janvikash FPC is in rural areas. Being portable, they are getting orders for festivals and marriages from many customers. A mini and decorated food van is eye-catching for everyone. Majority of group members are BOD/ farmers who collectively decide according to the benefits of farmers and low-income groups. The outreach has been done in the entire Kutra block. Even during the Urban Internship Campaign in Rourkela, they catered at several locations. The major indicator of its success is affordable pricing, product range and being mobile and hence being able to cater to a larger population.

Potential for upscaling and replicability: Instead of having a fixed or permanent location, mobility helps in increased acceptance of traditional and new millet recipes. This factor is



increasing the potential of such an initiative to be replicated in other blocks. Major advantage is that the FPO does not need to have a permanent vendor. They can change the food type as per the demand of the customer. A food van requires lower investments, working capital, equipment and resources in comparison to restaurants or tiffin centers, making it a profitable business in a short period. Besides, it can explore markets based on the local produce grown by farmers according to season and can sell the same.

Drivers of change: As the entity is controlled by farmers, they have better access to raw material, sourcing, transportation etc., and there is very limited wastage of raw material. Mobility allows the van to be in different premium locations helping the FPO sell products according to the market demand, develop better customer relations and gain confidence. Being managed by local farmers, they have better knowledge about customers, and they can take care of cultural constraints of the particular location. These are some of the elements which help the FPO in running the business smoothly.

Dilemma and barriers: Acceptance of new recipes in the market is a major risk. Identification and research strategies to find a

suitable location is a tedious job and requires time, hence, one needs to be ready for profit and loss. Making food items pocket friendly is challenging as it takes time to become profitable. Market and customer behavior is often unpredictable for acceptance of millets. Apart from the customer and taste of the product, the van requires regular maintenance for which mechanics are not readily available. Moreover, people of various skill sets are required for such an initiative.

Novelty and innovation of solution: Attractive food van in a rural area is an eye-catching and new concept. Such farmer owned businesses develop their entrepreneurial skills and benefit the farmers in the long run. The farmers can train and become a model for various other FPOs. The solution is also unique as it continuously focuses on both millets' recipe development and customer preferences. This gives a scope of growth to the farmers to understand and realize the value of their own produce. The concept of farm to plates completes a circle in this practice.

Contact details: Centre for Integrated Rural and Tribal Development (CIRTD), Opposite Government College Post Office, Rangadhipa, Sundargarh, Odisha

Institution: 38 SHGs working as THR unit, Dibyajyoti SHG (Café of Sundargarh) and local FPO

Summary: Introduction and acceptance of a particular product in a new rural market is a challenging process for every stakeholder. To achieve the objectives, products are processed, taste is improved as per preference, and the product is packed in safe and attractive packaging.

Pitch: Packaging and branding of products and its associated costs vary according to the product being sold. Problems associated with acceptance of products are also very different.

The packaging and branding are taken care of according to the product. Brand labelling is done for Take Home Ration (THR) units by 38 SHGs. Cookies and dry snacks packaging is done by Dibyajyoti SHG Café of Sundargarh and grain packaging is done by FPO. However, establishing a larger business can help improve the packaging and branding of such products. Hence, the local FPO has stepped up and taken the responsibility for packing the products.

Problem analysis: The problem lies in product awareness and its health information. Small scale businesses in rural areas use newspapers for wrapping food items and polythene bags for packing liquids. No animal products are used for packaging. Such kind of packaging can be used for a short duration and the products are meant for immediate consumption.

Solution: THR units' products like ragi laddoo mix are packed in good quality plastic packets. The sealing is done in a small sealing machine or manually. The entire process is carried out manually with the help of a weighing machine to maintain the quantity prescribed per ragi laddoo mix. The quantity is mentioned on the packet. A recipe manual and usage direction are also mentioned on the sticker. For packing of dry snacks like cookies and ragi biscuits, clear plastic boxes with zipper locks are used. The containers are made airtight so cookies can

Packaging and Branding by Small Scale Millet Enterprise

Location: Sundergarh, Odisha, India





last longer and can be consumed even after 20 days. However, support is required to improve the method of packaging. Unprocessed millet grain is high in demand. FPOs are involved in catering this product segment. For this purpose, transparent food grade quality polythene is used. FPO details, food license mark and quantity are mentioned on the packets for branding and building trust. Packaging is done with the aim to create awareness among customers, build recognition of products, support categorization of products and make the packaging durable.

Target population: Target population of products of THR units are mostly between the ages of 3 to 6 years. However, the products can be consumed by all age groups. Attractive packaging is being used for innovative products like ragi cookies, sorghum flour, bajra cookies, ragi sev, mixture and cakes. For grain packaging, clear transparent polythene is used so that the product is visible. These products cater to the general public.

Results: Consideration has been given on brand awareness and seller recognition based on location of business and scalability of business. For example, the millet shakti café is based in an urban area. Their millet-based products have successfully merged in the market and there has been a favourable demand for the product. Although to not hamper the cost and affordability of the product, expensive packaging technology is yet not utilized by any of the stakeholders. The basic, reasonable and attractive packaging technique has been successfully able to win trust of customers within the target segment.

Potential for upscaling and replicability: Being locally affordable and cost effective for small scale enterprises, its scope of replicability is favourable. As it does not use advanced technology, this practice is scalable in the long run. However, the practice still has scope of development as millet and millet-based products are in a developing stage. If there is a provision of adding health and nutritional benefits on the millet-based product, a class

of informed customers shall be created. Word of mouth can play a major role in making the products scalable.

Drivers of change: Simple technology, affordable cost, transparent product visibility, product preparation description, information about involvement of Government and necessary department and the shelf life of the product are the key drivers of change.

Dilemma and barriers: The key barriers are trust in the product as well as people's perception. The business is not readily recognized and is competing with other products. The people are also not usually aware about the millet products. Packaging was a critical issue; when done locally, people didn't find the products attractive, and when it was done properly,

people perceived the product as too expensive to buy.

Novelty and innovation of solution: The scalability to cater to larger segments of population using a cost-effective method has been a unique approach. Product description to a limited extent has been helpful to create curiosity amongst customers and they are willing to experiment on new products in similar categories. The value addition has impacted the lives of customers by adding a nutritional product in their list. The entrepreneurs are earning by making the products cost-effective.

Contact details: Dibyajyoti SHG (Café of Sundargarh), Bisra block and local FPO, Sundargarh, Odisha

Gender Sensitive Farm Mechanization – A Success Story of Mrs. Binodini Barwa of Radha Krishna SHG

Location: Sundergarh, Odisha, India



Institution: Radha Krishna Self Help Group

Summary: A SHG member from Kuarmunda block overcame the barrier of technological divide when she decided to step up and bridge the gap between women and machines. Not only did she empower herself, but her group also drew inspiration from her.

Pitch: A SHG from Kuarmunda, Radha Krishna SHG has members who are mostly uneducated. They had never seen a Thresher machine before, and when they were provided with one, they immediately wanted to return the machine and were reluctant to operate it. At that time Mrs. Binodini Barwa, who was the President, stepped up and went to Nuagaon block to learn how to operate the thresher machine. After coming back from Nuagaon block she gave training to SHG with support from Odisha Millets Mission block staff. OMM Staff also gave quarterly refresher training to Radha Krishna SHG.

Problem analysis: *Kalosiheria* is a tribal village under Kalosiheria GP of Kuarmunda block situated 9 km from the block headquarters. It has 188 households (HHs), of which 90% are tribal people who are dependent on agriculture (paddy and ragi) and livestock for their income. Farming is completely done manually, with no machinery used or available nearby due to the remoteness of the place. The initial introduction of farm machinery was met with reluctance from the SHG as it was treated as an alien concept. Therefore, it was not acceptable to them to utilise it regularly. They did not show any confidence to learn in the first attempt.

Solution: The president Mrs. Binodini Barwa of Radha Krishna SHG, showed her exceptional confidence and stepped up to try and learn about the machinery and its functionality. OMM arranged a separate training in Nuagaon block where it was already operational. After her training, she gained confidence to operate the machine and began to convince her team members. OMM team helped her in providing training to the other members of the SHG. As a

practice, OMM block staff started to train Radha Krishna SHG on a quarterly basis so that they could operate the machinery easily and were self-dependent.

Target population: The target group were the 188 HHs of Kalosihiria village, which constitute 90% tribal population mostly dependent on agriculture (paddy and ragi) and livestock as their major source of income. Radha Krishna SHG members became one group in the block to adopt the machinery for post-harvest activity.

Results: In 2020, when Radha Krishna SHG received thresher from OMM they started cleaning ragi in the thresher which saved farmers' time. In the 2021 Kharif season, Radha Krishna SHG cleaned 60 quintals of ragi and earned around Rs. 21000/-in 20 days. In 2022 Kharif season, Radha Krishna SHG targeted 120 quintals including a nearby village with 955 HHs.

Potential for upscaling and replicability: This case story is a good example of how individuals can inspire, motivate, and build capacities of groups to adopt changing technology with the help of ground agencies. Regular follow ups also help in building the confidence of the members. The women associated with the group have gained sufficient confidence to take over larger machinery and new assignments as well. Such training and snowball effect learning can trickle down to other areas easily.

Drivers of change: Mrs. Binodini Barwa acted as a driver of change not only for herself but also for the group. OMM supported the process and could find ways to anchor this change. The provision of machinery for making the work easy and more refined, as well as a chance to learn and explore new things are the key factors that helped empower these women.

Dilemma and barriers: Not having experience in machinery, their reluctance, ignorance and hesitation to use new things as well as remoteness contributed to the task being difficult to accomplish. The surety for everyone to show the same courage and enthusiasm as Binodini is difficult.

Novelty and innovation of solution: This practice came with a manifold effect. It not only opened the doors to explore new spheres of work and overcome the hesitation and doubt on their own capacity but also increased the profit of the group. It sets up a good example that showcases that the gap between women and technology is gradually reducing.

Contact details: Radha Krishna Self Help Group, Kalosihiria Gram Panchayat, Sundergarh, Odisha



Promotion of Millet Based Recipes by Tribal Woman

Location: Balangir, Odisha, India



Institution: Youth Council for Development Alternative (YCDA)

Summary: Padmabati Bariha, a tribal woman from Odisha's Balangir district is promoting millet-based recipes in Odisha's Balangir district.

Pitch: Padmabati Bariha is a tribal woman hailing from Dhandamunda village in Khaprakhol block of Balangir district. She is 41 years old and lives with her husband and two children. She has been associated with the SHG federation at GP level. Apart from her household work, she works with local women of SHGs. With the support of Odisha Millets Mission (OMM), she has been helping local SHG members learn different millet-based recipes and earn income from selling the same to customers. She has been also instrumental in organizing food festivals and promotion of traditional cuisine and crops like millets in rural areas.

Problem: Women in tribal areas of Balangir mostly engage in agriculture work and supplement their household income through collection and selling minor forest produce at the local weekly market. With the support of local NGOs, and OMM, women in the district like Padmabati have been able to set benchmarks. She is not only able to instill confidence among local women SHGs to prepare a range of millet-based recipes, but also enable them to earn more through selling millet food items. After being able to supplement their household income from millets-based food items, these women are now more confident and actively taking part in major decision making at their household and community level.

Solution: To create awareness on increasing household level millet consumption, YCDA had organized a two-day training session on millet recipe preparation in September 2019. 10 identified SHG members were trained as millet recipe masters and Padmabati Bariha was amongst them. After the training, Padmabati trained 9 more SHG members, facilitated awareness campaigns, food festivals and participated in the Block level *Krushik*

Sampark Mela at Khaprakhhol and District level Lok Mahotsav at Balangir. During these programmes, she and her colleagues prepared, sold, and served several types of millet recipes to the people and also sensitized them about the benefits of millets consumption.

Target population: Target groups under the initiative are women belonging to marginalized groups such as scheduled tribes, other backward caste communities and often single women. They are working in collectives such as SHGs and leading millet-based small-scale food enterprises to supplement their household income. This also helps them enhance their social dignity and instils a sense of self-confidence to deal with multiple stakeholders at community, block, and district level.

Results: After the training, Padmabati came to know about the millet recipes like Mandia Bada, Pakoda, Laddu, Jalebi, Malpua and Gurji Khir, Khechudi etc. She has facilitated events as a resource person for which she receives payment from the project. She also got selected as SHG leader and has become popular as a millet recipe master. She constantly receives party orders for supplying Mandia Jalebi, Malpua and Laddu. For the last 3 months, she has earned income of Rs. 4400 as a resource person and Rs. 12000/-from 4 party orders.

Potential for upscaling and replicability: Padmabati says that earlier she was only a housewife, and nobody knew her, but due to the mandia recipes, she has been recognized at block level. Her work has been appreciated and she has been felicitated at the Kansa Darbar, Khaprakhhol by the Kansa Maharaj.

As a result, BDO Khaprakhhol assured her to provide a stall for millet food selling which is her dream.

Drivers of change: Training programmes on millet-based recipes to local women SHGs played a key role in mobilizing women to adopt millet-based small-scale food enterprises. This has enabled them to augment their



household income and has empowered them to invest more on their health and childrens' education. Learning from WSHGs-to-WSHG members through exposure visits and training programmes also helped local NGOs to effectively disseminate vital information among the WSHG members. This has ensured smooth functioning of their business and has helped them make more profit.

Dilemma and barriers: Lack of financial support often poses as a major barrier for the local WSHGs to venture into business enterprises. Also, lack of training and capacity building programmes often limits their ability to operate and manage income generating models. However, with OMM assistance in the form of interactive and practical training sessions on millet recipe preparation, enterprise setup, and management, these women SHGs are

now paving the way for other women in their communities.

Novelty and innovation of solution:

Involving women resource persons in recipe training programmes and promoting model entrepreneurs like Padmabati and other local WSHGs-led enterprises has boosted confidence among the women members in the rural area. Earlier, they used to consider millets as traditional food only, but now OMM has given them a new platform to harness rich dividends from nutritious millet food enterprises. They are showing keen interest to set up and expand their millet enterprises in the locality.

Contact details: Youth Council for Development Alternative, Rajendrapara, Near Dampara, PO-Palaceline, Balangir, Dist-Balangir -767001, Odisha, India, Tel: 06652-230231

Institution: Youth Council for Development Alternative NGO in collaboration with OMM

Summary: The traditional pearl millet is helping tribal farmers in Balangir district of Odisha increase income and food security.

Pitch: Arjun Prasad Gupta is a small farmer hailing from Malpada village in Khaprakhol block of Balangir district. He lives in the village with his family members and his main source of income is farming. Arjun has 3 acres of land, out of which he cultivates paddy in 1 acre and cotton in 2 acres. Besides farming, he does not have any other alternative income sources. However, due to erratic rainfall and prolonged dry spells, farmers like Arjun incurred crop damages several times. Local NGO YCDA in collaboration with Odisha Millets Mission (OMM) introduced pearl millet in rural villages. Millets are highly climate resilient and can withstand water scarcity conditions. Arjun was the first farmer in his village to grow pearl millet after receiving training and seed support under the OMM programme.

Problem analysis: Arjun was cultivating cotton for the last 10 years in the same field. Earlier, cotton was profitable, but since the last 2 to 3 years with increasing cost of cultivation and low productivity, the crop has been failing. Erratic rainfall also affected the crop productivity and reduced yield of cotton. Arjun was not able to earn enough to take care of his family. To tackle such challenges, OMM in collaboration with the district agriculture department, local NGOs and technical experts, introduced a millet revival programme. This has improved farmer's climate resilience, food security, and their household income.

Solution: With the support of OMM, in 2021-22, the millet promotion program extended to the village Malpada, and Arjun was encouraged to cultivate pearl millet. He cultivated pearl millet in 2 acres of land, replacing cotton. Technical guidance and seed support was provided to him. He also attended training Crop that Increased Income and Food Security among Tribal

Pearl Millet: A Crop that Increased Income and Food Security among Tribal Farmers

Location: Balangir, Odisha, India





program on improved agronomic practices. The program technical team made multiple visits to monitor the crop. Arjun followed the SoP for the pearl millet cultivation. He ensured proper seed treatment with *Beejamarut* and applied *Handi Khata* twice during weeding. A farmer field day was conducted at Arjun's pearl millet crop stand where more than 50 farmers participated and saw a field demonstration of pearl millet.

Target population: Small-scale farmers received training and capacity building programmes on improved agronomic, seed treatment and organic way of soil enrichment methods to boost their production and yield.

Results: Arjun harvested 14 quintals of pearl millet grain which was worth Rs 31500. The cost of cultivation was Rs. 12,000, and he earned a net profit of Rs. 19500. Arjun kept 4 quintals of grain for his own consumption and seed purpose, and the rest of the grain was sold in the market. He also got Rs 2000 from the agriculture department as an incentive.

Potential for upscaling and replicability: After seeing the success of Arjun, many farmers in the area have adopted pearl millet farming in the district. Pearl millet needs less inputs, and is less labour-intensive unlike cotton, leading to farmers increasing their cropping area under pearl millet. Gradually, pearl millet is emerging as a high value crop, which can also withstand climate change, less rainfall among small-scale farmers in the area. This initiative is easy to replicate.

Drivers of change: Arjun and his family members are happy that they are growing a crop which they can consume daily throughout the year and get more income than the previous crop. Arjun has been recognized as a progressive farmer in the area and many farmers come to him to know about the crop. During the crop period, many visitors also came and appreciated his effort. In the coming year, he has planned to upscale the pearl millet cultivation and mobilize other farmers.

Dilemma and barriers: Since market price for traditional crops like pearl millet is low, farmers often show reluctance to grow it in their farm. OMM, in collaboration with the local NGOs, and progressive farmers like Arjun have been mobilizing farmers and sensitizing them about the multiple benefits of millet cultivation, reflecting its climate resilient qualities, rich nutrition content and longer storage quality.

Novelty and innovation of solution: Result demonstration and on-field training for farmers has been one of the key factors that has

ensured quality outcomes under the initiatives. Encouraging progressive farmers like Arjun also motivated and convinced other farmers in the area to adopt cultivation of pearl and other millets in their farms. This has resulted in better yield, improved household income, and ensured intake of nutritious millet-based food at the household level

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Sample Household Survey for Preparing Prevailing Benchmark Price for Little Millet and Foxtail Millet for Justifying MSP

Location: Kalahandi, Gajapati, Odisha, India



Institution: Odisha University of Agriculture and Technology

Summary: Among the millets, ragi has been covered under Minimum Support Price (MSP) programme by the Government of India. However, for minor millets (little millet and foxtail millet), there has been no MSP declaration.

Pitch: For estimation of benchmark price of little millet, the survey was conducted in 6 major districts of Odisha, viz. Koraput, Nuapada, Gajapati, Rayagada, Kandhamal and Kalahandi. The area is selected based on the implementation of the Odisha Millet Mission (OMM) in the district during the initial phases of its inception in 2017. From the survey it was found out that by adapting better agronomic practices from OMM, the yield of millets has increased in the last two years. Even though they have surplus production of minor millets, there was no MSP for them, and hence were sold to local traders at a lower price.

Problem analysis: Little millet and foxtail millet are majorly cultivated in Nuapada, Kalahandi, Koraput, Kandhamal, Gajapati, Rayagada districts of Odisha in solo, inter-and mixed-cropping system. The tribal farming communities have been cultivating millets since their forefathers for their own consumption and selling purpose. Due to its lower yield in the traditional practice, the marketable surplus is less. These two millets are highly nutritious, rich in fiber and micro-nutrients and are very much suitable for rainfed and dry land agriculture in the era of changing climate. They are resistant to disease and pests and require very few inputs. But there is no MSP declared for these two millets neither by the Centre nor by the State. There is a need to justify study to decide the MSP at state level which should be done by State Agriculture Universities or research organizations.

Solution: The demand from farmers, CDAOs, Academicians, FPOs, SHGs came for procurement of little millet and foxtail millet surplus. Series of discussions were held with the

Department of Agriculture & Food Production, WASSAN, OUAT, SSTL, OSSC, TDCCOL and other allied departments. The responsibility was given to OUAT to work with WASSAN for an immediate survey in potential little millet and foxtail millet districts with an objective to provide the provisional estimate of benchmark price as well as cost of cultivation and cost of production of little millet and foxtail millet of sample farmers based on survey of past two years of selected tribal districts of Odisha. For Koraput, Nuapada, Gajapati, Rayagada and Kalahandi districts, little millet was selected, whereas for and Gajapati, Rayagada, Kandhamal and Kalahandi districts, foxtail millet was selected. A group of B.Sc. students were trained on OMM activities in those districts and their field-visit for the study was organized. The OUAT has developed a standard survey format on cost of cultivation and cost of production. WASSAN has provided a list of farmers cultivating little millet and foxtail millet during 2020-21 and 2021-22. Out of the list, 100 farmers were randomly selected for interview from 10 GPs of 5 blocks of 5 districts in case of little millet and 80 farmers from 8 GPs of 4 blocks for foxtail millet.

Target population: The target groups are small and marginal farming communities. The line sowing of little millet and foxtail millet, application of adequate FYM, timely application of liquid manure like Jeevamrutha and Handi Khata, thinning & gap filling, and weeding at 15-days interval increased the productivity of the millets from 3 to 5 qtl/ha to 8 to 10 qtl/ha. OMM has trained women-SHG to prepare different-types of value-added-products like kangu kheer, suan upma to enhance household income. Providing a thresher and multi-grain mini-flour mill saves time and drudgery. The benchmark price will help SHGs/ FPOs sell their produce to Government Mandis with MSP price which is 20-25% more than the local price.

Results: Based on the two years' data collected from the 100 and 80 respondents during the survey, the prevailing benchmark price was proposed to be Rs. 4282/qtl for little millet and Rs.



4161/qtl. for foxtail millet, which is 20-25% more than local price. It will reduce the middleman intervention and engage FPOs for aggregating marketing. After submission of the report by OUAT, the Agriculture Commission Committee will decide the MSP for both little millet and foxtail millet for the state. In 2020, similar activities were conducted by the Chhattisgarh Government to fix the MSP for Kodo millet for tribal areas of Chhattisgarh. Once the MSP will be fixed by the state Government, there will be an increase in area under little millet and foxtail millet cultivation, employment generation in the agriculture sector and availability of raw materials for value added products.

Potential for upscaling and replicability: The benchmark survey will solve the problems of marketing for non-MSP commodities for small and marginal farmers. The area under cultivation for minor millets is expected to expand to other districts of Odisha past the declaration of MSP by the state. The raw materials will be easily available to the food industry to prepare the value-added products. Involvement of FPOs in the aggregating marketing process will increase their marketing ability and bargaining power. Accurate costing allows more informed agronomic and financial decisions to be made. This in turn helps businesses overcome challenges posed by changes in commodity prices and input costs, Government policy, tighter regulations, or shifting pest and disease threats.

Drivers of change: The rainfed areas, soil types and different types of land categories are major factors behind cultivation of the crop. These two millets are cultivated mainly by tribal farming communities where women are taking the major role from sowing to harvesting and post harvesting. So, more women farmers will be benefited for this benchmark price. B. Sc. (Ag) graduates were involved and guided by the OUAT professors for collection of information,

data compilation and report. The respondents properly understood the purpose of the study and answered, so that the data has a high accuracy level. Data on cost of inputs, household-labour, hired-labour, bullock-labour etc. is crucial for getting the benchmark price.

Dilemma and barriers: The benchmark survey should be carried out every year to determine the MSP for Kharif & Rabi considering the market fluctuation and cost of production.

The State Government should continue the study before the season starts, as MSP is generally announced by the Government at the beginning of the sowing season. Delay in the study will lead to delay in all processes. The factors like cost of production, changes in input prices, input-output price parity, demand and supply, inter-crop price parity, effect on cost of living, effect on general price level, effect on issue prices and implications for subsidy are to be considered for calculation of benchmark price of minor millets as these values change over time.

Novelty and innovation of solution: The Minimum Support Prices is a guaranteed price for their produce from the Government. The major objectives are to support the farmers from distress sales and procure food grains for public distribution. In case the market price for the commodity falls below the announced minimum price due to bumper production and glut in the market, Government agencies purchase the entire quantity offered by the farmers at the announced minimum price. Similarly, the State Government's decision on MSP for little millet and foxtail millet is a wise decision to help the tribal farming communities get fair prices at their doorstep.

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Institution: Saveri Setu Farmers Producer Organisation

Summary: To promote farmers' organizations in agriculture value chain development, FPOs supported under the Odisha Millets Mission (OMM) are empaneled as procurement agencies for ragi procurement in addition to or instead of LAMPSC and PACS in selected blocks of the programme areas under OMM.

Pitch: The Saveri Setu FPO provided a range of services to farmers by spreading village-level awareness campaigns, registering millet growing farmers on MPAS online portal and hosting Ragi Procurement Centre (mandis). The entire procurement operation was decentralized from earlier one or two societies in a block to multiple points in a cluster of GPs this year. Ragi aggregation points were set up at the village/GP, where farmers brought their ragi to be tested for FAQ and get it packed. The TDCCOL checks quality, lifts the produce and initiates payment to farmers directly from decentralized mandi points, thereby reducing overall transaction costs for farmers.

Problem analysis: The main problems were less farmer registration and low procurement in non-programme areas. This initiative was taken to increase the outreach of the ragi procurement initiative of Government of Odisha to the doorstep of the farmers. The empaneling of FPO as a procurement agency helped bridge the gap between the village and procurement point and motivated the FPC to reach the doorstep of the farmers. The community resource persons of the FPC have been instrumental in facilitating the registration of farmers and after surplus generation.

Solution: It solves the problem of registration of farmers which in turn increases farmers' coverage and the procurement of finger millets at the village level. More farmers have been registered under this initiative. It helped create awareness on ragi and hosted the procurement centers in the vicinity of potential Farmers Producer Organization as a Procurement

Farmers Producer Organization as a Procurement Agency under Odisha Millets Mission

Location: Malkangiri, Odisha, India





Agency under production areas. The produce was packed in the aggregation center itself which helped in early transport of the ragi to the TDCCOL godown. In the Kharif Marketing Season 2021-2022, the FPC has procured 9323.47 qtl. in Mathili block of the Malkangiri district.

Target population: The target groups are the millet farmers who have been engaged in the cultivation of finger millets for a long time. Village wise farmers were identified, and Community Resource Person facilitated the process of farmers' registration for the ragi procurement. They have registered the farmers' Panchayat wise and submitted the forms to the FPC office. FPC digitized the form, and it helped generate the surplus for the farmers which in turn helped the farmers sell at the ragi procurement centres and get the amount through Direct Benefit Transfer (DBT) mode within 7 days of the procurement.

Results: Millets provide food and nutritional security at household level. It enhances household income by disposing the surplus to the market distributors/wholesalers/retailers in nearby markets. In the past, the farmers were not able to get the right price for their produce in the local market and there was a lot of exploitation by the private traders. However, owing to the intervention by the Government towards promoting and strengthening the FPOs, Saveri Setu Producer Company is offering a range of services to the farmers, leading to growth in ragi procurement and enhancement of farmer income.

Potential for upscaling and replicability: Millets have enormous marketing potential; also, they offer tremendous scope for commercial scale cultivation in tribal areas in Odisha. Millet is a perennial product and is used extensively in many food preparations. Millet also has more nutritional value and is used in many households. The exports of these products have also increased manifold in recent times. In view of the increasing application of these products in the various food and allied

industries in the country and abroad, there is a good scope for large scale millet cultivation and market linkages through various entrepreneurs.

Drivers of change: The CRP engaged under the FPC have been the driving force behind the implementation of this initiative. They have basically identified the village wise farmers, collected the documents, filled up the application forms for the farmers and submitted the forms at the FPC office. They have also played a key role in awareness raising of this initiative at the village level. After surplus generation, they informed the farmers regarding the same and it helped them bring the exact quantity of ragi to the procurement center and enabled them to get the price within 7 days of selling the ragi at the procurement centers. A positive thought by the Odisha Government of focusing on promoting and strengthening the FPOs which aims to follow a low risk-low reward strategy than a high risk-high reward one is also a driver of change.

Dilemma and barriers: Lack of recognition of women as farmers, access to credit, know-how

to maximize productivity in small patches of land, critical irrigation facilities in drought prone areas, long dry spells, remote project locations, no collective bargaining power and distress sale and exploitations by middlemen due to lack of knowledge about market are some of the key barriers in the system.

Novelty and innovation of solution: This is the first intervention by a State Government where millets are being procured through FPO. The Saveri Setu FPO has welcomed this development and hopes to get space in other Government operations as well where FPO can provide a better quality of service for the Government and the end user-be it farmers or consumers. Based on the outcomes of the intervention, it is expected that a similar procurement model can be implemented in other crops to increase the basket of Government procurement at MSP. This will provide an assured price guarantee on main food crops to a farmer while also reducing the cost incurred to sell the produce.

Contact details: Saveri Setu Farmers Producer Organisation, Mathili Block, Malkangiri, Odisha

Community-Managed Seed Centres (CMSCs) Improving Yield with Resilient Seeds

Location: Rayagada, Odisha, India



Institution: Maa Tarini SHG, Rayagada Farmers Producer Organization, Kalyansingpur and NIRMAN organization.

Summary: In 2020, a community-based seed center called 'Maa Sitalama SHG Seed Centre' was established in Budaguda village with the support of OMM and NIRMAN. The center stores and conserves different varieties of indigenous seeds and provides them to farmers during Kharif and Rabi seasons, helping improve millet cultivation.

Pitch: FA staff interacted with farmers on various improved agronomic practices like System of Millet Intensification (SMI), Line Transplanting (LT), Line Sowing (LS), seed purification, conservation, and seed multiplication to increase millet productivity. However, farmers were initially not following these practices, so multiple trainings and awareness campaigns were conducted to emphasize the importance of quality seeds and these practices. Seed conservation training programs were also conducted to teach farmers how to collect and store indigenous seeds.

Problem: The key problem was that farmers were not using improved agronomic practices, such as SMI, LT, and LS to enhance production and productivity. Additionally, managing the seed centre was challenging, from identifying and treating the seed to connecting with a large number of farmers to sell the seeds.

Solution: To solve these issues, the management team collaborated with Rayagada Farmers' Producer Company Ltd. to produce a particular variety of seeds in the farmers' fields, which were graded, treated, and packaged before being stored in the seed centre. FPO started promoting the use of indigenous seeds for millet cultivation, and in 2022, collected 27 quintals of seed from ten farmers from various villages of Kalyansinghpur block. SHG members helped grade and treat the seeds in the seed centre, and FPO sold 24.5 quintals of seed to local farmers at affordable prices for better millet practices in the blocks.

Target population: In the last Kharif season, 500 small and marginal farmers received indigenous seeds from the Seed Management Centre and benefitted from the program. The farmers involved in seed production sold their ragi seeds to the FPO at Rs. 36,000 per quintal. The Seed Management SHG members were also benefitted by supporting the FPO in seed center management.

Results: The Seed Management Centre provided 24.5 quintals of treated indigenous seed to 500 small and marginal farmers. The FPO earned a profit of Rs. 3,300/-through the seed business. Ten seed production farmers also benefitted from the FPO by selling their seeds at Rs. 36,000 per quintal. Other local farmers are visiting and learning about seed conservation and understanding the process of proper seed storage from the Seed Management Centre.

Potential for upscaling and replicability: Unavailability of quality seeds at the appropriate time during the cropping season is a common concern in all regions. The CMSC is one solution to address this issue. As per the unique feature of OMM, the choice of seed and crop is decided and managed by the farmer and community itself. Such seed centers need to be expanded to help all farmers access good quality seeds. The Rayagada Farmer Producer Organization plans to collaborate with women SHG members to expand the CMSC across the blocks where millets are being promoted and connect to every farmer household through a Direct-to-Customer business model.

Drivers of change: The Seed Centre's management by the local FPO/WSHG/ farmers convinced farmers to procure seeds from the CMSC. The cluster-level approach played a crucial role in reaching out to the maximum number of small and marginal farmers. The barter system was a key weapon for successfully implementing the program. As farmers do not possess money during the cropping season, it was agreed to give equivalent produce in terms of grains after production.



Dilemma and barriers: The key barriers faced by the CMSC were difficulty in grading, safely storing and preserving the seeds. Collection and implementing proper practices in seed production fields were also a challenge. In the initial stage, it was difficult to motivate farmers to adopt and cultivate ragi from the seeds produced in the seed production fields. Lack of knowledge about proper conservation, management, and safe storage led to farmers mixing seeds and giving ungraded seeds to seed centers. After multiple trainings, awareness campaigns, and demonstrations, the CMSC managed to conserve proper seeds for the seed center.

Novelty and innovation of solution: The seed centre is managed by ten women SHG members of Budaguda village associated with Rayagada Farmer Producer Company Ltd. and Nirman Organization. The seed centre not only provides quality seeds but also helps the farmers in the development of agronomic

organic millet practices through the participation of all farmers. Through the FPO collaboration, farmers can easily purchase treated seeds at reasonable prices and sell their seed produce. The FPO is also successfully running a seed business and earning profits, which is divided between all shareholders annually.

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Editor's note: *Different CBOs, FA, FPOs, SHGs, and NGOs are promoting CMSCs across Odisha under OMM.*

In Keonjhar district – (1) Dasery Producer Company Limited (DPCL) (Community Based Organization) and Saunta Gaunta Foundation (SGF) (FA)

In Raygada district – (1) Siridi SAI SHG in association with Prabhat Organization and the Gudari Farmers Producer Organization.

Institution: Agriculture Department,
Government of Uttarakhand

Summary: In Uttarakhand, farmers in hilly regions primarily grow local crops like finger millet, barnyard millet, and Amaranthus. The organic production and certification of these millets is being done under various Centrally Sponsored Schemes, including the RKVY-Organic Programme covering 70,240 hectares, Paramparagat Krishi Vikas Yojana (PKVY) covering 1657 clusters (33,140 hectares), and Namami Gange Programme in 620 clusters (12,400 hectares).

Pitch: Millets are primarily grown in the hilly regions of Uttarakhand, which are naturally organic. These crops are highly nutritious and have medicinal values, requiring less water and inputs, and are better suited for water-stressed and drought-prone conditions. The Central Government has declared traditional crops like finger millet, barnyard millet, amaranthus, and buckwheat as nutri-cereals due to their nutritional and medicinal value. However, earlier, there was no organic certification or documentation for these crops, forcing farmers to sell their produce as normal crops. With organic certification, farmers can sell their produce at higher prices, making organic certification a potential source of income for farmers in the hilly regions.

Problem Analysis: Previously, the average selling price was 40-50% lower than the Minimum Support Price, making it difficult for farmers to make ends meet. The lack of collection centres and processing facilities caused delays in procurement and supply, affecting the quality of the produce. Additionally, farmers were unaware of the value-added by-products of millets, which are in great demand.

Solution: After Government intervention through various schemes, such as RKVY-Organic, PKVY, and Namami Gange, cluster-based organic farming has led to bulk production of these millets. Farmers can now sell their produce as organic produce at a 20-30% premium. The State

Organic Production and Certification of Local Millets in Uttarakhand

Location: Uttarakhand, India





Agriculture University GBPUA&T, Pantnagar, and Central Research Institute Vivekanand Parvatiya Krishi Anusandhan Sansthaan (VPKAS) have developed improved resistant varieties of millets for the Himalayan and North-Eastern states. These improved varieties have been introduced under various schemes, benefitting farmers. The Government also provides organic inputs like manure, bio-fertilizers, and bio-pesticides to facilitate organic farming. Private entrepreneurs, under different Government-sponsored schemes, have started making value-added products from millets, such as biscuits, cakes, namkeens, and momos. These value-added products have been well received within and outside the state. In recent years, the cultivation of millets has increased as better market prices are being offered to farmers.

Target population: The target audience includes small and marginal farmers. As part of the PKVY and Namami Gange Programs, groups of 40 to 50 farmers with a combined land area of 20 ha. have been formed to register under the PGS portal for Organic Certification. Similarly, under the RKVY program, a group consisting of 50-500 ha. of land has been formed to register under NPOP Organic Certification (third party). The Agriculture Department and Uttarakhand Organic Commodity Board (UOCB) have made several efforts to facilitate forward linkage activities, such as buyer-seller meets, website advertising, promotion activities, and development activities to generate interest amongst wholesalers in the millet supply chain. These projects are being implemented according to the duration sanctioned by the Govt. of India.

Results: The certification of organic farming practices under RKVY–Organic, PKVY, and Namami Gange schemes, along with capacity building of farmers, has brought about significant changes. Linking farmers with organic buyers, mandi, and cooperatives for the marketing of their produce has helped them secure better prices. Efforts are underway to provide farmers with premium prices for their organic products and to train them in the value

addition of their produce. Presently, organic production and certification of millets cover a total of about 1.16 lakh ha. of land. Farmers are receiving a premium price of 20-25% for organic millets compared to the market rate. To facilitate the marketing of organic products, 430 organic outlets are being developed at main tourist places such as Char Dham yatra route, railway station, airport, main religious places, and markets.

Potential for upscaling and replicability: Organic millet production, especially finger millet, has a lot of potential as it is being traditionally practiced organically. Therefore, there is a great opportunity for scaling up and replicating this success in other regions.

Drivers of change: The key drivers of change are the organic certification of products, the availability of improved traditional millet varieties, and organic inputs, and local entrepreneurship development for producing millet products.

Dilemma and barriers: The average selling price was very low compared to the MSP, and the lack of collection centers made the procurement and supply process very challenging and time-consuming. The Uttarakhand Government, through the RKVY-Organic, PKVY, and Namami Gange Programs, promoted cluster-based organic farming, resulting in bulk production of millets, which helped farmers fetch premium prices for their millet produce.

Novelty and innovation of solution: The certification of organic millets cultivated in hilly regions is helping farmers improve their incomes and strengthen the millet value chain.

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Apna Bakery Manufacturing Ragi Based Bakery Goods

Location: Dangs, Gujarat, India



Institution: Aga Khan Rural Support Programme India (AKRSPI) and Ridhi Sidhi Self-Help Group (SHG)

Summary: Apna Bakery is a millet-based enterprise operated by tribal women in Dangs, Gujarat. The bakery produces and sells healthy delicacies made of finger millet, which is a first-of-its-kind business in Gujarat. The bakery is owned by the Ridhi Sidhi Self Help Group (SHG) and supported by Aga Khan Rural Support Programme India (AKRSPI). The enterprise has played a significant role in developing various millet-based baked products, promoting millet processing among local tribal communities and tourists, and creating a successful business that can be adopted by other tribal women.

Pitch: Finger millet is a low-cost traditional crop grown extensively in Dangs, Gujarat. As the district did not have any millet processing unit, the demand for millet was low. Apna Bakery identified this as an opportunity and is now producing ragi-based delicacies like biscuits, chakri, shakarpara, toast, makhaniya, Nagli papad. With a simple problem-solving approach, it has created a three-pronged impact: income generation activities for tribal women, creation of a market for locally produced millets, and healthy snacking alternatives for the masses.

Problem: Apna Bakery is solving two problems. The first is the declining trend of millet consumption and production, and the second is the lack of employment for tribal women in Dangs, Gujarat. Almost 95% of the tribal population of Dangs is dependent on agriculture. The local community depends on rainfed agriculture and practices subsistence farming. Given the agro-climatic condition, millets are the most suited crop for the area; however, over the years, rice took over millet. Commercial promotion of rice and lack of processing to increase the shelf life or create value-added millet products amplified the problem. Juxtaposed with this problem is the condition of tribal women who had to resort to agricultural labor at low wages due to the lack of decent employment avenues. This impacts

their life both economically and socially. When viewed in conjunction, the problems expose the need for creating an income-generating opportunity where tribal women promote millet production.

Solution: Apna Bakery is using an entrepreneurial approach to solve the problem of low demand for millets while creating employment for tribal women in Dangs. The bakery works on a minimal and solution-oriented strategy. Ten enterprising tribal women, who have been part of a village Self Help Group in Nadagkhedi, with the support of AKRSPI, worked together to bake millet-based products. They source millet locally and process them using basic commercial baking machinery. These products are packaged and sold under the registered label of “Apna Bakery” in local markets as well as delivered to nearby towns, including Surat, Ahmedabad, Saputara, and Pune. The women have established a payment system wherein each woman is paid Rs. 200 per day, and any additional profit after payment is invested back into the business. This ensures that the business has running capital and is constantly saving to expand. This women-run business has established a value chain for millets, benefiting the local farmers. Additionally, it is also providing healthier snacking alternatives and motivating women to innovate and venture into self-employment.

Target population: The primary target group of the initiative is ten tribal women of the Self Help Group (SHG).

Results: The Apna Bakery has a monthly turnover of Rs. 2-2.5 lakh, which has helped the WSHG earn a regular income of Rs. 6000-8000 per month. The women have become confident entrepreneurs and developed their own unique identity as the “Bakery Sisters,” setting an example for others. They have learned to run a successful business, and the impact of their success is trickling down to the millet cultivators in the area who were struggling to sell their produce. The bakery serves as a market for locally produced millets,



and is driving a tiny agricultural revolution in the village. The women's hard work has been recognized by Y4D India Conclave, NRLM, and District Development Authority.

Potential for upscaling and replicability:

Currently, the unit has an annual turnover of Rs. 24-30 lakhs and provides an average monthly income of Rs. 6000-8000 to ten women. The Apna Bakery's functioning is based on a simple model of collaboration between community members with the support of a social welfare organization. The model finds its base in village-level institutions with an entrepreneurial approach, and the results of the model have been improving progressively. The bakery's growth in the past five years testifies to its potential to scale up and create large-scale impact. The basic strategy and business plan make this solution fit for replication with a range of target groups in any millet producing part of the world.

Drivers of change: Apna Bakery owes its success primarily to the unending spirit and exceptional coordination of the group of women running it. The women, known as the "Bakery Sisters," persevered in the face of challenges and created an innovative product line that generates income while creating a stable value chain for finger millets. Timely identification of opportunity and correct understanding of the market have been key to their progress. Apna Bakery constantly works on diversifying its products and experimenting with new marketing ideas to keep up with the dynamic times. Additionally, the handholding support provided by AKRSPI at various junctures, including establishment, training, packaging, and market linkages, has also been helpful.

Dilemmas and barriers: Started in 2017, Apna Bakery faced several challenges, such as the initial setup cost of around Rs. 7.5

lakhs, which was a big amount for the group, but AKRSPI supported them with the initial cost and setup the units. Some people also tried to scare them by quoting an inaccurate and very high setup cost for a commercial electricity connection. The group had to brave these pressures and persevere. Initially, as the group was experimenting with recipes and learning to operate the machinery, there were frequent episodes of spoilage, but trainings were organized by AKRSPI to streamline the production process. Being new to the business world, it was anticipated that it would be difficult for Apna Bakery to secure orders and fulfil them on time, but constant handholding support was given by AKRSPI. COVID-19 was tough for the bakery as they lost various orders, making it hard to sustain the unit.

Novelty and innovation of solution: Apna Bakery is currently the only business selling millet-based snacks in Dangs district. Its product line includes unique delicacies like nagli biscuits, nagli chakri, nagli shakarpara, nagli toast, nagi makhaniya, and nagli papad. By offering diverse range of baked goods made of wholesome nagli instead of unhealthy maida, the bakery is becoming the flag bearer of change in the eating habits of the community. It is also bringing the traditionally grown millet crop to the forefront. This women-led business is providing the crucial service of bridging the gap between the farmer and the market by sourcing its raw material locally, processing and packaging it into finished goods, and selling it in and around the district. Hence, it is creating a stable value chain that can benefit the farmers in the long run.

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Institution: Dhan Foundation

Summary: The Dhan Foundation developed innovative and gender-neutral machinery, and formed symbiotic partnerships to promote small millet processing technologies, reduce the drudgery of women, and improve nutritional security in India. By focusing on enabling environments, gender and inclusion, and stakeholder partnerships, the project aimed to scale up the processing of small millets and reverse the decline in their cultivation and consumption.

Pitch: The manual processing of small millet grains using inefficient machines led to drudgery and the gradual abandonment of small millet cultivation and consumption, risking the extinction of these important crops. Through a holistic approach that included innovative machinery, strategic partnerships, and grassroots involvement, the Dhan Foundation successfully promoted the consumption and cultivation of small millets, potentially reversing their decline.

Problem analysis: Inefficient primary processing machinery hindered the mainstreaming of small millets, with most machines provided in millet-growing areas being designed for processing paddy grains. These machines were not efficient in processing millets due to differences in size and shape, and there was also a mismatch between power requirements and availability. The younger generations' reluctance to engage in manual dehulling of small millets further compounded the problem, causing in-house consumption of small millets and area under small millet cultivation to shrink.

Solution: To address this issue, the Dhan Foundation developed custom-built, site-specific machines that were simple to use, highly efficient, and gender friendly. These included single-phase/solar/petrol-driven small millet hullers of various capacities, including India's first Tabletop Huller, as well as minor modifications to other primary processing machines. They collaborated with equipment manufacturers

Development of Site-Specific Machinery, Partnerships, and Grassroots Action to Mainstream Small Millets in India

Location: 20 states in India and Nepal



to fabricate these machines in large numbers and provided training and support to users. As a result, these machines became popular throughout the country, making the processing of small millets easier and promoting their cultivation and consumption.

Target population: The target groups positively affected are the tribal population, especially women in remote small millet-growing areas who previously had to endure hardship in manually processing small millet grains. The availability of better machines has made primary processing easy, and most marginalized families and the poor, who used to sell their entire harvest of small millets to intermediaries and traders, have started to save some for their own consumption. It has also opened up new opportunities for the sale of millet rice and other value-added products, which has helped increase family income and stopped migration for livelihood enhancement.

Results: The Dhan Foundation revived defunct small millet processing units in Tamil Nadu, Maharashtra, Madhya Pradesh, Uttarakhand, and Chhattisgarh and penetrated areas with no small millet processing units with site-specific machines in Arunachal Pradesh, Sikkim, Assam, Tripura, Bihar, and U.P. Small millet cultivation and processing on a pilot scale has started in non-small millet growing areas like Punjab with the help of Dhan Foundation's ecosystem. Agricultural Universities, IIMR, and many KVKs throughout the country have started promoting small millets in their respective regions with the help from the NGO's solutions. As an offshoot, some of their custom-built machines were purchased by existing millet processors to increase efficiency, have better quality outputs and reduce cost. The tabletop hullers have proved a boon to research scholars and institutes working on millets as no machine was previously available to dehull small quantities. Many first-generation millet entrepreneurs have come in the last few years, both in millet-growing areas as well as in many cities throughout the country with the help of this ecosystem.

They have given support to beneficiaries in seventy-eight districts of twenty states in India and Nepal, thereby increasing the processing capacity throughout the countries by 46,713 MTs per year.

Potential for upscaling and replicability:

The solution of creating decentralized primary processing units by learning about the unique problems of the particular site and making appropriate commercially viable machinery with after-sales services and strong handholding support to the beneficiaries during the installation and commercial run period has shown results. Creating an ecosystem of institutions, beneficiaries, grassroot workers, consultants, entrepreneurs, fabricators, extension workers, and marketing agencies to support from the concept stage to the implementation stage has helped in the success of this solution. This holistic solution has the potential for upscaling and replication in even small regions or states across countries. The only constraint is that it takes time and effort to create the ecosystem, sustain and nurture it, and any of the constituent players becoming idle or opting out can have a detrimental effect on the solution. Thus, creating and sustaining an ecosystem is key to upscaling and replicability of this solution.

Drivers of change: The various factors crucial for the success of this practice include institutional commitment, coordination, support, an able leadership that could sense a problem being resolved by working in a particular direction, innovators who custom-built site-specific commercially viable machinery, small-scale fabricators who did not compromise on quality, qualified and honest quality checking teams, after-sales installation and training support, good demonstrators and training staff, handholding support from ground staff and central team to the local processing units, incorporating suggestions from peers, scientists, and consultants working in the millet field, making changes to machines and processes based on actual practical results, proper selection of site

and suitable machinery, promotion of solutions through word of mouth by well-wishers and satisfied customers, promotion through institutions, web, and other internet tools and apps, and participation in exhibitions and fairs.

Dilemmas and barriers: The foundation faced a dilemma when funding agencies for small millet promotion stopped supporting them in 2018. However, institutional support and encouragement enabled them to continue following their desired path. Despite their efforts, no reputed manufacturers were willing to fabricate machines according to their specifications. Nevertheless, they overcame this obstacle by collaborating with small-scale fabricators who were committed to their strict quality control standards. Once they ensured the production of reliable machinery, the next significant challenge was marketing these machines. Initially, there was little enthusiasm for small millet machinery because many earlier machines failed to meet expectations. However, through word-of-mouth publicity by satisfied customers and live demonstrations at exhibitions and fairs, they eventually succeeded. Winning the National Siridhanya Award in 2019 for Best NGO also helped them promote their solutions.

Novelty and innovation of the solution:

Previous attempts to mainstream small millets had little success because they relied on one-size-fits-all solutions that were time-constrained and often resulted in inefficient and incompatible machinery. Moreover, there was little effort to install, run, or train locals on how to operate the machinery. The foundation realized that a complete ecosystem was needed to sustain the initiative until the locals became empowered. Their innovative approach was to develop decentralized primary processing units instead of large-scale ones, involving various players from institutions, innovators, and fabricators working with local staff and beneficiaries to design site-specific commercially viable machinery. Additionally, they provided capacity building for beneficiaries until they were able to operate the units independently. This solution marked a significant departure from previous attempts to promote small millets and proved successful in addressing the challenges faced by the community.

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Implementation of Community Seed Banks and Seed Exchange by North-East Slow Food and Agrobiodiversity Society (NESFAS)

Location: East Khasi Hills, West Jaintia Hills, Ri Bhoi, and West Garo Hills, Meghalaya, India



Institution: North-East Slow Food and Agrobiodiversity Society (NESFAS)

Summary: Community Seed Banks and Seed Exchange initiatives are being implemented by NESFAS to revitalize and rejuvenate production of *Digitaria sanguinalis* (commonly known as crabgrass, finger grass, and fonio), *Eleusine coracana* (commonly known as finger millet), *Setaria italica* (commonly known as foxtail millet), *Coix lacryma-jobi* (commonly known as job tears), and *Pennisetum glaucum* (commonly known as pearl millet) in Meghalaya by preserving agrobiodiversity and strengthening the local food system.

Pitch: NESFAS conducted a participatory mapping exercise with 32 communities in Meghalaya and Nagaland to document the agrobiodiversity present in both states. The survey revealed an average of 202 food plants recorded, including different species and varieties of millets. The participatory ranking exercise, which was part of the mapping, also revealed that while the millets documented were highly nutritious and climate-resilient, their cultivation had declined in the last few decades. NESFAS is working to revive its cultivation in areas where it is declining and strengthen it by increasing the diversity of varieties in areas where it is still under cultivation.

Problem analysis: Till a couple of decades ago, millet was an important staple crop for the Khasi indigenous community. However, due to the supply of cheap rice in the PDS (Public Distribution System), the importance of millet has declined, with other crops replacing it, such as potato, maize, etc. At the same time, the latest National Family Health Survey (NFHS-5) indicates that Meghalaya has continued to underperform in various parameters. The figures under stunting are most concerning, where the state figure of 46% is worse than the national average, and half or more of the children and adults are anaemic. Climate change is also adversely affecting the production of crops, especially potatoes, which had replaced millet in many areas. Reviving and

strengthening the cultivation of millet can play a big role in combating not only these symptoms of malnutrition but also add resilience to the local food system to help combat climate change.

Solution: NESFAS established Community Seed Banks (CSBs) in ten communities of East Khasi Hills, West Jaintia Hills, Ri Bhoi, and West Garo Hills. These are managed by a committee composed of knowledgeable farmers, most of whom are women. Selection of seeds for storage was based on three main criterias, viz., seeds that were on the verge of disappearing, seeds that had high resilience to climatic stress, and seeds that were important from the economic point of view. Millets were among the seeds selected. While finger millet and job tears were the main millet species selected for storing in the seed banks located in East Khasi Hills, West Jaintia Hills, and Ri Bhoi, foxtail millet was more important in West Garo Hills. Connected with the seed bank initiative, NESFAS also identified and supported more than 800 individual farmers who were keeping more than 15 seeds and designated them as seed keepers. In certain cases, when local seeds were not available for storage, especially millet, for e.g., *Digitaria sanguinalis* (commonly known as crabgrass, finger grass and fonio) seed exchange programs were held between communities. Participation in seed exchange programs outside the state was also used to get seeds of especially foxtail millet to the farmers of East Khasi Hills.

Target population: Women farmers, especially from low-income groups, are the main target for this solution. They are part of the Community Seed Bank Management Committee and benefit through the sale of seeds. While the individual seed banks are at different stages of their development, at least one in West Jaintia Hills has been able to build a strong network of buyers who regularly purchase seeds of different crops from them. In another case, female members of a CSB in Ri Bhoi have created a system of working together as a group for hire. This, along with the sale of seeds, has



greatly benefited them. Indirectly, women entrepreneurs in villages that have seed banks benefit by preparing local snacks and selling them. These are the benefits that the solution has brought to low-income women farmers.

Results: NESFAS started their initiatives on millet in 2010 from Nongtraw, a village in East Khasi Hills which had almost discontinued the practice. By starting seed exchanges between neighbouring communities and with some communities from Nagaland, the crop was revived. Subsequently, a millet network was formed which connected more than a dozen villages in East Khasi Hills and West Garo Hills district. In 2017, six communities with Mawkynrew Block, East Khasi Hills also joined together to revive millets. With the need to reach more villages and areas, since 2018, Community Seed Banks were established in 10 villages. In 2020 when the pandemic brought about a lot of restrictions, 8 more villages in Ri Bhoi decided to revive millets by sourcing seeds through seed exchange. Dewlieh, a village in East Khasi Hills also decided to do the same. Both the number of households and production of millet increased as a result. Since the establishment of the seed bank, they started playing a very important role in supplying seeds to households and communities that had lost millet. Just in the Khatarshnong Block of East Khasi Hills, 13 out of the 46 villages have started growing millets after the intervention. But the intervention is not limited only to millets, and includes other crops as well. Overall, the seed exchange and community seed bank initiatives are meant to counter the threat of the loss of traditional seeds, including millets, and strengthen the local food system.

Potential for upscaling and replicability: As mentioned above, the 2018 participatory mapping exercise conducted by NESFAS in 32 villages of Meghalaya and Nagaland reported an average of 202 food plants. Millets, an important starchy staple, were reported from more than half of the villages. Of the reported species and varieties, *Digitaria sanguinalis* is

an endemic specie found only in the Khasi Hills. At the same time, it is also among the most threatened specie. For revitalizing and encouraging millet cultivation, the main solution proposed, i.e., the Community Seed Banks, are not very difficult to establish and include the scope of incorporating traditional methods of seed keeping and preservation, which is still very strong. The seed exchange, which formalizes a long-standing community practice, is a feasible solution. Meghalaya has over 6,000 villages, and at least a quarter of them are estimated to still cultivate millet (but are under threat or in decline). Thus, there is significant potential for replicability and scalability of the initiative.

Drivers of change: The success of the initiative is largely due to the high agrobiodiversity already present in the region, which includes millet as part of the traditional farming system. Millet has been on the decline, and the seed bank will help in arresting this decline by storing seeds and making planting materials available. For those who have lost local varieties and associated knowledge pertaining to millets, the initiative creates a sense of nostalgia, which serves as an entry point. The revival of the crop has also revived certain festivals, like Bom Krai in the village of Nongtraw in East Khasi Hills, further linking the initiative with traditional culture. Many elderly farmers in the villages are aware of the nutritional richness of the crop, particularly for pregnant women. Linking the initiative with the protection and strengthening of traditional farming practices and nutrition has been an important factor in its success.

Dilemmas and barriers: The biggest challenge is finding a site for constructing the seed bank. In some cases, the same site in Garo Hills is used for multiple purposes, which can create friction among community members. Another challenge is investing in the infrastructure. Some of the seed banks lack strong infrastructure; for example, one of the seed banks in Ri Bhoi is a small hut made of bamboo. A cost-sharing mechanism has been developed where the community contributes labor and materials, but

some villages still need additional support. The most significant challenge has been keeping the initiatives financially viable and sustainable. Some seed banks have developed a strong client network and have been able to build savings, but others still need buyers who can purchase from them regularly.

Novelty and innovation of solution: Farmers in Meghalaya have a long history of seed keeping and preservation, but it was always done at the individual level. Keeping seeds in a bank (house) managed by a group of community members was a novel concept that works to increase the resilience of the seed system in the village. The focus on seeds under threat, particularly millet,

helped to spread the risk, which was previously concentrated in only a few households, especially the elderly members. This ensures that the variety will not be lost. For community members and others who have already lost those seeds, this initiative is especially important in reviving millet cultivation through seed exchange or purchase from the seed bank. Managing the seed bank also helps supplement the income of members and engage in microfinance activities such as lending among themselves.

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Promoting IndGAP and ISO 22000 Standards for Food Safety Management in Millet Farming

Location: Hyderabad, Telangana, India



Institution: eFresh Agribusiness Solutions Pvt Ltd

Summary: India Good Agricultural Practices (IndGAP) and ISO 22000: Food Safety Management Systems (FSMS) are two internationally recognized standards that address economic viability, environmental and farming sustainability, social acceptability, food safety, and quality in agriculture. These standards aim to produce safe food at the primary level, which facilitates availability of quality raw materials to the food processing industry and safe food to consumers. IndGAP gives access to small and marginal farmers and addresses the demand of many importing countries and organized retailers as a prerequisite for procurement. The intervention is made on Pearl Millet, Finger Millet, Foxtail Millet, Sorghum and Kodo Millet.

Pitch: GAP addresses environmental, social, and governance concerns of Governments and society in agriculture. The production of safe food at the primary level helps in better implementation of food regulations, bring in a culture of food safety, enhance quality, optimize human and natural resources, make the produce internationally competitive, and capture new markets. GAP also increases farm value and farmers' skills in farming operations.

Problem analysis: The key problems identified are doubling of farmers' income in the next five years, multiplicity of GAP standards and regulations creating confusion in the marketplace, increased costs from GAP implementation, record-keeping, consultancy costs, and certification, inability of small farmers to seize export market opportunities, and lack of awareness on GAP standards and its benefits.

Solution: To counter all these issues, eFresh Agribusiness Solutions Pvt. Ltd. proposes the following solutions:

- Increase competitiveness of agricultural exports with better price realization by using IndGAP certification scheme launched by Quality Council of India for inspection and certification, which

is accredited under International Standard ISO17065.

- ◉ Use digital platforms to ease implementation by providing record templates and trainings on GAP practices. eFresh introduced Krishi GAP Platform to address the problem of increased costs due to different activities. KrishiGAP Platform, a one-stop digital platform for FPOs and exporters helps ease compliance. It covers all the components of GAP – farmer handbook, demo farm, capacity building, internal inspections, internal audit, plant protection products, Pops harvesting, worker’s welfare, and crop standards.
- ◉ Encourage FPOs with a large pool of farmers to implement GAP to help small farmers access opportunities.
- ◉ Promote model FPOs in crop production centers with GAP as role models to help increase GAP awareness.
- ◉ Create a large pool of trainers through capacity building of rural agricultural or diploma graduates, KVK personnel, CEOs of FPOs, and local entrepreneurs to ease implementation. They become torchbearers of good practices.

Target population: The target population includes:

- ◉ Farmer Producer Companies (FPOs) who can increase the competitiveness of their farm output, achieve better visibility in the marketplace, enhance market price realization, and promote sustainable farming operations.
- ◉ Food processing units, which benefit through quality input supplies that facilitate their processing related food safety standards with much ease through traceability and quality produce without contaminants.
- ◉ Small and marginal farmers benefit through the formation of farmer groups, which become centers of

contact for market linkages through aggregation of the certified produce. IndG.A.P is structured to address the small and marginal farmers.

- ◉ Consumers get access to quality and safe produce in the marketplace.

Results: eFresh has taken up millets based FPOs for IndG.A.P implementation and facilitation of certification during Kharif 2022. eFresh has signed an agreement with Samunnati Agro Solutions Pvt. Ltd. on 19th July, 2022 to facilitate the adoption of food safety standards for millet value chain covering IndG.A.P for millet crop cultivation and ISO 22000 Food Safety Management System for millet processing. Out of the four FPOs, 3 FPOs in Andhra Pradesh, Tamil Nadu, and Madhya Pradesh in the process of implementation. eFresh has signed another agreement on 13th July, 2022 with Kashimnagar Farmer Producer Company Ltd. based in Telangana state for IndG.A.P implementation for millet crop cultivation and is in the process of getting certified by the end of October, 2022. These will be the first FPOs getting certified under the Ind G.A.P scheme developed in India-KrishiGAP. FPOs with IndG.A.P are assured 20% additional income.

Potential for upscaling and replicability:

GAP can easily be scaled up and replicated everywhere. Best practices and high-quality standards in food safety are both remunerative in terms of trade and better price realization. Once farmers taste the rewards in terms of returns, they will be ready to scale up operations and replicate them in all places and crops. Scalability and replicability are linked to returns enjoyed by the farmers and food processors through the implementation and certification of FSMS. Developing model farms with GAP implementation in crop production centers and showcasing their success stories in terms of increased income, reduction in farming costs, benefits of mechanized operations through collective bargaining, and the social impact it is creating will encourage others in the region to replicate similar practices. Capacity building of a large number of trainers in crop production

centers and agri-export zones will also be crucial in this regard.

Drivers of change: The key drivers of change are –

- ◉ Development of model farms with GAP in crop production centers, which will act as learning centers and showcase the benefits to potential entrepreneurs.
- ◉ Digital platform enablement for capacity building of trainers on the implementation of GAP and ISO 22000 food safety management system in crop production centers.
- ◉ Prioritization of critical success factors, understanding and analyzing them for the implementation of food safety management systems mainly in small enterprises, as these face greater difficulties related to the implementation due to the fact of not having sufficient expertise, required competence, and human resources.
- ◉ Creation of software tools integrated into the implementation of food safety management with ease of implementation.
- ◉ Continuous monitoring of the food safety management system implementation in the pilot project.
- ◉ Facilitation of a market linkage platform for the produce of organizations that successfully implemented GAP, which will bring increased visibility in the marketplace.

Dilemmas and barriers: The primary challenge faced was the lack of awareness surrounding on-farm and post-farm food safety standards at all levels in crop production centres, which acted as a significant barrier. To tackle this, the promotion of model farms and FPOs in crop production centres with GAP as learning centres was adopted as the primary strategy. Another key obstacle was the unavailability of a one-stop solution platform for all available information on Food Safety Standards, leading

to the development of KrishiGAP. Presently available only in English, the platform will soon be translated into regional languages. Furthermore, the lack of presence of catalyst agencies to offer the Food Safety Standard services also posed a significant barrier, which was addressed by training local agri-institutions and FPO promoting agencies. Lastly, farmers accustomed to conventional agriculture systems of production practices often resist any changes. To overcome this challenge, success stories with economic benefits arising out of the implementation of GAP were published.

Novelty and innovation of the solution: The solution offered numerous key aspects, including:

- ◉ The development of a digital platform like KrishiGAP, which acted as a one-stop solution, was a significant requirement for scaling up food safety systems implementation and reaching all critical crop production centers.
- ◉ KrishiGAP covers all internationally recognized standards related to on-farm produce by importers/retailers globally, such as Global G.A.P, Organic-NPOP, Organic-NOP, Fair Trade International, and RainForest Alliance. It also includes India Good Agricultural Practices (IndG.A.P), which has been benchmarked with GlobalG.A.P.
- ◉ Post-farm related standards like ISO 22000 Food Safety Management System and BRC Global are in the process of being added to the platform.
- ◉ The platform facilitates digital access to exporters/retailers/importers through market linkages, promoting the certified farm produce for the first time in India.

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Institution: Baiga Chak Mahila Kisan Producer Company Limited

Summary: Baiga Chak Farmer Producer Company (FPC) has 60,000 shareholders as members. Shareholders are the main pillars of the FPC which covers their local areas for the mobilization and procurement process. All the shareholders operate through a collective procurement centre along with digital equipment that impacts their personal growth. The FPC procured 10 MT of minor millets from the shareholders.

Pitch: Baiga Chak Mahila Kishan Utpadak Limited is a Farmer Producer Company established on 18 June 2020 under the project name 'Millet and Lentils Value Chain Development Project' by Madhya Pradesh State Rural Livelihood Mission Limited (MPSRLM) under the Government of India project of National Rural Economic Transformation Project (NRETP). The company produces, processes, and markets commodity Kodo, Kutki, Masoor, and other farm-based products from the women farmers of Dindori and Mandla districts.

Problem analysis: Farmers are realizing lower prices due to the dominance of local traders. They are usually left with small quantities for marketing after domestic consumption. Farmers have less bargaining power due to the low volumes available with them for marketing, and they are forced to sell in the village to avoid marketing expenditures.

Solution: Establishment of a Collective Procurement Centre at the village level and an institutional mechanism for procurement. The Farmer Producer Company enables farmers to realize better prices by procuring, processing, and marketing commodities like kodo, kutki, masoor, and other farm-based products. The company focuses on value addition and processing of farm commodities like production of millet biscuits to increase farmer incomes.

Strengthening FPOs for Procurement, Processing, and Marketing of Kodo and Kutki Millet by MPSRLM

Location: Dindori, Madhya Pradesh, India



Results: Farmers are able to realize upto 30% higher prices than the market price.

Potential for upscaling and replicability:

The collective procurement centres can be established in all villages. The collection centres need small investments and enable the farmers to fetch better prices. The collection centre can be managed by a community resource person under the supervision of the board of directors.

Drivers for change: Realizing better prices, transparency in weighing, procurement, and timely payment are the key drivers of change.

Dilemmas and barriers: One barrier is the initial resistance of farmers to adopt new practices, which can be overcome through awareness generation activities.

Novelty and innovation of solution:

Establishing a processing unit ensures greater benefits for the FPC and their farmer members. Value added product increase the farmers' income and all farmers from the villages can get a fair price according to the quality of their produce and the processed goods. Also, processed kodo and kutki, and its value-added products like biscuits fetch better rates than just purchasing and selling the produce. By collectivizing and covering all villages, middlemen can be eliminated, impacting price.

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Institution: Kudumbashree Attappady Comprehensive Tribal & PVTG's Development Programme, Govt. of Kerala

Summary: The Tribal women of Attappady Association grow, collect, and market traditional produce and products such as Finger Millet (Ragi), Little Millet (Chama), Foxtail Millet (Thina), Kodo Millet (Varagu), Barnyard Millet (Kuthiravali), Pearl Millet (Kambu), Proso Millet (Panivaragu), Sorghum, and Maize from farms of Attappady under the brand name 'Hill Value.' The initiative includes millet products such as Ragi powder, Chama, Thina, Varagu, and other produce like forest honey, mustard, pepper, and a variety of pulses. The initiative focuses on packaging and branding.

Pitch: The formation of tribal women's farming collectives that provide all assistance and subsidies, brand their farm produce, and help the farmers reach the main marketing centers and get a fair price.

Problem: As Attappady is a hilly terrain and hamlets lack transportation facilities, farmers cannot carry their agricultural produce to the marketing centers and get a fair price. As they do not have collection centers, during the harvest season, middlemen merchants from the cities buy their produce at under-priced rates than the market price. Adivasis lack bargaining power, and it has been their practice to only share their produce. For example, a kilo of ragi would fetch them Rs. 20/-or 25/-when they sell to the local shops. Without updates about increasing market rates and the absence of farmer groups or unions, they were exploited and fell prey to middlemen who misguided them to cultivate cash crops like cotton, sugarcane, and groundnut.

Solution: The most critical activity that the MKSP program carried out was finding a sustainable and profitable market for the farm produces cultivated by Adivasi women's collectives. The first step was the formation of Joint Liability Groups of 4 to 10 Adivasi Hill Value: A Brand for Marketing and Distributing Millet Produce

Hill Value: A Brand for Marketing and Distributing Millet Produce Cultivated by Adivasi (Tribal) Women of Attappady Association

Location: Palakkad, Kerala, India





Cultivated women to take up farming. These groups were registered in the Panchayat Samithi and elected from the hamlet-based exclusive Adivasi Self Help Groups ('ayalkkoottam') of women. 1037 JLGs have been formed so far. Under their leadership, producer groups and entrepreneur groups were organized. The latter groups are in charge of collecting the produce from the farmers, processing, grading, labeling, packing, and marketing them under the brand name 'Hill Value.' A mill for dehusking and processing the millets and pulses has also been started by the women's collectives. The entrepreneur groups were given training in processing, labelling, and marketing in the National Millet Research Institute, Hyderabad. The main produce marketed includes ragi powder, little millet rice, maize flour for puttu and other preparations, rava or sooji (granulated millet or semolina), varagu (kodo millet) rice, kambu (pearl millet) rice, thina (foxtail millet) rice, and 32 other products, including bamboo rice, forest honey, and a variety of pulses.

Target population: The Hill Value branded marketing system is aimed at benefiting Adivasi women farmers and entrepreneur groups by stopping their exploitation by middlemen and local shops. They have now developed the capacity for bargaining and getting a fair and profitable price for their produce. The initiative has helped them understand the value of their produce and hence are determined to sustain their traditional crops and cultivation patterns.

Results: The Adivasi women farmers cultivate upto 665.49 acres of indigenous millet varieties in Attappady. They were able to procure, process, and market their farm produces at a good price and make a profit, in addition to ensuring food and nutritional security. They now market 30-40% of their produce, which is in addition to what they consume. The total sales for millets from 2019 to 2023 under the Hill Value initiative were Rs. 1.53 lakh (approximately). The Planning Board recognized this endeavour and sanctioned Rs. 1 crore to the Panchayat Samities to continue the work.

Potential for upscaling and replicability:

Millets, which are gluten-free, high-fiber, and have low glycemic Index, should become a part of our diet to control and manage diet-related illnesses and lead a healthy life. Attappady is a hub of a rich diversity of millets and pulses. The unique procuring, processing, and marketing system initiated under the Hill Value has given an impetus to farmers to extend their cultivation to more areas and make Attappady the Millet Basket of India. The whole process is encouraging more women to take up farming and ensuring support from the menfolk. This endeavour can become a model for the whole country, especially in the hilly Adivasi tracts where land and soil are suited for millets and dryland farming.

Drivers of change: The success of the Hill Value initiative is that the women farmers are now recognized and appreciated by the whole society as brilliant farmers and change makers. They have been able to develop the agency to bring in funds, technical help, and give advice to young women willing to take up farming as a sustainable livelihood. The trainings they received from the Kudumbasree Mission on marketing via the online platform, various trade and other fairs, Government programs, and supermarkets made them confident about taking orders, and supplying good quality produce on time. All these factors have contributed to the success of the initiative.

Dilemmas and barriers: The Joint Liability Groups (JLGs) are the best solution to the problem of lack of unity and cooperation among Adivasi farmers who face landlessness,

wildlife depredation, climate change, and so on. However, these groups need to become stronger and more resilient to the challenges that come with time. The unity and cooperation among the entrepreneur groups involved in procuring and processing, branding, and marketing also need a lot of strengthening. The women entrepreneurs need to develop more technical skills in online marketing, advertisements and promotion, and connections with the supermarkets and other organic markets in cities who will buy the products.

Novelty and innovation of solution: The Hill Value products are one of the very few enterprises in Kerala which market Indigenous and organic farm produce from the Adivasi communities. The endeavor promotes sustainable livelihood options and ensures food and nutritional security in an area suffering from acute and severe malnutrition. As it is a women-centered practice, it will bring prosperity and health to the families, communities and ensure that the unique cultivar seed diversity and climate resilient farming practices are conserved. The endeavor will be beneficial to the whole State as it is eco restorative in addition to being restorative of whole agro ecosystems. It will also help solve the challenges of malnutrition, lifestyle diseases, endocrine and metabolic disorders, reproductive disorders and boost the immunity and the health of the whole society. The urban, rural and Adivasi communities will benefit from the nutraceutical Hill produce which is nutritious as well as medicinal.

Contact details: Kudumbashree State Poverty Eradication Mission, Govt. of Kerala.

Initiative of WBSRLM to Improve Income of Dairy Farmers by Growing and Feeding Millets

Location: Bankura, West Bengal



Institution: West Bengal State Rural Livelihoods Mission (WBSRLM), Govt. of West Bengal

Summary: Millet (Jowar, Bajra and Barnyard) farming has helped dairy farmers in Bhutama and Sheuli villages of Bankura district to revive their dairy sector by producing quality green fodder for their milch animals. With increasing fodder prices and water scarcity, millet farming has provided a sustainable solution for the farmers to reduce production costs and increase milk production.

Pitch: Millet farming can be a self-sustainable model for agriculture and can help farmers diversify their livelihoods, while also meeting the demand for quality green fodder for their milch animals.

Problem analysis: Bhutama and Sheuli villages in Bankura district are located in one of the most water-scarce regions of the Chotanagpur plateau in Western West Bengal. The communities in these villages have traditionally relied on milk business for their livelihoods. However, with increasing fodder prices and water scarcity, milk production costs were increasing, and profit margins were decreasing. To diversify their livelihoods towards agriculture, the farmers needed a sustainable solution that would help reduce production costs and increase milk production.

Solution: The organised dairy sector, including Government-backed district milk cooperatives and private dairy players, played a crucial role in introducing millet farming to the farmers. WBSRLM trained the farmers in millet farming techniques and introduced them to three types of millets: Jowar, Bajra, and Barnyard (Shyama). These millets were used as green fodder for their milch animals as they are suitable for dryland areas. With consistent efforts from the dairy sector players, the farmers were able to cultivate interest in millet farming. As the millets were used as green fodder, the farmers were able to harvest the crop at least three times in a single season without harvesting the main crop, thus meeting their main need for quality

green fodder. This has helped dairy farmers reduce production costs and increase milk production, providing a sustainable solution for their livelihoods.

Target population: The intervention targeted women farmers and dairy farmers in rural villages.

Results: Millet fodder was found to be of excellent quality for cattle feed, which helped solve the problem of expensive market-bought fodder for farmers. Additionally, feeding cattle millet fodder increased milk production, resulting in higher profits for farmers and leading to the establishment of 2-3 milk collection centres in the villages. The district milk cooperatives (Kangsabati Dairy) now purchase milk from farmers at Rs 30-32 per litre, while private players (Red Cow Dairy) purchase milk at Rs 34-35 per liter.

Potential for upscaling and replicability: With the success of the intervention, there is potential for millet-based farming practices to be scaled up and replicated in other villages. Farmers are willing to switch to millet food grains if they can earn remunerative prices for their produce. Additionally, the re-introduction of millet-based traditional and nutritional food dishes has begun to make a comeback at the household level.

Drivers of change: The intervention's success can be attributed to the distribution of quality millet seeds and training for farmers. Farmers were taught how to plan their fields for constant millet fodder production throughout the season, leading to multiple fodder productions from a single field. This constant fodder supply helped meet farmers' needs for a major part of the year.

Dilemma and barriers: The major problem faced by farmers during the intervention was the availability of quality seeds. As millets were a dying traditional crop, the seed was not readily available. To address this issue, the WBSRLM block team supplied farmers with quality seeds during their training workshops.

Novelty and innovation of the solution:

The intervention was market-driven, aimed at reviving a dying millet cultivation culture. This intervention opened up an avenue for farmers to switch to millet farming as an input service to the dairy value chain. As the market is now accepting the millet harvest, the intervention is self-sustainable, and farmers can scale up their millet cultivation.

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Launch of Biofortified Sorghum “Prabhani Shakti” for Improved Nutrition in African and Indian Drylands

**Location: African countries
and India**



Institution: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Summary: In 2018, ICRISAT launched India’s first biofortified sorghum, named Parbhani Shakti (ICSR 14001), which has higher iron (Fe) and zinc (Zn) content than regular sorghum. The cultivar also has high protein content and low phytate levels, making its nutrients more bioavailable. Parbhani Shakti was developed through progeny selection from a high Fe and Zn landrace accession (IS 26962) from India, without genetic modification. It has been proven to increase yields and is adaptable to cultivation in different seasons.

Pitch: Biofortified sorghum is a cost-effective, sustainable solution to address hidden hunger and micronutrient deficiencies, particularly Fe and Zn, which affect over three billion people globally. Parbhani Shakti has the potential to increase sorghum cultivated areas and boost primary productivity, leading to healthier lives and improved total factor productivity.

Problem analysis: Micronutrient deficiencies, particularly Fe and Zn, can impair physical and mental development, cause stunting and blindness, and lower IQ, particularly in women and children. Sorghum is a staple crop in developing countries, and biofortified sorghum can provide a good source of energy, protein, and micronutrients. Over two billion people suffering from Fe deficiency globally are in developing countries, particularly in Africa and India.

Solution: Parbhani Shakti is a white grained race sorghum tolerant to grain molds and adaptable to cultivation in rainy, post-rainy, and summer seasons. It has upto 40% higher content of Fe and 25-30% higher content of Zn than conventional cultivars. Parbhani Shakti was bred as part of ICRISAT’s efforts to eradicate hidden hunger linked to poor nutrition, particularly in the drylands of Africa and Asia. It offers a solution to high anaemia rates among women and children in India and the world.

Target population: The proposed good practice aims to target poor households in the drylands of India and Africa who suffer from micronutrient deficiency, particularly iron (Fe) and zinc (Zn) due to their consumption of poor-quality and insufficient diets. Wealthy families in both developed and developing countries can benefit from this good practice and help fulfil the UN's SDG 3 goal. The main demographics targeted include children, adolescents, and women who are the most vulnerable to micronutrient deficiencies. In India, the focus will be on the poor tribal farming communities who rely heavily on millets, indicating a high uptake of millet-driven technology.

Results: Developed by ICRISAT and released for cultivation by VNMKV, Maharashtra, Parbhani Shakti (PS) offers a cost-effective and sustainable solution to micronutrient deficiency. A MoU was signed between ICRISAT and VNMKV for large-scale seed production and dissemination. Although more support is still needed for major national and international scaling, the Parbhani Shakti was tested in Maharashtra state and in All India Co-ordinated Sorghum Improvement Project (AICRP) Trials. Scaling to other states is possible but would require additional financial support. Parbhani shakti can be grown in kharif, rabi, and summer seasons in India and has high yield (>5.0 t/ha). It may require irrigation in rabi and summer seasons. Farmers who participated in the participatory field trials were satisfied and acknowledged that they achieved a higher yield of 10-15% and the traits they preferred. PS seeds are in high demand, with 50 tons of seeds produced and supplied in 2018 and 40 tons each in 2019 and 2020. Progressive farmers were trained to produce and share its seeds for a sustainable seed chain. PS was taken up by users as a Stage 4 and Maturity Level 3 innovation and performed well in India and Sudan.

Potential for upscaling and replicability: The biofortified PS variety has huge potential for replicability. It was developed using conventional pedigree selection. Dissemination

activity followed its release, and the production environment was appropriately structured to build a robust seed production system, which is a cornerstone for downstream scaling-up. Raising awareness of the PS health-promoting properties was instrumental in letting stakeholders know the direct benefits that vulnerable communities and demographics can derive from the biofortified sorghum grain. The replicability could also be ascertained from the stability of the biofortification traits across multi-environmental trials in Maharashtra state and AICRP-S. The stability and replicability were also observed from the PS adaptation to kharif, rabi, and summer seasons in India, and during the National Variety Testing trials in Sudan where PS is headed towards its release.

Drivers of change: The success of PS can be attributed to several factors including, but not limited to:

- The biofortification plant characteristic, which resonated well with end users due to the widespread issue of malnutrition. In fact, the NFHS-5 survey indicates that over 57% of women (15-49 years) and over 67% of children (6-59 months) in India suffer from anaemia. For example, Assam state has a high burden of anaemia, with 66.4% of women (15-49 years) and 68.4% of children (6-59 months) affected.
- The general staple food attribute of PS made its uptake easier.
- The dissemination effort and the structured production environment for seed production chain also played an important role in the success of PS.

Dilemmas and barriers: The major risks associated with PS were poor adoption and adaptation. To mitigate the risk of poor adoption, progressive farmers were targeted to run on-farm demonstration trials, and extension services were involved. Progressive farmers were effective in transferring the technology

to other farmers, as other farmers were able to assess the success of the technology and overcome their original aversion to the innovation. To mitigate the risks associated with poor adaptation, the new PS cultivar was developed based on an existing sorghum Caudatum landrace accession, IS 26962, which is a domestically adapted traditional variety that combines most of the farmer-preferred agronomic and organoleptic traits, making it more appealing to farmers.

Novelty and innovation of solution: The low-income populations in India rely on sorghum for calorie intake and obtain over 50% of their required micronutrients from sorghum-based diets. However, the concentration of micronutrients such as Fe and Zn in popular sorghum varieties is low, contributing to

malnutrition. To address this issue, ICRISAT standardized phenotyping methods and assessed over 3,500 sorghum populations for their grain Fe and Zn contents, identifying promising lines for use in breeding programs. The most promising line, ICSR 14001 (aka Parbhani Shakti), was the first biofortified sorghum variety released in India with higher iron and zinc than regular sorghum. The major value added by PS is the higher nutritional value, including high Fe and Zn, low phytate content, and high nutrient bioavailability.

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Institution: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Summary: Finger millet production has been declining due to the labor-intensive practices required throughout the production process, especially during harvesting. Typically, women and children harvest the crop by hand using knives, which is a tedious and time-consuming task. This has made finger millet production less appealing and large-scale production impractical, as household labor can only support one acre of the crop. However, the “snapping trait,” present in a few landraces of finger millet, simplifies the harvesting process by allowing the vegetative part and stalk of the crop to snap when sharply bent. The trait has been incorporated into popular lines like U15 and P224, and other improved varieties in the eastern and southern African region. Two varieties have been released in Kenya based on the “snapping trait” as a social/cultural trait, other varieties such as “snapping U 15” and “snapping P224” are in advanced stages of release.

Pitch: Harvesting finger millet using a knife or sickle is a long and tiresome process that requires hours of standing and bending in the field. This often results in the knife cutting the hands of the harvester, and the constant bending and standing can make the person tired. As a result, most of the harvesting is left to women and children. However, varieties with the “snapping trait” simplify the harvesting process and do not require a knife or sickle. This makes harvesting faster and easier, and now men are also willing to participate.

Problem analysis: Finger millet is a highly adaptable crop that requires few inputs for its production and is a staple for a large population in eastern Africa. Despite its great significance as a food, nutrition, and income security crop, its production has been decreasing due to the labor-intensive nature of its production operations, including planting, weeding, and harvesting. Demand for the grain outstrips supply, and it fetches the highest price in the

Simplifying Finger Millet Harvesting with Snapping Trait

Location: Bulawayo,
Zimbabwe, Africa





market among cereals in the region. However, farmers cannot increase production because households providing the labor cannot manage more than one acre per season. Moreover, harvesting is left to women (who are already overburdened by other household chores) and children (who have to attend school). With the introduction of varieties with the “snapping trait,” it takes four women to harvest one acre of the snapping variety, totaling USD 20 a day, compared to 20 women to harvest one acre of finger millet without the snapping trait, totaling USD 40 an acre. This reduces the harvesting time by five times and the cost by half. Moreover, now men are willing to join in the harvesting. This has caused 100% adoption of the variety and a doubling of the area under finger millet in the Bomet area of the Kenyan Rift Valley.

Solution: The “snapping trait” in finger millet is a characteristic that causes the vegetative parts of the plant to bristle and break upon sharply bending. The stalk does not break on gentle bending and is not affected by wind or objects passing by. By holding the head and sharply bending the stalk, the stalk breaks with the head in the harvester’s hand, making harvesting as simple as picking the heads from the stalks of the plants. This greatly simplifies the harvesting process, which, in varieties without this trait, is done by cutting the stalk just below the head.

Target population: Finger millet harvesting is a tedious process usually carried out by women and children, often resulting in injury due to the use of crude knives. This process deprives women time to attend other household chores and children from attending school. Adoption of snapping trait varieties has released time during harvesting, allowing women to engage in value-adding activities to generate income and children to attend school. This leads to improved household welfare. The target population includes women, children, and disabled individuals.

Results: The snapping trait variety has been introduced into Bomet, Nakuru, Elgeyo Marakwet, Baringo, Taita Taveta, Kericho, and

Narok in the Rift Valley, which accounts for about half of the finger millet growing area in Kenya. In Bomet, the variety was adopted 100% after two seasons, and acreage doubled. The time required to harvest one acre has been reduced to 4 women days from 20 women days, and the cost halved. In a focused group discussion with farmers in the target area, snapping trait was placed third in importance after only two seasons of introduction. Farmers appreciated the ease of harvesting using fingers instead of traditional cutting with a knife. Men in the areas have also started to harvest the crop, which is likely to increase acreage and production. Other counties in the country are taking up the production of the variety. Because of the high response to the variety, Egerton University has submitted another line, "Snapping U15," to NPT.

Potential for upscaling and replicability:

The potential for scalability of the innovation is enormous as it solves a problem universal across all finger millet communities in the countries in the region. Most of the NARs programs in the region have requested and accessed the lines and are being tested at various stages for release. In Kenya, the success of the first release snapping variety—snapping green—has prompted Egerton University to request more lines, and they have submitted "snapping U15" to NPT for release. Malawi has also requested to have the lines tested and submitted for release within the next two years.

Drivers of change: Finger millet demand in the region outstrips supply, but production is declining due to the labour intensity associated with the various operations, including harvesting. Labour prices in the region are rising, and child labour associated with finger millet production is on the decline due to universal primary education policy in several countries. Besides, there is a push to reduce the labour burden on women. The finger millet growing areas are, therefore, looking for cheaper, faster, and reliable alternative harvesting techniques. Snapping trait provides a less drudgery, time-consuming, and efficient harvesting method.

The trait presents a socially and culturally acceptable alternative to the traditional hand harvesting method.

Dilemmas and barriers: The main risk was that the introduction of the trait into the desired improved varieties could affect the agronomic and yield characteristics of the new lines. Taste and grain traits like colour and size acceptance by farmers and consumers were also a concern. To mitigate this, breeders mainly selected lines that looked like farmer-preferred varieties, thus coming up with "snapping U15," "snapping P224," and "snapping SEC 915," which stand a better chance of being accepted by farmers. The lines were tested for agronomic and yield traits conformity on station by the breeder and on-farm during the Participatory Variety Trials (PVT) with farmers and end-users like grain millers, processors, and consumers.

Novelty and innovation of solution: The adoption of snapping trait varieties presents a significant advancement in crop production as it does not incur additional costs. These varieties have been developed without altering the other genetic nature of the crop, ensuring that the cost of production, including the price of seed, planting, weeding, and pesticide control, remains constant. Furthermore, the taste and grain properties of the crops remain unchanged. The innovation improves the harvesting process, reducing costs and time associated with delayed harvesting and minimizing harvest losses. This allows households to increase their acreage under production, leading to increased income. The reduced labour demand also frees up time for women to attend other commitments and allows children to attend school regularly. With the reduced labour constraints, men are also willing to participate in harvesting activities. As a result, households can increase their acreage and overall production, resulting in increased income and improved livelihoods.

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Strengthening Agribusiness and Value Chain through Good Manufacturing Practices (GMP) in MSMEs

Location: Asifabad, Bhadrachalam and Eturnagaram, Telangana, India



Institution: 3 associations Sri Anjaneya Dry Mix Industries, Swayam Krushi Dry Mix Industries, and Sri Lakshmi Ganapathi Dry Mix Industries, and ICRISAT

Summary: The Agribusiness and Innovation Platform (AIP) at ICRISAT and the Telangana Tribal Welfare Department (TWD) have collaborated to work towards strengthening agribusiness value chain and improve rural livelihoods for target tribal farmers. The project aimed to increase self-employment opportunities, decrease dependence on middlemen, and enhance employment opportunities. To achieve these goals, Joint Liability groups (JLGs) were strengthened, MSME units were established for localized processing of millet produce, and products were supplied to Anganwadi Centers (AWCs).

Pitch: In target districts, processing of locally produced millet crops and malnutrition were major challenges. ICRISAT and TWD collaborated to address these challenges by establishing sorghum processing units and providing self-employment opportunities for women and youth through these centres.

Problem analysis: Tribal populations are highly dependent on natural resources, but resource potential and agro-climatic conditions vary considerably with each tribal area. Small-scale industries or business enterprises can lead to greater utilisation of natural resources, production of goods and services, creation of employment opportunities and improvement in the general standard of living of the tribes. ICRISAT is working towards creating better livelihood opportunities for marginal farmers, women, and youth of Asifabad, Bhadrachalam, and Eturnagaram districts in Telangana through creative thinking, collaborative partnerships, and hard work. Empowering small and marginal farmers, providing access to technology, and supporting value addition and market linkage can improve livelihoods, employment opportunities, and decrease dependence on middlemen, enabling tribal farmers in

these districts to move from subsistence to commercial operations.

Solution: ICRISAT facilitated setting up of eight “Nutri-Food” processing units at three ITDA locations in Telangana, out of which three units are exclusively devoted to millet processing.

These units utilize locally produced crops to empower small and marginal farmers and transfer new technologies and knowledge that they can use to uplift their own communities. The work of ICRISAT with tribal populations also contributes to United Nations Sustainable Development Goals.

Target population: The MSME units provide employment to nearly 108 tribal members in Telangana, while the food products manufactured by the business units cater to 68,856 people in Utnoor and 67,486 people in Bhadrachalam and Eturnagaram districts, respectively.

Results: The initiative has successfully created a unique identity of the community in the open market and has involved the community in the small business sector in a larger way. It has provided employment opportunities to tribal youth and women and has developed entrepreneurship in the community. Such projects help in slowing down migration as they promote local production, processing, and consumption. The availability of locally made nutritious products has attracted customers and contributed to the local vibe. Moreover, it promotes dietary diversity and may positively impact the health and nutritional status of tribal households, leading to a reduction in prevalent malnutrition and anaemia.

Potential for upscaling and replicability: This sustainable model can be replicated in other tribal areas in the country, putting the most vulnerable population in India at the center. It empowers them, makes them self-sufficient, and transfers new technologies and knowledge that they can use to uplift their own communities.

Drivers of change: ICRISAT’s convergence

model, in collaboration with TWD, Telangana, and ICDS, has been crucial for the success of this project. The efforts of all stakeholders have been instrumental in implementing this project.

Dilemmas and barriers: Initially, streamlining the tribal farmers towards value addition and introducing and gaining acceptance of millet-based food products into AWCs were identified as potential risks. However, these were handled and mitigated through continuous training and interactive sessions with beneficiaries.

Novelty and innovation of solution: This project proposes a unique sustainable enterprise model that organizes tribal women into legal entities called JLGs, providing self-employment to the tribal communities, enhancing their economic status, and transforming them into sustainable market-oriented communities. This will, in turn, generate further employment within their own social system. Improved livelihoods, employment opportunities, and decreased dependence on middlemen are also important components of this initiative.

Contact details: Dr. Saikat Datta Mazumdar, Principal Scientist, Cluster Leader – Nutrition, Dietary Behaviour and Smart Food, COO-Nutriplus Knowledge Program (NPK), AIP, ICRISAT, Patancheru, Telangana. Email–s.dattamazumdar@cgiar.org *Chikki processing unit in Utnoor*



Chikki processing unit in Utnoor

Use of improved Sorghum Varieties and Good Quality Seeds

Location: Eastern and Southern Africa–ESA (Zimbabwe, Zambia, Malawi, Mozambique, Namibia, Angola, Ethiopia, Sudan, South Sudan, Kenya, Eritrea, Tanzania) and West and Central Africa–WCA (Nigeria, Burkina Faso, Mali)



Institution: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Summary: Sorghum production in Africa is significant as millions of hectares is cultivated under sorghum, but smallholder production still predominates with unimproved sorghum varieties due to lack of, or poor access to, available improved varieties. This is due to poor seed delivery systems, lack of promotion support, lack of investment interest, and policies that favor other staple grain crops. Consequently, the average productivity of sorghum under smallholder production in Africa is still very low. Several improved varieties with average yield and enhanced content of iron and zinc have been developed and released by ICRISAT and partners in Africa over the years, but very few have been adopted by farmers in the region. In recent times, ICRISAT and partners have developed several superior hybrids with higher yields, and some of these have been released in Africa, opening up great opportunities to increase productivity per unit area at the farm level and attracting industrial use, considering that high productivity reduces production costs. However, the adoption of these available improved varieties and hybrids by farmers is still very low. Therefore, promoting sorghum, considering its high benefits, to increase access and adoption by smallholder farmers will significantly increase sorghum production among smallholder farmers in Africa. The increase in commercial interest by the industry based on commercial traits is also a great opportunity to increase demand for sorghum in the region. Availability of advanced processing equipment has eased postharvest handling, and improved technologies for better utilization providing good opportunities for diversification of products that would attract high demand for sorghum. Diversification of products and utilization will also strengthen market opportunities among food and feed processors.

Pitch: Sorghum offers significant benefits in times of climate change and increased non-communicable diseases. However, the awareness and promotion of sorghum, especially its suitability as a climate-resilient crop and its high nutritional benefits in terms of iron and zinc, remain very low. The high-yielding and stress-tolerant varieties developed at ICRISAT are a great solution to mitigate climate risks and provide solutions for good health by reducing the incidence of non-communicable diseases such as diabetes. Processing and value addition technologies available at ICRISAT will provide a solution to allow open market opportunities through diversified utilization and products that have market appeal.

Problem: Recurring droughts in the region are one of the major problems in crop production for millions of farmers in Africa and are becoming worse due to the effects of climate change. The incidence of non-communicable diseases and malnutrition among children and breastfeeding mothers is on the rise. The use of unimproved sorghum varieties in food production systems offers a huge affordable solution to poor farming communities to secure better harvests under adverse climatic conditions and as a source of better nutrition among consumers to reduce health problems such as diabetes. Low productivity due to the use of unimproved varieties owing to poor seed delivery systems for better access to quality seed is also a significant challenge. Options and capacity to build improved seed systems are available at ICRISAT but require financial resources to implement and strengthen existing systems. Poor processing and lack of value addition knowledge among producers and processors limit diversification of utilization.

Solution: ICRISAT's improved sorghum varieties and hybrids, developed in collaboration with partners, are climate-smart and resilient to stresses like drought. These varieties have enhanced levels of micronutrients like iron and zinc, which provide a solution to food and nutrition insecurity, especially for the less

privileged in semi-arid regions. Additionally, ICRISAT is using advanced processing and value addition technologies to generate diverse utilization of sorghum, creating market opportunities for processors and producers and improving their livelihoods.

Target population: The intervention targets smallholder farmers and consumers, as well as food and feed processors. The majority of smallholder farmers and consumers live in rural areas where sorghum is grown as a traditional crop, rather than at a commercial scale. Targeting this group has a greater impact since most of the sorghum production is done by them. It also targets food and feed processors to bring value addition, creating market opportunities by improving product diversity and appeal and increasing demand.

Results: In Africa, there is a high demand for improved sorghum varieties and hybrids, and the use of stress-resilient varieties by farmers has significantly reduced the risk of crop failure due to climate-related challenges like drought. The availability and access of these high-yielding varieties and hybrids have improved the productivity of sorghum at the farm level, resulting in better food security and livelihoods. Increased productivity has also reduced the cost of production, making sorghum a more viable option compared to other staple cereals such as maize. Increased awareness about the nutritional and health benefits of consuming sorghum has resulted in increased demand for sorghum, both in rural and urban areas, as a mitigation strategy to reduce non-communicable diseases. The availability of modern post-harvest processing equipment and value addition has reduced drudgery and increased market opportunities in terms of products, due to increased appeal.

Potential for upscaling and replicability: Improved sorghum varieties and hybrids are in high demand by farmers, local producers, and processors. Availability of improved post-harvest processing and value addition technologies is driving the demand, as it eases post-harvest

handling and provides opportunities for more product options for consumption and market. The health benefits of sorghum, specifically its high nutrition content of iron and zinc, have increased the interest in sorghum. However, promoting new improved varieties or hybrids and post-harvest technologies associated with processing is critical for increasing adoption. There is a lot of opportunity for scaling if more intensive promotion is implemented. There is also more interest from the commercial sector; therefore, awareness about the benefits of sorghum, both on yield, climate resilience, nutrition, and product diversity, would create more demand and support scaling of sorghum and associated technologies.

Drivers of change: New breeding approaches have accelerated the development and release of improved varieties. The climate risks and vulnerabilities experienced more frequently in the region, especially in drier regions, have raised the need for climate-proof crops such as sorghum. The increase in incidences of non-communicable diseases such as diabetes has resulted in higher demand for healthy foods, and sorghum and other millets are the best crops to address this, given their high fiber content and slow release of energy. The nutritional benefits as a result of naturally available iron and zinc in grain are great drivers of affordable, nutritious foods, especially for rural poor communities. Furthermore, the use of improved processing and value addition technologies has reduced post-harvest processing drudgery and increased market opportunities through diverse utilization.

Dilemmas and barriers: The implementation of sorghum research activities, such as hybrid development, is faced with numerous challenges, including adverse weather conditions, especially during multi-location trials where irrigation facilities are not available. Drought situations, particularly during critical stages of

crop development, have resulted in poor grain production and seed set, leading to poor quality data. However, ICRISAT has used more suitable statistical models and experimental designs to process poor quality data and analyzed it as random stress, enabling the selection of stress resilience. Another challenge has been the acquisition of modern post-harvest processing equipment, especially for poor farmers. To overcome this, ICRISAT collaborated with local fabricators to develop more affordable versions of the prototypes so that farmers can afford them. Additionally, farmers and processors were trained to adopt a communal approach to using some of the processing equipment that cannot easily be acquired by individual farmers.

Novelty and innovation of solution: The solution of developing stress-resilient and highly nutritious varieties provides a novel approach to sorghum production. Identifying and developing genotypes with high genetic potential and good adaptation and stability to marginal agricultural production areas is a novel and innovative process that applies advanced scientific approaches and statistical tools to achieve effective selection. Similarly, designing affordable post-harvest processing equipment by fabricators is a novel and innovative process that has led to the availability of low-cost equipment and the acquisition of the equipment by many farmers. This also allows for easy maintenance by local technical experts, as opposed to imported equipment. The development of different recipes that enable the production of diverse food products from sorghum is also innovative and novel, leading to increased acceptability of sorghum products due to improved consumer appeal.

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Institution: Mahatma Gandhi Seva Ashram under Regional Nutrition Program

Summary: The introduction of child-friendly millet recipes, made from Sorghum, Pearl Millet and Kodo Millet in Sheopur, Madhya Pradesh, India has been successfully implemented to combat child malnutrition. The project is a collaboration between the local community, Government agencies and NGOs to raise awareness and increase nutrition security among children under five years of age.

Pitch: The Mahatma Gandhi Seva Ashram, under the Regional Nutrition Program is promoting the consumption of traditionally grown millet-based baby food recipes. The project is disseminating and amplifying these recipes through demonstration and feeding camps at the village level, in active collaboration with local child development, Government machineries, and service providers. This will help mainstream traditional food consumption at home, improve childcare practices, and decrease malnutrition in the process.

Problem analysis: Malnutrition is a significant problem in the Sahariya tribe-dominated Sheopur district, where 55% of children under five are malnourished, according to NFHS-4. The reasons behind this range from poor dietary diversity and maternal health to food insecurity and various economic and political factors. To address this issue, the initiative is promoting the consumption of balanced, child friendly recipes made from locally grown and available diverse foods, fruits, and forest produce in collaboration with ICDS and related service providers.

Solution: The initiative has focused on millets to curb malnutrition. Village-level recipe demonstration camps, called Baal Bhoj, are being organized to promote child-friendly recipes, dietary diversity, better child feeding practices, and improve nutrition education for mothers and children from the community. The initiative also promotes Nutri mix, which is a balanced and ground instant mix of any Combating Child Malnutrition with Child-Friendly one millet-based

Combating Child Malnutrition with Child-Friendly Millet Recipes

Location: Sheopur, Madhya Pradesh, India





cereal with pulses and oilseeds with a shelf life of upto two weeks. The mix can be served with milk or water and mashed fruits throughout the day to children. Camps are being organized in collaboration with ICDS, wherein anganwadi workers are trained on nutrition education, growth monitoring, and child care by the project team. Additionally, state-level advocacy is being done for millet revival, wherein a millet cookbook comprising of 71 different millet-based recipes was co-created with the Women and Child Development Department of Madhya Pradesh. It was released by the Honourable CM of Madhya Pradesh and disseminated across the state by the department. Production is also promoted to increase consumption and the revival of local millets. Millets are being grown in over 130 acres, and more than 260 project-supported farmers are growing kodo. The consumption of jowar and corn is also being promoted.

Target population: The target population of the intervention includes mothers of children below five years, other vulnerable communities in the intervention villages, and ICDS service providers. The Sheopur district has over 23% of Scheduled Tribe population, with the Sahariya tribe dominating the intervention area, which has a history of severe child malnutrition.

Results: The initiative's collective management of resources and collaboration with Government service providers, local and district administration has empowered the community to ensure child nutrition security. Recent media reports and studies by the Directorate of Women and Child Development indicate a decline in malnutrition levels in Sheopur. The Baal Bhoj initiative has been adopted statewide, according to a Madhya Pradesh Government circular, and more than 2000 children have improved their nutritional status. Most of the mothers of these children prepare Nutri-mix at home and try to include at least five different food groups. The recipe demonstrations have helped in behavioural change and improved nutrition awareness levels.



Potential for upscaling and replicability:

The multidimensional millet-based solution to address malnutrition has high potential for upscaling and replicability in other areas, both by the community and through Government intervention. Nutri-mix is easy to make and store and is a convenient recipe for new mothers to feed young children tasty balanced food. Community-organised feeding and demonstration camps organised in collaboration with local Government are inexpensive and easy to organise. Gradual and systematic reintroduction of millet production with knowledge building of selected farmers on production, processing, and market engagement is highly effective in gaining trust.

Dilemmas and barriers: One of the challenges faced is the indifferent, hesitant, or orthodox community. To effectively mitigate such challenges and bring acceptance within the community, the initiative has implemented easy recipe demonstrations, frequent community

meetings, increased engagement through diverse tools and practices, and linkages and convergence with local Government and state-level advocacy.

Novelty and innovation of solution:

The collaborative efforts through direct implementation and advocacy to simplify food preparation and incorporate diverse local food in the diet through community meetings, gatherings, and house visits for behavioural change is a novel and innovative solution for community-based management of malnutrition from the block to the district to the state.

Editor's Note: *The story is interesting, and assessment of nutritional impact would further strengthen the replicability.*

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Institution: Welthungerhilfe

Summary: Bhoomi Ka, meaning “from the earth,” aims to transform the food systems in India by promoting ecological, safe, and healthy consumption, which benefits both the farmers and the consumers. The programme focuses on increasing the demand for millets to create a pull factor for farmers to produce healthier food and get fair prices. Bhoomi Ka works with all stakeholders of the value chain to address gaps and challenges.

Pitch: The programme collaborates with consumers to create awareness, promote, and develop innovative millet recipes to address the low demand for millets. Bhoomi Ka organises awareness camps, multi-stakeholder meets, cooking classes, nutrition talks, and food yatras. To promote the production and supply of millets, Bhoomi Ka works with smallholder farmers to build their capacities in millet production systems, form FPOs, and connect them with urban markets to ensure a farmer-to-consumer connection.

Problem: The current agriculture and food system in India faces numerous challenges, including degradation of land and water, climate change, high use of chemicals, unhealthy food habits, and declining health of people. The promotion of production and consumption of millets directly addresses these challenges. Millets are nutri-cereals rich in iron, zinc, proteins, vitamins, and minerals, and have a low glycemic index that helps tackle health challenges such as diabetes, heart diseases, anaemia, and obesity. Millets are climate-resilient and drought-tolerant plants that require minimal inputs, irrigation, and care, making them good for both farmers and the planet.

Solution: Bhoomi Ka addresses the demand side of millets to revitalize the missing urban-rural and producer-consumer connect in selected towns. It improves visibility and product experience, communicates producer and product information to consumers, Bhoomi

Bhoomi Ka-Promoting Sustainable Production and Consumption of Millets

Location: Punjab, Haryana, and Delhi, India



Embracing Organic Farming

#BhoomiKa



Ka-Promoting Sustainable Production and Consumption of Millets Mainstreaming in India, Asian and African Countries-A Compendium of Inspiring Stories from Field and increases accessibility to millets. The programme achieves this through advocacy and awareness campaigns in schools, colleges, fairs, festivals, hospitality sector, farmers' markets, and food yatras in rural and urban regions. The second objective of the programme promotes production and marketing of millets through direct engagement with smallholder farmers and small local businesses. The programme promotes FPOs and CFCs to support farmers in marketing and promoting their produce. Attractive packaging and branding make millets attractive to high-end consumers who would pay better prices for the products. Bhoomi Ka also engages with the Government to advocate and promote millets in the state, resulting in the inclusion of millet processing units in subsidized agri-machines.

Target population: The programme aims to create awareness and promote healthy and safe foods like millets among urban and rural consumers, while also working with smallholder farmers to promote millet production and ensure fair prices, as well as ecological production systems.

Results: The programme has successfully reached over 500 farmers in Punjab and Haryana who have transitioned from inorganic to organic food systems and are now engaged in millet production. These farmers are associated with 48 Participatory Guarantee Scheme (PGS) groups, which provide them with support through certification and production. Additionally, three Farmers Producer Organizations (FPOs) have been established in the states, each with a Common Facility Center (CFC) to support the processing and packaging of millets. Over 20 Memorandums of Understanding (MoUs) have been signed between FPOs and local retailers to sell their produce in their stores. The programme has also reached over two lakh consumers through various awareness programmes, online events,



school programmes, food yatras, and social media promotions. Where awareness activities have been conducted directly with consumers, local retailers have seen a 10% increase in consumption.

Potential for upscaling and replicability: The programme's solution is simple, direct, and easily replicable. It is not limited by geography or locale and can be scaled up to different parts of the country as well as globally. Creating a strong network of similar awareness and promotion can be done in different locations. Similar activities have been initiated in Rajasthan through programme partners, which has started to show promising results.

Drivers of change: There is a growing consciousness among consumers towards healthy lifestyles and diets. More and more people are now seeking healthy foods to replace their unhealthy habits. This was further triggered by COVID-19 and its impact on health. When millet was offered as a solution, many consumers were interested in learning more and incorporating it in their diet. Another important factor that supported the acceptance of millets among the farming community was climate change and the degradation of land and water due to the heavy use of chemicals and fertilizers. Millet production supported the farmers in facing adverse weather changes and improving the soil and water requirement in the

field. They are also economical for smallholder farmers as they have very little production cost.

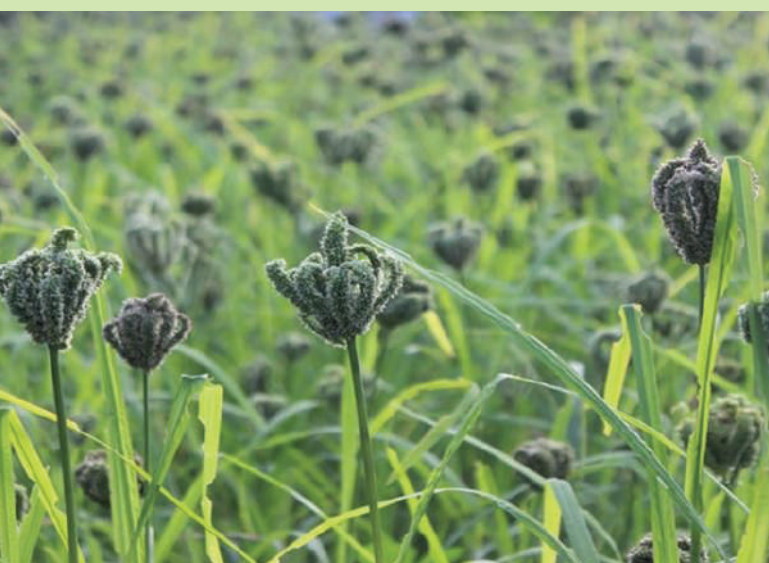
Dilemmas and barriers: One of the key risks anticipated was how the farmers and small retailers would be able to cater to the increased demand once it arose. The programme strengthened farmer groups and systems to address growing demand. The programme also worked to map and identify local businesses that would be able to supply products to consumers in different cities and locations.

Novelty and innovation of solution: The solution looks at the entire value chain to address the key challenges faced at different levels by creating awareness and promoting millets through health talks, nutrition awareness, cooking classes, and peer-group sharing. While creating awareness among consumers, the programme also links them to local ecopreneurs and farmers who can supply them with the produce. Simultaneously, it builds capacities of farmers and promotes millet production among them. The third key aspect has been to engage with local Government to advocate for the promotion of millets in the states. The solution addresses gaps at different levels by creating a strong network to make the practice sustainable.

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Promotion of Improved Agronomic Practices for Finger Millet

**Location: South Sikkim,
Sikkim, India**



Institution: Agriculture Department, Govt. of Sikkim

Summary: Finger Millet is a crucial crop in Sikkim that fulfils the nutritional needs of families and generates income through its sale in local markets. However, its cultivation is labor-intensive, and women face significant drudgery during threshing and dehulling. The lack of women-friendly tools and proper storage and processing units, as well as the absence of awareness programs, training on value addition, and marketing logos, are some of the challenges faced in this area. To address these challenges, high-yielding varieties were introduced, and units for storage, packaging, and value addition were installed. Training on value addition, packaging, labeling, and marketing was also provided to increase production and marketing. Millet flour is nutritious, gluten-free, and has excellent scope for marketing both inside and outside the state, including in the form of bread, noodles, and pasta. Young entrepreneurs are encouraged to come forward to cater to the needs of consumers in Sikkim and beyond.

Pitch: Finger Millet, a superfood, is organically grown in Sikkim and fulfils nutritional needs while generating income for families through its sale in local markets. By promoting improved agronomic practices, such as the use of high-yielding varieties and value addition techniques, the production and marketing of millet can be increased, benefiting both farmers and consumers in Sikkim and beyond.

Problem: The cultivation of finger millet is labor-intensive, and women face significant drudgery during threshing and dehulling. The lack of women-friendly tools and proper storage and processing units, as well as the absence of awareness programs, training on value addition, and marketing logos, are some of the challenges faced in this area. There are also many landless farmers who can be integrated into the millet value chain in activities like packaging and labeling.

Solution: To address the challenges faced, high-yielding varieties were introduced, and units for storage, packaging, and value addition were installed. Training on value addition, packaging, labeling, and marketing was also provided to increase production and marketing. By promoting the use of millet flour in various products, such as bread, noodles, and pasta, and encouraging young entrepreneurs to come forward, the scope for marketing both inside and outside the state can be expanded.

Target population: The local population of Sikkim consumes millet flour, which is available in almost every place in the state. Business ventures with organically made products like bread, noodles, and pasta have a vast scope within and outside the state. Young entrepreneurs who can come forward to earn an income by catering to the needs of consumers in Sikkim and beyond were considered as a key target.

Results: Mrs. Maya Thapa, a 50-year-old woman farmer from Mangan, North Sikkim, has become a successful millet farmer after receiving training and support from the Agriculture Department under the NFSM-Nutri cereals scheme. With the help of quality seeds and other inputs, she cultivated finger millet (VL-352) in 0.5 hectares and adopted good agricultural practices resulting in higher productivity. Mrs. Thapa earned a net profit of Rs. 52,500/-from her small holding of 0.5 ha and now provides nutritious food to her family, while earning a livelihood. There are many such stories of empowerment owing to Sikkim's millet intervention.

Potential for upscaling and replicability: Millet is a superfood, and its production and value-added products can fetch remunerative prices in the market, especially in Sikkim, an organic state. The production and packaging of millet products at the village level can also create employment opportunities for women

Self Help Groups and youths. The success of Mrs. Thapa's story can inspire younger generations to take up millet farming, leading to greater adoption and success in the future. Additionally, integrating millet into the mid-day meal scheme at Government schools can provide children with nutritious food.

Drivers of change: Sikkim's organic status is a major driver of the adoption of millet farming. Millet's status as a superfood also drives its production, and the potential for remunerative prices motivates farmers to take up millet cultivation.

Dilemmas and barriers: Despite the historical practice of millet cultivation in Sikkim, its production is declining due to the lack of interest among the younger generation and the unavailability of farm laborers. Additionally, the cultivation of finger millet is labor-intensive and requires involvement from women in sowing, transplanting, harvesting, threshing, dehulling, and storing. The lack of women-friendly farm tools, storage facilities, and processing units also poses a challenge. Furthermore, there is a lack of awareness and training on value addition, packaging, shelf-life, and labeling, which needs to be addressed to overcome these barriers.

Novelty and innovation of solution: Finger millet flour is a rich source of vitamins, minerals, and antioxidants and is gluten-free. Finger millet flour and its organic products like *dhainro* (porridge) and chapatti are consumed by the local population of Sikkim and are available in almost every place in the state. The adoption of millet farming and its value-added products can not only provide nutrition but can also contribute to the local economy, creating sustainable livelihoods.

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Management of Downy Mildew Disease in Pearl Millet through Host Plant Resistance

Location: India and Africa



Institution: International Crops Research Institute for the Semi-Arid Tropic (ICRISAT), Patancheru, Hyderabad in partnership with ICAR-AICRP on Pearl Millet

Summary: Pearl millet, being grown by resource-poor farmers, the diseases such as downy mildew are managed through host plant resistance as it doesn't incur additional cost to farmers for the disease management, though initial cost is involved in research and development to develop resistant cultivars.

Pitch: An estimated 30-40% of potential crop production is lost due to pests and diseases annually. These losses could be much higher if a susceptible cultivar is grown over a large area, and environmental conditions are favourable for disease development. The diseases can be best managed through host plant resistance, which is a cost-effective and environment friendly approach. However, continuous emergence of host specific virulences leads to frequent break down of resistance and poses a continuous challenge to resistance breeding. Close monitoring of the pathogen and identification and utilization of diverse resistance sources would form the effective disease management strategy.

Problem: Downy mildew (DM), caused by *Sclerospora Graminicola* is highly destructive and widespread disease in the most pearl millet growing areas of Asia and Africa. The disease was considered as a minor disease in India till 1970 due to fewer incidences on local cultivars; however, it reached epidemic levels during the mid-1970s to 1980s when only a few single-cross hybrids were cultivated on a large scale. The first epidemic of DM occurred in 1971 on a popular pearl millet hybrid, HB 3, and resulted in severe grain loss of about 4.6 million metric tonnes. The estimated annual grain yield loss due to DM is approximately 20-40% but could be much higher, up to 80%, under favourable environment and widespread use of same cultivar across fields. Several commercial F1 hybrids being grown in different states become

susceptible to DM within 3-5 years due to large virulence diversity existing in the pathogen.

Solution: With increasing area coming under pearl millet hybrid cultivation in India since the 1970s, DM severity and spread increased proportionately. The first DM epidemic occurred on the most popular hybrid HB 3 in 1971, and the first report on pathogenic variability appeared in 1973 when NHB 3 was found susceptible at Gulbarga but resistant at Mysore. With increasing reports of pathogenic variability in the pathogen and hybrids succumbing to DM, a systematic study was initiated in the early 1990s following discussions between ICRISAT and ICAR scientists on characterization of the pathogen populations. Monitoring virulence of pathogen populations through on-farm surveys and reaction of isolates on host differentials, selection of diverse pathotype-isolates, conducting disease nurseries, screening of germplasm/breeding material against different pathotype-isolates in the greenhouse, identification of multiple-pathotype resistant lines and multi-location field screening of selected lines for the identification of stable resistant lines forms the strategy to manage this disease by developing DM-resistant hybrid parent lines and hybrids. Large number of DM resistant lines were used in the breeding programs and diversified genetic base of pearl millet hybrids for DM resistance contributed to arresting the occurrence of widespread DM epidemics.

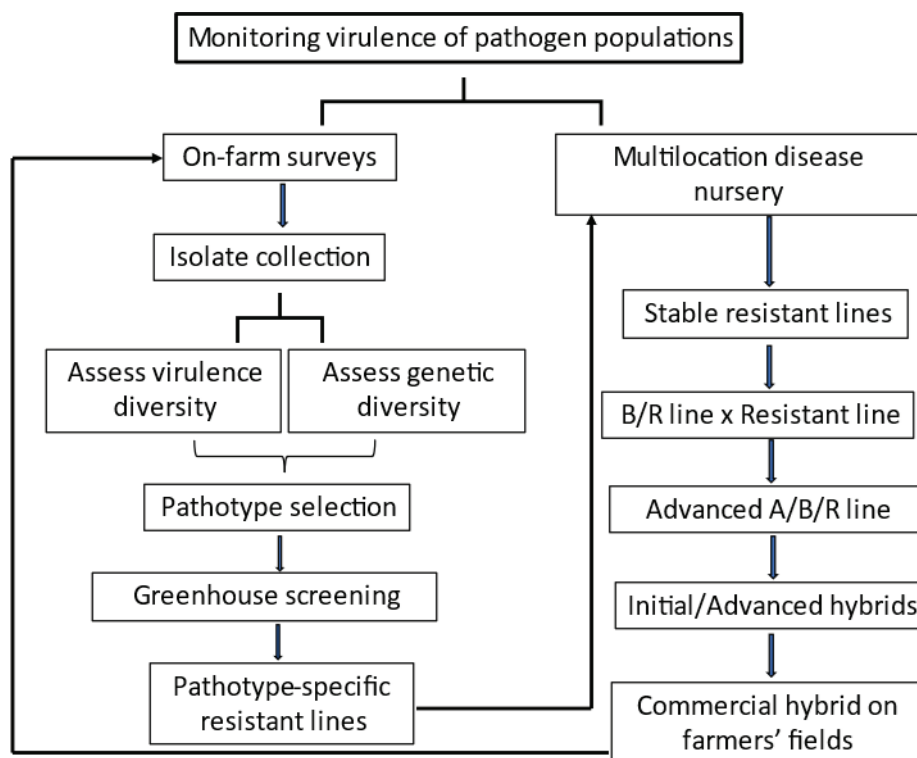
Target population: The sources of broad-based stable resistance to DM are shared with the breeding programs to develop disease-resistant high yielding cultivars that are finally grown on farmers' fields. Breeding lines developed at ICRISAT are screened against diverse pathotypes and agronomically superior lines with resistance to at least two pathotypes are designated and shared with NARS and private sector partners to develop DM resistant hybrids. Though primary users are the researchers who use this information and material to develop DM resistant pearl millet hybrids, actual beneficiaries

are the resource-poor farmers who now need not spend on expensive chemicals for disease management.

Results: During the past 30 years, several DM resistant lines such as P7 (ICML 12), SDN 503 (ICML 13), 700251 (ICML 14), 700516 (ICML 15), 700651 (ICML 16) and 7042R (ICML 22), P 310-17, P1449-3, IP 18292, IP 18293, IP 18294, IP 18295 and IP 18298 have been strategically used in resistance breeding programs and some of the resultant hybrids have been commercially successful. There has been substantial progress in managing the risk of losses caused by DM epidemic by diversifying the hybrid cultivars base by screening breeding lines to diverse pathotypes and breeding DM resistant hybrid parental lines at ICRISAT that are utilized by private and public organizations for developing hybrids. The yield improvement in pearl millet has mostly occurred due to the development and adoption of a large number and diverse range of high-yielding DM resistant hybrids, of which about 60-70% are based on the ICRISAT-bred hybrid parents, or on the proprietary hybrid parents developed by the seed companies that included the improved breeding lines developed at ICRISAT in their parentage. The large on-farm hybrid cultivar diversity not only led to increase in grain yield, but also stemmed the large-scale DM epidemics, which were frequent events prior to 1990.

Potential for upscaling and replicability: The greenhouse screening technique can be used to screen large number of pearl millet lines at seedling stage against diverse pathotype-isolates collected from different ecologies. This has led to the identification of multiple-pathotype resistant lines for further use in developing DM resistant hybrids in pearl millet. National programs mostly use the field-based screening which can be used to screen the material against the pathogen population present in a particular field. The greenhouse screening facilities can be established in the major pearl millet growing states in India as well as in Africa to strengthen pearl millet DM resistance breeding programs.

Greenhouse screening for DM resistance



The strategy used to manage DM in pearl millet can also be used to target blast disease which has emerged as another serious threat to pearl millet cultivation in India.

Drivers of change: Managing DM to a level that no wide-spread epidemics of the disease are now reported has only been possible through multi-institutional and multidisciplinary approach. The virulence change in the pathogen is monitored through on-farm surveys and characterizing the pathogen population on host differentials. On-farm surveys provided the initial information on virulence change when a resistant hybrid started showing the disease symptoms after a few years of its release and cultivation on farmers' fields. The multi-location screening of germplasm and breeding material by pathologists helped in the identification of stable sources of resistance for use in breeding programs. The elite breeding lines with DM resistance were shared with public and private sector partners. Private sector played an important role in taking the seed of DM resistant improved hybrids to farmers' fields.

Dilemmas and barriers: The major barrier in managing pearl millet DM through host plant resistance is the variability in the pathogen populations. Evolution of host specific virulences in pearl millet DM is well documented. As a result of evolution of host specific virulences, resistant genotypes lose their effective resistance within

a short period and lead to the development of new pathotypes/races in the pathogen populations. Therefore, pathogen populations in the major crop growing areas need to be periodically monitored and characterized to identify new pathotypes in the target area. There is a need to keep pace with the evolving pathogen by identifying and utilizing diverse resistance sources to manage this disease.

Novelty and innovation of solution: The successful management of highly variable pathogen causing DM in pearl millet is the result of close collaboration between pathology and breeding teams. As the disease is caused by an obligate pathogen, it needs to be maintained on live host. Pathogen isolates are collected every year from different pearl millet growing areas in India, characterized, and maintained on live host in isolation chambers in glasshouse at ICRISAT. ICRISAT has repository of isolates representing spatial and temporal diversity and diverse pathotype-isolates are used to screen the breeding material at different generations. The elite breeding lines having resistance to different pathotypes are shared with different partners for use in their breeding programs to develop DM resistant pearl millet hybrids.

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Enhancing Livelihood of Post-rainy Season Sorghum Farmers through Technological and Institutional Interventions

Location: Parbhani, Beed, Aurangabad, Ahmednagar, Pune, Solapur, Maharashtra, India



Institution: International Crops Research Institute for the Semi-Arid Tropic (ICRISAT), Patancheru in partnership with Mahatma Phule Krishi Vidyapeeth (MPKV)-Rahuri and Vasant Naik Marathwada Krishi Vidyapeeth (VNMKV)-Parbhani

Summary: Through in-situ soil moisture conservation, improved varieties, seed treatment, seed drill sowing, soil test-based fertilizer use, and timely weed control, the productivity and profitability of post-rainy sorghum farming in Maharashtra, India was transformed, benefiting farmers' grain and stover output. This was achieved through a partnership effort involving ICRISAT, MPKV, VNMKV, and other public, private, and civil society partners, funded by the Bill & Melinda Gates Foundation.

Pitch: Post-rainy season sorghum, grown on residual soil moisture on black soils, is a vital crop for farmers in the dry tracts of Western Maharashtra and Marathwada regions in India. However, the productivity of post-rainy sorghum remained low at 650 kg/ha, with challenges such as the use of landraces, higher population, shoot fly, and drought. To address these issues, ICRISAT, MPKV, and VNMKV partnered with other organizations to provide innovative solutions, which transformed post-rainy sorghum production in Maharashtra.

Problem: Post-rainy sorghum is a critical crop in India, underpinning the livelihoods of around 5 million households through 3 million tons of grain produced on 5.7 million ha of cropped area in the Deccan Plateau. However, the crop faces challenges due to reduced photoperiod, low minimum temperatures during flowering time, and terminal drought. Despite being the most important crop grown on residual soil moisture in black soils in the Deccan Plateau, the productivity of post-rainy season sorghum was dismally low at 650 kg/ha. Poor adoption of improved varieties, higher seed rate than the recommendation, blanket use of fertilizers, shoot fly damage, poor weed control, and

terminal drought were serious constraints affecting productivity.

Solution: ICRISAT and partners developed innovative biophysical solutions, which were deployed in farmers' fields to address constraints in post-rainy sorghum production. These solutions included rainwater harvesting through the formation of raised beds in fields during the rainy season, the use of improved post-rainy sorghum varieties with adaptation and market preferred traits, treating seed with insecticide for shoot fly control, using seed drills for maintaining optimum plant population, fertilizing the crop as per soil test-based fertilizer recommendations, and controlling weeds through inter-culture operations. These interventions were undertaken on 40,000 farmers' fields in Maharashtra and were made possible by close collaboration with the Department of Agriculture, State Agricultural Universities, NGOs, and input suppliers. The crop was harvested at physiological maturity.

Target population: Post-rainy sorghum is typically grown by small (1-2 ha) and marginal farmers (1 ha) who have limited access to inputs, improved cultivation practices, processing technologies, and markets due to their affordability. Their production is mainly for household consumption with limited marketable surplus. Most of these farmers are poor, marginalized communities that suffer from rampant malnutrition. Through an inclusive approach, rural women and youth were organized into groups and trained in improved technologies and seed production methods. The five-point program combines improved varieties and cultivation practices to change the way post-rainy sorghum is cultivated, resulting in higher productivity, profitability, and nutrition through community participation.

Impact: The interventions under the five-point program were implemented on 40,000 farmers' fields in six districts of Maharashtra (three each in Western Maharashtra and Marathwada) over four years with the participation of public, private, and civil society partners. The



deployment of improved technologies and knowledge sharing with farmers resulted in a significant increase in post-rainy sorghum grain yield (by 35%) and stover yield (by 20%) in farmers' fields. Implementing improved technologies helped overcome yield losses during drought years as well. Economic analysis of improved technologies indicated that the additional cost of replacing the local variety with the improved variety is Rs. 3,413, yielding a net gain of Rs. 6,088 per ha with an incremental returns-to-cost ratio of 1.78. The incremental income is Rs. 2,675. Similarly, the additional cost associated with replacing the variety along with improved management practices is Rs. 4,083 with an incremental cost-to-return ratio of 3.51. With supplementary irrigation, the net gain increased to Rs. 14,418 per ha with an incremental returns-to-cost ratio of 3.78. Thus, the contributing factors towards improved productivity in the case of rabi sorghum are management practices such as nutrient management, supplementary irrigation, and improved production technology.

Potential for upscaling and replicability:

Dryland farmers tend to under invest in improved capital-intensive technologies because of risk and uncertainty, vagaries of monsoon rains, and scarcity of labor. The interventions clearly demonstrate the potential of improved technologies in increasing the grain and stover yields on 40,000 farmers' fields. These interventions are scalable by forging innovative partnerships and designing context-specific solutions. While deploying these innovations, there will be challenges initially. For instance, despite popularizing the use of seed drills to maintain the required row spacing in post-rainy sorghum, the demand for fodder often drives out the desire to maintain higher plant population than is recommended. Further, post-rainy sorghum farmers tend to prefer stover quality to improved varieties along with grain quality besides higher yields. A strong livestock economy is the driving force for adopting the improved varieties of rabi sorghum farmers. The

success story is replicable and scalable through context-specific design and deployment.

Drivers of change: The critical factors for the success of the practices were the availability of technologies and the synergy among partners in deploying them in farmers' fields. While the use of old landrace cultivars, higher seed rate than the recommendation, blanket use of fertilizers, shoot fly damage, poor weed control, and terminal drought were serious constraints affecting productivity, the technologies developed by ICRISAT and partners helped overcome these challenges. The Parbhani Moti, Phule Vasudha, Phule Chitra, Phule Anuradha, and Akola Kranti were improved post-rainy sorghum varieties developed by the Indian NARS and ICRISAT. Similarly, the crop management technologies suitable for post-rainy sorghum were developed by the Agricultural Universities in Maharashtra. Under the HOPE-Sorghum and Millets project, ICRISAT and their partners have combined them into a 5-point program and implemented it on 40,000 farmers' fields leading to significant increase in grain and stover yields with strong support from Dept. of Agriculture and NGOs.

Dilemmas and barriers: One of the main challenges faced was the acceptance of new technologies by farmers, who had been accustomed to the status quo for a long time and had apprehensions about the quality of new varieties, especially in terms of grain and stover. Additionally, the availability of inputs such as seeds, seed treatment chemicals, fertilizers, and seed drills for maintaining optimal plant populations posed a challenge, as their distribution and acceptance among farmers were found to be highly challenging. To overcome these risks, seeds were produced in advance and liaised with other input suppliers to manufacture seed drills locally. The staff also worked closely with farmers to guide them through the implementation of all interventions thoroughly.

Negotiations were made with various seed producers to supply improved varieties of seeds and requested Government departments were requested to support the adoption of improved management practices by farmers through various schemes, including capacity building programs.

Novelty and innovation of solution: All the interventions implemented were novel and very new to the farmers. Prior to the intervention, farmers had been accustomed to using old landrace cultivars, high-density planting, limited adoption of fertilizers, and other management practices, which were the main reasons for low productivity. Through an innovative partnership effort led by ICRISAT, the NGO significantly changed the way post-rainy sorghum is cultivated. Employed methods included in situ moisture conservation by harvesting rainwater

and forming raised beds in the fields during the rainy season, use of improved post-rainy sorghum varieties with adaptation and market-preferred traits, treating the seed with insecticide for shoot fly control, and use of seed drills to maintain optimum plant population. The crop was fertilized according to soil test-based fertilizer recommendations and controlled weeds through inter-cultural operations. These interventions were carried out on 40,000 farmers' fields in Maharashtra, India and were made possible through close collaboration with the Department of Agriculture, State Agricultural Universities, NGOs, and input suppliers.

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Empowering Tribal Women through Millet Value Chain Aggregation

Location: FPC Karanjia and Samnapur Block of Dindori District, Madhya Pradesh, India



Institution: Aarastha Mahila Kisan FPC and Hal Chalit Mahila Kisan

Summary: The project aims to promote the cultivation of traditional minor millets, i.e., kodo and kutki, among tribal women farmers by strengthening the value chain, improving market access and creating sustainable livelihood opportunities. Through the adoption of aggregation principles and the establishment of Farmer Producer Companies (FPCs), the project is enhancing the bargaining power of women farmers in the market and improving their incomes.

Problem: The shift towards paddy cultivation and changed food practices have led to a loss of traditional crops which were more nutritious and had higher resilience to climatic shocks. Marginalized tribal women farmers faced challenges such as distress selling, influence of middlemen and traders, and lack of understanding of market systems. As a result, they often sold their produce at unfair and lower prices.

Solution: The project mobilized tribal women farmers to form FPCs and provided them with training on multiple topics such as aggregation and collection systems, quality control, record-keeping, and processing at the producer level. The FPC staff was trained on business planning, market understanding, and negotiation skills. Exposure visits were organized for the team to help them understand millet processing systems including the machinery and its operation. In the year 2021-22, a total of 24 tons of millet produce was aggregated and processed by the FPC and supplied to B2B vendors. By aggregating their produce and processing it, tribal women farmers now have better access to markets and can avail better prices. The project has impacted the lives of over 40,000 households in the district directly through income gain and indirectly through increased consumption by over 2 lakh population. Women farmers have expanded their scope of work and responsibilities from production to marketing, thus empowering themselves.

Target population: All participating women farmers are from the Scheduled Tribes and Primitive Tribal Groups from the two blocks of Dindori District. The average landholding of the member is 2.5-4 acres. The project is helping create sustainable livelihood opportunities for marginalized tribal women farmers and empowering them.

Results: Currently, the marketing initiative covers a total of 1250 women farmers from two blocks encompassing 32 villages. The average volume of millet produced and marketed per farmer has increased from 40 kgs to 75 kgs in the past 2 years. The key performance indicators of the value chain work, which are mapped under the intervention, include (1) average produce collected, (2) quality of produce supplied, (3) payment clearance time by the FPC, and (4) order delivery parameters (time, volume, and quality-wise).

Upscaling and replicability: The tribal and arid regions of the state have immense potential to integrate millet crops into their production systems. With regards to the districts in eastern Madhya Pradesh, the marketing work can be expanded to 25 more blocks, covering around 1 lakh women farmers in total. Additionally, there are ongoing efforts to promote the consumption of millets locally by supplying them under the Mid-Day Meal scheme and promoting newer variants such as ragi millet for production.

Drivers of Change: The key factors that are essential drivers of change include:

- Ensuring commitment to delivering orders in a timely, quality, and quantity-wise manner
- Clearing payment to the producer according to the aggregated quantity
- Maintaining quality parameters at the producer level and from FPC to vendor
- Setting up processing machines that are able to cater to the needs, requirements, and forecasted business cycles for at least 5 years.



- Furthermore, capacity building of board members and staff members of the FPC, along with setting up systems for reviewing the FPC's work and member accountability, is necessary.

Dilemmas and barriers: List of identified risks and mitigation steps taken are:

| S.No. | Identified Risk | Mitigation strategies |
|-------|---|---|
| 1 | Supply of produce as per the order need from the members | Member wise targets and marking reserve stocks from the intervening pockets |
| 2 | Quality assurance of the produce | Training and exposure on importance of maintaining quality for sustenance of business at the FPC level |
| 3 | Mixing of produce because of the usage of traditional seeds at the producer level | Mapping of seed variant and crop plots to map in advance the type and volume of surplus availability before the end of the season |
| 4 | Handling of cash at the producer level | Setting stringent norms on payment in cash and using group-based transaction |

Novelty and innovation of solution: The production enhancement efforts made over the previous few years in the Mahakaushal region have increased the confidence of women farmers and stakeholders in adopting more agriculture and allied sector work. Improving the marketing of millets has helped synchronize production and aggregation efforts and bypass middlemen by negotiating directly with vendors. The collective energy of the Federation (the apex body of women SHGs) has steered and supported the formation of the FPC, helped build synergy between women collectives and promoted women SHGs nurtured under the SRLM.

Contact details: Halchalit Mahila Kisaan Women FPC, H/O Gulab Singh, AjanTekri, Village & GP Dewalpur, Block Samnapur (Dindori-481778). Email-hcmksamnapur@ gmail.com. Phone number: 8305734598/ 8017839479

Institution: RCDS (Kosagumuda), Gobindalaya (Nabarangpur), DOST (Papadahandi), SAHARA (Umarkote), Harsha Trust (Jharigam)

Summary: The Odisha Millets Mission (OMM) organized awareness programs to promote consumption of finger millet, little millet and kodo millet among the farmers of Nabarangpur. This included awareness campaigns, recipe trainings, and food festivals.

Pitch: Despite growth in global food production, supply, and distribution, poor nutrition and food insecurity persist in both rural and urban areas. Climate change further poses a risk to nutrition and food security. In the past, millets were a staple food for rural and tribal people of Odisha, but they have overtime been replaced by paddy. Thus, millet practices were unknown to the majority of the farming community. The OMM aimed to raise awareness about millet cultivation and nutritional benefits through awareness campaigns, training on millet-based recipes, health benefits of millets, and food festivals at the district, block, and Gram Panchayat levels.

Problem: Nabarangpur district is known for maize production, and large areas of land are dedicated to maize and paddy cultivation. Private companies provide cash advances, hybrid seeds, chemical fertilizers, and pesticides to support maize production, which deteriorates both soil and human health. Unlike paddy and other cash crops, millets did not receive state or market-led support, and people lost touch with millet production and consumption practices and knowledge of their benefits.

Solution: The OMM conducted awareness campaigns on millet cultivation and their nutritional value through various methods, including awareness campaigns, training on millet-based recipes, and food festivals at the district, block, and Gram Panchayat levels. Facilitating agencies supplemented these events with village meetings, distribution of IEC materials, and wall paintings and posters mentioning the nutritional value of millets

Awareness Building for Millet Production and Local Consumption

Location: Nabarangpur, Odisha, India





and how they prevent nutritional deficiency diseases. The Department of Agriculture and the Facilitating Agencies conducted ten Awareness Rath campaigns in each of the five blocks. The Awareness Rath visited all the villages of the targeted Gram Panchayats to raise awareness about millet cultivation and its benefits. SHG members from different villages were provided training on diverse recipes, aimed at increasing overall millet food awareness among the community and boosting local consumption. Food festivals were organized in public arenas where SHG members exhibited different millet items, such as cake, mudki confectioneries, and biscuits, to scale up awareness campaigns on millet preparations and benefits at a larger scale and in peri-urban contexts.

Target population: The target groups for the Odisha Millet Mission (OMM) were farmers, community members, Self Help Group (SHG) members, and school children. Despite the nutritional value of millet crops, information regarding their benefits had not yet reached every household, resulting in a lack of access to high-value nutritional foods such as fruits and vegetables. This has led to many school children, marginal farmers, and women suffer from diseases. The OMM aims to address these deficiencies by increasing awareness about millet consumption, and farmers are also made aware of Government support available for Package of Practices (PoP) and procurement surplus.

Results: In the first year of the program, only 518 hectares were covered under finger millet due to a lack of awareness among farmers and community members about millet cultivation and consumption. However, through awareness campaigns and training, engagement with 14,000 farmers has been achieved within three years. This year, more than 4,500 hectares are expected to be covered under millet cultivation, with 4,200 hectares under ragi, 200 hectares under suan, 50 hectares under kodo, and 50 hectares under kangu.

Upscaling and replicability: There is an opportunity to spread awareness on millets, scientific practices, and dietary diversification in new areas, as many villages in the five target blocks have not yet been covered through awareness activities. It is critical to train women members from all SHGs in preparing millet-based food to ensure that millet reaches every household in the district. Larger food festivals can be regularly conducted at different venues, targeting various community groups. Once people increase millet-based food in their diet, millet cultivation will sustain through local consumption even after the project ends.

Drivers of change: Planning, coordination, and implementation by the Facilitating Agencies (FAs), Farmer Producer Organizations (FPOs), and Agriculture officials have been critical in bringing millet-based foods to more households. The FAs have been instrumental in making these awareness campaigns successful and generating dialogue among the community. Training SHG members has been key in increasing household consumption, as one member of a SHG can train the rest of the members and their relatives and neighbors.

Dilemmas and barriers: During the initial implementation phase, there was less participation from the community during the campaigns. However, by ensuring that millet farmers received support with the Package of Practices and Procurement, the community was convinced of the benefits of millet cultivation. Ready-to-Eat millet items are still not available at scale, but there is a plan to establish five Millet Tiffin Centers in each block to increase their availability.

Novelty and innovation of solution: The Rath Awareness Campaign, which moves according to a route map of villages prepared for maximum coverage, has been successful in increasing awareness about millet culture. Local tunes and artists are engaged in composing songs on millet culture, and the Rath is decorated with colorful informational banners. Adapting such local customs in the Government program has been a successful innovation.

Contact details: RCDS (Kosagumuda), Gobindalaya (Nabarangpur), DOST (Papadahandi), SAHARA (Umarkote), Harsha Trust (Jharigam)

Foliar Spray of Potassium Sulphate for Improving Yield of Small Millets

Location: Tamil Nadu, India



Institution: Regional Research Station, Tamil Nadu Agricultural University

Summary: Foliar spray of 1% Potassium Sulphate (K₂SO₄) at 35 Days after Sowing (DAS) in *Samai* and *Tenai* recorded higher partitioning efficiency and increased grain yield. It recorded improved partitioning efficiency percentage to grain (*Samai*: 34.6% and *Tenai*: 43.8%). The cost of technology is Rs. 1250/ha with yield potential of 847 kg/ha in *Samai* (15% increment over control 735 kg/ha) and 2237 kg/ha in *tenai* (18.4% increment over control 1890 kg/ha).

Pitch: Small millets growing farmers of Tamil Nadu can increase yield with foliar spray of Potassium Sulphate.

Problem: Poor partitioning efficiency in small millets leads to less productivity. Non-application of potash fertilizers to small millets is one of reason for poor yield. Hence, foliar application of potassium will increase the partitioning efficiency and ultimately yield. Since, small millets are mostly grown in rainfed condition, foliar application is a possible way to improve productivity.

Solution: Adopting the foliar spray of 1% K₂SO₄ at 35 DAS in *Samai* and *Tenai* recorded higher partitioning efficiency and increased grain yield.

Target population: Small millet growing farmers of Tamil Nadu and Agriculture Department Extension officials.

Results: Increased production of small millets with higher productivity.

Potential for upscaling: Innovation can be upscaled with dissemination of technological know-how among target group of small millet growing farmers.

Drivers of change: Achieving maximum yield potential and increasing the farmer income with high Benefit-Cost Ratio (BCR).

Dilemmas and barriers: Convincing farmers to adopt the technology and practice the PoP without any deviation were the biggest challenges faced.

Novelty and innovation of solution: As the production needs to be increased to meet the present-day demand with the decreasing

land area towards farming and increasing the productivity, such a practices can help in achieving higher productivity.

Contact details: Regional Research Station, Tamil Nadu Agricultural University, Paiyur, Krishnag



The background features a stylized illustration of millet plants with long, narrow leaves and several panicles of grain. The illustration is rendered in a light green color against a darker green background. A horizontal band with a fine vertical-line pattern is positioned behind the text.

B. Millet Mainstreaming

Odisha's Tribal Women Spearheading the Mission to Promote Millets A Farm to Plate Approach

Location: Keonjhar, Sundargarh,
Odisha, India



Institution: Mission Shakti Department, Government of Odisha in collaboration with Odisha Millets Mission (OMM)

Summary: The Mission Shakti Department in collaboration with Odisha Millets Mission (OMM) has supported tribal women in Odisha to lead their communities in including and promoting millets, ensuring their nutritional and livelihood security, while also providing an impetus to revive the millet economy. The story focuses on gender and inclusion dimension of millet mainstreaming.

Pitch: WSHGS in Odisha have established 76 millet-tiffin-centers at various community locations in 13 tribal-dominated districts. The initiative has fortified the strength and conscientiousness of women-collectives by setting up primary-processing and post-harvesting-units for millets in rural-areas. Under OMM's initiative, institutional, and technical support has been provided to WSHGs to set up millet-processing-centers. Children too are a focus of the mission. In a first of its kind initiative in the state, ragi ladoo has been distributed to pre-school children in the Anganwadi Centres in the Keonjhar and Sundargarh district. The main objective is to address malnutrition and nutritional at deficiency.

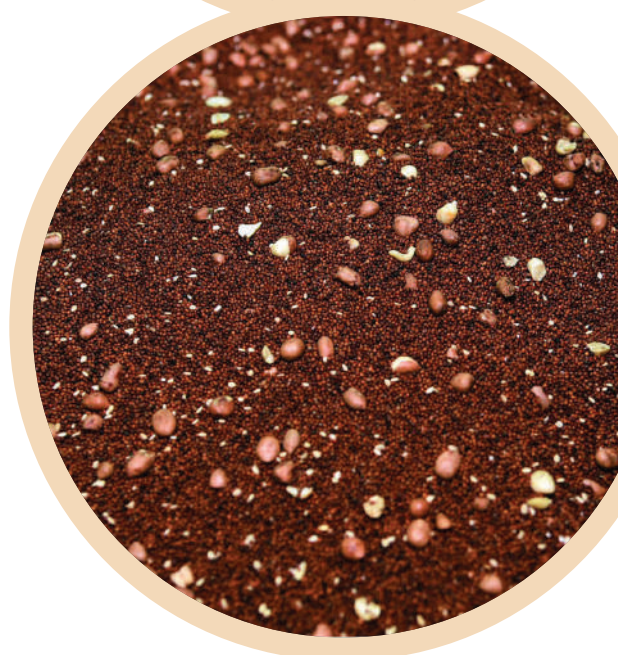
Problem analysis: These millet-based enterprises can become a comprehensive solution for addressing malnutrition and unemployment, and motivating farmers to increase their millet cultivation area which has reduced due to aggressive promotion of cash crops, claim Civil Society Organizations facilitating the implementation of OMM at the grassroots.

Solution: Awareness building activities were organised, such as food festivals, cooking competitions, and celebrating local millet food cultures. Participatory training programmes were also conducted for WSHGs on millet recipes and millet enterprises. Millet tiffin centers were launched in rural areas to create a demand for millet recipes and ensure access to

diet diversity that is locally acceptable and highly nutritious. The WSHGs entirely manage these centers. They prepare a range of millet-based hot cooked items and Ready-to-Cook products. Efforts have also been made to promote millet consumption in urban areas. For instance, Millet Shakti Café have been established in Keonjhar and Sundargarh district headquarters. Different food items made from millets are available in the café such as biscuits, mixture, khurma, rose cake, laddoo and eight grain varieties, including ragi flour, sorghum flour, little and barnyard millets. The café also provides tea, coffee and snacks to attract customers. In the state capital Bhubaneswar, the Shaktimayee Ward Women Federation members have established a 'Millet Shakti Outlet' in Kurshi Bhawan. A range of packaged millet food items is available such as ragi and sorghum flour, ragi cookies, ragi laddos, ragi mixture, khurma and mudki.

Target population: Women-led groups were supported to set up millet-based enterprises. The effort has also provided them income generating opportunities and enhanced their decision-making and leadership skills to lead, manage, and operate business entities on millets.

Results: Phulbasa Barla, a member of Dakua WSHG in Sundargarh district, recalled that initially their tiffin centers faced some resistance from locals. For years, it has been unheard off for women from their village to be involved in businesses. However, gradually, things are changing. Today, the women are more organised as a group, and people respect them and love their food. In Sundargarh, six millet tiffin centres were established between December, 2021 and January, 2022. An additional 21 such centres have been approved, and the Memorandum of Understanding was signed among the WSHG, Project Director, ATMA and District Social Welfare Officer. To set-up these tiffin-centres, the OMM has sponsored Rs. 30,000 for each WSHG. Similarly, in the Collectorate Campus of Keonjhar district, a Millet Shakti Café was established in October, 2021. Ma Mission Shakti



Women Federation manages the café, which offers different food items made from millets. According to Suprabha Mahanto, a federation member may earn around Rs 50,000 as profit per month. As the demand for millet food recipes has been growing in the district, around 200-300 customers regularly visit this café per day. To expand their customer base, they are also providing home delivery services.

Potential for upscaling and replicability:

Initially, the OMM was launched in 30 blocks in seven districts and subsequently scaled up to 84 blocks in 15 districts, covering more than 1.2 lakh farmers with 52 thousand hectares under sustainable agronomic practices. The State Government has allocated Rs 2800 crore to expand the OMM to 143 blocks in 19 districts in the financial year 2022-23. Considering its visible impact, the OMM model has received numerous recognitions from other State Governments and credible institutions.

Drivers of change: One of the most important factors is providing seed capital to the women SHGs to set up millet-based enterprises. Earlier, this financial support was not there. Also, these WSHGs had never received any kind of capacity building programmes on millet-based recipe preparation and enterprise management. Under OMM programme and with the handholding support provided by Mission Shakti Department in terms of leadership skill development and guidance, WSHGs members have been able to build their confidence to manage business operation. Also, providing necessary equipment and processing machineries to WSHGs under OMM programme has facilitated their value addition and processing work.

Dilemma and barriers: Traditionally, women in the tribal communities were not into business operation and management. Initially, they were reluctant to accept and lead millet-based enterprises under OMM. But with regular meetings, training programme, handholding support, and exposure visits conducted under OMM programme and technical support given by Mission Shakti Department, women are now more confident. They have demonstrated their leadership skills to lead, manage, handle challenges and planning to expand their business scale and diversify their product portfolio.

Novelty and innovation of the solution: For the first time in the state, millet-based café has been established in Sundargarh and Keonjhar districts, where WSHGs are taking leading initiatives. These WSHGs supported by the Mission Shakti department under OMM have not only augmented their income level but are now living a dignified social life. These millet-based enterprises have also created income generating opportunities for local women groups. Ragi ladoos have been also prepared by WSHGs and served in the Anganwadi Centers for pre-school children to improve their health and enhance intake of nutritious food. The model has been recommended by the World Food Programme, United Nations and Government of India. The WSHGs-led millet enterprises are enhancing consumption and branding millets, reinforcing the supply chain and promoting millets from farm to plate.

Contact details: WASSAN, B/206 HIG Duplex Colony, Baramunda, Bhubaneswar, Odisha, 751003

Institution: Peoples Cultural Centre (PECUC)

Summary: The project promotes little millet, finger millet and foxtail millet cultivation for fighting malnutrition and promoting sustainable living. The case story focuses on gender and inclusion, institutional commitment and coordination, multi-stakeholder partnership, and enabling environment for safety nets inclusion.

Pitch: The project tried to address malnutrition by reviving local, traditional, nutritious, and low-cost food practices among the community. It also helped reduce market dependency by introducing organic farming and preserve seeds by using traditional methods. Changed food habits improved health and livelihood and reduced health expenditure.

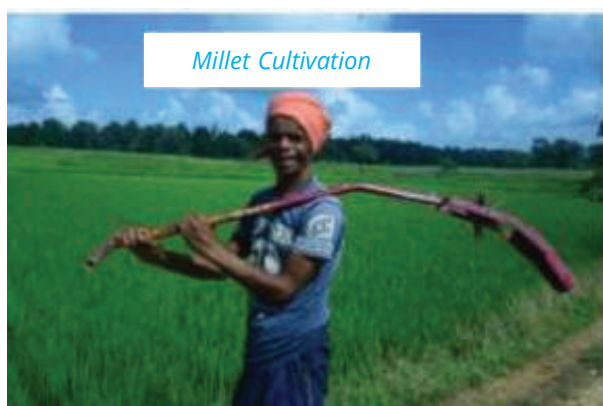
Problem analysis: The project tried to address the issue of malnutrition and ensure food sovereignty of the communities. The project villages are inhabited by Adivasi communities, Dalit or other marginalized ethnic groups. Their means of income are subsistence agriculture and daily wage work. The steady loss of forest cover, cultivation on small patches of land, lack of crop diversification practice, disappearance of traditional nutritious foods, forest foods, and local foods, change in habits, and market dependency resulted in the community's loss of food and seed sovereignty and an increase in child malnutrition. The project, through a systematic integrated approach, tried to reduce market dependency, thereby ensuring food sovereignty, improving livelihoods, and reducing malnutrition.

Solution: The project focused on solving the issue of malnutrition by improving their livelihoods, their practices by mobilizing the community and forming and strengthening Community-Based Organizations, involving different stakeholders and linkages to different schemes and programmes of the Government. Reviving millet, a local nutritious food, after 25 years and incorporating various traditional

Promoting Millet Cultivation to Fight Malnutrition and Sustainable Living

Location: Keonjhar, Odisha, India





Millet Cultivation



Preparation of Organic Fertiliser



Local Food Festival

millet-based recipes into their food practice was a major achievement of this project.

Target population: Marginalized farmers, small farmers, women farmers, youth groups and children were the major beneficiaries. Farmer groups, women's groups, and youth groups were formed and strengthened. The organic method of farming, organic manure preparation, seed preservation, training on food and nutrition, practice of kitchen garden, vermicompost, training on poultry, and bee keeping helped the group with knowledge building and also in changing their practices and habits.

Results: The project was implemented in the 6 villages of Badjamuposi GP of Ghatagaon block and covered 7351 people. Significant improvement is noticed in the income. The average household monthly income has increased by 30% (from Rs 6726 to Rs 8804) due to the substantial income increment from

the agriculture, which has almost doubled. The project has also led to increase in self-employment (34.63%), business (16.43%), and wages (18.65%). Out of the 600 children covered under this project, about 60 percent reported improved nutritional status.

Potential for upscaling and replicability: The project can be replicated by integrating it into the Millet Mission and Mission Shakti. The replication requires involving the communities and strengthening their capacities through various training and involving the stakeholders at different levels.

Drivers of change: For the success of the project, the participation of the community is crucial as they are the target beneficiaries of the project. The involvement and support of stakeholders at different levels is also of equal importance. The most important factor for the successful implementation of this project is

raising awareness among women, youth, and the community about the health benefits of local food, millet-based food, organic food, and forest food.

Dilemma and barriers: Mobilising the community, changing farming practices moving from conventional to organic methods of farming, and involving the women in the process were the major barriers faced during the implementation process. They were mitigated by regular meetings and interacting with them, organizing exposure visits to show the benefits of organic farming and the benefits of millets, and encouraging them to start on a small scale. When they saw the results, they started changing their practice.

Novelty and innovation of the solution: Through this intervention, millet, a traditional local crop, was revived in farms as well as plates after 25 years. New innovative millet recipes like mandia chai, millet laddoo, millet pakoda,

and millet cake were created and popularised through local food melas and also through state level forest food festivals, where they were much appreciated by the public. Through district and state level programmes, the project tried to popularize the use of local food and millet by demonstrating its benefits. The Government of Odisha unveiled a mascot named Tiki Mausi with the aim of spreading awareness about the nutrition of children and women and the use of local food for improving the nutritional value of food. Ragi laddoo was also introduced in the AWC of Keonjhar as a nutritious food supplement for children.

Contact details: Peoples Cultural Centre (PECUC), Registered Office: VII-M-13, Sailashree Vihar, Bhubaneswar-751021, Odisha, India, Coordination Office: Plot No-63, Phase-2, Indraprashtha, Pokhariput, Bhubaneswar -751020, Odisha, India. Email-pecuc@hotmail.com

Compliance Tracker for Smooth Functioning of Farmers Producer Organisations

Location: 19 districts of Odisha, India



Institution: Odisha Millet Mission (OMM), Govt. of Odisha

Summary: Odisha Millets Mission has developed a compliance tracker for FPOs to ensure smooth functioning and reduce the chances of becoming defaulter. The solution focuses on institutional commitment and co-ordination and creating an enabling environment.

Pitch: When a Farmer Producer Organization (FPO) is registered, the members often lack knowledge about the technical aspects of legal compliances that are to be followed so that they can conduct business without hassle. A tracking sheet was introduced to help them regulate their accounts and legal compliances without defaulting. When members had to apply for any loans or business deals, they could show their readiness about it.

Problem analysis: The problem faced largely was compilation of the data at the FPOs end and keeping up-to-date with all the regular and annual compliances. Another problem was that the Board of Directors (BOD) primarily belonged to the farming community and were not very well versed with legalities and compliances. The importance and means of doing it remained a big challenge. Many of them were not maintaining the details of the shareholders and books of accounts in a manner such that it can be easily shared with a third party on requirement. Many of them were not aware of these tasks and if known were not sure how to approach it. Rest of them were doing it manually and hence were prone to making mistakes and redundancy when failing to update in time.

Solution: Once the problem was identified, there was a training conducted with farmers and especially BoD and Chief Executive Officer of the FPO, about the requirement and importance of keeping track of updates and compliance maintenance. After the context, the members were given hands-on training on the utilization of compliance tracker designed for them. The tracker has been carefully curated to cover both financial as well as legal aspects of the FPO. In

finance it considers the book of accounts that are maintained by them on a regular basis, and in legal it lists the compliances with due time and requirements on quarterly and annual basis. These aspects provide a detailed picture of the FPO to the supporting agency. If they are defaulting, then it is easier to flag and provide support in that specific area.

Target population: The target population is the members of the FPO along with accountants and CEO. Often facilitating agencies are also trained so that they can extend help to their FPO as well.

Results: When the legal and financials of any organization is as per the requirement, it becomes very easy to track the business, understand profits and losses, and progress of the organization. When a FPO is registered as a section 8 company they are entitled to the dividends with the shareholders. Keeping a track of all books of accounts makes things easy. A tracker comes handy and is of great use in times of loan application and any business opportunity.

Potential for upscaling and replicability: The idea is to bring systematization when farmers are on-boarded as Board members of a company. It is a concept applied across the country, hence a more advanced version of the tracker that captures, administration, operations, business, compliances as well as growth and progress can be prepared. It can be implemented with all FPOs, to make them self-sufficient and in compliance with the requirement of the day-to-day opportunities.

Drivers of change: The farmers have shown interest in adapting to these changes. Apart

from them, the continual monitoring by the scheme and FAs have helped in providing the handholding support. Continuous training has been useful in adopting the tracker as technology which was earlier an alien concept for the farmers.

Dilemma and barriers: The barriers initially faced included bridging the digital divide and bringing the social acceptance of the tracker. Apart from acceptance, the idea to use it and update it is considered as another challenge. Many times, the information was incorrectly placed or switched. Farmers were sometimes found hesitant in sharing the financial details of their organizations due to the fear of being duped. Biggest barrier has also been the complexity to complete many documents and the time it consumes. As most of the things are now online, the support is required on a more permanent basis as compared to the temporary support.

Novelty and innovation of the solution: The farmers in the country are perceived to be naive with limited knowledge of legal and financial aspects required to run a company. Such trackers not only help in overcoming those challenges but also allow the farmers to expand their portfolio to deal in business and trade their produce. The compliance being fulfilled makes them a good candidate for all the prospects as well. Attaining loans for business establishment and trust of traders are easily achieved.

Contact details: Odisha Millet Mission, Project Management Unit, Krushi Bhawan, Bhubaneswar. Phone: +91-674-2395532. Email: omm.spmu@gmail.com

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N2 Election of Board members

| S. No. | Election of Board members | Annual returns with RoC | General reserve | Rent Agreement Revised | Cash Register | Bank Register | Purchase Register | Sales Register | Stock Register | Fixed Asset Register | Loan Register | Voucher Book & Original Bills, Invoices |
|--------|---------------------------|-------------------------|-----------------|------------------------|---------------|---------------|-------------------|----------------|----------------|----------------------|---------------|---|
| | Date | Date | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No |
| | NA | 12/31/2021 | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | N/a | Yes |
| 1 | 25.10.2019 | 31.3.2021 | No | No | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| | 11.11.2019 | 31.3.2021 | No | No | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

List of FPO NON-Compliances Compliance Track New FPO Sheet1

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| S. No. | Reclivables (Debtors) Register | Payables (Creditors) Register | Resolution Register | Minutes of Meeting Register | Staff Acuitance Register | Nos of Member have DSC (Filing of E.KYC by CA) | Internal Audit | External Audit - Government Department | Income tax Filling | List of Updated Share Holdes details | GST returns filing | Ann Divid Distrib |
|--------|--------------------------------|-------------------------------|---------------------|-----------------------------|--------------------------|--|----------------|--|--------------------|--------------------------------------|--------------------|-------------------|
| | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Number of Members | Date | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No |
| | Yes | Yes | Yes | Yes | Yes | 5 | 05.03.2022 | No | Yes | Yes | Yes | No |
| 1 | Yes | Yes | Yes | Yes | Yes | 4 | 05.02.2022 | No | Yes | Yes | Yes | No |
| | Yes | Yes | Yes | Yes | Yes | 4 | 09.02.2022 | No | Yes | Yes | Yes | No |
| | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

List of FPO NON-Compliances Compliance Track New FPO Sheet1

Institution: Agriculture and Technology Management Agency, Mayurbhanj

Summary: Bio-input preparation, promotion, and marketing by Women Self-Help Group members in collaboration with Farmer Producer Organizations. The story focuses on gender and inclusion.

Pitch: Farmers were encouraged to use agrochemicals during the green revolution. However, agrochemicals strip the soil of its natural health. Bio-inputs made from natural ingredients like cow dung, cow urine, seeds, etc. can serve as an alternative. Usage of bio-inputs can help rejuvenate the soil and enhance its productivity, thus improving yield. In the year 2021-22, 1,08,731 farmers worked on 47,339 hectares of land across 14 districts of Odisha using bio-inputs like jibamruta, handikhata, etc. to produce 3,415 quintals of millets. Bio-inputs can act as a sustainable practice and change the course of agriculture by replacing chemical-inputs.

Problem analysis: Agrochemicals are a source of concern when we look at sustainability. They affect soil, water, and human health. Use of chemical fertilizers and pesticides in millet cultivation is not cost effective in the long run. The same crop production will eventually require an increased amount of agrochemicals, which won't be conducive to input costs borne by farmers as well as public health. Bio-inputs, made of natural locally sourced raw materials, can be produced and sold at local level to help with crops. 115 SHGs and 54 FPOs across the districts of Odisha produce jibamruta, bijamruta, handikhata, agniastra, and nimastra. It acted as a secondary source of income to women farmers as well as SHG women along with reflecting the organic values of traditional agriculture.

Solution: Agronomic practices such as application of organic inputs resulted in higher yield. This, in turn, led to higher income, and provided diversified organic food to the households, improving their health. Use of

Promotion of Bio-Inputs For Yield Enhancement and Strengthened Livelihood

Location: Mayurbhanj, Odisha, India





conveniently available raw materials in the area to prepare organic inputs, the usage of chemical fertilizers and pesticides in millet farming is decreased and, correspondingly, input costs lowered. Women of Self-Help Groups (SHGs) along with women farmers participate in the preparation of the bio inputs. 54 FPOs and 115 SHGs across 17 districts facilitate marketing and promote the product along with sensitizing the local community using community-based programmes. The entire process promotes empowerment of the marginalized financial or otherwise. It promotes environmental conservation and sustainable agricultural practices using eco-friendly and ubiquitous ingredients.

Target population: Women farmers have the responsibility of doing most of the labor-intensive work in fields. Bio-inputs can act as a boon as it is made from natural and locally sourced ingredients, along with being cost-effective. They promote the use of bio inputs and spread awareness through community-based programmes. With adequate training and resources, they prepare bio-inputs from scratch and package them to use in their fields. This reduces the drudgery faced by women and empowers them since they generate revenue by selling these products.

Results: Three treatments were conducted to see the effects of bio-inputs a control area with no inputs, an area with bio inputs, and an area with chemical-fertilizers and pesticides. A total of 7541 liters of bio-input were produced across the districts in the piloting phase, and 5671 liters were sold in the locality. The total cost incurred for the production was Rs. 96,136.75 and the revenue earned was Rs.1,19,105. For example, in Jashipur block of Mayurbhanj, one Farmer Producer Organization along with Ma Hingula SHG set up a production unit with an aim to produce 3000 liters of Jibamruta, 1000 liters of Handikhata and 500-liters of Nimastra initially and supply them across the Block on a requirement basis. The production process began on the 25th July 2020 and the

marketing of the product started after a week. A community-based activity was designed to orient farmers about the usage. The WSHG-managed to prepare and sell 3,406 litres of jibamruta, 60-litres of handikhata and 40-litres of nimastra, making a profit of Rs. 15,614. In the month of August 2022; almost 35,000 litres of bio-inputs were sold in Mayurbhanj.

Potential for upscaling and replicability: Bio inputs have incredible scope for scalability. With organic produce being more in demand, bio-inputs can possibly replace agrochemicals that harshly impact the human body as well as the environment. Being inexpensive is an added forte. Stakeholder involvement through SHGs and FPO would be required to bring the product to the forefront and promote the product at a national and international level. Replicability of bio-inputs is heavily dependent upon the practices in place. SHGs and FPOs can conduct training programmes across villages to impart the knowledge of bio-input preparation. The purity, proportion and the availability of the raw materials won't be an issue if the materials are locally sourced. A detailed recipe with substitutes for locally unavailable raw materials needs to be prepared.

Drivers of change: Stakeholders like SHG members and women farmers make the initial processing possible. Both Farmer Producer Organisations and SHGs work in the packaging and branding of the bio-inputs as well as their promotion. Sensitization of the farmers through community outreach programmes and mass media to increase their knowledge about the usage and motivating them to replace agrochemicals with bio inputs would go a long way. Regular follow ups conducted by Community Resource Persons could contribute to the success of the practice.

Dilemma and barriers: One of the major risks is the shelf life of the product. If not used within 15 days, the effectiveness of the product decreases. When the time required for packaging and branding is factored in, it becomes difficult to distribute the product within its shelf life which further reduces its chances for proper usage. Another risk is the mindset of the farmers. Years of practicing chemical intensive farming has posed a challenge for mobilizing farmers to adopt organic farming methods.

Novelty and innovation of the solution: The world today is recognizing the adverse impact of chemical-intensive farming on the environment and human health. From surface water contamination and soil toxicity to neurological and developmental toxicity, agrochemicals are a recipe for disaster. In a world of SDGs, use of such destructive agents needs to be stopped. Sustainable and organic agricultural methods like bio-inputs would go a long way into upholding the integrity of the SDGs while empowering FPOs to gain control over their farming processes. WSHGs and FPOs are trailblazing with regular training sessions and awareness programmes to foster community sentiment, empower women and motivate farmers to switch to organic farming methods. Low-cost bio inputs nurture local agrobiodiversity and soil health, thus improving nutrition outcomes and livelihood of small-scale tribal farmers.

Contact details: Agricultural Technology Management Agency (ATMA), Odisha.

Gender Responsive Capacity Building Support and Services to Women Self Help Groups For Setting-Up Millet -Based Processing and Value-Addition Enterprises

Location: Koraput, Odisha, India



Institution: International Initiative for Impact Evaluation (3ie) (Funding Agency) and Watershed Support Services and Activities Network (WASSAN) (Implementing agency)

Summary: Gender responsive capacity building and technical support to WSHGs can help WSHG members come up with sustainable business plans and optimally utilize the available resources and opportunities. The case story focusses on processing gender and inclusion, institutional commitment and multi-stakeholder approach.

Pitch: Lack of capacity building and technical support to WSHG hinders the development of millet-based processing and value addition enterprises, despite having support and opportunities for accessing processing machinery. Investing in the knowledge, skills and capacity building of these WSHGs along with facilitating proper linkages with available Government schemes and markets can assist the women in setting up sustainable enterprises and this will have an impact on their economic and empowerment indicators.

Problem analysis: Millet is a major crop traditionally grown in the Koraput district of Odisha by small and marginal farmers. Koraput is the highest millet producing district in Odisha. Millets are also an important part of the diet and culture of the region. The earlier generations used to cultivate a diverse variety of millets and included these grains in their daily consumption. However, with the high level of drudgery involved in processing these grains and lack of access to modern processing technology, these millets have gradually been replaced by paddy, both in agriculture and in consumption patterns. Lack of a robust local market for millets, as compared to paddy, is another reason for its declining cultivation. Today, farmers of Koraput mostly cultivate finger millets and little millets, and a small amount of foxtail millets and sorghum in some specific regions. To address the declining cultivation and consumption of millets, the Odisha Millets

Mission has been promoting millet processing machines such as thresher cum pearer, grader, destoner, dehuller, pulverizer, etc. Some other Government programmes, notably Mission Shakti have also supported Women SHGs to procure machinery. However, in many cases it has been seen that access to machinery has not led to increase in number of WSHG led enterprises around millet processing and value addition. This is mostly due to lack of capacity building training and systematic handholding for WSHGs, along with lack of access to the market.

Solution: E2IMPART is an action research project led by the Natural Resources Institute, University of Greenwich and funded by the International Initiative for Impact Evaluation. The project seeks to understand the impact of capacity building support and services for millet-based enterprises on the economic empowerment indicators of members of WSHGs. It aims to measure the impact of such technical support on WSHG and provide a set of good practices for future interventions by Odisha Millet Mission. The project is being implemented with 170 WSHGs across 10 blocks of Koraput district, randomly selected and stratified into three treatment groups.

The primary intervention of the project is a progressive series of gender-responsive training modules on millet-based enterprise development. These training modules have been designed to assist these SHGs articulate the importance of millet in their cultural and economic life and take decisions to build up a business plan in a participatory manner. After business plan development, these SHGs will also be given training on financial management around their enterprise. SHGs planning to start value addition enterprises would also be provided with training on recipes and support on market linkage.

These trainings are designed to be as gender responsive as possible, to ensure maximum



and comfortable participation of all WSHG members. This was done through steps like organizing the training venue as close to the members' houses as possible, deciding training time in consultation with the WSHG members, keeping in mind their domestic and agricultural work schedule and setting up of creche facilities with toys and drawing books for the children of the participants. The training involves using different IEC materials to make the sessions more engaging for the members.

The training is supplemented by exposure visits to different millet enterprises in Odisha and Andhra Pradesh. This helps the WSHG members get a clear understanding of the processes involved in an enterprise. Convergence with Government schemes, market players and platforms will also be explained.

Target population: The target population are WSHG members across 10 blocks of the district. For the impact evaluation study, 170 WSHGs were randomly selected, out of which half had access to a thresher unit provided by Odisha Millets Mission. Out of these, 170 SHGs, 58 SHGs belong to Treatment 1 who are being provided training support for processing enterprises, 58 SHGs belong to Treatment 2 who are being provided training support for processing and value addition enterprises. 54 SHGs belong to the control group, where no interventions are being done to help quantify the impact of the interventions in the two treatment groups.

Results: Till date, 157 field trainings have been conducted with the 116 treatment 1 and treatment 2 WSHGs covering content till the third module where the WSHGs build up a vision of possible enterprises, based on their interests and opportunities and identify their market options, challenges, additional requirement in terms of funds, infrastructure and trainings. A total of 146 WSHG members were taken for exposure visits to millet enterprises.

Owing to the capacity building support, most of these WSHGs have identified the possible

enterprises for them. The fourth module which will be administered next will facilitate these WSHGs to chalk out a sustainable business plan for themselves (based on the options available to them) and a plan of action as well.

Potential for upscaling and replicability: These gender responsive trainings can assist Women Self Help Groups to set up enterprises through participatory planning and proper linkages. The project is trying to assess the impact of such a package of knowledge and services and then recommend similarly designed capacity building services for future policy and implementation on enterprise development.

Drivers of change: Gender responsiveness lies at the base of the project, guiding the designing of the training modules and its implementation on field. By recognizing the various factors which constrain a woman's full participation in training programs, we can take steps to address them. Since women have the primary responsibility of domestic work such as cleaning and cooking, along with agricultural labor, it was important to ensure that the timing of the training was suitable for all the members. This was done by consulting the members before fixing the timing of each training, taking into consideration their current workload and organizing the training as close to their homes as possible (in Anganwadi Centers or community halls in the villages) to reduce travel time. Giving them the flexibility to decide the training timing according to their availability can help ensure that the women can comfortably attend multiple trainings over the months. The training also had creche facilities to ensure women with small children could attend the training while their children were positively engaged near the training venue.

Dilemma and barriers: The greatest challenge right now is to facilitate WSHG to set up robust and sustainable market linkages both within and outside Koraput district. While many WSHGs are interested and willing to take up millet-based enterprises, the linkages to market are essential for the sustainability of any enterprises.

Novelty and innovation of the solution:

While enterprise development implementations have majorly focused on ownership and access of SHG to physical and financial resources, attempts are being made to measure the impact of knowledge transfer, capacity building support for skill building, exposure visits and participatory business plan development. These interventions will help these enterprises to take informed decisions and make plans around a sustainable enterprise.

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Editor's note: *Similar initiatives have been undertaken across Odisha's different districts to empower women and build their capacities through WSHGs for different activities from production, processing to marketing through millet tiffin centres.*

MIS Management and Dashboarding under Odisha Millets Mission

Location: 19 districts, Odisha, India



Institution: Department of Agriculture and Farmer Empowerment, Govt. of Odisha (Implementing Agency) and Watershed Support Services and Activities Network (Facilitating and Technical Support Team)

Summary: Odisha Millets Mission has adopted the process of data collection through a Mobile App from field and supports validation and approval by nodal officers and dash-boarded at milletsodisha.com. It is a web-based-MIS-provision supporting monitoring. It focuses on institutional commitment.

Pitch: The MIS system of Odisha has 3 major aspects:

- Data collection through mobile app: Data is collected by Community Resource Person from field along with all stakeholders.
- Data consolidation, validation and dashboard for transparency: Data is consolidated and verified by Block Level and District Level Nodal Officers and shared on the “milletsodisha.com” official web portal of Odisha Millets Mission.
- Web-based MIS for physical and financial monitoring and reporting for keeping track of finance at all levels and with all stakeholders involved for timely action.

Problem analysis: OMM has mandate of working with atleast 4000 farmers in a programme block along with Community-Based Organizations like WSHGs, FPOs and multi-stakeholder association for programme implementation. It is really difficult to handle data and ensure transparency at all levels of implementation for proper management of programme with multiple collaboration with line departments. Major issues faced are documenting the diversity of practices with farmers, reporting and monitoring entire programme direct benefit transfer provision to farmers and also financial support for millet-enterprises need critical data-driven MIS-system within the programme.

Solution: For addressing the issues mentioned above, OMM has developed:

- ◉ Standardized formats for data collection: Standard formats for data collection suitable for management and supporting programme deliverable are designed and stakeholders are oriented for the filling and timely submission in web-based Management Information System (MIS) within Odisha Millets Mission.
- ◉ Data collection through mobile application: Critical data from the field were collected through Community Resource Persons mobile application named “OMM Data Collection”. Farmer identification, tracking agronomic practices, incentive data for farmers, data on GEO tagging of enterprises and mapping of outposts and outcomes desired by programme.
- ◉ Dashboard development: Information dashboard was developed and linked with the web portal to ensure transparency and timely action.

Target population: The key target population were:

- ◉ Facilitating & Implementing Agency: Facilitating and implementing agencies at block level were able to record and update financial and physical data in appropriate web-forms in MIS and use it.
- ◉ Farmer and Established Enterprises: Available data in MIS system ensures timely and critical support to farmers along with WSHGs and FPOs in their enterprises management.
- ◉ Nodal Officers and Department: Nodal officers at different levels are also benefited by handy, easy to use monitoring and reporting system.

Results: Currently the designed mobile application is used by more than 700 Community

Resource Persons at the grassroots’ level reaching 2 lakh farmers during Kharif 2022-23 across 143 programme blocks under OMM in 19 districts of Odisha. Submissions of monthly progress reports, both physical and financial, are monitored since 2017-18 using the MIS portal with all other implications of data for monitoring all activities digitally and it supports physical audits and compliances regarding programme management.

Potential for upscaling and replicability: The model is suitable for upscaling within the same programme for scale at any level. The same model can be replicated and used for other mega programmes, millet missions in other states, with minimum changes of programme variables and indicators.

Drivers of change: Government adopted in-house software designing and management practices with the Programme Secretariat under OMM. Regular orientation of stakeholders on usage of applications for data collection, validation, submission and further approval and usage for decision making are ensured. Through the dashboard, it became attractive to track programmes in a designed view by all stakeholders and the public.

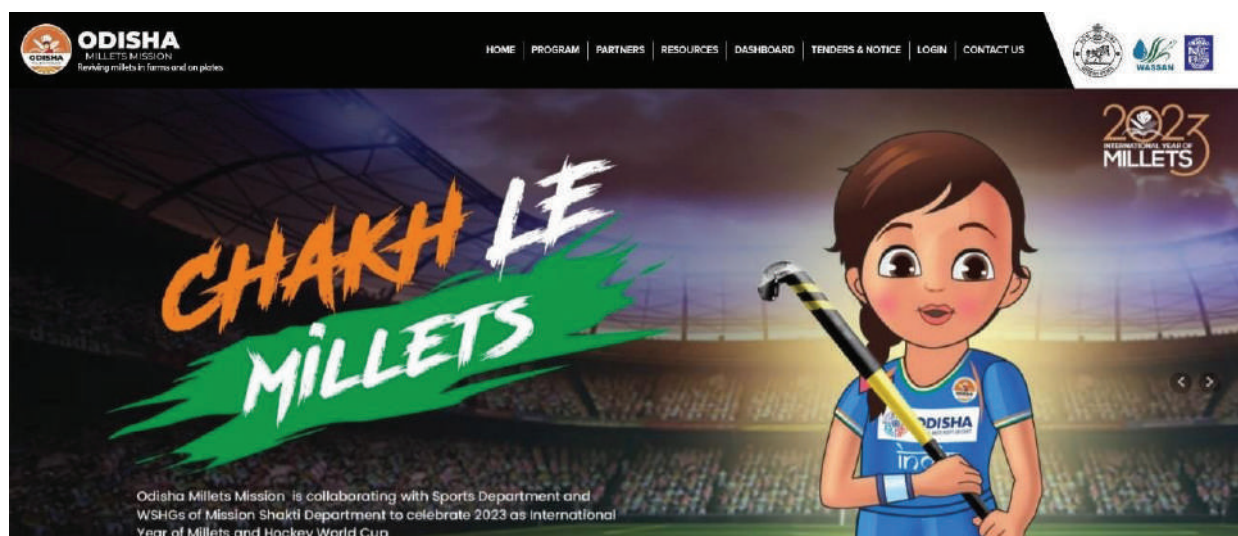
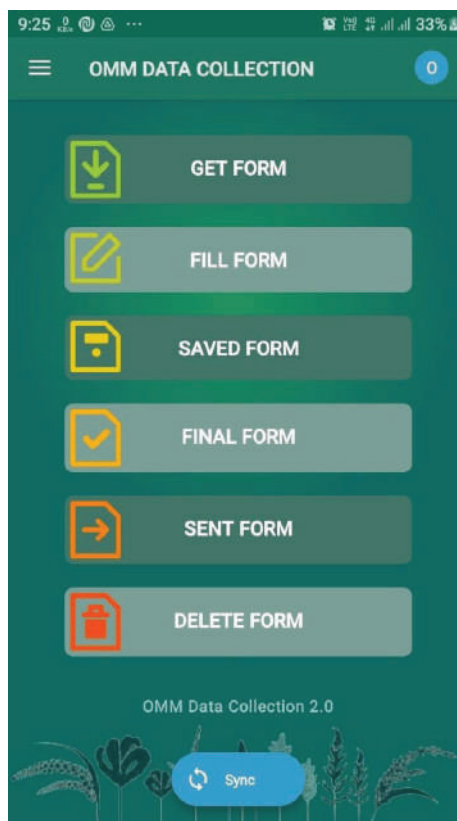
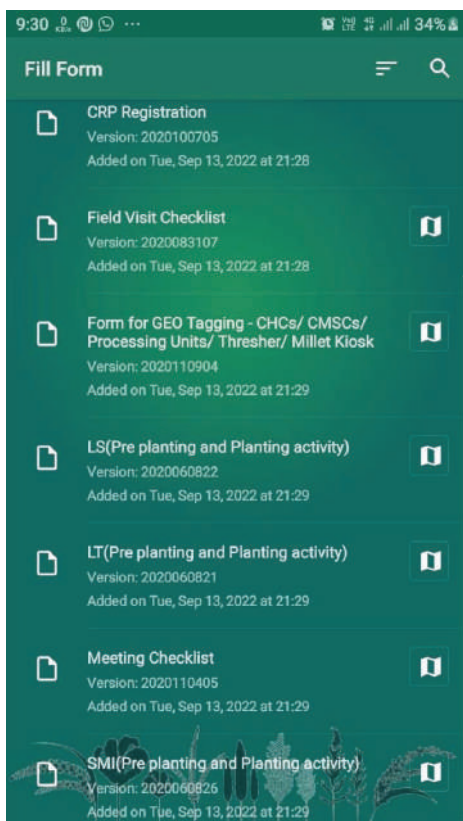
Dilemma and barriers: The key barriers include limited capacities of field functionaries, need for continuous upgrade, use of innovative technologies leading to multiple modifications, catering to diverse communities and with different orientation and expectations requiring multi-stakeholder engagement and varied implementation and management strategies. For example, departments usually need signed hard copy for approvals while the systems generate digital formats which may be different from usual practice.

Novelty and innovation of the solution: The leveraging of technological instruments like mobile app for data collection and web-based MIS for physical and financial monitoring and reporting for large-scale Government program makes it an innovative solution. The designed

data collection and monitoring process of MIS supports end-to-end monitoring, decision making and enables tracking of critical programme activities with lots of diversity. It also encourages researchers and technical agencies to collaborate and suggest in-time improvements. Data from Odisha Millets Mission shall

be updated through mobile application and web application.

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Institution: Taptapani Farmers Producers Company Limited

Summary: The case story focuses on ensuring easy to access, available affordable and quality seeds for farmers through decentralized Community Managed Seed System (CMSS) – An institution managed by CBOs

Pitch: Private sector focuses on profit margins through high value, and low volume seeds. On the other hand, public sector presence is limited in remote rural regions of heterogeneous farming system. This is primarily due to infrastructural, human resources and budgetary constraints to carry out research, multiplication, and supply of seeds of diverse crops, varieties, and meet information needs of smallholder farmers. Hence, decentralized CMSS is important to meet the diverse needs of smallholder farmers in marginal farming systems and supply variety of seeds and seed classes that not often supplied by private and public sector organizations.

Problem analysis: The formal seed system is dominated by major cereals and modern varieties of rice, maize, and wheat in market accessible areas. Community based seed system is dominant in minor crops and for local farmers' varieties of major crops in marginal regions, where up to 90% of seed requirements are met by farm produced and community exchanged seeds. However, the ineffective traditional seed storage structures, poor facilities and improper management in the informal system makes seed quality and viability poor. Most of the seeds produced and marketed from CMSS are managed by FPOs. The CMSS of Mohana block of Gajapati districts is managed by Taptapani Farmers Producer groups. The FPO identified a group of experienced seed farmers, built their capacity on seed production, and ensured the quality of the seeds for marketing.

Solution: The CMSS is being applied through nodal CBOs of Odisha Millets Mission. It runs as enterprise organization through generating, maintaining, and supplying best seeds. Facilitating Agency (FAs) at the block level is

Community Managed Seed System (CMSS) for Millets

Location: Mohana, Gajapati
Odisha, India



assigned the task of exploring the availability of local landraces within the block through village meetings, Focused Group Discussions, Seed fairs, Melas, personal contacts, Government, and non-Government sources, etc. FAs are also collecting the information on the landraces in passport data format prescribed by the National Bureau of Plant Genetic Resources (NBPGR), which generally contains the basic details of the conserver along with the geographical information and varietal characters. Technical persons/skilled farmers associated with the FPO are looking after the proper storage of the seeds in plastic containers. Seed containers are stored in dry, clean, and sanitized places in normal room temperature. Storekeepers keep a continuous vigil for pests like mice. Collection and disbursement of seeds are recorded both manually and digitally in a systematic format for future reference and audit. There is also a provision for signing Seed Transfer Agreement in case of supply for commercial or scientific purposes. For easy access to farmers, three sub-seed centers were established.

Target population: The small and marginal farmers are the targeted population for the seed centers. They often face challenges to access quality seeds at an affordable rate. The Taptapani FPO supported farmers with quality seeds at their doorstep at an affordable price. The farmers can avail the seed even if they do not have money, and can return the same seed with seed interest in kind post-harvest. The FPO fulfils the seed security for the small and marginal farmers and also provides seeds for re-sowing if there are any natural calamities.

Results: The Community Managed Seed Centre (CMSC) at Mohana has remarkably impacted the locality directly and indirectly. Farmers attached to the seed center are not only getting the truthful labelled seeds but are also trained on quality seed production and improved Package of Practices. Seed scarcity in the locality is declining. Area under millet cultivation and production has also increased with the

advancement of seed centre. Accessibility to moisture meter, storage materials, weighing machine and tarpaulin in the seed bank to small and marginal farmers is helping in maintaining the seed quality. Many landraces of rice, pulses, millets, and vegetables are being conserved. Researchers are benefiting with the range of germplasm conservation. The use of local varieties of crops on-farm resources such as crop diversification, mixed cropping and cow dung and compost has increased in Mohana. In the COVID days during lock down, when communication and transportation was totally restricted, the farmers of the locality were unable to get quality seeds. The staff of the FPO succeeded in distributing seeds to more than 400 farmers, which helped the marginal farmers continue their livelihood and consumption.

Potential for upscaling and replicability: The seed bank solves the problem of seed scarcity, supports seeds for crop diversification and different types of cropping systems. FPO or SHGs build trust among the landless or tenant farmers, reducing their dependency for seeds on landlords and private agencies. The availability of seeds, safe storage, proper management, and primary processing of seeds create an impact on other Government and non-Government agencies for replication. The monitoring system, involvement of the agriculture department, and management system will scale up seed village programmes in future. The congregation of FPOs of each block will help make a regional level seed bank in future which not only helps small and marginal farmers, but also helps all the farming communities of the district.

Drivers of change: Community seed banks can secure improved access to, and availability of diverse, locally adapted crops and varieties, and enhance related indigenous knowledge and skills in plant management, including seed selection, treatment, storage, multiplication, and distribution. It ensures the conservation of agro-biodiversity. It also provides a range of germplasm for further research and

development. The indigenous seeds will survive and help production in changing climate with different cropping systems.

Dilemma and barriers: Formation of the local bodies, coordination and mutual understanding among the local bodies and farmers, exploration and collection of indigenous seeds, propagation of sporadic cultivated varieties, establishment of proper storage system and distribution pattern are most important tasks for achieving the objectives of Community Managed Seed Centers.

Novelty and innovation of solution: Seeds are the most important production input. Access to productive seeds supports resilience and

sustainability, especially in traditional production systems in comparatively low-income countries where agriculture accounts for the majority of their economies. Commercial seed companies are not in the business of selling seeds in a wide range of varieties that are specialized for small farmers. Seed availability for many underutilized crops is very less. Whereas forgotten or underutilized crops like millets play a key role in providing livelihoods to poor farmers, lowering famine risks, and providing more complete and balanced diets. Advent of CMSS solves all these problems, providing best quality seeds to the farmers and conserving the biodiversity.

Contact details: Taptapani Farmers Producers Company Limited, Mohana, Gajapati

Pragatisila FPC Reducing Drudgery in Millet Cultivation through Technological Intervention

Location: Ganjam, Odisha, India



Institution: Pragatisila Farmer Producer Company Limited, Balichhai PACS, and INDIA NGO

Summary: Intervention of the FPO in the Polosara block has changed the life of millet farmers. It has reduced the drudgery of the millet cultivator, decreased the production cost by introducing various scientific methods and technology intervention in the field of millet cultivation. The intervention focuses on FPOs institutional commitment and co-ordination skills.

Pitch: Millets are grown more in the Polosara blocks as compared to the other blocks. However, there was distress selling of millets, people were selling in local markets in an unorganized way. Yield of the crops was very less. Most of the times, crops were unsold and stayed at home. Under the Odisha Millet Mission (OMM) project, all these issues were streamlined through promotion of Pragatisila Farmers Producer Company which focuses on building farmer welfare. FPO conducted community sensitization campaigns regarding various techniques for the cultivation, introduced high yield varieties crop at field level and supported crop sale post-harvest through mandis.

Problem analysis: Nearly 1120 ragi cultivating farmers were facing the problem of distress selling, low productivity and less income.

Solution: The FPO has addressed the farmers problems of distress selling, low productivity and income. The farmers are now well aware about the modern techniques and technology for the ragi cultivation and high yield variety seeds due to FPOs training programs and awareness campaigns, that leads to increase in the income of the farmers. Village-wise production plan and surplus plan is prepared, and each Gram Panchayat is assigned one CRP to ensure proper village registration in portal. All the Board of Directors (BoD) members are also actively engaged in creating awareness among the community regarding Fair Average Quality of ragi, registration on the procurement portal

and Government fixed MSP on ragi. During procurement time, one token is generated for one village to ease transportation of ragi from the village to mandi, reducing the cost. All the farmers' produce is sold in the market through mandi at MSP. Farmers' level tracking-sheet is maintained by the CRP to ensure all the farmers' products are sold. Various training programmes are organized at community level to generate awareness on health benefits among the community and disseminate various recipes of millets.

Target population: All the millet growing farmers are getting benefits through the intervention of Pragatisila Farmers' Producer Company. The farmers, primarily small and marginal farmers, are timely getting high yield varieties seeds and technical support. Vulnerable sections of women like widows and separated women are getting support and information through the FPO. At Gram Panchayat level with the help of SHGs, the initiative has established Millet Shakti Tiffin Center that provides cooked food as snacks and breakfast. SHG members are opening small enterprises and getting self-employed.

Results: Through this FPO, nearly 18 Gram Panchayat members are getting benefitted. Every year, the area under millets and quantity of millet produced is increasing. The number of farmers cultivating millets has also increased. Nearly 1700 farmers are directly getting benefits through the FPO and 26 women SHG members are self-employed. Three Custom Hiring Centers (CHCs) and three Seed Centers have been established in the blocks to provide services to all the vulnerable people so that they do not need to make big investments and instead can pay a small user fee for cultivation activities, reducing the cost of cultivation.

Potential for upscaling and replicability: Reducing the drudgery of the farmers through FPOs is a unique and sustainable model and reflects positive results in the field. As FPO is promoted by the farmers and they are a part of it, all the rules and regulations regarding



management of the FPO are set by the farmers. The policies developed to govern the FPO are farmer focused. This model can be replicated in other projects also.

Drivers of change: FA-NGO and FPO staff's continuous efforts towards the empowerment of farmers' is the main factor of success of the good practices of the FPO. BoD members are also very actively involved in all the assigned activities such as creating awareness or any campaign, etc.

Dilemma and barriers: There are no clear guidelines for the strengthening of the FPO and their capacity building. FPO is only getting business idea of bio-input which is not marketable as expected and also business itself is not self-sustainable. The FPO had taken up procurement activities last year. It has given good amount of commission to FPO, but for

long run sustainability, there is need for clear guidelines and multiple business models. If the capacity of FPO, BoD and CEO are strengthened, they would be able to work on broader aspects of sustainability.

Novelty and innovation of solution: FPO is a proven model for empowerment of the farmers and any producer groups. Also, it is clearly visible that through FPO, farmers are getting benefits. Through the FPO intervention, farmers' production cost has decreased, their productivity has increased, and their income has doubled. The market issues are generally resolved by the intervention of FPO.

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Institution: State Project Management Unit, Odisha Millets Mission, Govt. of Odisha

Summary: Decentralized governance and multi-stakeholder model have led to the success of Odisha Millets Mission. The intervention focuses on institutional commitment and stable financing.

Pitch: Before the beginning of Odisha Millet Mission, millets were an underutilized crop. When the Millet Mission was being designed, one of the most important considerations was replicability, both within and outside the state. In the guidelines of the Millet Mission (they can be found at www.milletsodisha.com), roles and responsibilities of each and every stakeholder are clearly spelt out. The programme components have been made in line with either central or state schemes to the extent possible. Tasks and activities for each stakeholder were assigned based on the existing operational model of the Agriculture, Department while bringing in new thinking.

Problem analysis: Overtime the share of millets in area and its household consumption has declined. Main challenges include:

- There has been lack of focus on millet and development of its value chain in the policy of the Govt., research institutions and public at large.
- Traditional methods of cultivation induced low productivity.
- Lack of quality seeds
- Lack of millet processing units
- Lack of awareness on nutritional benefits
- Lack of proper market linkages
- Decentralized Governance and Multi-Stakeholder Model of Odisha
- Non-inclusion of millets in procurement and distribution in food security schemes of Government

Decentralized Governance and Multi-Stakeholder Model of Odisha Millet Mission

**Location: 19 districts,
Odisha, India**



As the project spans across various sectors, it had to be vetted by various departments and committees. The convergence across sectors not only broke silos, but it also broke the comfort zones. This did create apprehensions, calling for caution and due diligence. The progress has been slow and steady. It took time to build confidence among stakeholders.

Solution: After launching the Odisha Millet Mission, there has been a sea of change in the last four years. Crop demonstration and incentive have encouraged the farmers to take up millets again. Procurement of ragi, being done in collaboration with SC & ST Dept/TDCCOL, has changed the price dynamics. Increase in prices and access to state procurement has prompted more farmers to take up millets. Inclusion of millets is being done in State Nutrition Programme & PDS in collaboration with W&CD Dept. Establishment and management of enterprises through WSHGs is being done in collaboration with Mission Shakti Department. Facilitation and capacity building is being done by NGOs as Facilitating Agencies and field implementation is being done by Community-Based Organizations i.e., FPOs & WSHGs.

SPMU of OMM under DA&FP and WASSAN develop the guidelines and protocols for implementation of each activity as per Annual Action Plan which was finalized in consultation with all stakeholders. Training of trainers and capacity building of the NGOs, CBOs and CRPs is done by WASSAN. SPMU and DPMU monitor the implementation of each activity through the department staff and WASSAN staff.

Target population: Farmers, mostly belonging to the tribal and other marginalized communities, women groups, Community-Based Organizations, Farmers Producer Organizations, local civil societies, etc. are the targeted population.

Results: Despite many challenges, after nearly five years of implementation, all the stakeholders are satisfied and motivated to a great extent. As per the report of NCDS, the millet yields have

increased from 6.4 quintals/ ha in 2016-17 to 14.9 quintals/ha 2019-20 and 1.5 quintal per farmer to 5.6 quintal per farmer respectively during the same period. The growth rate in the involvement of farmers in crop production was 15.4% in the year 2019-20 from the base year 2016-17. The adoption of improved agronomic practices such as SMI and LT/LS farmers increased from 0.3% in 2016-17 to 62.9% in 2019-20 and 2.5% to 33.1% respectively during the same period. The consumption of millets in winter, rainy, and summer seasons respectively increased from 64.3%, 66.9% and 85.8% in 2016-17 to 98.5%, 72.6%, and 79.9% in 2019-20.

Potential for upscaling and replicability: Odisha received the best performing-millet-promotion state-award at the National Convention on Nutri Cereals by the MoA&FW and UN-FAO. Government of India and NITI Aayog have identified OMM as one of the best models and role model for other State Governments. WFP identified OMM as one of the best practices that can be replicated in the other states and other countries in Africa as part of South-South Collaboration. An alternate seed system for landraces was developed for the first time in the world under OMM. Odisha became the first state to declare direct incentive to farmers for three years through Direct Benefit Transfer (DBT). Odisha became the first state to develop standard specifications for the minor millet machinery through a recognized panel of experts from different scientific institutions and the third state to distribute millets in PDS in the country.

Drivers of change: Ensuring availability of quality seeds, training programmes on Package of Practices, engaging local Farmers Producer Organizations, Engagement of multiple stakeholders, etc. are the main drivers of change.

Dilemma and barriers: Millets were considered as low value crops earlier among the farmers. Farmers were not interested to expand their millet cultivation area. Poor marketing facilities at the community level often demotivated

farmers to grow millets. Lack of training and capacity programmes on improved agronomic practices resulted in low crop yield. OMM in collaboration with the local NGOs, district agriculture officials and ATMA professionals have organized a series of training programmes for the farmer groups on organic practices and different agronomic practices for better yield.

Novelty and innovation of the solution: The approach is novel and innovative as it involves:

- ◉ A supportive policy framework for disbursement of public funds through convergence of Government departments and programmes
- ◉ A participatory multi-stakeholder consultative approach and a strong partnership between the Government and civil society
- ◉ Decentralized governance and research honoring indigenous knowledge and grassroots experiences allowing for ownership of the programme by farmers
- ◉ Ongoing collaboration between the research and programme implementation agencies, ensuring

regular monitoring of practices and real-time policy recommendations to make the food system responsive and resilient

- ◉ Creating consumer awareness and encouraging household consumption by producers
- ◉ Encouraging research and entrepreneurship of the private sector
- ◉ Piloting millet inclusions in State Nutrition Plan
- ◉ Promotion and establishment of decentralized processing and value addition enterprises with farmer collectives and WSHGs
- ◉ Building capacities of local Community Based Organizations, such as FPOs and WSHGs to add value to the supply chain and thereby enhance rural livelihoods

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Release of First Biofortified Iron (Fe) Pearl Millet

“Chakti” in West and Central Africa

Location: Niger, West Africa



Institution: ICRISAT

Summary: “Chakti”, the first Fe biofortified pearl millet variety in West and Central Africa, addresses malnutrition prevailing in the region and combats iron deficiency anaemia in children, adolescent girls, and pregnant women, and assures food security in the region.

Pitch: Pearl millet is a staple cereal for low-income families in Africa and Asia. Chakti, the first biofortified pearl millet variety in Africa, is naturally higher in grain iron and zinc, essential for good health and productivity. Chakti was officially released by the Government of Niger for commercial cultivation. For millions of women and children in Africa, anaemia is a significant public health concern and diets deficient in iron are the responsible factors. But consuming a new variety of pearl millet called “chakti”, with an additional 20% of the estimated average requirement of iron may improve nutritional status and help reach their physical and cognitive potential.

Problem analysis: The people living in the semi-arid regions mostly consume cereal-based foods and do not have access to diverse food, hence, leading to serious malnutrition in children and anemia in women. Micronutrient malnutrition is a major concern in the developing world, where more than 2 billion people are malnourished. Malnutrition in Africa is a rising concern where children are affected by stunted growth and low IQ. Young children and pregnant women are most vulnerable to micronutrient deficiencies due to their rapid growth and development. At least half of the children worldwide younger than 5 years of age suffer from vitamin and mineral deficiencies, while almost 2 in 3 children between 6 months and 2 years of age are not fed food that supports their healthy development. Globally 3.5 million deaths were seen because of malnutrition.

Solution: Pearl millet has the potential to fight iron deficiency, the highest nutrient deficiency in the world especially prevalent among women

and children across India and sub-Saharan Africa. Recent studies have shown that the bioavailability (absorption) of iron in pearl millet is high enough to provide more than 50% of the daily requirement for children or adult males. One meal of a biofortified high iron variety of pearl millet can meet approximately 50-100% of the daily allowance for iron to combat iron deficiency/ anemia in women, men, and children. It is also the cheapest source of these micronutrients as compared to other cereals and vegetables. Thus, pearl millet biofortification opens up the possibility of a cost-effective strategy to beat hidden hunger in millions of poor families in Africa. Chakti is high yielding OPV with early maturity and is productive under low rainfall conditions. It is climate smart and assures food and nutritional security to the region.

Target population: Iron biofortification of pearl millet significantly improves the health of adolescent girls, pregnant women, and children. Biofortification of staple crops is a sustainable way to reach people in remote areas where they do not have the facilities to get access to fortified foods and mineral supplements.

Results: Chakti is an early maturing high grain yielding biofortified variety that suits well to agroclimatic conditions of the region. It not only addresses malnutrition but also feeds the population when their food reserves exhaust before the local variety is harvested. Farming in West and Central Africa is dependent on rain and usually, one crop is taken per year. With the introduction of the early maturing Chakti, farmers have started taking two crops in one year, with limited irrigation facilities. Because of its earliness and nutritional benefits, there is high demand for the Chakti seed which has taken the third position with 5.0% of the total seed quantity produced during 2021 in Niger. Chakti is promoted in food transformation and several commercial products such as “Crunch de Mil”, “Mogoudji” and “Decue Moukou” were developed in the region. NGO Kawolor in Senegal has taken up the production of Chakti

in 1200 ha of farmers’ fields and is working towards increasing the availability of nutritious foods in the market.

Potential for upscaling and replicability: Biofortified pearl millet will play a crucial role in improving the health of the people and will strengthen the economy of the region. There is a huge demand for this technology in West and Central Africa as severe micronutrient malnutrition is prevailing. Several NGOs and the World Food Program are working in promoting biofortified varieties in the region through their programs. Quality seed is important in maintaining grain nutrients and their reachability to consumers. Hence, the private seed sector and the Farmer Group Organizations were trained on the quality seed production for upscaling of this variety.

Drivers of change: Biofortification is the process of improving the pearl millet OPVs or hybrids for the nutrient factors. This can be achieved by having the potential and genetically diverse germplasm and the effective breeding program to generate the breeding pipeline material and evaluate it in multi locations. NARS partners, Farmer Group Organizations, and NGOs have played a major role in promoting this technology across the region. The public sector also played a crucial role in creating awareness of this technology by organizing the millet festival (FESTIMIL) every year.

Dilemma and barriers: Acceptability by the farmers and end users was a big challenge. Awareness created by conducting on-farm demonstrations in the farmers’ fields and culinary studies with the village groups has played a major role in promoting Chakti in the region. Weak seed systems were another barriers to promoting this technology. To mitigate this, continuous efforts were made to fill in the gaps by supplying the necessary early generation seed, engaging the Farmer Group Organizations and the private seed sector in training and knowledge transfer for effective upscaling of the biofortified varieties in the region.

Novelty and innovation of the solution:

Biofortification is a cost-effective way to bring important micronutrients into the diet of the poor, who have limited access to different diets and micronutrient interventions. Chakti is the first biofortified pearl millet variety released in West and Central Africa. High-grain Fe can combat the iron deficiency anemia (IDA) prevailing in the region. Biofortified crops can reach even remote areas where fortified food

and food supplements are unavailable. Usage of the biofortified crops can improve the health conditions of the people and in turn help in contributing to the economic stability of the region.

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Institution: ICRISAT

Summary: ICRISAT with INERA in Burkina Faso released the first single cross pearl millet hybrid ICMH 147007 in West and Central Africa with grain yields 46% higher than the popular OPV and is upscaled by NAFASO, a private seed company in Burkina Faso. The entry focuses on institutional commitment & coordination and multi-stakeholder partnership.

Pitch: ICRISAT's Pearl Millet Breeding Program for West and Central Africa developed ICMH 147007 (Nafagnon) in Niger and the Institut de l'Environnement et de Recherches Agricoles (INERA) evaluated it in Burkina Faso. Nafagnon matures early in 80-85 days and has a yield potential of about 3.0 tons per hectare; early maturity helps overcome terminal drought stress. It is a dual-purpose hybrid, resistant to downy mildew, the most devastating pearl millet disease in WCA. This high yielding hybrid can improve the food security of the country and can fetch greater income to the farmers and other value chain actors.

Problem analysis: Pearl millet is a staple cereal crop and is majorly grown by smallholder farmers in West and Central Africa (WCA). It is a climate smart crop and grows in harsh and variable climatic conditions. Nigeria, Niger, Senegal, Mali, and Burkina Faso are the major pearl millet-producing countries in WCA. Niger stands first in WCA with an area of 35.09 Mha of land and a production of 6.4 Mt in WCA, but the productivity is 500-800 kg/ha which is very low. This is because productivity in WCA is dependent on the local landraces. The food crisis is deepening in WCA, affecting 27 million people in 2021, which may rise to 38 million in 2022 if the crisis deepens at the same pace, which is a 42% rise in one year. This may aggravate further due to persistent insecurity and climate change. Hence, hybrids with high grain yields can help Addressing Hunger and Achieving Food Security through Pearl Millet Single Cross Hybrid the region address the issue of hunger and achieve food security.

Addressing Hunger and Achieving Food Security through Pearl Millet Single Cross Hybrid "ICMH 147007" and Establishing Effective Seed Systems in West and Central Africa

Location: Burkina Faso, West Africa



Solution: Pearl millet production in West and Central Africa (WCA) is still based on the landraces which is one of the factors for low grain yields in WCA. ICRISAT, has developed new hybrids that can out yield the local varieties grown by the farmers. ICRISAT with the help of INERA, Burkina Faso has released the first single cross pearl millet hybrid "ICMH 147007". This hybrid has garnered interest in the farmers' community because of its high grain yield, early maturity, stay green nature, and resistance to downy mildew. This hybrid has wide adaptability to variable climatic conditions existing in the Sahel. Access to quality seeds is difficult in Sub-Saharan Africa because of weak seed systems and bottlenecks in Early-Generation Seed (EGS) production. Hence, a Consortium is developed where all the private seed companies were gathered under one platform to transfer the hybrid seed production technology. At the same time, a partnership was established between INERA and local seed companies to promote the hybrid released in Burkina Faso. The intervention helped strengthen the formal seed sector, and enable farmers to have access to quality seeds.

Target population: ICRISAT works in improving the livelihoods of the resource poor farmers and the population of West and Central Africa. Developing dual purpose hybrids not only benefits the people but also improves livestock integration in these production systems to enhance animal nutrition and performance while maintaining human food and nutritional security. ICRISAT works in collaboration with NARS, Farmer Group Organizations, NGOs, and the private sector in taking the hybrids to the farmers and the households. Farmer Group Organizations and the private seed sector are supported by the early generation seed necessary for seed production.

Results: There is a growing interest in the farmers for hybrids. NAFASO a private seed company in Burkina Faso is upscaling the hybrid ICMH 147007 and has reached 150 hectares of the farmers' fields since the time of release. An

agreement was made between INERA and seed company NAFASO to produce foundation seed of parental line 1 ha of AB pair and ½ ha of the R line. This will be used for the production of 100 ha of certified hybrid seed in 2023. About 40 tons of certified seeds are expected at the end of rainy season 2023, and the same can be used to plant about 1000 ha in 2024.

Potential for upscaling and replicability: The availability of breeder and foundation seed of parental lines will speed up the process of scaling up the hybrid. Also, the continuous training of seed companies in quality seed production and in intensive agriculture during the rainy and off-season will strengthen seed production, therefore the availability of hybrid seed to farmers. More seed companies are expected to be involved moving forward. Another seed company (FAGRI) is ready to start certified seed production in 2023. A Consortium is formed with the private seed sector where they will get continuous backstopping with the elite material and in turn, the farmers will have the access to the best seed material for sowing.

Drivers of change: West and Central Africa has poor nutrient soils and is highly affected by climate change. The erratic rainfall in the Semi-Arid tropics is leading to crop failures with the local varieties grown. This is further leading to hunger and malnutrition in this region. Developing climate smart hybrids that can yield high in nutrient poor soils, can feed the growing population and lead to the food security of the region. The primary factor responsible for successfully achieving this, is effective collaboration with the NARS partners, NGOs, Farmer Group Organizations, and private seed companies in the region. This intensive networking helped in taking the novel technologies to the farmers and achieving sustainable agriculture development in the region.

Dilemma and barriers: The major barrier was the lack of hybrid seed production knowledge with the private seed companies in this region. ICRISAT has moved forward by establishing

connections with private seed companies and training them in quality hybrid seed production. Once they got the technology, the private seed companies in West and Central Africa have taken forward the hybrids to the farmers by conducting on farm testing in the farmers' fields. The NARS partners in the region have established a public private partnership for an effective hybrid seed production process.

Novelty and innovation of the solution: West and Central African agriculture is dominated by the open pollinated varieties. ICMH 147007 is the first single cross dual-purpose hybrid that fits well in the existing agro-climatic conditions.

The role of the private seed sector in upscaling hybrids is quite important. The sustainability of the hybrids depends on the building up of strong and efficient seed systems. Hence, training and knowledge transfer are important for effective seed systems. ICRISAT has taken this as an opportunity to build up the seed systems by forging collaborations and transferring the hybrid seed production knowledge to the seed sector.

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Transformative Seed Consortium Involving Multisectoral Partnerships and Community Engagement for Sustainable and Inclusive Seed Supply to Post-rainy Sorghum Farmers

Location: Parbhani, Beed, Aurangabad, Ahmednagar, Pune, Solapur



Institution: International Crops Research Institute for the Semi-Arid Tropic (ICRISAT) Hyderabad in partnership with Maharashtra State Seeds Corporation (Mahabeej), Akola, Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri and Vasantrya Naik Marathwada Krishi Vidyapeeth (VNMKV), Parbhani

Summary: A transformative seed consortium involving multi-sectoral partnerships and community engagement is committed to building a sustainable and inclusive seed system that supplies improved varieties to over three lakh post-rainy sorghum farmers annually, making significant impact on their livelihoods.

Pitch: Despite the release of improved varieties with market-preferred traits adapted to different growing ecologies, weak seed systems have resulted in low adoption rates (<20%) of these improved varieties. This is one of the major reasons for the low productivity (650 kg/ha) of post-rainy season sorghum in India. For the past 9 years, ICRISAT and its partners have built a transformative seed consortium involving multi-sectoral partnerships and community engagement to create a sustainable and inclusive seed system that supplies improved varieties to over three lakh post-rainy sorghum farmers annually. As a result, there has been a significant increase in their productivity (1000 kg/ha) and profitability (35% higher).

Problem analysis: The Semi-Arid Tropics (SAT) are characterized by a poor natural resource base, high day-time temperatures, high evapotranspiration, poor market linkages, low returns, risk-bearing ability, and repayment capacities. These areas shelter 75% of the poor and therefore deserve prime attention from technologists and policymakers. ICRISAT and its partners have provided key technological and institutional interventions that have given a boost to the integrated farming system characterized by the time-tested crop-livestock combination in Maharashtra. The diffusion of innovations, provision of quality seeds, efficient input delivery and market linkage have resulted in more than 75% of farmers

benefiting from bridging productivity gaps and thereby enhancing incomes in both crop and livestock sectors. The welfare gains accrued to the farming community are evident due to cost-effective technologies in harsh agroclimatic conditions. These interventions have nullified the vicious circle of poverty through effective and appropriate institutional interventions and infrastructure tailored to semi-arid areas.

Solution: Based on the findings of a baseline survey (Pokharkar et al., 2014) on the existing seed systems of post-rainy sorghum in Maharashtra, where the adoption rates are very low, a model called the 'Seed Consortium' was developed to multiply improved varieties and distribute them to farmers. The seed consortium model includes ICRISAT, ICAR-IIMR, private and public sector seed companies, State Agriculture Universities (SAUs), Krishi Vigyan Kendras (KVKs), Self-Help Groups (SHGs), Non-Government Organizations (NGOs), and farmers. In this model, a decentralized seed production and centralized seed procurement and distribution through a buy-back agreement in the initial years was envisaged, however it was planned to eventually shift to decentralized seed production and distribution. The public sector Research and Development institutions (ICAR, SAUs, and ICRISAT) and private sector seed companies engage in partnership research to develop improved products. The private sector seed companies and public sector seed agencies play a critical role in seed production, procurement, and dissemination of these improved products to farmers. The seed consortium partners meet annually and develop a work plan to produce a specific quantity of seeds annually to reach farmers. From there, all partners work together and produce the seeds in farmers' fields under the best supervision to produce high-quality seeds. They then process and supply them to farmers.

Target population: Small and marginal farmers (1-2 ha) were selected for seed production. These seed producing farmers were trained on seed production techniques, maintenance of isolation distance, sowing practices, and other



agronomic practices to be followed for the sorghum seed crop. They were also trained to identify off-types, and rogues, and to remove them from the seed plots to maintain the quality of seed production. Furthermore, training was organized after harvest and at the time of seed processing to impart knowledge about seed cleaning, seed grading, seed treating, seed storage, and seed packaging. Women farmers were given high priority in seed production.

Results: Under the Seed Consortium, ICRISAT and its partners supply the breeder seed, train seed farmers, and monitor seed production plots periodically. The State Seed Corporation (Mahabeej) gives a buy-back guarantee to seed farmers and procures seeds by paying a 25% higher price than the market price. Mahabeej processes the seeds and supplies them to farmers through its network in the entire country. With the concerted efforts of all partners, the Seed Consortium started in 2013, producing a total of 300 tons of improved seeds in farmers' fields, procuring, processing, and supplying seeds to 30,000 farmers for cultivation in the next season. In 2014, it produced 1000 tons of seeds and supplied them to 1,00,000 farmers, and in 2015, it produced 1500 tons of seeds and distributed them to 1,50,000 farmers. In 2017, it achieved 2200 tons of production, reaching 2,20,000 farmers with improved seeds, and in 2018, it produced 1000 tons of certified seeds. With the adoption of these improved seeds, coupled with increased adoption of management technologies, there has been a steady increase in post-rainy sorghum productivity in Maharashtra, which is now more than 1000 kg/ha and growing. During 2019-22, this initiative expanded, producing 3000 tons of seed, meeting the seed needs of 3,00,000 farmers.

Potential for upscaling and replicability: The unavailability of improved post-rainy sorghum seeds is a major constraint in adoption, persisting despite credible evidence that farmers in Maharashtra who adopted seeds of improved varieties and recommended management technologies achieved a 35% improvement in

grain yield and a 20% increase in stover yields across over 40,000 farmers' fields. The post-rainy sorghum seed consortium was designed to scale up the gains and interventions of the HOPE Sorghum and Millets project. This was funded by the Bill & Melinda Gates Foundation during 2009-14 in 11 countries, including India. The Consortium harnessed the synergies of its partners to enhance adoption rates of improved varieties by working with communities and Self-Help Groups. It entices them to seed production by providing technology, a remunerative price, and a buy-back guarantee. This initiative is now flying without funding and expanding based on market needs. Therefore, it is replicable and scalable by building purposeful partnerships.

Drivers of change: Critical factors for the success of the practices were the availability of improved varieties with market-preferred traits suited to post-rainy agroecology and the partners' teamwork in deploying them in farmers' fields. It is noteworthy to mention the role played by Maharashtra State Seeds Corporation (Mahabeej), who, upon seeing yield gains in farmers' fields through improved technologies, readily agreed to multiply seeds of improved varieties and buy back the seeds from seed farmers by paying 25% higher premium than the prevailing market price. This was a game-changer for the seed consortium. With support from ICRISAT, MPKV, and VNMKV, the breeder seeds were supplied to seed farmers, who were empowered in quality seed production. The Maharashtra seed certification agency monitored seed plots and certified seeds. Mahabeej procured, processed, and supplied quality seeds to commercial farmers. The ripeness of technologies, their acceptability by farmers, passion, and synergy among partners and farmers have all contributed to this success.

Dilemmas and barriers: One of the key risks was the acceptance of new varieties by farmers, as they have been accustomed to cultivating landraces for a long time and have apprehensions about these varieties, particularly their grain and starch quality.

Secondly, the availability of inputs such as seeds, seed treatment chemicals, and fertilizers, as well as the seed drills advocated for maintaining optimum plant population, was a challenge. Their reach to farmers and acceptance by farmers were found to be highly challenging. Furthermore, the farmers had to cope with the removal of off-types from seed plots, which reduces their plant population and yields. ICRISAT and its partners worked hand-in-hand with seed farmers in implementing all the interventions thoroughly and guiding them. They negotiated with various private seed producers to uptake improved varieties multiplied by the seed consortium and requested Government departments to support seed multiplication by farmers through various schemes, including input supply, certification costs, and training programs.

Novelty and innovation of solution: Across post-rainy sorghum ecologies, landrace cultivars possessing white bold lustrous grains with photoperiod sensitivity, cold tolerance,

shoot fly resistance, and terminal drought tolerance, like M 35-1 and Dagadi, are popular. Indian NARS has developed some improved varieties, but they are not available to most farmers, and the seed replacement ratio is very low (20%). Therefore, the establishment of the “Seed Consortium” by ICRISAT and its partners is an innovative and first-of-its-kind approach, wherein all stakeholders are brought onto one platform and passionately work to improve seed availability and push adoption rates. With improved seeds, post-rainy sorghum productivity reached 1000 kg/ha vis-à-vis 650 kg/ha when the Seed Consortium was initiated. The annual per capita income in the HOPE seed production area is Rs 38,118, while in the non-HOPE area, it is Rs 25,000, of which 65% is derived from crop enterprises only. The involvement of women in seed production is very significant.

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Food Security and Income Generation through Cultivation of Proso Millet and Foxtail Millet in Char areas of Bangladesh

Location: Bangladesh



Institution: Bangladesh Agricultural Research Institute (BARI)

Summary: In Bangladesh, there are approximately 0.82 million hectares of Char land or riverine island. About 70% of the people who live in the char areas across Bangladesh rely on agriculture for their livelihood. Due to low soil fertility, most of the char land remains fallow. Under poor soil conditions, millets, particularly foxtail millet and proso millet, give a better yield compared to all other crops; in case of other grain crops, there is a probability of complete failure. These are hardy crops and quite resilient to a variety of agroclimatic adversities, such as poor soil fertility and limited rainfall. For many years, farmers in this char region have grown the local cultivars of foxtail millet and proso millet. The area of millets in the char regions is decreasing day by day due to the lower yield of local varieties. The Plant Breeding Division of Bangladesh Agricultural Research Institute (BARI) is working on millet research. They have developed four high yielding varieties of foxtail millet and one variety of proso millet. These varieties are higher yielding compared to local cultivars. Farmers are now growing BARI released high yielding millets instead of local cultivars in majority of the char land. Therefore, crop productivity as well as cropping intensity has increased, which has helped achieve food security. Hence, both the socioeconomic condition and income of the people in char areas are improving. Millets are rich in protein, minerals, vitamins, and micronutrients; they are gluten-free and therefore, ideal for people who are gluten intolerant. The needy people in char areas used to eat millet as an alternative to rice since it met their nutritional needs. The people of the char regions are changing their livelihood status by cultivating the new improved BARI released varieties of millet, which will assist in achieving food security and nutritional security.

Pitch: The Char lands are home to some of the poorest and most vulnerable people in Bangladesh. About 6.5 million people (i.e. 5% of Bangladesh's total population) live in

the Char lands and depend on agriculture for their livelihoods. For many years, farmers in the Char regions have grown local millets, but this has resulted in low grain yields. As a result, the area of millet-cultivable land in the Char area has decreased. BARI has released high-yielding millet varieties suitable for Char lands. Currently, farmers in the Char area are growing BARI-released millet varieties, including BARI Kaon 2, BARI Kaon 4, and BARI Cheena 1, and they are achieving positive results, changing their livelihood status and earning more money.

Problem analysis: The main issue in the Char area of Bangladesh is the lack of good-yielding millet varieties, along with challenges in obtaining high-quality seed and marketing millets. The scarcity of quality millet seeds in the Char area has forced farmers to rely on poor-quality seeds. Farmers depend on labour-intensive, time-consuming, and tedious conventional grain processing techniques. Women in the Char area have traditional knowledge of millets and their use in making local foods. However, these recipes have low commercial potential due to their short shelf life and lack of preference beyond their locality. To address these challenges, BARI is working to increase popularity of millets in the Char area. BARI has a millet variety improvement program and quality seed production activities. It has introduced simple and user-friendly millet processing equipment, and is also organizing field days, block demonstrations, and training programs to promote the adoption of newly developed millet varieties.

Solution: BARI has released four foxtail varieties (BARI Kaon 1, BARI Kaon 2, BARI Kaon 3, and BARI Kaon 4) and one proso millet variety (BARI Cheena 1). Adaptive trials of millet varieties, along with local cultivars were conducted in the Char areas of different districts. These districts included Munshigonj, Rangpur, Tangail, Borguna, Jamalpur, Gaibandha, Faridpur, and Manikgonj. In the case of foxtail millet, BARI-released varieties such as BARI Kaon 2 and BARI Kaon 4; these varieties produced higher yields

than local cultivars. In the case of Proso Millet, the newly introduced variety BARI Cheena 1 consistently outperformed local cultivars in yield. BARI conducted block demonstrations of their millet varieties in farmers' fields in targeted Char areas. They also arranged field days on millet production in Char areas with the participation of farmers and agriculture officers. BARI also organized a participatory varietal selection program in farmers' fields and provided simple, user friendly millet processing equipment in targeted Char areas. In the Char areas of farmers' fields, BARI produced two tons of breeder seed millets. Additionally, BARI organized millet-made food exhibitions in Gazipur for top officials.

Target population: The millet cultivation project targets marginal and smallholder farmers, including men and women. These farmers are in the Char areas of Munshigonj, Rangpur, Tangail, Borguna, Jamalpur, Gaibandha, Faridpur, and Manikgonj districts. In the Char areas, both men and women are involved in farming activities. Although the percentage of male farmers is higher than female farmers, women are directly involved in different post-harvest activities. The adoption of high-yielding millet varieties is expected to increase the productivity of Char areas, improve farmer income, and create empowerment opportunities for women.

Results: Billah et al (2019) conducted an experiment in the Jamalpur char land area during 2018-19 to find out the yield performance and promote proso millet in char land areas. BARI Cheena-1, Local-1, and Local-2 were used as varieties/cultivars in that experiment. They observed that BARI Cheena-1 was a dwarf type (61.43 cm) compared to Local-2 (76.60 cm). They found that BARI Cheena-1 had the most effective grains per panicle (364g) compared to the Local Cultivar. They also found that BARI Cheena-1 had the maximum 1000 seed weight compared to Local-1 and Local-2. BARI Cheena-1 produced the highest yield (2.4 t/ha) compared to Local-1 and Local-2 (Table 1). Rahman et al (2018) conducted an adaptive trial experiment

at the farmer's field in Gaibandha char during 2016-17 to disseminate and promote BARI Kaon varieties to the farmers of char areas. They used BARI Kaon-2, BARI Kaon-4, Local Cultivar-1, and Local Cultivar-2 as their experimental materials. They observed the highest number of spikelets/spike, number of grains/spike, and 1000-grain weight (g) in BARI Kaon-4 compared to the

local cultivar. They recorded the highest grain yield (2.98 t/ha) in BARI Kaon-4, which was statistically similar to BARI Kaon-2 (2.96 t/ha) but significantly higher than the local cultivar (Table 2). Here, it was observed that BARI released millet varieties performed better compared to the local cultivar.

Table 1: Performance of different proso millet varieties with local cultivar at the Jamalpur char area during the rabi season of 2018-19

| Genotypes | Plant height (cm) | Panicle length (cm) | No of grain/panicle | 1000 grain wt. (g) | Grain yield (t/ha) |
|---------------------|-------------------|---------------------|---------------------|--------------------|--------------------|
| BARI cheena 1 | 61.43 | 26.15 | 364 | 2.6 | 2.90 |
| Local 1 | 69.60 | 18.83 | 313 | 2.3 | 2.16 |
| Local 2 | 76.60 | 20.83 | 322 | 2.4 | 2.26 |
| CV (%) | 2.82 | 9.37 | 4.77 | 4.49 | 5.31 |
| LSD _{0.05} | 4.43 | 2.46 | 8.61 | 0.28 | 0.60 |

Sources: BARI Annual Research Report 2018-19

Table 2: Performance of different foxtail millet varieties with local cultivar at the Gaibanda char area during the rabi season of 2016-17

| Genotypes | No of spikelet/spike | Length of spike (cm) | No of grain/spike | 1000 grain wt. (g) | Grain yield (t/ha) |
|---------------------|----------------------|----------------------|-------------------|--------------------|--------------------|
| BARI Kaon-2 | 60.23 | 24.15 | 367.25 | 2.51 | 2.96 |
| BARI Kaon-4 | 65.60 | 21.80 | 397.70 | 2.64 | 2.98 |
| Local 1 | 55.08 | 19.83 | 311.50 | 2.20 | 2.00 |
| Local 2 | 58.08 | 20.83 | 321.50 | 2.36 | 2.15 |
| CV (%) | 0.60 | 1.37 | 0.62 | 0.55 | 2.01 |
| LSD _{0.05} | 0.58 | 0.46 | 3.61 | 0.04 | 0.09 |

Sources: BARI Annual Research Report 2016-17

Potential for upscaling and replicability: In Bangladesh, most cultivable land is used for rice. Therefore, preliminary surveys should be conducted in char areas based on millets' uses, constraints, and opportunities. For upscaling the production of millets, the following interventions should be taken:

(i) increase the allotment of land to these crops in char and plain lands, (ii) use better seeds and improved cultivation practices to increase yield and productivity, (iii) enhance regional capacity for seed production and supply quality seed at the local level, (iv) introduce labor-free grain processing technologies to help women

promote the consumption of these grains and increase their income through value chain construction, (v) raise public awareness of millets' significance for food and nutritional security, (vi) develop marketing strategies for millets, and (vii) develop consumer need-based value-added products from millets.

Drivers of change: Several factors have contributed to the dissemination of millets in Bangladesh. These include rapid technological advancements, expanded farming possibilities resulting from agricultural research, increased market opportunities, and higher profit and income. Policies, public investment in agriculture, and the delivery of essential inputs have successfully encouraged farmers' aspirations and positive attitudes toward change. Improved crop varieties with useful traits, higher yields, and higher profitability are being developed and disseminated for millet cultivation. Other improvements include better irrigation management, policy reforms, and agriculture investments. Access to domestic and international markets via improved road networks and trade policy reform (reduction of input tariff rates) has helped increase domestic production and consumer access to food. Farmers have improved access to technological information through face-to-face interactions with extension personnel, agricultural information centers, and other stakeholders. Millets are suitable for cultivation on marginal (low fertile) and dry soils (rainfed) and have low infestation rates of crop pests and diseases.

Dilemma and barriers: There were several risks and constraints that hindered the popularization and spread of millet products. These risks and constraints needed to be properly addressed to promote the use of millet with success.

These included: (i) People's belief that millet is a low-status food, (ii) Lack of awareness of millets' potential and nutritional value, (iii) Low public interest in value-added millet products, (iv) Consumer preference for spending less on millet items than on rice products, (v) Lack of training in value addition and product development for millet growers and business owners, (vi) No assured marketing, and (vii) Lack of financial assistance for small businesses and entrepreneurs for the production of diversified recipes based on millets. Mitigation strategies include (i) Effective marketing strategies for millets, (ii) Development of consumer need-based value-added products for millets, (iii) Training and capacity building for farmers and extension personnel, and (iv) Public awareness.

Novelty and innovation of the solution: Millets such as proso millet and foxtail are playing a significant role in ensuring Bangladesh's food security and achievement of SDG-2 of the United Nations. BARI has released mega varieties of millets (Proso millet-BARI Cheena-1; Foxtail millet-BARI Kaon-2 & BARI Kaon-4), which farmers throughout the country are increasingly cultivating. As a result, most of the infertile land is now being cultivated, increasing crop production and cropping intensity, and contributing to achieving food security. Bangladesh is now very close to achieving food security, and the release of these millet varieties by BARI has made a tremendous contribution towards this goal.

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Public-Private Research Partnership to Enhance Sorghum and Pearl Millet Productivity in India and Other Parts of the World

**Location: Sangareddy,
Telangana, India**



Institution: ICRISAT

Summary: ICRISAT, as a public-sector institution, is responsible for developing improved varieties and hybrid parents of mandate crops. Recognizing the value of private sector seed companies as research partners for hybrid cultivar development and seed production, ICRISAT formed the Hybrid Parents Research Consortia (HPRC) about twenty years ago in India. Due to the success of this Public Private Partnership (PPP) model, HPRC was also initiated in ICRISAT's Eastern and Western African crop improvement programs. At present, about 35 seed companies are members of HPRC for millet crops, including pearl millet and sorghum. This includes around ten companies in Eastern and Western Africa. Private sector companies provide a token research grant each year to join the consortium. This approach utilizes complementary expertise and resources and generates synergies between International Agricultural Research Centers (IARCs) and the private sector in the development and marketing of improved cultivars' seed without compromising the global research agenda in delivering International Public Goods (IPGs). ICRISAT employs this approach to deliver its research products such as improved hybrids and varieties to poor farmers through Public-Private Partnerships. The consortia funds complement ICRISAT's core funds for pearl millet research. All ICRISAT-bred materials remain in the public domain as IPGs, and no seed company has exclusive rights.

Pitch: This research partnership between IARC, NARS, and the private sector harnesses the power of crop improvement to generate "bankable" research products that catalyze private and public investments and generate multiple benefits along the value chains of two millet crops: pearl millet and sorghum.

Problem analysis: A diverse array of germplasm is required by breeding programs of both the public and private sectors to continuously enhance the productivity of millet crops. Through this consortium network, ICRISAT generates

significant genetic diversity and shares it with both public and private sector partners, which helps develop promising cultivars for farmers.

Solution: Public-private partnerships bring all the stakeholders on board and handle the challenges jointly. As a group, the consortium seed companies represent a large human resource with expertise in diverse areas such as parental line breeding, hybrid development, hybrid testing (both on-farm and farmer participatory), seed production, and hybrid seed marketing. Hence, through the consortium network, ICRISAT-bred materials find a fast delivery vehicle to reach farmers, leading to the rapid adoption of a diverse range of hybrids on farms.

Target population: The availability of diverse and productive cultivars through the Consortium has greatly benefited the farming community. In India, at least 60 to 70% of pearl millet and sorghum hybrids are based on ICRISAT Consortium-bred hybrid parental lines, which has contributed significantly to biodiversity with the largest number of hybrids on-farm in sorghum and pearl millet compared to any coarse grain cereal. Additionally, it has led to enhanced disease resistance with no downy mildew epidemics in the last fifteen years, yield stability, and increased productivity with a genetic gain of about 3% per annum. The Consortium has also helped develop promising cultivars of sorghum and pearl millet in Brazil, Central Asia, and many African countries.

Results: A third-party evaluation of the on-farm impact of pearl millet hybrids developed under Pearl Millet Hybrid Parents Research Consortium (PMHPRC) by member partners for ten years (directly or indirectly based on ICRISAT breeding lines) in India was carried out and published (Venkata Rao et al. 2018). The study covered five hundred and sixty-three pearl millet growers spanning fifty-seven villages and twenty-five Mandals in three states (Rajasthan, Gujarat, and Uttar Pradesh) in India, revealing that PMHPRC hybrids covered about sixty percent of the pearl millet hybrid area. These hybrids provided

at least twenty percent higher grain and fodder than the varieties/other hybrids they replaced. For Gujarat, HPRC hybrids were grown in 0.72 ha, while the non-HPRC hybrids were grown in 0.19 ha. A hectare of HPRC hybrids, on an average, yielded 21.76 quintals of grain and 32.55 quintals of fodder per ha. Similarly, a hectare of non-HPRC hybrids yielded only 18.57 quintals of grain and 30.22 quintals of fodder in Gujarat. In Rajasthan, HPRC hybrids were grown in 0.58 ha, while the non-HPRC hybrids were grown in 0.52 ha. A hectare of HPRC hybrids, on an average, gave 27.28 quintals of grain and 38.7 quintals of fodder. A hectare of non-HPRC hybrids yielded 22.03 quintals of grain and 31 quintals of fodder. In Uttar Pradesh, HPRC hybrids were grown in 0.57 ha, while the non-HPRC hybrids were grown in 0.28 ha. The average yield of HPRC hybrids was 39.35 quintals of grain and 55.4 quintals of fodder per ha. The non-HPRC hybrids gave only 32.78 quintals of grain and 47.7 quintals of fodder per hectare. The longevity of the hybrids developed using PMHPRC-bred genetic materials was 8–20 years in the market, compared with 3–7 years for the hybrids of non-PMHPRC bred lines. The total benefits on account of HPRC hybrids were worked out as US\$39.5 million in Gujarat, US\$55.2 million in Rajasthan and \$39.0 million in Uttar Pradesh. The total benefits due to these hybrids in the three states added up to 133 million US Dollars. The overall benefits at the country level could exceed 150 million US Dollars per year if contributions of HPRC hybrids are accounted for in other states of India as well.

Potential for upscaling and replicability: The same model has been replicated in sorghum and pearl millet crops in Eastern and West African regions.

Drivers of change: Formation of the Consortium platform with formal guidelines developed in consultation mode helped public and private sector organizations gain trust in the platform. The mantra of equality for all partners drives the PPP model.

Dilemma and barriers: The risk was that the private sector organizations might not be satisfied with the research products and as a result, their capacity to develop productive

Novelty and innovation of the solution: This PPP model was developed for the first time

in the CGIAR network. Other CGIAR centers like IRRI and CIMMYT have also replicated this model successfully.

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CONCLUSION

The good practices from Asia and Africa, mapped in this compendium showcase a range of learning opportunities for millet mainstreaming from diverse set of stakeholders including Governments, NGOs, FPOs, startups, cooperatives, KVKs, academia, private sector and grassroot implementers. The stories documented from the ground are testaments to the existing capacities of different stakeholders that can help in revitalizing millet in food systems across the world.

The call was open for all stakeholders and engagement/orientation workshops organized for all states within India and multiple stakeholders in Asia and Africa. While the stories have been shared from different corners of the world, Odisha with over hundred stories submitted has clearly championed the cause of millets in their state and needs to be recognized as a true leader in millet value chain development and mainstreaming. The stories shared bring experience from different geographies, but the interconnectedness between different stories is evident through the commonalities in the problems, drivers of change, barriers, or strategies employed. The case stories in the compendium are innovative and solution oriented, focusing on millet value chain development and millet mainstreaming. Separate sectional focus has been given to both categories, however overlaps do exist in a few case stories.

The compendium will be useful to a wide range of users as the different solutions can serve as a template to catalyze policy and practice reforms through replication in a wider geography with contextual adaptation. The compendium brings

together multiple stories strengthening the various dimensions of millet value chain i.e., production, storage & distribution, processing, packaging & branding and consumption. It covers both major and minor millets cultivated globally and provides kaleidoscope of solutions relevant across the spectrum of problems like climate change, environmental degradation, food, and nutritional insecurity. From innovative cultivation practices like System of Millet Intensification to increase production being practiced in Odisha and Tamil Nadu to marketing innovative millet-based products in Gujarat and Kerala to increase consumption, the compendium covers a wide range of initiatives. The stories from Niger on biofortification of pearl millets, hybrids in west and central Africa region, technical advances and agriculture research focus from Bangladesh provide further insights.

Some of the initiatives like utilization of millet as green fodder to improve dairy outcomes were unique but were restricted to locations, while others like the role of FPO in millet procurement and marketing found mention in multiple stories across geographies. The stories also captured ground-breaking research in varietal and technology development and diffusion for different millets. Each of these stories are promising pathways for the researchers, policy makers and on-ground implementers for improving and strengthening the millet value chain and making it a win-win proposition for every stakeholder.

Besides focus on Government led program interventions like OMM, novel initiatives led by communities are also at the forefront of this

compendium. Case stories like community seed banks from Meghalaya illustrates how local communities are reducing their dependency on external stakeholders and strengthening their internal capacity to ensure food and nutritional security. The stories from other nations like Bangladesh, Mali, Niger, Nepal also provide significant opportunities of cross-learning which can be easily tapped to collectively address the complex challenges faced in millet mainstreaming. Stories cover important aspects of value chain from seed production, seed quality, seed priming, safe storage, seed treatment, community participation in varietal conservation, community management of seed centers, varietal trials, improved agronomic practices encouraging community organizations including WSHGs. They have stressed on other important aspects from training and awareness raising to branding, value-added products, safety standards and certification

The compendium also synthesized stories on the five broader mainstreaming dimensions of institutional commitment & coordination, sustainable and innovative financing, multi-stakeholder partnership, enabling environment for enhanced production & inclusion in safety nets and gender. It highlighted different strategies and approaches used for smooth implementation of solutions like Odisha's MIS Management and Dashboarding system or compliance trackers for FPOs. A majority of the stories emphasized the importance of institutional coordination not just between different ministries and departments at the center and state, but also between actors at the various level to bring about positive change. The importance of co-ordination on ground and developing local capacities is acknowledged in most of the case stories as the most important element of success.

The role of gender mainstreaming and cases of economic and social empowerment of women have also received adequate representation in the compendium. Multiple stories specifically credit the success of their projects to the transformative capacities of local women leaders. Women sensitization and empowerment have been given due importance by including establishment of millet tiffin centers, millet-based recipes by tribal women, combating child malnutrition with vitamin and mineral fortified recipes besides supporting and hand holding women in seed production, farming and promoting millet processing.

Sharing knowledge and learnings about the key issues, barriers, and drivers from existing success stories can revitalize the millet value chain and strengthen millet mainstreaming initiatives. As India is spearheading the global initiative to celebrate the International Year of Millets in 2023, this compendium offers a unique opportunity to facilitate the transfer of knowledge and promote peer-to-peer sharing of best practices between the Indian states and developing nations. The MEGP aims for greater engagement leading to collaboration and cooperation from local to regional level for mainstreaming millets into the food systems. Moving forward, stakeholders including the Government, private sector, research institutions, donor agencies, UN and multilateral agencies should strive to work together to replicate their proven solutions at a wider scale for the larger global interest. MEGP will inspire many more players to engage in the 'Millet Revolution', participate, innovate, validate and collaborate in making this resilient crop a right choice for future generations.

