



Sustainable Energy Access for

Millets



APRIL 2021 | SELCO Foundation



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Context

Millet is a common term to categorize small-seeded grasses that are often termed nutri-cereals or dryland-cereals. They are adapted to the harsh environment of semi-arid tropics. They require low or no purchased inputs, thus they are the backbone for dry land agriculture.

Millets were traditionally part of tribal diets but now is making its way back with the changing patterns of food consumption. They have been categorised as healthy super foods and have begun to have a significant market share in urban market centers where they are further processed to other processed foods.

FOOD

Madhya Pradesh's century-old millet sikiya finds few revivalists

The Baiga community vouches for protein-rich sikiya but many have lost access. Deepanwita Gita Niyogi travels to Madhya Pradesh to find out what is causing the disappearance

By Deepanwita Gita Niyogi
Published: Thursday 23 August 2018



▶ Laheri of Baiga tribe in Madhya Pradesh shows sikiya as a plant, and its whole and dehusked grains (Photographs by Vikas Choudhary)

www.downtoearth.org.in/news/food/madhya-pradesh-s-century-old-millet-sikiya-finds-few-revivalists-61394

Millet Value Chain

Millet by virtue contribute to the means of livelihood, food and nutritional security of the poor in various parts of the world. **Existing and new livelihood opportunities within the millet value chain can be catalysed by sustainable energy driven solutions and thus enable sustainable development.**



AGRICULTURE

Millet processing units in Andhra Pradesh, Madhya Pradesh to give impetus to farmers

Processing is difficult and rural women often feel the burden of this onerous task. To help them, both states have set up processing units

By Deepanwita Gita Niyogi
Published: Tuesday 17 July 2018



Recognising the lack of [modern processing facilities](#) as one of the major obstacles in promoting millets across the country, the Andhra Pradesh government has set up processing units (grader, dehuller and destoner) in 10 mandals since April this year. This is likely to give an impetus to farmers to cultivate the nutritious grain, that are plagued by low produce, weak markets and difficult processing methods.

www.downtoearth.org.in/news/food/madhya-pradesh-s-century-old-millet-sikiya-finds-few-revivalists-61394

Sustainable Energy and Millet Ecosystem

Stakeholders and Partnerships

Technology

Irrigation equipment manufacturers
On-farm equipment manufacturers
Energy enterprises
Research and development labs

Training and Capacity Building

NGOs
Farmer support centres
Agricultural training institutes
Agri universities
Agriculture and Livelihood Training Centres

Ownership and Linkages

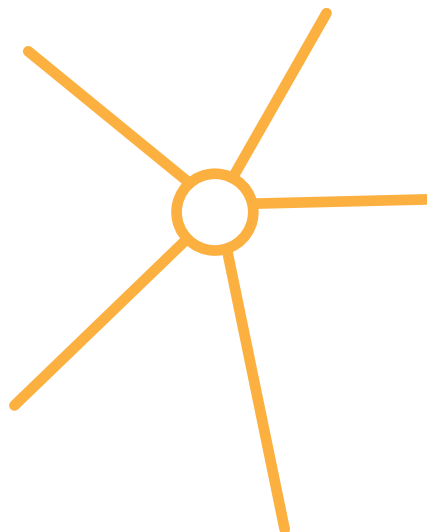
Farmers and Entrepreneurs
Processing Centres
NGOs
FPOs
Farmer Co-operatives and Enterprises
Self Help Groups

Finance

NABARD
Commercial Banks
FPOs
State and National Governments
Philanthropy
Corporate Philanthropy

Policy

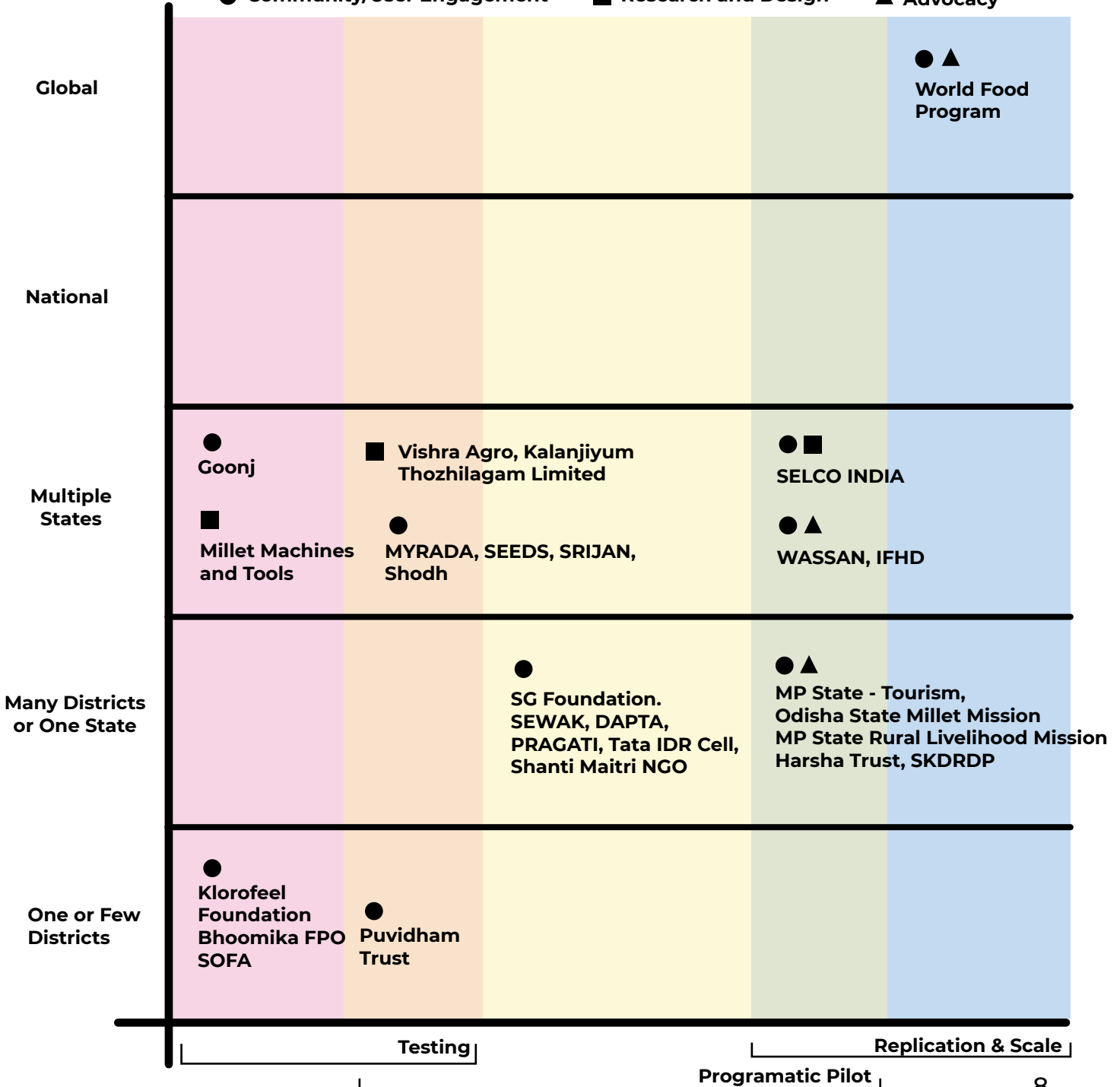
Food and Civil Supplies
National and State Livelihood Missions
Ministry of Panchayati Raj & Rural Development
Ministry of Agriculture
NABARD



● Community/User Engagement

■ Research and Design

▲ Advocacy



Testing

Replication & Scale

Programmatic Pilot

Millet Processing



A woman at work pounding millet in Ndiael, Senegal, December 9, 2016. Photo: TRF/Nellie Peyton

Key Challenges

Millet processing needs, determined by type of millet. With most innovations catering for the dominant grains there is scarcity in the number of millet processing units within the India as well as the world, this leaves most millets out from the food chain.

The concentration of processing units are at peri-urban/urban centers, thus making value addition and further consumption challenging for the rural economy.

Types of Millets and Processing Needs

Naked/Major Millets -

Finger Millet, Sorghum, Pearl Millet

These millets are sorghum millet, finger millet, pearl millet.

These require minimal processing after harvest

They just need are typically cleaned manually and consumed.

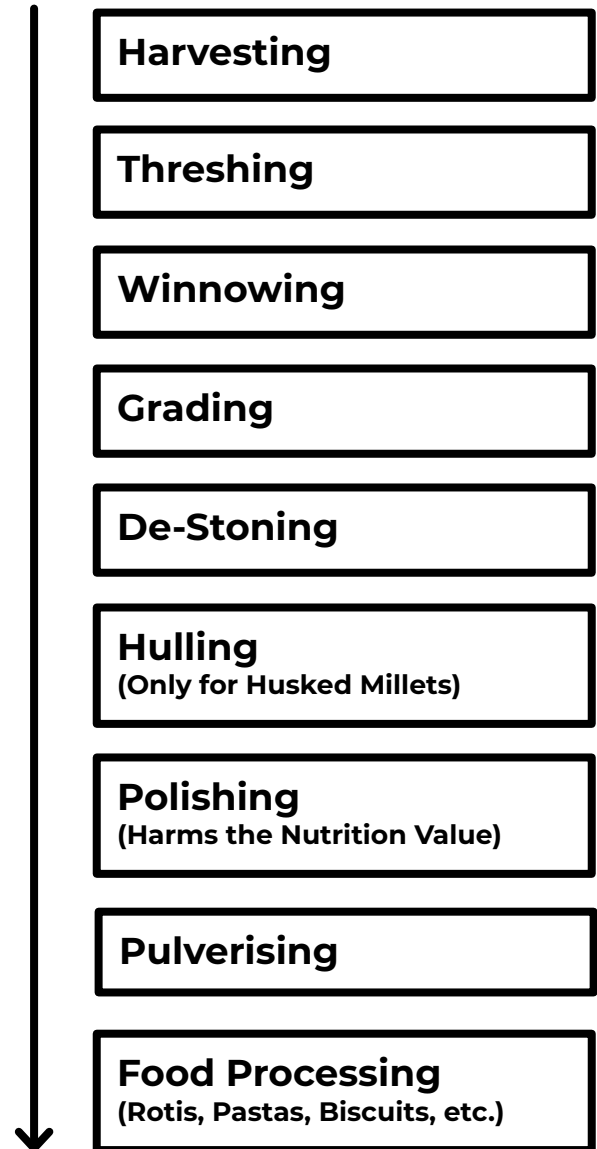
These millets are often processed to flour and to prepare further processed foods.

Husked/Minor Millets -

Foxtail, Barnyard, Kodo, Little, Posro

The husk needs to be removed before of these millets is fit for human consumption.

The mechanization of the processing of these minor millets are not on par with other cereals.



Distribution of Millet Processing Typologies Implemented With

BY LEVEL OF PROCESSING

Only Grain Processing	Only Flour Milling/ Pulverising	Grain Processing & Flour Milling/Pulverising
6%	53%	31%

BY BUSINESS MODEL

Only Community Consumption	Only Trading	Community Consumption & Trading	Food Processing
59%	13%	13%	13%

BY OWNERSHIP MODEL

Individual Entrepreneur	Farmer Producer Organisation	Self Help Groups
56%	28%	16%

BY PROCESSED VOLUME(KG OF MILLET/MONTH)

200-500	500-1000	1000+
13%	38%	49%

Key Inferences

Finger Millet or Ragi is the most processed grain for self consumption across implementation, appearing in 91% of such sites.

Primary processing of Millets is usually carried out with an add on of Flour Milling/Pulverising - 83% of all such sites.

An emerging model which has demonstrated its viability among individual end users is when flour milling solutions are packaged with spice grinding.

FPOs are most like to carry out businesses more than 1000 kgs in month due to enhanced market linkages, accounting for 60% of such sites.

Emerging Models

INDIVIDUAL OWNED, MILLET GRAIN/PRIMARY PROCESSING MODEL FOR TRADING

Avg. Quantity Per Month (KG)	Avg. Income Per Month (INR)	Milling Income Per KG (INR)
3,750	55,000	80-120

INDIVIDUAL OWNED FLOUR MILLING/PULVERISING MODEL FOR COMMUNITY CONSUMPTION

Avg. Quantity Per Month (KG)	Avg. Income Per Month (INR)	Milling Income Per KG (INR)
1,200	6,000	5-7

INDIVIDUAL OWNED FLOUR MILLING + SPICE GRINDING MODEL FOR COMMUNITY CONSUMPTION

Avg. Quantity Per Month (KG)	Avg. Income Per Month (INR)	Milling Income Per KG (INR)
500	2,760 - 12,000 (Millet) (Spice)	5-7

FPO/SHG/ENTREPRENEUR OWNED MILLET PRIMARY PROCESSING MODEL WITH FLOUR MILLING/PULVERISING FOR TRADING AND SELF CONSUMPTION

**Avg. Quantity
Per Month (KG)**

15,000

**Avg. Income
Per Month (INR)**

11,25,000

**Milling Income
Per KG (INR)**

50-100

(Based on type of Millet)

INDIVIDUAL/FPO OWNED MILLET PROCESSING + FOOD PROCESSING MODEL FOR TRADING

**Avg. Quantity
Per Month (KG)**

600

**Avg. Income
Per Month (INR)**

30,000

(After Value Addition)

**Milling Income
Per KG (INR)**

5-7 per Roti

(Appx. 15 Rotis/Kg of Flour)

SHG OWNED FLOUR MILLING MODEL LINKED TO ANGANWADIS

**Avg. Quantity
Per Month (KG)**

550

**Avg. Income
Per Month (INR)**

2,750

**Milling Income
Per KG (INR)**

5

Case Study 1

INDIVIDUAL OWNED, MILLET GRAIN/PRIMARY PROCESSING MODEL FOR TRADING

Laxminarayan Reddy, Individual Entrepreneur, Chikballapur, Karnataka

BACKGROUND

Lakshmi Narayan Reddy is a software engineer who decided to set up a social enterprise focussing on processing millets. His inputs are from own 5 acre land, also aggregates produce from farmers in the nearby region. His enterprise focuses on primary processing of millet grains and further are packaged and sold on retail and wholesale around the country. He is a well networked individual with some well established market linkages for his sales.

TECHNOLOGY ADOPTED

Solar Integrated millet processing unit

IMPACT

The area faces power cuts, though now the solar powered processing unit his enterprise runs uninterruptedly.

KEY ISSUES

Lakshmi wanted to build a sustainable social enterprise and wanted his unit to be dependent on a consistent reliable source of energy.



Case Study 2

INDIVIDUAL OWNED FLOUR MILLING/PULVERISING MODEL FOR COMMUNITY CONSUMPTION

Shivamma, Individual Entrepreneur Tulsikere, Chamrajnagar, Karnataka

BACKGROUND

Shivamma and her family of 4 reside in a remote off grid region named Tulsikere in Chamrajnagar. Her husband was the primary bread earner of the family, he is a seasonal migrant worker at construction sites in Mysore. They own 2 acres of land where they cultivate ragi, turmeric with other horticulture produce, such is the case of most households in the region. Ragi is a vital part of theirs and their communities everyday diets

TECHNOLOGY ADOPTED

Solar Powered Pulveriser for Flour
Grinding/Milling

IMPACT

Shivamma's flour mill caters to 50- 60 households in the region, which has aided her to generate an additional source of income for her and her family. She approximately generates INR 5200 per month from the milling services she offers for her community.

KEY ISSUES

Community members had to travel to the town area 8 kms away coupled with poor accessible roads, poor modes of transport to cover this distance they often travel by foot to flour mill their ragi. They spent about INR 50 to cover these distance via shared vans.



Case Study 3

INDIVIDUAL OWNED FLOUR MILLING + SPICE GRINDING MODEL FOR COMMUNITY CONSUMPTION

Kondu Bodekar, Mundgod, Uttara Kannada, Karnataka

BACKGROUND

Kondu Bodekar hails from the Gowli community of Margadidaddi, a village that lies in a remote forested area situated in Mundgod, a panchayat town in Uttara Kannada, Karnataka. The people residing here belong to the cattle rearing folk. Only two to three households own land and predominantly engage in the cultivation of rice, areca nut, maize while the rest of the community engages in daily wage labour in other farms nearby. Initially Kondu's primary occupation was practicing daily wage labour.

IMPACT

From only flour milling generates a monthly income of INR 2760 whereas during summers, along with chilling grinding he generates an income of INR 12000 just from processing chilli's.

A reliable and a sustainable flour milling service is easily accessible to the community members now.

KEY ISSUES

Being a remote forested community, there were no milling facilities in the village or nearby. People would have to travel to the closest town Katur, 5-8 kms away to access these services.

TECHNOLOGY ADOPTED

Solar Powered Pulveriser for Flour and Spice Grinding



Case Study 4

FPO/SHG/ENTREPRENEUR OWNED MILLET PRIMARY PROCESSING MODEL WITH FLOUR MILLING/PULVERISING FOR TRADING AND OR SELF CONSUMPTION

Sittilingi Organic Farmers Association (SOFA), Dharampuri, Tamil Nadu

BACKGROUND

SOFA works with 500 farmers and 600 women groups who are spread across 22 villages in the valley of Sittilingi located in Dharmapuri. Malavasi community inhabit the Sittilingi valley and have lived by rain-fed subsistence farming and the produce of their forests for a very long time. Traditionally, they grew about fifteen different varieties of crops suited to the environment and had ample food the whole year around.

IMPACT

With interventions for post processing in millets, SOFA has created a revenue ecosystem with the Sittilingi. Farmers do not go seeking markets besides SOFA, as they are remunerated fairly.

The processed good have created a local linkages for selling the produced goods, this has boosted the local economy and the food security within the region.

Besides, SOFA has been able to showcase best practices in farming and allied activities which are sustainable across indexes of income and health within the region.

KEY ISSUES

The traditions of cultivation has been displaced by the pressures of a modern consumer economy to grow cash crops. These crops are water intensive and people are forced to use chemical fertilisers and pesticides in an attempt to maximise returns. Eventually, the tribal farmer finds himself in a situation where he is easily exploited.

The community unanimously was diagnosed with poor health index due to malnutrition caused by lack of food security.

TECHNOLOGY ADOPTED

Integrated millet processing unit, Pulveriser (flour milling and spice Grinders), roti rolling machine, ovens.



Case Study 5

INDIVIDUAL/FPO OWNED MILLET PROCESSING + FOOD PROCESSING MODEL FOR TRADING

Preeti Joshi, Individual Entrepreneur, Haliyal, Uttara Karnataka

BACKGROUND

Preeti Joshi is an individual entrepreneur placed in the town of Haliyal. On losing her husband she she wanted to start off with a micro food processing enterprise and owns and runs condiment store to support herself and her family.

TECHNOLOGY ADOPTED

Solar Powered Flour Grinding Mill and Roti Rolling Machine

IMPACT

The flour mill has reduced her dependency on outside services and is now able to timely deliver to the orders she receives. This has significantly increased her productivity and profits.

She now has no additional overheads on logistics and money paid towards flour milling

KEY ISSUES

For snack making and roti making requires flour as a basic ingredient for further value addition. With the absence of a nearby flour mill she needs to appoint a lady just for milling all the essentials, where a whole day would be spent to mill flour required for the whole week. . Sometimes it would take more than a day if there is a power cut in the milling shop. Thus resulting in lack of productivity.



Case Study 6

SHG OWNED FLOUR MILLING MODEL LINKED TO ANGANWADIS

Mothercare NGO, Odisha

BACKGROUND

Mothercare is a Self Help group which was organized to address the nutrition needs of the Kankubadi village. The prominent crop cultivated in the region are millets (specifically ragi) with other horticulture produce. Most of the community members are engaged in farming and cattle rearing as their primary occupation, on lean seasons they migrate for daily wage labour.

TECHNOLOGY ADOPTED

Solar Powered Pulveriser for Flour Grinding/Milling

IMPACT

The flour mill has made milling services easily accessible within the community. Also, has given rise to self consumption quantities, instead otherwise would have been sold off to markets. Thereby hindering one's own food security and sustainability.

The surplus quantities among the farmers in region is purchased by the SHG and further sold to Anganwadis in the village as part of Odisha Millet Mission programme.

KEY ISSUES

Flour milling was carried out manually within the village or a processing center away from the village was accessed for the service.

Since, flour milling was carried out manually, the drudgery caused was immense particular for the women in the community



Conclusion and Way Forward

Scaling of Proven Models -

Individual or group owned models of flour milling services for local community consumption have proved to be successful and can be scaled with a larger group of customers from specific types of communities. These could be scaled with or without additional spice grinding services - where applicable. However, financing channels would need to be identified with gap financing of 50-70% of the total system cost provided bearing in mind the volume of usage, potential incomes and inefficiency of currently available machines in terms of energy consumption.

Demonstrating Scalable Models for End to End Millet Processing for Policy Interventions -

Full scale solar powered millet processing would need to be demonstrated at a larger scale across geographies and scales of operation before being recommended towards integration within millet mission programs in Odisha and other states. These would need to be demonstrated at block or district levels with ownership between FPOs and SHGs for different types of Millets processed.

Technology Benchmarking for Millet Processing -

While many technologies already exist for processing of millets, suitability of these makes across specific geographies is a current gap - with specific technologies meeting the demands of specific geographies and implementation sites. A broad and deep technological benchmarking and suitability study would need to be made for scaling efficiently.

Identifying problem areas and specific technology needs in pre-harvest processes of millets -

While millet processing has made much progress both in terms of implementation and solar energy integration, core farming processes and pre-harvest processes in the millet value chain have been less explored in terms of automation and technology interventions. A deeper assesment would need to be carried out to identify technology needs to this effect.

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