

REVIVAL OF FINGER MILLET



Project by
Pragati Abhiyan,
Nashik for increasing
productivity and consumption
of Nagali by adivasis and
supported by the Tribal
Development Department,
Maharashtra

April 2019 - March 2022



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ABBREVIATIONS

ANAVIKA - Adivasi Nagali Vikas Karyakram
CCE - Crop Cutting Experiment
CFR - Community Forest Rights
CHC - Custom Hiring Centres
CRP - Cluster Resource Person
CSO - Civil Society Organisation
FRA - Forest Rights Act
ICDS - Integrated Child Development Scheme
IFR - Individual Forest Rights
LT - Line Transplantation
MDM - Mid-day Meal
MGNREGA - Mahatma Gandhi National Rural Employment Guarantee Act
MSP - Minimum Support Price
POP - Package of Practices
PDS - Public Distribution System
SMI - System of Millets Intensification
TDD - Tribal Development Department

FOREWORD

We are happy to present the project report titled 'Revival of Finger Millets', which was implemented during the period 2019-2022 in collaboration with the Tribal Development Department. The report highlights our efforts and the knowledge gained throughout the process of enhancing millet productivity with tribal farmer families. This report holds great significance for us, especially considering its publication in 2023, which has been designated as the International Year of Millets.

The decline in millets productivity is a matter of concern for all of us. Millets are soon expected to become a vital component of our everyday food. The cultivation of staple grains such as wheat and rice faces numerous challenges, including climate variability, diminishing soil fertility, pest infestation, and high water requirements. To supplement these staple crops, a significant proportion of millets will be required in the future.

However, it is crucial to acknowledge that mainstreaming millets cannot be done at the cost of marginalising the very farmers who have preserved these crops. These are mostly marginal, adivasi farmers, engaged in rainfed and small scale farming. It is important to consider how we plan to support these farmers who have persistently cultivated millets despite the lack of government or market assistance. We must also recognise their invaluable contribution in preserving the crop's germ plasm for its revival.

In addition to presenting the project's success, this report aims to highlight these crucial concerns. We will continue to advocate for the issues faced by farmers and strive to amplify their voices. We hope that this report contributes to raising awareness of their challenges and that policymakers take note of their needs.



Ashwini Kulkarni
Executive Director,
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EXECUTIVE SUMMARY

Nagali, also known as Ragi or Finger millet, is a crop that is central to the lives of adivasi communities across Maharashtra, known for its nutritional value. However, over the years, the productivity of the crop has been declining, making it difficult for adivasi cultivators to sustain its cultivation amidst various challenges.

In 2018, Pragati Abhiyan initiated ANAVIKA- Adivasi Nagali Vikas Karyakram - as a pilot programme to improve the productivity of Nagali. With knowledge support from the national network RRAN (Revitalising Rainfed Agriculture Network, <https://www.rainfedindia.org>), the programme yielded promising results, leading to the initiation of a project for the revival of millets from April 2019 to March 2022, with support from the Tribal Development Department, Government of Maharashtra.

Working with over 2000 farmers directly in 7 blocks from 3 adivasi districts (Nashik, Palghar, and Thane) for three consecutive Kharif seasons, following trained in identification and management of pests, insect or fungi attacks on crops, making and using organic fertilisers, and new cultivation practices like nursery bed, line sowing, and seed treatment.

At the heart of this Nagali revival programme lies the Package of Practices formalised by Pragati Abhiyan. System of Millets Intensification (SMI) is a set of tried and tested agricultural practices adopted to improve quality and quantity of the produce. By studying them and consulting field experts, we formalised the Package of Practices tailored for the region and people it was going to work with.

The introduction of improved practices was accompanied by the procurement of basic equipment aligned with the new agronomic practices introduced to the farmers, such as a cycle weeder for weed management, spray pumps, and a thresher for processing.

Community Hiring Centers were set up in the village for storage and management of the farm

equipment. Local level farmers' groups managed these centres and made the equipment available to farmers on a nominal rent. The collected money was utilised for maintenance of tools and equipment.

The revival of Nagali programme did not stop with increased productivity and led to promoting consumption in various ways by engaging Adivasis, especially women, establishing platform events to revive old recipes and evolve/spread new ones through recipe competitions, promoting local millet bakery products, conservation of indigenous seed varieties, etc. The campaign is an yearly event with local self-help groups and Aanganwadi Centres and aims to bring back Nagali in the diet of children and the younger, who may have lost the taste for it.

As it is evident, that this project period involves the pandemic and lockdown period. Though we could continue working with farmers with training on PoP and demonstrations, it did affect some important activities. The primary processing of Ragi with Thresher has been introduced but other processing machines are yet to be handed over to Farmer's Groups as part of CHC. In addition to Covid there were issues with flow of funds which affected sequence of activities. We have increased the time period of the project and look forward to complete planned activities. This second phase of the project will command a comprehensive report.

The project demonstrated that it is possible to revive Nagali by working with adivasi farmers, ensuring their financial, food, and nutritional security. This programme is replicable and can be applied to all types of millets and taken across the state with the help of civil society organisations and state governments. However, it needs a supportive policy framework along with proper incentives for farmers to cover the costs associated with growing millets, assured purchase of the crop at MSP, and R&D and technological support to develop high-yielding varieties, better farming practices, and appropriate farming and processing equipment. ●

1. PROGRAMME BACKGROUND

Nagali, also known as Ragi or Finger millet, is a crop that is central to the lives of adivasi communities across Maharashtra, known for its nutritional value. However, over the years, the productivity of the crop has been declining, making it difficult for adivasi cultivators to sustain its cultivation amidst various challenges.

In 2018, Pragati Abhiyan initiated ANAVIKA - Adivasi Nagali Vikas Karyakram - as a pilot programme to improve the productivity of Nagali. After the promising results of the pilot, the organisation with support from with Tribal Development Department, Government of Maharashtra, started a project for revival of millets from year April 2019 to April 2021, which was extended till March 2022.

This report presents the process and outcomes of this collaborative project titled: "To increase yields by comprehensive millets revival and to include primary processing units for young entrepreneurs; capacity building for various recipes that can be included in ICDS, MDM and Ashram Shala". ●

1.1 Relevance and Importance of Finger Millet

The adivasi farmer families of North Maharashtra are predominantly located in hilly areas with high rainfall. They are mainly small and marginal landholders and rely entirely on rainfed agriculture. The primary crops they cultivate are Nagali and Paddy, along with some amount of other pulses and oil seeds. While paddy is sold in the market, most other crops are used for household consumption.

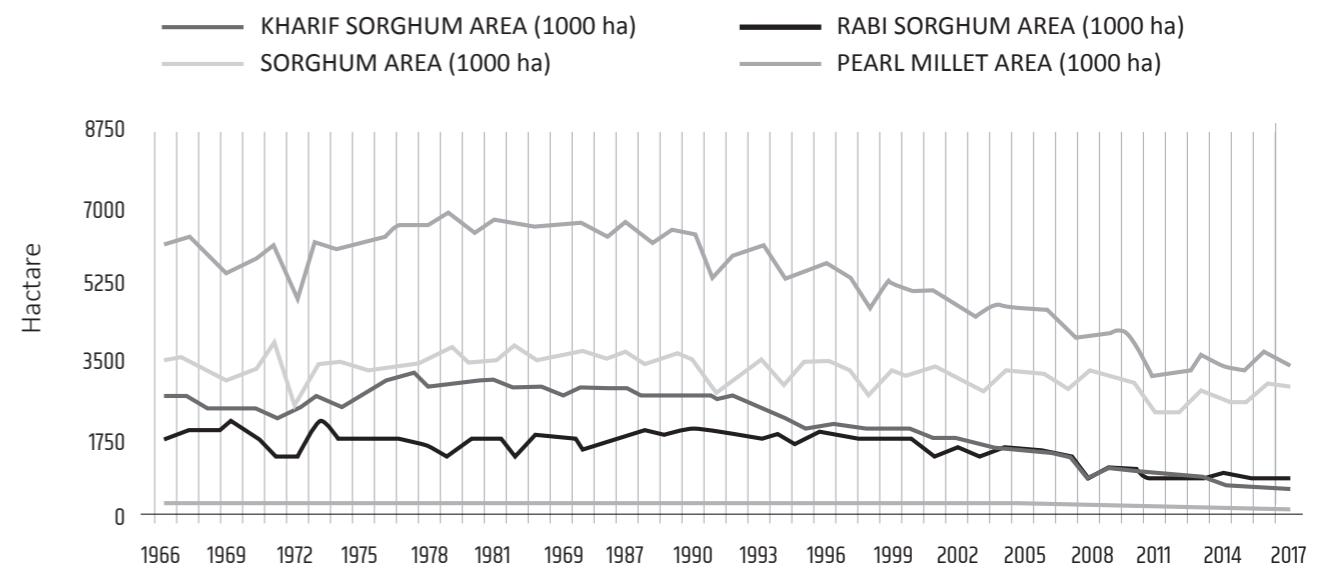
Millets are grown on undulating plots, plots with high slopes and low soil depth, and are considered **climate-resilient crops** that require less water and can withstand short dry spells. Nagali is also a low water-consuming crop that is resilient to drought spells and climatic changes. It does not increase input costs of frugal living for adivasi communities and is an essential part of their staple diet.

Adivasis grow Nagali primarily for household consumption, and a portion of the yield is preserved as

seeds for the next season. Properly stored Nagali lasts for two or more years, ensuring long-duration food security for the cultivators. Nagali is rich in protein, vitamins, minerals, calcium, fibre content, and energy, making it a natural source of micronutrients that can moderate the epidemic of undernourishment, especially among women and children.

(Since a significant proportion of women and children in Maharashtra are undernourished, it is essential to ensure dietary diversity and nutritional security at the household level, particularly among adivasi households. Increasing productivity and production of millets, including Nagali, without increasing production costs, can strengthen livelihoods and increase income for adivasis. With the growing market for millet-based products among urban families who are health conscious, there is a significant opportunity to increase market demand and income for adivasi farmers.) ●

Graph 1: Millets Area in Maharashtra from 1966 to 2017



Graph 1 shows the declining trends of Millets in Maharashtra. The conscious pursuit of an agricultural policy since the 1960s to meet national food security with paddy and wheat has led to a decline in millet production and consumption. Although, Sorghum and Pearl Millet is very dominant in the state, other millets such as finger millets little millets are at the verge of vanishing from the farm and plate of the people.

(Source: ICRISAT)

There Was Recognition, But No Action

Thus, the government should stand behind the cultivators and assure them of incentives and benefits they deserve.

This problem has not gone unnoticed, and the State recognises the significance of Nagali and other millets and the deteriorating state of their cultivation. Prior to the Millet Mission initiated by the Indian government, Nagali was not viewed as a crop worth investing in. However, the government declared 2018 as the "National Year of Millets" to increase demand and promote their consumption and production.

The GoI's Gazette notification dated 10 April 2018 recognises Minor Millets as Nutri Cereals and states that "Millets hold great potential in contributing substantially to the food and nutritional security of the country and thus they are not only a powerhouse of nutrients but also are climate resilient crops and possess nutritional characteristics." To translate this

vision into reality, the government needs to invest in research and development, propagation of minor millets, and establish a smooth procurement system with appropriate minimum support prices, especially at the state level.

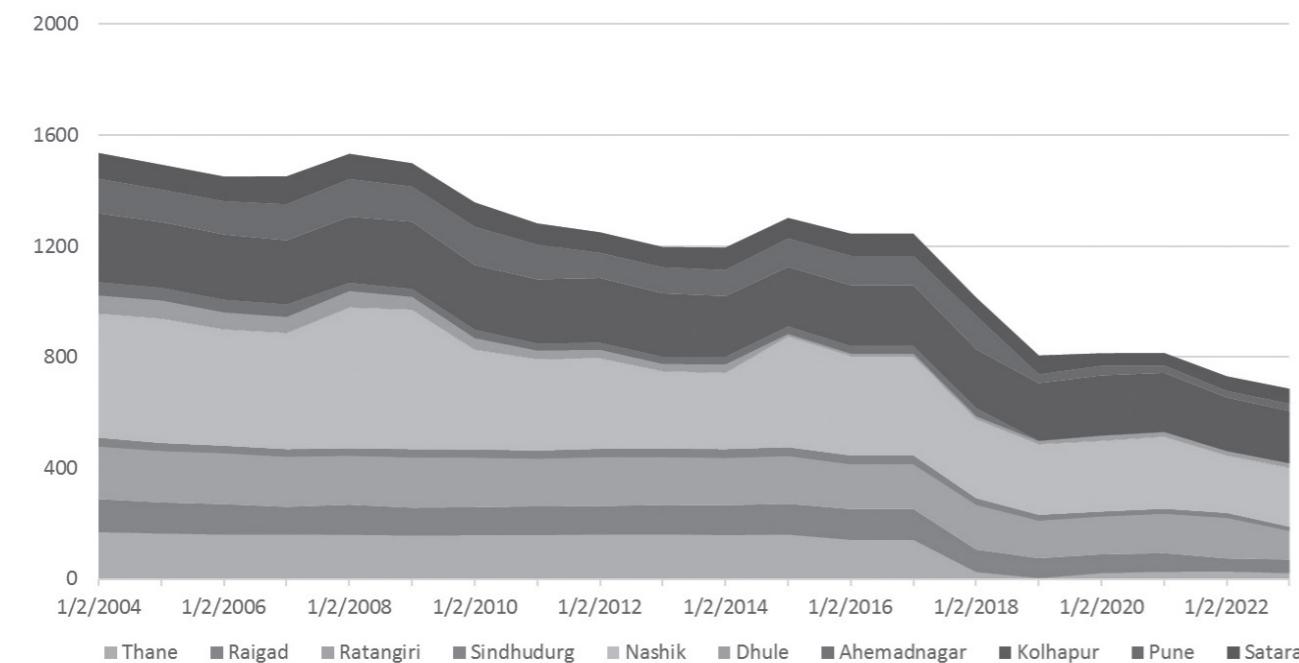
The government should support cultivators by providing them with incentives and benefits they deserve. A pro-cultivator policy with adequate public investment for the promotion of millets will make rainfed agriculture systems more resilient and ensure food and nutritional security. States like Odisha, Andhra Pradesh, and Chhattisgarh have demonstrated this through their successful efforts and provide a learning ground for other states, including Maharashtra.

Recognising the need for a policy framework and to boost millet cultivation, we decided to work with Nagali cultivators. We began by studying the problem by speaking directly with cultivators themselves. ●

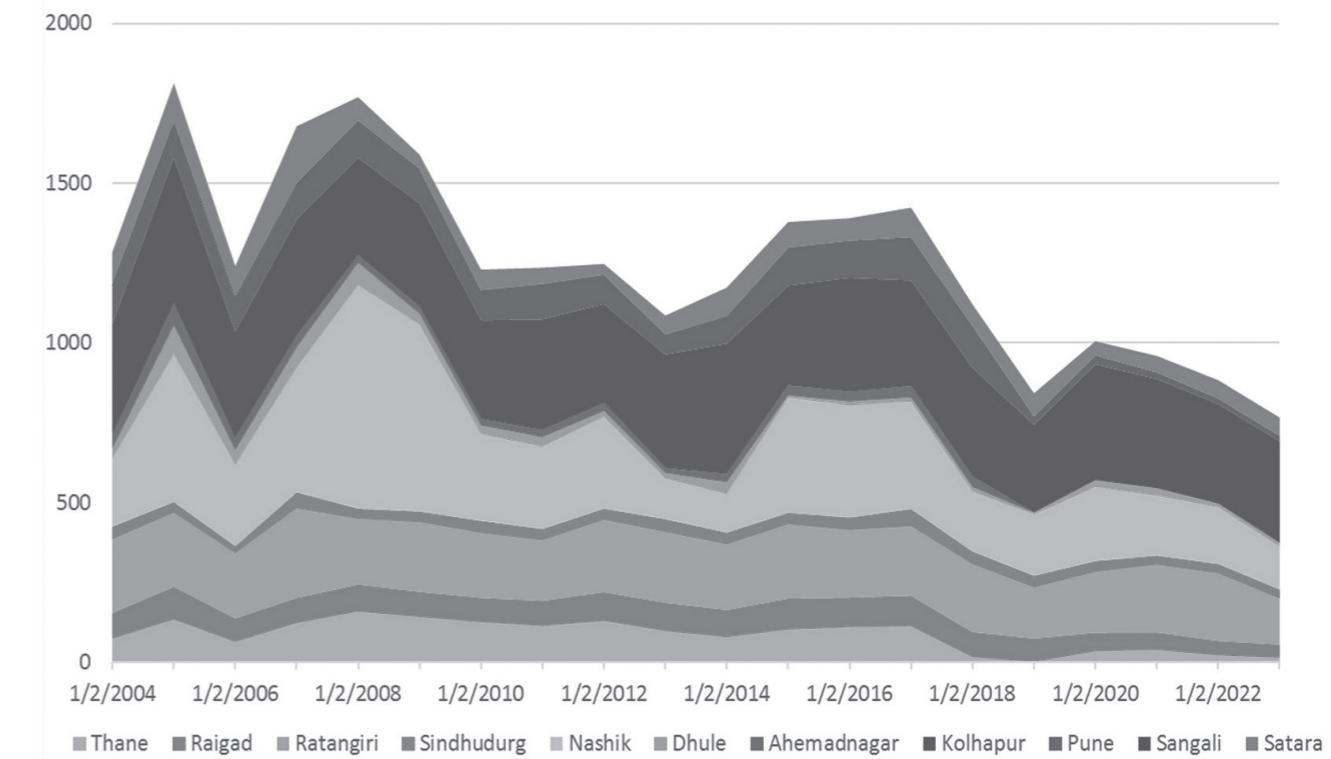
Situation of Nagali/Ragi cultivation in Maharashtra over the last two decades (2004-2022)

(Source : District Handbook of Agriculture Department (<https://krishi.maharashtra.gov.in/Site/Common/ViewGr.aspx?DocType=e8bdd10e-d33d-4ea0-865f-140a5284a2bc%3fMenuID%3d2906>)

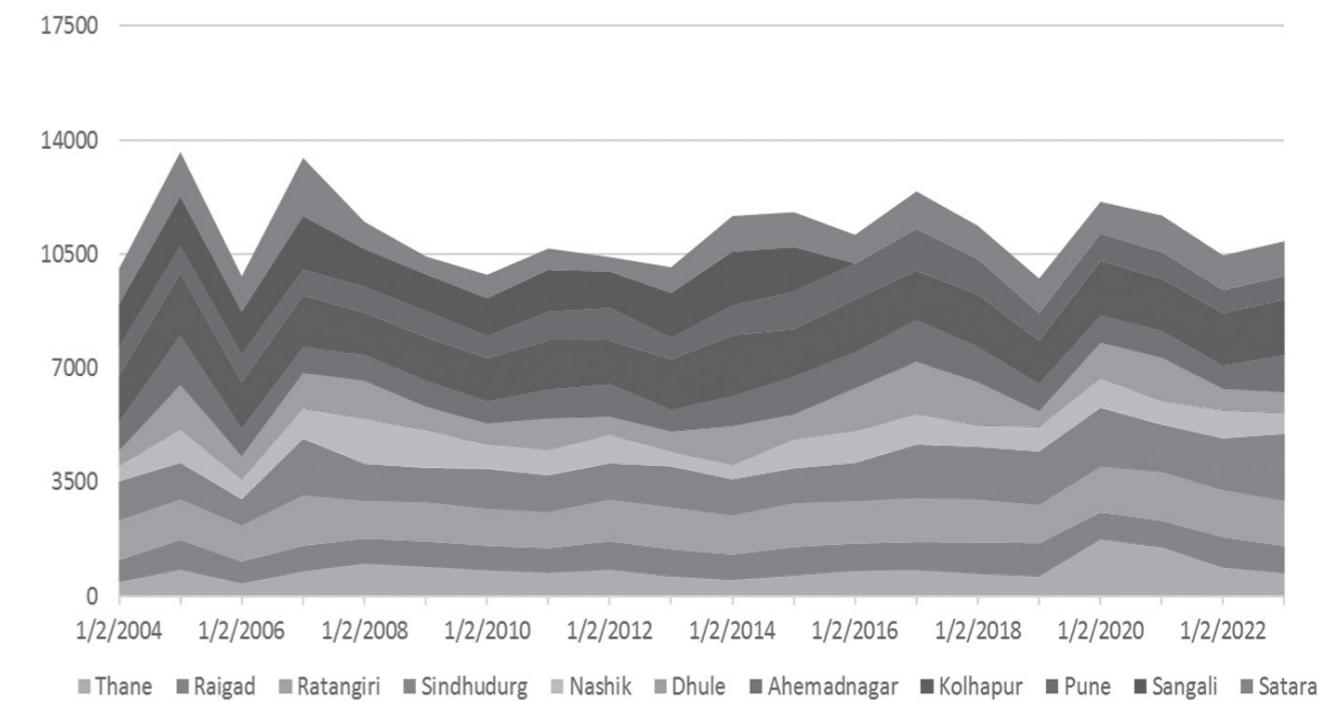
Graph 2: Area (in '00 Hectares) under ragi - across districts - over last two decades



Graph 3: Ragi Production (in '00 tonnes) _ across districts, over two decades



Graph 4: Ragi Productivity (in Kilo in Ha)- across districts, over two decades



The three graphs above, sourced from the District Handbook of Agriculture Department, Maharashtra depict the concerning decline in the state of Ragi/Nagali crop over last two decades. The graphs illustrate the reduction in cultivation area, decreased production, and diminishing productivity of the crop highlighting the deterioration.

1.2 Rapid Assessment, followed by a Successful Pilot Programme

In 2018, during one of our field visits, we were confronted with the Nagali issue when adivasi cultivators talked about the crop deterioration and demanded a concrete solution. To gain a better understanding of the challenges faced in cultivation, we conducted a rapid assessment with 109 Nagali farmers from 25 villages in four blocks of Nashik district. Our assessment revealed the following findings:

98%
small and
marginal
farmers; Nagali
part of their
daily diet

- Typically grown on slopes
- Almost half of them change their plots across seasons
- All use seed stored at home; seed rate 2.11 per kg per acre
- Seed selection only by size
- No awareness about seed treatment
- All grow it in the most basic traditional way; transplantation
- Use of fertiliser, random use of urea, not based on dosage
- Survey found 8 varieties of Nagali in the focus area
- Two types of crops common – one takes 70-80 days and the other 110-120 days
- Experienced 9 types of diseases
- On an average 25% of their cultivable land is under Finger Millet
- There is 5% reduction in production over last 3 years
- Rate has varied from 10 to 40 rupees per kg
- Average productivity around 2 quintals / acre

The fact that 98% of farmers consume Nagali as part of their daily diet highlights the significance of Finger Millet in their lives. However, the average yield per acre was around 2 quintals, which was lower than earlier and suggested a decline in production and productivity of the crop. Therefore, there was potential for improving productivity with simple and sustainable changes in the package of practices. Other critical information such as frequent pests and diseases observed locally, traditional methods of cultivation, fertiliser use, market and price for the crop indicated required changes and improvements in existing cultivation practices. Based on our assessment, we planned a demonstration on 100 acres in Nashik district. •

Learning from RRAN Partners

As a member of the Revitalising Rainfed Agriculture Network (RRAN), a national network that focuses on issues of marginal farmers, we learned about multiple efforts by partners in Andhra Pradesh and Odisha for the revival of millets. Their sustained work led to large scale programmes by the state governments of Odisha and Andhra Pradesh. Odisha pioneered this process by promoting Nagali cultivation in all respects, including setting up the Odisha State Millet Mission in 2017.

The key point that emerged from RRA experiences is need for comprehensive approach. RRA's Millet promotion program focuses on increasing household consumption, establishing localised processing facilities and in improving productivity simultaneously. It is essential to promote demand and supply simultaneously for enterprises and markets to get established and stabilise.

1.3 ANAVIKA Pilot Demonstration

From our experiences in the field and the lessons learned from RRAN partners, we understood the need for a comprehensive approach to tackle the issues of Nagali cultivation. Our pilot program, *Adivasi Nagali Vikas Karyakram* (ANAVIKA- Tribal Finger Millet Development Program), was planned with the knowledge support of RRAN to tackle this issue in our work area.

Through interactions with Nagali farmers, we found that they mostly used traditional methods of making 'rab,' which involves burning dried leaves, branches, and sticks, and did not apply any organic or inorganic fertilisers. They complained that their standing crops were attacked by a number of pests and insects, and their sense of disappointment was palpable. We encouraged them to try out a new method by deploying a smaller plot of land without any additional cost.

The Pilot programme was successfully implemented during the Kharif season of 2018 across 9 Villages in 3 blocks (Tryambakeshwar, Peth and Igatpuri) in the Nashik district, covering an area of 100 acres. With support from experienced RRA Network partners, we introduced a package of improved practices to farmers. Farmers could see that productivity increases when certain practices are adopted.

In addition to implementation, we collected data of the participated farmers relying on their recollection of the previous years' yields. This data, obtained from 202 farmers cultivating Nagali on around 136 acres, revealed an average production is 594 kilogram per hectare. This served as a baseline figure against which we compared the results of our pilot. •

1.4 Results of the Demonstration

The pilot demonstration results (Table 01) were encouraging, indicating a significant improvement in the average yield after application of agronomic cultivation practices introduced through the program. The **average yield is 2000 kilograms per hectare**, almost four-fold increase from the previous productivity of 594 kg/ha. The highest production demonstrated was 2603 kg/ha, demonstrating almost six-fold increase. These impressive results were achieved despite facing two dry spells, one in June and the second in August-September, indicating resilience of the standing crops. So the outcomes were attained in spite of **drought conditions**. •

Results of ANAVIKA Pilot 2018 in Nashik

Village	Block	Number of farmers	Average Yield (kg/ha)
Aamlon	Peth	23	1648.70
Asvali Harsh	Trimbakeshwar	25	2097.92
Avahate	Trimbakeshwar	7	2043.43
Chinchohol	Trimbakeshwar	39	1982.36
Dongarshet	Peth	37	2603.24
Kurungwadi	Igatpuri	11	1367.27
Pimpalvati	Trimbakeshwar	11	1978.18
Valvihir	Igatpuri	7	1325.71
Zarvad K	Trimbakeshwar	28	1881.14
Grand Total			2005.62

2. ANAVIKA - TDD PROJECT: AN OVERVIEW

Based on the success of the pilot programme, we approached a government department that is organically linked with adivasi communities and is committed to uplifting them in all aspects of their life - the Tribal Development Department (TDD). TDD welcomed the idea of giving rise to a three-year project: Comprehensive Revival of Millets in Adivasi Areas of Maharashtra. The Government of Maharashtra approved the project under the Special Central Assistance to Tribal Sub-Schemes (SCA to TSS).

2.1 Objectives

- Increase productivity of Finger Millets by at least 25% on an average
- Increase nutritional security and income security of the participating farmer households
- Build enterprises for post-harvest processing units in the area of operation
- Build Farmer Producer Organisations of Finger Millet growing farmers

2.2 Key Components of the Programme

Designed with an integrated approach, the programme focused on four key components as the four pillars of the programme;

1 *Improving productivity by introducing better agronomic practices* - This entailed formalising a package of practices that is relevant for the local needs and easier to adopt and requiring no or low cost inputs by studying the agronomic cultivation practices successfully adopted in various states for higher millet productivity.

2 *Establishing processing and equipment units at the local level* - This meant reducing drudgery and bringing efficiency in farming activities done at various stages of crop growth, which were otherwise done manually, such as weeding, threshing and disease management. Appropriate farm equipments were purchased and made available to the local Farmer Group, who gave them on hire to local farmers and maintained them through Custom Hiring Centre (CHC).

3 *Restoring consumption to ensure nutritional security* - This entailed several initiatives for promoting consumption of Nagali as part of daily diet and to tackle malnutrition by introducing newer recipes of Nagali for children in Anganwadi Centres and Ashram Schools.

4 *Capacity building* - One of the most important components of the programme, capacity building was aimed at skill development of and knowledge transfer to farmers for adopting agronomic cultivation practices, learn new recipes, and adopt primary processing machineries. ●

2.3 Programme Outreach

Total outreach of the three year project (2019-2021) in collaboration with TDD, GoM								
District	Block	2019		2020		2021		No. of farmers
		No. of villages	No. of farmers	No. of villages	No. of farmers	No. of villages	No. of farmers	
Nashik	Surgana	17	520	8	203	8	203	
	Trimbak	20	282	12	141	12	141	
	Peth	16	353	10	113	10	113	
	Nashik	10	133					
	Kalwan	16	244					
Palghar	Mokhada	18	333	5	82	5	82	
Thane	Shahapur	19	196	11	154	11	154	
Total	7 blocks	116	2061	46	693	46	693	

** In the first year of the project in 2019 outreach was in 3 districts, 7 blocks and 116 villages. From subsequent years the project outreach area reduced (as per project plan) to 3 districts, 5 blocks (two blocks from Nashik dropped) and 46 villages. ●



3. PROGRAMME TEAM

3.1 Programme Team

We started by setting up a programme implementation team: District coordinators, Block Coordinators, and Cluster Resource Persons.

The Cluster Resource Persons (CRPs) were the primary project team responsible for maintaining regular contact with farmers, facilitating the process, and providing handholding support as needed. It is noteworthy that most of our CRPs were Certificate holders of the Programme in Rural Livelihoods by Bharat Rural Livelihood Foundation (BRLF), which deserves credit for equipping them with the necessary skills and perspective to work with rural communities.

After their recruitment, we organised an intensive six-day training for CRPs to familiarise them with the program's objectives, key components, and their roles and responsibilities. They were supported by a team of Farmer Trainers who had adopted improved practices and achieved the best results in their farms during the pilot phase. These trainers were a crucial link in the knowledge transfer since they were convinced about the agronomic practices.

An in-depth Training of Trainers helped

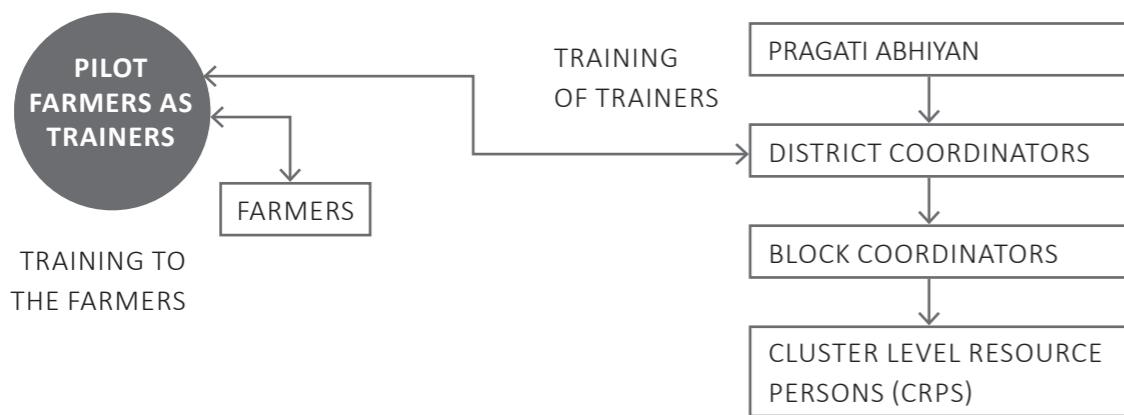
the Farmer Trainers to strengthen their experiential knowledge and equipped them to transfer their expertise to other farmers. They did an excellent job of ensuring that the right knowledge and information reached the farmers consistently and correctly.

Since the trainers were from the local area, they played an important role as grassroots resource persons. They provided the necessary support and practical demonstrations at different stages of cultivation. They could reach out to local farmers and were also accessible to them.

The farmers found the training team trustworthy and convincing, as they were locals who were familiar with the geographical conditions and spoke in a language that the farmers could understand. This peer learning approach proved to be effective.

After the programme team was prepared, they began rolling out a series of training programmes for the farmers. These included block-level training to introduce farmers to the new methods and village-level training to provide demonstrations of the various practices to be used at different stages. ●

3.2 Programme Delivery Structure



4. KEY ACTIVITIES

4.1 Capacity Building

Capacity building activities for millet revival included classroom and on-field training as well as demonstrations with the participation of peer educators, all of which were aligned with the crop cycle.

Village Level Training: The village level trainings were primarily focused on demonstrating different package of practices for millet revival at various stages on farmers' plots.

Block Level Training: Unlike village level training, block level training was designed to orient and familiarise farmers with the new methods. The training emphasised the preparation and application of organic manure (Bijamrut and Jeevamrut), knowledge sharing through videos, posters, and leaflets of past success stories of the program, and demonstration of package of practices. However, in the initial months, block level meetings were conducted for selecting villages and farmers, and farmers were given an orientation about the program.

Exposure visits: At least one exposure visit was conducted for each block. The exposure visits were mostly organised for farmers who were somewhat convinced about the improved agronomic practices. During the visit, farmers were taken to the best farmer's field within the block or district. The exposure visits had a significant impact on the visiting farmers as they gained more knowledge about the package of practices and could easily relate it to their own practices. After exposure visits, most farmers were convinced about the effectiveness of the new farming methods (Improved agronomic practices). ●

Exposure Visit to Odisha

An inter-state exposure was organised to Odisha between January 29th to February 5th, 2020, to gain a deeper understanding of the various initiatives being carried out under the 'Odisha Millet Mission' (OMM). The visit included 33 farmers, officials of TDD, and the project team, who visited several locations in Nashik, Kalwan, Javhar, and Shahapur. During the visit, they had the opportunity to interact with Odisha Mission officials, who explained the five core components of the mission- Promotion, Procurement, Processing, Consumption, and Marketing.

The group visited various field activities, including crop plots, Seed Banks, Custom Hiring Centres, Small Processing Units, and entrepreneurs associated with the OMM. They also had the opportunity to interact with Producer Groups and witness the demonstration of a variety of food products that promote the consumption of millets. Overall, the exposure visit was a valuable learning experience for the participants, who gained insights into the OMM's implementation and the different ways in which millets are being promoted and integrated into the local food system. ●



FROM SEED TO LADDUS: JOURNEY OF THE CROP



Seed treatment with Beejamrut



Sowing seeds on nursery bed



Spraying neem oil



Preparing the land



Line plantation



Ready crop



Crop Cutting Experiment



De-weeding with cycle weeder



Harvesting



Distribution of Nagali laddus in Anganwadi

“

I never saw such a bumper crop of finger millet, I did not take the introduction of new practices seriously this year, but next year I will definitely follow all the practices for finger millet cultivation” said a farmer from village of Shahapur block during the exposure visit.



4.2 Introducing the Agronomic Package of Practices

At the heart of this Nagali revival programme lies the Package of Practices formalised by Pragati Abhiyan. System of Millets Intensification (SMI) is a set of tried and tested agricultural practices adopted to improve quality and quantity of the produce. By studying them and consulting field experts, we formalised the Package of Practices tailored for the region and people it was going to work with.

The Package of Practices is essentially a systematic and user-friendly plan for cultivators, which is low cost, uses local materials while preparing organic fertilisers, and does not increase labour days of farmers. •

Types and number of training organised through the project										
	Surgana		Peth		Trimbakeshwar		Mokhada		Shahapur	
	No. of trainings	No. of farmers								
Preparation of nursery bed, seed preparation	13	299	13	362	17	378	13	264	20	323
Transplantation	14	230	9	289	25	529	18	343	17	315
Jeevamrut/ organic manure preparation	19	212	9	287	28	554	15	343	12	249
Seed bank creation	1	19	1	8	2	17	1	16	1	22
Crop cutting training to trainers	1	9	1	16	14	45	1	7	7	72
Farmers Group capacity building	1	24	1	26	3	42	1	9	1	17
Nagali recipe training	5	137	2	42	11	241	5	113	7	117
Total	54	930	36	1030	100	1806	54	1095	65	1115

Millet Revival Through Agronomic Package of Practices

We focused on reducing the input cost by introducing low-cost home-grown organic manures and fertilisers.

Seed Selection

- Selecting local varieties suitable to respective soil conditions. Locally adapted seeds can withstand climate variations.
- **Seed rate:** 3-4 kg per acre. It varies with the variety of Nagali and land conditions.

Seed Treatment

- Treating seeds with Bijamrut, a locally made organic solution with manure, cow urine, soil, lime, and water.
- Treated seeds are left for drying in the shade before sowing.

Making Nursery Bed

- Preparing a raised nursery bed of around 40 sq. mt. for one acre by mixing vermicompost with soil for sowing treated seeds.
- Spraying neem oil, as a precautionary measure, to protect the seedlings in their delicate stage.

Land preparation

- Plowing land and preparing ridges and furrows.

Transplantation

- Marking the planting points 1ft to 1.5 ft spacing with rope and stick, that is using SMI (System of Millet Intensification) or LT (Line Transplantation) method.
- Planting 12-18 days of age plants on the marked points.

Weed Management

- First de-weeding at 10-12 days after transplantation using cycle weeder
- Applying jeevamrit after weeding
- Log rolling, that is running a light weighted log over the plants soon after weed management, was recommended. This boosts the growth of more tillers leading to more production.

Application of fertilisers

- Handi Khat- this is a manure prepared with leaves ((Neem, Arakha & Karanja), cow-dung, cow urine, and jaggery. Since the ingredients are mixed and fermented in an earthen pot (Handi/Mataka), it is called handi khat.

Managing pests and diseases

- Early identification of pests, insects, and fungal attacks
- Spraying Neem oil mixed with water periodically as preventive as well as

4.3 Making Farm Equipment And Inputs Available

Absence of modern processing facilities is identified as one of the major bottlenecks in revival of millets. Farmers need some instruments which are necessary for better cultivation practices or for protecting their crop. Manual weeding and processing of millets, often done by women, increases their work burden and discourages them to adopt millets.

We decided to procure basic equipments that aligned with the new agronomic practices introduced to the farmers, such as cycle weeder for weed management, spray pumps, and a thresher for processing. Introduction of agricultural equipments and processing units through this programme was expected to reduce the time and efforts required for crop management.

However, it was challenging for us to procure the equipments, as specific equipments required for primary processing are not commonly made. This indicates how the crop and its cultivators remain neglected! After consulting the practitioners in the field, we found two agencies - one in Ludhiana (Punjab) and other in Coimbatore (Tamil Nadu) - who were manufacturing them. We ordered machinery and equipment from both places and handed them to the farmers.

Community Hiring Centres

To ensure that farmers could access the necessary equipment, we set up Community Hiring Centers (CHC) in the village for the storage and management of the farm equipment. These centers were managed by local-level farmers' groups, who made the equipment available to farmers at a nominal rent. The collected money was used for the maintenance of tools and equipment, ensuring that they remained in good condition for future use.

Eventually the farmer groups managing the CHCs got formal registration as ATMA (Agricultural Technology Management Agency) groups to ensure their access to benefits from the agricultural department.

List of farm equipments available at the CHC

- 1) Cycle Weeder
- 2) Spray Pump
- 3) Drums for preparing organic fertilisers
- 4) Thresher

The equipment we procured proved to be very useful, as they saved labour and time while also boosting the growth process of the plants. For example, the cycle weeder was a valuable addition to the package of practices. Weed management is a crucial part of this package and is carried out 12-15 days after transplantation to help the plant grow healthily and ultimately result in good yields. Although farmers traditionally practiced weed management manually, it was difficult to maintain the desired regularity since it was time-consuming. This labour-intensive task was mostly done by women. However, through the new agronomic practices, the farmers were introduced to a semi-mechanical method of weed management using the cycle weeder.

The cycle weeder was specifically designed for dry land agriculture, which proved to be less time-consuming and less labour-intensive. It could be operated by both men and women, which was an added advantage. However, it was only effective on plain land and not useful on uneven or sloped and rocky land. Despite this limitation, the cycle weeder proved to be a valuable tool in reducing the workload of farmers and improving the efficiency of weed management.

Pest Management and

Neem Oil Distribution

Although, millets are pest resilient crops, there are few landraces that have become susceptible to pest attacks over the years. Moreover, there are possible pest attacks on the crops if the neighbouring crops are severely attacked by pest. Hence, the farmers were provided with Neem oil and advised to apply on time to time. Emphasis was given on early identification of pests, insects, and fungal attacks, so that they can be managed easily.

Processing units

In traditional method, farmers do the threshing manually and later take it to rice mill and flour mills for further processing. But there are few machines which are designed for Finger Millets. These are small scale units which can be set up as local enterprises for the youth of the farmer community and operated for the community. We provided such units to CHCs. Two types of processing machines were made available - one flour mill/pulveriser for making flour from Nagali grain and other for all the post harvest processing, such as threshing, de-hauling, de-stoning, grading and such. ●



Nagali farmers in Aswali Harsh village along with the thresher that helped them mechanise processing and reduced drudgery

Farm equipments donated by an with the Agriculture University

Appreciating the efforts of the farmers for millet revival, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani in Maharashtra Brahmagiri Shetkari Samuh, Aswali Harsh, Trambakeshwar block, Nashik under tribal sub-plan provided 18 types of agricultural tools and equipments, including a flour mill. The other equipments include seed grading machine, sowing machine, weeding tools, and thresher. ●

CHC in Nashera

Nashera is a remote village in Mokhada taluka in Palghar district situated on a hill slope. With no proper roads, the villagers lead an isolated life. No connectivity means no attention from the outer world, especially government system. The villagers were willing to be a part of the Millet Revival programme. Looking at their interest and because of remoteness of the village, organisation decided to set up a CHC in the village and provided farming equipments - cycle weeder, thresher, spray pump etc.

"None of us had used any of these tools earlier, except spray pump. For spraying insecticide on rice crop, we usually hired the pumps from another village. None of us afford to buy a pump or any other farm equipments. But when they were made available here in the village, we started using them. It is useful as the work can be finished in less time and with less labour," shared Police Patil from Nashera village.

The CHC has managed the equipments well and makes sure that all farmers get the farming tools turn by turn. ●

Women are happy with the Cycle weeder and Thresher

Women do major share of work in Nagali cultivation, from planting stage up to threshing. Many women suffer from lower back pain, an occupational hazard because of the back breaking work of weeding or processing. Sumanbai from Aswali Harsh village in Trimbak taluka compares the manual threshing with the mechanical one. "Earlier the threshing was done by animal treading, by rolling over a bullock cart on the harvested crop for two-three times and the straw would be separated from the grains and cleaning of the grain was done by winnowing. It would take almost 3-4 days for threshing one sack (100 kgs). We women would help one another for threshing and do one field after the other. It was hard work, but we know no other method. The same work we would do in 3-4 days earlier, can be completed in half day with thresher." Besides saving labour and time, mechanical threshing also reduced losses from broken or damaged grain that the manual processing caused. ●

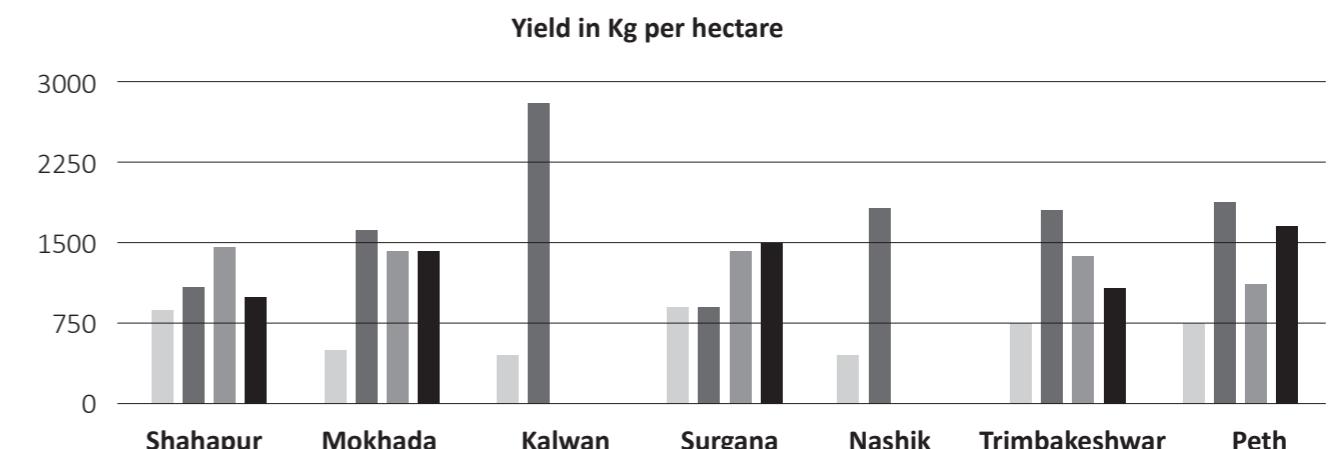
4.4 Crop Cutting Experiment (CCE)

CCE is basically demonstrated to compare and assess the yield difference. It is a common practice which is executed in other crops as well. Through this process, crop is harvested from a randomly selected 5x5 meter patch of the ragi field. After the harvest from the patch, green weight (weight with the stems, leaves and panicle) of the crop is taken and then threshed grain weight is taken to calculate the productivity per hectare or acre. However, actual projection of productivity can be calculated only after drying the grain when the specified moisture content is maintained.

To conduct this crop cutting village level volunteers are selected and trained and they organise crop cutting for each farmer's field. ●

CCE Data for the project period kg/ha					
District	Block	2018-2019 (Agri dept)*	2019-2020 (Under project)	2020-2021 (Under project)	2021-2022 (Under project)
Thane	Shahapur	886.5	1073.88	1464.68	986.67
Palghar	Mokhada	503.1	1618.2	1406.83	1440.00
Nashik	Kalwan	448.9	2836.89	**	**
	Surgana	903	892.85	1448.18	1508.18
	Nashik	456.4	1823.76	**	**
	Trimbakeshwar	739.7	1798.87	1374.18	1091.43
	Peth	729.5	1922.66	1119.65	1654.78

*This is CCE data conducted by Pragati Abhiyan and Agriculture census data.



■ 2018-2019(Agri dept)
■ 2019-2020 (Under project)
■ 2020-2021 (Under project)
■ 2021-2022 (Under project)

The above table and graph show the increased productivity of the crop over the period (three crop cycles from 2019 to 2022) as measured through CCE under the project. It is compared to the crop data sourced from Department of Agriculture. The average produce by the farmers adopting newer practice is clearly more than the Agricultural Department's Data from government website. There is a variation in the average yield despite using the agronomic practices (compare the last three columns). This could be because of drought spells, pest attacks, and less frequent field visits during the COVID period.

Witnessing and Measuring the Change

As they say, seeing is believing. Witnessing the results of the new practices convinced the farmers of their effectiveness. They observed marked difference between the demo plot and conventional plot at every stage of plant growth.

Shantaram Choudhary, a farmer in Sadakwadi village from Mokhada block in Palghar district noted a considerable difference in plant growth when he planted the seedling instead of randomly throwing it as earlier.

"When we plant the seedlings by maintaining a distance between them, the plant comes to life within a week, initial leaves look stronger and more tillers grow on the plant. More tillers mean more production."

Talking about the disadvantages of traditional raab (burning biomass on the field) he said, "Raab required a lot of preparation and we had to start six months in advance. We used to gather twigs, leaves, and hay much early to let it dry properly, then it was mixed with dry cow dung, spread on the farm, and burnt it. It was a lot of work. Now, we do not do it. It saved our labour and also saved wages that we had to give to labourers." ●

Motiram Bhangare, who is involved in Nagali revival programme since the pilot stage, is one of them. This farmer from Ghosali village, Pimpalwati Gram Panchayat, Peth block in Nashik district got a bumper crop! His per acre produce was 32 quintals, almost 15 times more than 2.25 quintals that he used to get before per acre. He adopted the entire POP including watering during the dry spell.

"Before I grew Nagali without any expectations. It is better to have at least some yield instead of keeping the land unused, I thought. By broadcasting the seeds, I accepted whatever got produced. After adopting the new method I look at Nagali cultivation differently. If I am a little systematic in growing it, I benefit. Therefore, I am using the same method since 2018. With seasonal changes, production can vary, yet it is much more than earlier." Says Motiram who is now supporting other farmers in his village to adopt the improved method. ●



Main speakers & exhibition stall at the first Farmers Meet organised on 23.20.2018 in Ghosali village, Peth block.



Farmers gathered enthusiastically for the Meet at Aswali Harsh village on 24 March 2022. This event was organised after a gap of two years due to COVID. Women participated in large numbers and listened to main speakers intently.

ANAVIKA Farmers Meet

'ANAVIKA Farmers meet' is an annual event organised since 2019, after Nagali harvesting. The event brings together Nagali farmers from different villages to provide them a platform for exposure and knowledge sharing experiences regarding the newly adopted agronomic practices. Government officers of various ranks and responsibilities, especially from Agriculture and Tribal Development Departments, and other concerned departments were also invited to inform farmers about their respective schemes for cultivation and marketing of Nagali and also answer farmers queries.

The event was organised in one of the project villages, so that visiting farmers can see the Nagali farms in the village and other activities of the local farmer groups. The Farmers Meet is an information-rich event that includes exhibitions of posters on millets cultivation, government schemes, and other relevant information for farmers.

During the event, farmers share their experiences about each and every aspect of the new practices adopted by them and compare them with the earlier

methods they used to use. Along with working in their farms, these farmers also encourage other farmers in their village to know and adopt the practices.

According to some farmers, they have sometimes not fully adopted the package of practices (POP) and have missed out on some of the practices. They then realised that results were still better than their conventional method, but certainly not as good as the farmers who adopted complete POP.

These life experiences have been motivating and have helped to popularise the program among the farmers. They have been shared with others through various meetings, trainings, and annual gatherings, helping to establish acceptance and ownership of the package of practices adopted by Nagali cultivators.

The Farmers Meet is a collective celebration of the success that Nagali cultivators have achieved through sharing and experiencing the change. It also builds the confidence of farmers that they can protect and increase their Ragi yield if they stick to what they have learned. ●

4.5 Ensuring Increased Consumption

Since the inception, the project emphasised upon increased consumption of Nagali by those who cultivate it. We believe that if we have to revive millets, revival of millets should be focussed on consumption rather just increasing production. Thus, the revival of Nagali programme did not stop with increased productivity and led to promoting consumption in various ways by engaging Adivasis, especially women in a large way, establishing platform events to revive old recipes and evolve/spread new ones through recipe competitions, promoting local millet bakery products, conservation of indigenous seed varieties, etc.

Every year we run campaigns with local

self-help groups and Anganwadi Centres to bring back Nagali in the diet of children and the younger, who may have lost the taste for it. Women's groups experimented with a variety of Nagali dishes, so that its intake increases. Delicious Nagali snacks, such as laddu, kheer, upama, and cake, learned and made by adivasi women collectively, were introduced in Anganwadi Centres, so that children get a nutritious diet. This programme is popular among women who get to showcase their culinary skills and make nutritious recipes for children. Along with these campaigns, we want to promote local enterprises and also develop urban outlets for rural products. •

Chandrakala Jadhav, AWW, Shirasgoan, Mokhada, Palghar -
"Malnutrition among children is a common problem in our area, from my experience I know that it can be cured by intake of Nagali. Known as a rich source of iron iron and calcium, Nagali laddus are given to underweight children and women. Introducing a variety of recipes, like laddus, khir, vadi, would surely make children eat it with delight."



5. CHALLENGES & LEARNING

Cultural significance of Nagali: We have learned a lot through this process, especially about the people we worked with. After the first year crop cycle, when farmers were convinced that the new Package of Practices is beneficial to them, Pragati Abhiyan proposed that farmers can expand the coverage of cultivation if they so wish. The organisation explained that they could sell the surplus and this, along with food and nutritional security, would also ensure financial security. But most farmers were unwilling to go after an extra or surplus yield. Interestingly, some of them said they were thinking of reducing the cultivation area, since the productivity has increased and their family requirement could be met by cultivating Nagali on a smaller area. This thinking comes from the special place the Nagali holds in their living and lifestyle. They want to retain the cultural significance of Nagali, which was an important insight for the organisation. Any effort to commercialise Nagali cannot overlook its cultural value. •

Kansara Devi Represents the Cultural Significance of Finger Millets

During our engagement with Adivasi farmers, we discovered the profound cultural significance of Finger millets in their community. Adivasi farmers have deep-rooted traditions and rituals associated with the Nagali crop. For them, Nagali is not just a mere crop; it holds a sacred place as their deity. To preserve this sacred association, they cultivate Nagali without the use of external fertilisers or pesticides. In fact, once the saplings are planted, they refrain from intervening in its growth, allowing it to flourish naturally. Ironically, this is one of the main reasons for the decline in production. Nonetheless, it is their customary practice in growing Nagali.

Typically, Nagali is cultivated on sloping lands that can drain water. The cultivation process begins on Akshat Trutiya, an auspicious day. Prior to that, Adivasis sow seeds of seven different grains and offer prayers, observing the plant growth over the following seven days. This serves as an indicator of the prevailing climatic conditions and helps them anticipate which crops will thrive the best. During the harvesting period, farmers offer prayers to the deity, expressing their hopes for a fruitful harvest, and subsequently celebrate with a feast for the villagers upon obtaining a bountiful yield.

In the Kalavan block of Nashik, the Kansara Devi temple, situated on a hill in Javale village, holds great significance as it is worshipped after the Nagali harvest. It is believed that this goddess safeguards the farmers by ensuring the robust growth of their crops. The ancient Kansara Devi temple hosts an annual jatra (fair) in October-November, following the harvest, where farmers gather in large numbers to offer the freshly harvested Nagali to the goddess. •



6. WAY AHEAD

Nagali is an insurance crop for farmers

Nagali is a valuable crop for adivasis and not a surplus or marketable crop. It is meant to be stored and not sold. Nagali also lasts for years if stored properly. Therefore, it assures their food security unlike any other crop. The experiences of pandemic situation are still fresh in their minds. There was no work in the non-agricultural season and therefore no income. The starvation could be averted because they had enough stock at home. Nagali is thus an insurance crop for them, a safeguard against any such crises.

Documentation, a major hurdle

All adivasi farmers grow Nagali, hence most of them were interested in participating in the Nagali revival programme, especially after they saw the increased productivity because of the new practices adopted by their fellow farmers in the village. We also would have liked to include more farmers in the programmes. However, the paperwork was a major hurdle. Tribal Department had some set criteria for farmer selection to participate in this programme. Accordingly, possession of documents such as clear land ownership document (name of the farmer included in the 7/12 extract), having a bank account linked to Aadhar card, and an adivasi caste certificate was mandatory. Ironically, all the programme villages came under Panchayat (Extension to Scheduled Areas) Act (or PESA), 1996.

We conducted a Document Survey in October 2021, revealing that only about 10% of adivasis possess essential documents such as Aadhaar, Record of Land, a Bank Account, Caste Certificate, and similar records. Consequently, the majority of them are rendered ineligible for numerous government benefits. Despite our program's efforts to engage with many farmers, we could only include those individuals in the database who could provide the required documentation. As a result, a significant portion of the genuinely needy focus group, whom the government schemes aim to assist, automatically gets excluded due to their lack of documentation. Updating land documents is both a laborious and costly process, which explains why it remains largely undone. Additionally, adivasis do not possess land titles for lands acquired under FRA or other government benefits, as these acquisitions often experience delays.

Being sensitive to these challenges, the hurdles in the documentation process should be addressed and the government must take steps to facilitate their smooth delivery. ●

Support to cultivators to grow more

Since 2018, there has been a greater thrust on millets for their nutritional value. Government is actively promoting consumption of millets, encouraging a range of millet-based products. As an organisation working with the cultivators, We think that improving and increasing the production should be prioritised before talking about increased trading or consumption. While the thrust on consumption and increasing demand is welcoming, there has been equal or even more thrust on improving productivity of the crop and encouraging farmers to expand the area under Nagali cultivation. Unless there is marketable surplus grain, farmers will not sell their produce in the market and there would not be enough grain available in the market for urban consumers who are drawn to it as a superfood. For this purpose, institutional arrangement can be made with Agricultural Universities, Agricultural Departments to provide extension support.

Incentives Essential

To increase productivity and area under cultivation, farmers need to get incentives. For instance, For improving production, the Odisha government gives a per hectare incentive of around Rs 26,500 spread over a period of five years for adopting better agronomic practices. Such cash incentives can help farmers cover the costs associated with growing millets, such as seed, fertiliser, and labor costs, and can also provide a financial boost to support their livelihoods.

The incentive can also be in form of a special package for the land titles received under IFR and CFR for development of these farm plots, through MGNREGA. For instance, promoting soil conservation measures,

like bunds for lands where will millets are typically grown. These are mostly uplands and rocky terrain with low soil depth.

Assured purchase at MSP

The incentive can also be in the form of assurance that their surplus grain will be purchased by the state machinery at the Minimum Support Price (MSP). The procurement policy should be clear and long term. Farmers would be more willing to expand area under cultivation, if there is assurance their produce will be purchased by the state MSP..

R&D for appropriate technological support

According to the Parliament's reply, India's annual production of millets has risen from around 17.26 million tonnes during 2019-20 to 18.02 million tonnes in 2020-21, a growth of 4.40 per cent. This is a lesser growth percentage compared to rice and wheat. Millets need a big R&D and technological support to develop high-yielding varieties, better farming practices, and appropriate farming and processing equipments.

To increase the value of the yield, primary processing facilities, in the form of small scale units, should be accessible to farmers. Small scale processing units should be promoted to boost processing, making value added products, and consumption at local levels.



Along with Nagali farmers we set up a Nagali stall in Birsa Munda Art Festival at Nashik in January 2023. Along with farmers initiative to revive Nagali, we also shared Nagali recipes to promote its consumption. Many people visited the stall and were curious to know about the programme. Shri Koshyari, former Governor of Maharashtra and Dr. Bharati Pawar, Minister for Health and Family Welfare were among the honourable dignitaries. They appreciated our work of reviving Nagali and introducing it in Anganwadi Centres and Ashram Schools, which would ensure a nutritionally rich diet for children in their growing years, they said.

Millets need to be mainstreamed

Government has to ensure that millets did not remain a niche consumed item but are mainstreamed and included in government programmes. Increased productivity should benefit the growers as well. Appropriating growing urban market should not be the only focus and it should not be at the cost of nutritional security of adivasis, who are primary growers of the crop. The National Food Security Act has recommended provision of millets and it can be distributed through PDS. Inclusion of millets into state-food-programs, such as school Mid-day meals, Ashram schools, Anganwadi Centres, is also needed to contain the nutritional risk of poor and marginalised who avail these services.

Producers Organisations and Market Integration

It is essential to promote farmer's groups/ community organisations to set up required support systems like seed bank, harvesting and post-harvest machinery, access credit, promote aggregation, setting up storage facilities etc. Formal linkages with markets, dealers, retail outlets for selling millets and its products.

Involvement of CSOs

For all the above the government should consider engaging with CSOs who are experienced in working in these areas for at least 5 years and have the knowledge expertise in agriculture or MGNREGA or FRA. ●

“Where there is a will, there is a way” Story of hurdles in the Nagali selling

Acknowledging the efforts of the Nagali cultivators, the Tribal Development Corporation decided to purchase Nagali from farmers we work with. Ms. Leena Bansod, IAS, Managing Director, was keen to take it up and issued an order to take needed steps to Nasik TCC. Delighted with the proposal, we coordinated a meeting of TCC representatives with the farmer groups. There was willingness to purchase, and there was also an official order. Therefore, the purchasing process should have been smoother and simpler.

However, when the actual process began, TDD officials expressed inability to purchase. “The farmers do not have pik pera documents, so we cannot purchase from them,” they said.

Why didn't the adivasi farmers have it, even though they cultivated Nagali? Because they had never thought they would be selling Nagali. Also some of them do not have clear land titles in their name, as they had got possession of the land under the Forest Rights Act but not the documents. In short, they did not have a paper to show that the Nagali they are selling was actually grown by them.

The purchasing process could have come to a halt at this stage. However the sensitive MD of TCC understood the ground reality and wanted to find a way out of the problem. It was decided that each farmer would write a self-declaration, get it signed from Gram Panchayat head, and submit it to collector. This would suffice as a proof that they were eligible as cultivators for purchase.

While this was underway, the TCC focused

their attention on other aspects of purchasing. For instance, as part of the purchasing process, grain is checked for its moisture content, and only grain having moisture within permissible range is purchased, while the rest is rejected. For rice, for instance, the usual moisture content permissible for procurement is less than 17%. However, there was no clarity on the proportion for Nagali. Most likely it has never been specified. Thus, the systems and procedures of procurements needed to be clearly established.

Another aspect of the purchasing system is deciding timetable to purchase grain. Rice is purchased by the end of December. What is this purchasing period for Nagali? It has not yet been decided. From our experience of working with Nagali farmers, we feel it should be till end of the March, by then the farmers have grain ready for selling.

The farmers were happy that their Nagali was being purchased by the government, but they were not sure whether it is a one-off event or they will be considered eligible for the next year purchasing as well. ‘Whatever decision you take, let it be long term. If we are assured you will purchase the next year, we will grow more, otherwise why would we take the trouble?’ suggested a farmer in one of the meetings. He rightly highlighted need for sustainable systems.

Undoubtedly, there is need to have a policy, but there also has to be systems in place to operationalise the policy. These need to be developed urgently and with due regard to situation of Nagali cultivators. ●



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