राष्ट्रीय नवप्रवर्तन प्रतिष्ठान – भारत
विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार का स्वायत्तशासी संस्थान
National Innovation Foundation - India
Autonomous Institute of the Department of Science and Technology, Govt. of India

# Innovation Frontline

July - August 2025 / Vol. 01 / No. 03

## Cover Story

## Turning Waste into Wealth - How Grassroots Innovation is Empowering Farmers in Manipur

**Editor-in-Chief**
Dr. Arvind C. Ranade

**Editor**
Dr. Rintu Nath

**Publication Committee:**
Dr. Vivek Kumar
Dr. R K Ravikumar
Dr. Nitin Maurya
Er. Rakesh Maheshwari
Shri Hardev Choudhary
Dr. Satya Singh
Dr. Poonam Singh

**Design**
Ms. Bhavna Desai

**Coordination**
Dr. Neha Tavker

**Address for correspondence**
National Innovation Foundation - India
Grambharti, Amrapur, Gandhinagar,
Gujarat- 382650

Tel: +91-02764-261131, 32, 34, 35

e-mail
info.nif@nifindia.org

website
https://www nif.org.in



Published by Dr. Arvind C. Ranade on behalf of National Innovation Foundation -India

# CONTENTS

# Editorial

***"There is no chance for the welfare of the world unless the condition of women is improved. It is not possible for a bird to fly with one wing." -Swami Vivekananda***

The United Nations' declaration of 2026 as the *International Year of the Woman Farmer* arrives at a moment when global agricultural systems face unprecedented challenges, yet it also represents a profound opportunity for civilizational reflection and policy transformation. The *OECD-FAO* Agricultural Outlook 2024-2033 report expects India to overtake China as the leading player in the global agricultural landscape, positioning the nation at the center of discussions about sustainable food security and equitable development. This recognition is not just a symbolic gesture but a moral responsibility. It calls for real action to address the unfairness and problems built into today's global farming systems. As one of the oldest agricultural civilizations, India has always revered the land as a mother, a nourisher, a giver. Yet, paradoxically, the women who cultivate this divine earth have too often labored in silence, invisibility, and inequity. The United Nations' declaration of 2026 as the International Year of the Woman Farmer is a moment of global introspection and a reflective mirror held to the conscience of the humanity.

Agriculture employs over 60% of women in India, making it the single largest source of female employment in the country. However, women own only around 14% of land holdings, revealing a fundamental disconnect between productive participation and legal recognition. The Food and Agriculture Organization's data demonstrates that globally women hold less than 15% of agricultural land constitute approximately 43% of the agricultural labor force, and thus, their access to productive resources remains systematically constrained across all regions. In sub-Saharan Africa, where women perform 60-80% of agricultural work, they receive less than 15% of agricultural credit and own less than 20% of land. Latin American countries show similar patterns, with women providing 40-50% of agricultural labor while receiving minimal institutional support. In western countries, women represent about 20% of land holdings, and report significant challenges in accessing credit, and market opportunities, suggesting that gender inequities in agriculture transcend development levels and require targeted policy interventions.

In recent years, the Government of India has launched a series of forward-looking initiatives specifically aimed at empowering women in agriculture, recognizing their vast yet undervalued contributions to the rural economy. Recently launched the *Namo Drone Didi Yojana* provides women-led Self-Help Groups (SHGs) with training and access to agricultural drones, enabling them to participate actively in high-tech farming practices such as spraying fertilisers, crop monitoring, and offering drone services to fellow farmers. Complementing this is the *Lakhpati Didi* Scheme, which seeks to enable rural women to earn decent livelihood by supporting their participation in farm-based microenterprises like organic farming, food processing, and livestock rearing with financial aid, training, and market linkages. A more foundational initiative, the Mahila Kisan Sashaktikaran Pariyojana (MKSP), has been a strong pillar of women's empowerment in agriculture, promoting collectivization, agroecological practices, and women-led Farmer Producer Organizations (FPOs). To continue this momentum, we need more systemic reforms. Land titling should move toward joint ownership, recognizing the role of both spouses, and credit frameworks should also evolve to recognize women's informal and collective ownership models. Moreover, Extension services must train and recruit increasing number of women officers who can serve as agents of change in their own communities, and markets must be reimagined to include local, women-run aggregators and buyers' collectives.

Recognizing women farmers is not merely a matter of statistics, but one of cultural and civilizational significance. For millennia, India has worshipped the feminine as both nourisher and creator, *Annapurna and Durga, Ganga and Lakshmi.* The idea of *Shakti* i.e., feminine power, is deeply embedded in our Indian civilizational ethos. In this light, the declaration of year 2026 as the International Year of the Woman Farmers is a critical moment of acknowledgment of women in farming across the globe.

Today, the world stands at a pivotal moment where the challenges of food security, climate change, and ecological stress demand bold and inclusive solutions, and at the heart of these solutions are women farmers. Far from being passive recipients of aid, rural women in agriculture are emerging as innovators, stewards of the land, and vital agents of change. As India moves forward toward the vision of *Viksit Bharat* by 2047, the path forward is challenging but illuminated by great potential of *Nari Shakti.* ■

**Dr. Arvind C. Ranade**

# Turning Waste into Wealth

## - How Grassroots Innovation is Empowering Farmers in Manipur

Rajiv Mili, Vivek Kumar, Nitin Maurya, and Bharat Chandra Raut

### Background

In rural India, manure management remains a critical yet often overlooked challenge. Despite the widespread presence of livestock and the traditional use of organic manure, its full potential remains largely untapped due to unscientific handling, poor storage practices, and limited awareness regarding nutrient preservation. Farmers frequently use raw or partially decomposed manure, leading to nutrient loss through volatilization and leaching, thereby reducing its effectiveness as a soil amendment. Moreover, the lack of structured composting methods contributes to the spread of pathogens and the emission of greenhouse gases, posing threats to both environmental and public health.

The increasing dependence on chemical fertilizers - driven by the immediate need to boost yields - has further marginalized organic manure, contributing to long-term soil degradation and declining fertility.

**'This effort aimed to assist marginal and smallholder farmersor farmer groups in Manipur by promoting sustainable, locally adapted technologies'**

The current challenges of inadequate extension services, weak policy support, and limited market linkages for organic inputs further exacerbate the problem, leaving farmers with few incentives or resources to adopt improved manure management practices.

Addressing these issues demands a comprehensive understanding of local traditions, barriers to adoption, and the development of context-specific interventions. Scientifically enhancing the value and use of manure offers great promise for promoting sustainable agriculture, restoring soil health, and strengthening the ecological and economic resilience of rural farming communities in India.

### NIF–India and MASTEC: A Collaborative Effort in Manipur

The National Innovation Foundation-India (NIF) identified and documented an innovative manure-making machine developed by grassroots innovator Bharat Chandra Rout from Kendrapara, Odisha. This technology was recognized during the Mukhya Mantri Abinav Krushi Jantrapati Samman, a regional innovation competition conducted in collaboration with the Department of Agriculture and Farmers' Empowerment, Government of Odisha.

Following validation and refinement by NIF's Value Addition Research and Development (VARD) division, the innovation was selected for broader dissemination by the Dissemination and Social Diffusion (DSD) division. In Manipur, NIF collaborated with the Manipur Science and Technology Council (MASTEC) to implement this initiative. During FY 2023-24, NIF provided MASTEC with two manure-making machines, along with other grassroots innovations, and facilitated hands-on demonstrations and training programs.

This effort aimed to assist marginal and smallholder farmers or farmer groups in Manipur by promoting sustainable, locally adapted technologies. Additionally, the initiative sought to foster rural entrepreneurship and elevate the role of grassroots innovations in improving agricultural productivity and livelihood resilience in the region.

*Bharat Chandra Rout - The innovator*

### The Innovation: Manure-Making Machine

Bharat Chandra Rout's manure-making cum granulation machine is designed to promote sustainable agriculture and efficient organic waste management for smallholder farmers. This compact and cost-effective device transforms biodegradable materials-such as cow dung, kitchen waste, dry leaves, and vegetable peels-into granular organic fertilizer. It serves as an eco-friendly alternative to chemical inputs.

The machine operates on a 1-horsepower electric motor and

processes raw organic matter into uniform granules approximately 3 mm in diameter. These granules are easy to store, transport, and apply, significantly enhancing the efficiency and convenience of organic fertilizer. Maintaining optimal moisture levels in the input is crucial: dryness impedes granulation, while excessive moisture disrupts processing. Hence, user awareness and local knowledge play an essential role in its effective operation.

A built-in water pump helps regulate compost moisture and can also be used for irrigation, increasing the machine's utility. Its compact, user-friendly design allows for single-person operation, making it especially suited to resource - limited farmers. Under optimal conditions, the machine can process up to 1 kg of organic waste per minute - or around 60 kg per hour - making it ideal for farmer cooperatives or community-based systems.

**'The Manipur case study exemplifies the transformative potential of decentralized, low-cost technologies in strengthening rural agricultural ecosystems'**

A notable feature is the manual operation option, which ensures continued usability even in areas with inconsistent electricity supply. The resulting compost is rich in essential nutrients, fully organic, and compliant with sustainable agriculture standards. It improves soil structure, moisture retention, and microbial activity, ultimately enhancing farm productivity and reducing chemical fertilizer dependency.

*Manure making machine-The innovation that is now a ray of hope for many farmers*

Green Biotech, a key organization in this initiative, produces around 600 compost bags (40 kg each) per month. These are distributed through organized farmer networks - demonstrating how localized, context-sensitive technology can effectively meet rural needs, support circular economies, and strengthen low-input farming systems.

## A Model for Farmer Empowerment

The Manipur case study exemplifies the transformative potential of decentralized, low-cost technologies in strengthening rural agricultural ecosystems. Practical in the lived experiences and needs of smallholder farmers, these grassroots innovations


*Waste turned into wealth_Manure Product produced from grassroots innovation ready to sale*

*Team NIF demonstarting Manure making Machine at Imphal, Manipur*

**'The Manipur experience demonstrates that impactful agricultural transformation can emerge from the grassroots'**

flourish without relying on extensive corporate infrastructure or large capital investment. Instead, they are driven by local entrepreneurship, community involvement, and appropriate technological design.

**'Grassroots innovations like the manure-making machine are especially critical in the face of climate change, rising input costs, and soil degradation'**

MASTEC, in partnership with Green Biotech EcoSolutions, a Manipur-based startup, has promoted this innovation to support sustainable farming and rural livelihoods. More than 700 farmers across Imphal East, Imphal West, and Kakching districts have benefited from the compost produced using this machine. Offered at nominal rates according to monthly needs, the compost remains both affordable and financially sustainable. This model not only reduces farmers' reliance on chemical inputs but also enhances soil health and boosts yields. It also incorporates indigenous knowledge - such as optimizing moisture content - which improves both its relevance and adoption.

Importantly, the adoption of this organic compost has enabled many farmers to transition to organic farming without compromising yield or quality.

Grassroots innovations like the manure-making machine are especially crucial in the face of climate change, rising input costs, and soil degradation. Frugal yet impactful, they embody the principles of a circular economy and strengthen community resilience. Their success depends on vibrant local innovation ecosystems, where inventors, farming communities, and institutions collaborate and co-create solutions.

The Manipur experience demonstrates that impactful agricultural transformation can emerge from the grassroots. Based on indigenous knowledge and community-specific requirements, locally developed technologies encourage sustainable growth and offer scalable models for inclusive, resilient agriculture in similar rural settings.

## Acknowledgements

The authors gratefully acknowledge the support of Mr. Th. Rakesh, Director, MASTEC, and Mr. Sarat Singh, Program Officer, MASTEC, Imphal, Manipur. Sincere thanks are also extended to Dr. Asem Sundari Devi, Director, Green Biotech EcoSolution Pvt. Ltd., Imphal, for sharing valuable insights on the organization's innovations and contributions. ■

Dr. Rajiv Mili is a Principal Associate at the National Innovation Foundation – India. He holds a PhD in Botany and is associated with the Scouting, Documentation, and Database Management (SDDM) Department.
Email: rajivmili@nifindia.org

Dr. Vivek Kumar is Scientist – F and Head of Scouting, Documentation and Database Management Department at the National Innovation Foundation – India.
Email: vivekkumar@nifindia.org

Dr. Nitin Maurya serves as Scientist 'E' and Head of the INSPIRE-MANAK program and Dissemination and Social Diffusion (DSD) Department at the National Innovation Foundation – India. Email: nitin@nifindia.org

Mr. Bharat Chandra Raut is a serial innovator and has many innovations like dal mill, puff rice machine and organic manure machine.

# Bridging Tradition and Innovation

## - Integrating Traditional Knowledge into National Knowledge Systems

Vipin Kumar, Tushar Garg

### Introduction

In today's fast-paced world, where new technologies emerge almost daily, India is experiencing a quiet yet powerful transformation. This paradigm shift focuses on integrating ancient wisdom and traditional practices - honed over centuries - with the rigor and potential of modern science. At the forefront of this movement is the National Innovation Foundation (NIF) - India[1] , an autonomous institute under the Department of Science and Technology (DST), Government of India. NIF represents a national initiative to strengthen outstanding traditional knowledge and grassroots technological innovations.

NIF scouts, supports, and nurtures outstanding traditional knowledge from its original holders - whether individuals or communities - regardless of location, including remote and underserved regions. With the support of public and private sector partner institutions, NIF undertakes the scientific validation of these practices. Its end-to-end incubation model encompasses documentation, value addition, product development, intellectual property protection, and dissemination - through both commercial and non-commercial channels - of technologies derived from traditional knowledge.

This approach allows time-tested indigenous practices that have positively impacted local communities to be preserved, scientifically evaluated, scaled up, and made available to the wider population in India and beyond.

### Database and Recognition

To date, NIF has documented over 300,000 grassroots innovations, including approximately 200,000 traditional knowledge - based practices from across the country. The Innovation Portal[2] (www.innovation.nif.org.in), launched on 14 January 2021 by Dr. Harsh Vardhan, then Hon'ble Union Minister of Science and Technology, currently houses around 139,000 grassroots innovations and traditional practices[3].

**'Over the past two decades, 1145 grassroots innovators and traditional knowledge holders representing 20 States and Union Territories have been recognized with National, State, or Consolation awards'**

These span diverse fields such as engineering, agriculture, veterinary and human health, and cover domains including energy, mechanical, automobile, electronics, household, chemicals, textiles, civil engineering, plant protection, livestock management, nutraceuticals, and more.

The portal is a step toward building an Atmanirbhar Bharat (self-reliant India) and serves as a valuable resource for students, entrepreneurs, MSMEs, Technology Business Incubators (TBIs), and citizens engaged in various professions.

Over the past two decades, 1145 grassroots innovators and traditional knowledge holders representing 20 States and Union Territories have been recognized with National, State, or Consolation awards. These recognitions, conferred during eleven editions of the Biennial National Grassroots Innovation and Outstanding Traditional Knowledge Awards, are a tribute to the creativity of common people. The National Award, presented by the Hon'ble President of India, sends a strong message: grassroots innovation is deeply valued by the nation.

### Value Addition, Product Development, and IP Protection

To enhance the value of grassroots innovations, NIF has established frameworks, protocols, and collaborations with leading scientific and technological institutions

1. https://www.nif.org.in/
2. www.innovation.nif.org.in
3. https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1688583


*Innovations Portal was launched on 14th January 2021 by Dr. Harsh Vardhan, then Hon'ble Union Minister of Science and Technology, Government of India*

including CSIR, ICAR, and ICMR. A significant initiative includes the ICMR-NIF Task Force Project on the "Validation of Innovative Claims of Herbal Healers." This project laid the groundwork for the development of new drugs and formulations based on outstanding traditional knowledge.

**'Scientific validation efforts have extended to a wide array of human health conditions, including diabetes, hypertension, cancer, tuberculosis, epilepsy, dermatology, oral care, and wellness, among others'**

NIF has identified research laboratories with the capability and expertise for validation and invited clinical validation proposals from other institutions. It coordinates peer reviews, provides funding, and monitors project progress. As a result, eight technologies related to osteoporosis, obesity, arthritis, and cataract are currently undergoing clinical trials, with seven more ready for trials.

Scientific validation efforts have extended to a wide array of human health conditions, including diabetes, hypertension, cancer, tuberculosis, epilepsy, dermatology, oral care, and wellness, among others. Many of these are in advanced stages of product development.

For livestock health, NIF continues to validate traditional practices with the support of veterinary institutions. These address conditions such as mastitis, infertility (anestrus), retention of placenta, bloat, milk yield enhancement, ecto- and endoparasitic infections, and more. In poultry, traditional remedies are being evaluated for coccidiosis, respiratory distress, and immunity boosting against Ranikhet Disease Virus.

To date, NIF has filed 1478 patent applications, with 725 patents granted, reflecting both commercial potential and scientific rigor. NIF has also filed 95 PPV & FRA (Protection of Plant Varieties and Farmers' Right Authority) applications, with 46 registrations granted.

## Commercial and Social Dissemination

NIF functions as a comprehensive value chain, with its various verticals- including Business Development, Dissemination, Value Addition R&D (VARD), Scouting and Documentation, and IPR Protection - working in tandem to ensure that innovations originating from the grassroots reach the public without barriers.

Collaborations include an agreement with Bio Neutra Innovations, a DPIIT - recognized startup in Pune, Maharashtra, to license four value-added herbal technologies related to hepatic health, blood sugar management, obesity, and arthritis, along with the development of healthy cookies and tea variants.

Similarly, Shashwat Green Wellness Pvt. Ltd., Nagpur partnered with NIF to develop and market a herbal mosquito-repellent product named 'Mosthwak'. This product was disseminated extensively in malaria-prone regions including Odisha, Chhattisgarh, Meghalaya, Tripura, and Assam, reaching over 10,000 beneficiaries in collaboration with the National Vector Borne Disease Control Program and district administrations.

Commercial products now available include Mastirak[4] (for mastitis), Wormivet[5] (for internal parasites), and Estrona (for anestrus) - licensed to Rakesh Pharmaceuticals, Gandhinagar. These provide a safe, herbal alternative to chemical treatments for livestock.

One of the most notable efforts has been a nationwide campaign against tick infestation, a major challenge in

4. https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1765163
5. https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1613211


*Selected portfolio of Human health technologies commercialized by NIF through Bio Neutra Innovations, Pune, Maharashtra*

**'As India continues to emerge as a global leader in traditional knowledge, NIF's work - particularly in human health, veterinary science, and crop protection - ensures that the nation contributes valuable technologies to the global community'**

livestock health. A low-cost herbal formulation demonstrated 100% acaricidal efficacy within 48 hours, with no reinfestation observed for 29 days. Demonstrations were held across states including Gujarat, Andhra Pradesh, Himachal Pradesh, Maharashtra, Tamil Nadu, Chhattisgarh, Odisha, and Haryana. Dissemination occurred through milk unions, Doordarshan, veterinary institutions, and state animal husbandry departments. The practice[6] has also been recognized[7] by Indian Council of Agriculture & Research ICAR[8] , United Nations Centre for Alleviation of Poverty through Sustainable Agriculture [CAPSA] & Economic and Social Commission for Asia and the Pacific [ESCAP].

## Conclusion

NIF remains steadfast in its mission to build a robust technology base rooted in Outstanding Traditional Knowledge and to facilitate its rapid access to the public with the support of partner institutions across the country. Whether through commercialization, social dissemination, or scientific validation, the focus remains on preserving, evaluating, and scaling up practices that have served communities for generations.

As India continues to emerge as a global leader in traditional knowledge, NIF's work - particularly in human health, veterinary science, and crop protection - ensures that the nation contributes valuable technologies to the global community. By blending ancient wisdom with modern science, India is not only reclaiming its heritage but also offering sustainable, people - centric solutions to the world. ■

6. **https://www.pib.gov.in/PressReleasePage.aspx?PRID=1810576**
7. **https://dst.gov.in/polyherbal-eco-friendly-technology-can-combat-tick-infesta tion-among-dairy-animals**
8. **https://icar.org.in/node/5781**

Dr. Vipin Kumar is Chief Scientist and Former Director at the National Innovation Foundation – India (NIF). His research and interest areas are incubation and promotion of innovations by value addition, intellectual property protection, and commercialization. He leads the Business Development team.
Email: vipin@nifindia.org

Shri Tushar Garg is Scientist - D at National Innovation Foundation (NIF) – India working in the field of Impact Assessment and Public Policy. He has also served private sector and worked at Goldman Sachs Asset Management (GSAM) prior to joining NIF.
Email: tusharg@nifindia.org

# Combating Hypertension through Traditional Herbal Knowledge - A Promising Approach

Rameshwar Prasad Yadav, Panchsheela Nogia, and R K Ravikumar

The World Health Organization (WHO) defines hypertension (high blood pressure) as a persistently elevated pressure in blood vessels, measured at 140/90 mmHg or higher. It is influenced by modifiable risk factors such as obesity, elevated cholesterol levels, occupational stress, high sodium intake, excessive use of tobacco and alcohol, and a sedentary lifestyle. Additionally, non-modifiable factors including genetic predisposition, aging, and pre-existing conditions like diabetes and kidney disorders also contribute significantly to the condition.

Hypertension affects approximately 1.28 billion adults aged 30 to 79 globally and significantly elevates the risk of cardiovascular complications, including heart failure, stroke, coronary artery disease, and chronic kidney disease. The WHO's 2023 Global Report identifies high systolic blood pressure as a "silent killer," responsible for over 10 million deaths annually, underscoring its status as a growing global public health issue. Research indicates that a reduction of just 10 mmHg in systolic pressure can lower the risk of cardiovascular diseases by 20%, highlighting the importance of early preventive and therapeutic interventions.

As a chronic metabolic disorder, hypertension typically requires lifelong pharmacological treatment to manage blood pressure effectively and reduce associated complications. While modern medicine offers a range of effective drug therapies-often in combination depending on the severity-long-term use may pose concerns due to potential side effects. This has led to growing interest in alternative approaches, including natural and complementary therapies, which aim to improve overall health while minimizing adverse effects.

Herbal medicine, grounded in traditional knowledge systems, has attracted attention for its enduring effectiveness, safety profile, fewer known side effects, and holistic benefits. Traditional knowledge encompasses remedies with established efficacy passed orally through generations. India boasts a rich heritage of herbal practices, widely used by traditional healers across various communities to address diverse health conditions. These age-old practices offer significant potential for integration into mainstream healthcare systems and may contribute meaningfully to the development of plant-based therapeutic options.

**'Hypertension affects approximately 1.28 billion adults aged 30 to 79 globally and significantly elevates the risk of cardiovascular complications'**

The National Innovation Foundation - India (NIF) plays a vital role in safeguarding traditional wisdom by documenting and validating indigenous practices while recognizing exceptional traditional knowledge holders. As part of this mission, NIF has identified and supported a traditional herbal remedy for managing hypertension from the West Champaran district of Bihar.


*Anti- hypertensive NIF herbal medicine "Siramide Plus BP Care"*

**'To safeguard intellectual property and support further commercialization, a patent was filed for the herbal formulation'**

The practice, developed by Shri Rameshwar Prasad Yadav, a distinguished traditional healer, involves preparing and administering herbal medicine for hypertension, based on his experiential knowledge and observations from treating patients in nearby villages. NIF has been incubating this knowledge to advance its technological maturity and enable viable product development.

The therapeutic claim made by the healer was scientifically validated using animal models, confirming its blood pressure-lowering properties. To safeguard intellectual property and support further commercialization, a patent was filed for the herbal formulation. In alignment with the herbal value chain, a tablet formulation of the product was developed for clinical evaluation. For pilot-scale human trials, NIF collaborated with the College of Ayurved, Bharati Vidyapeeth, Pune. The study involved patients diagnosed with mild to moderate hypertension, who received a daily dose of 4 grams of the tablet over a 90-day period. Researchers monitored systolic and diastolic blood pressure levels, as well as related symptoms such as fatigue, dizziness, and headache.

*Shri Rameshwar Prasad Yadav, outstanding traditional knowledge healer with herbal product developed from his knowledge for managing high blood pressure*

**'For pilot-scale human trials, NIF collaborated with the College of Ayurved, Bharati Vidyapeeth, Pune'**

The clinical findings were promising, showing a significant reduction in blood pressure levels among participants. Additionally, patients reported relief from hypertension-associated symptoms, reinforcing the potential of traditional herbal formulations as a natural solution for blood pressure management. These results highlight the importance of scientifically validating traditional medicine and its relevance in addressing modern health challenges.

**'The National Innovation Foundation - India (NIF) plays a vital role in safeguarding traditional wisdom by documenting and validating indigenous practices'**

Currently, 70–80% of the population in developing countries relies on herbal medicine for primary healthcare. NIF's herbal formulation, composed of commonly available ingredients, demonstrates potential for broad societal and commercial application. Furthermore, integrating herbal remedies with allopathic treatments could provide a synergistic approach to managing chronic metabolic disorders such as hypertension. Such scientifically supported initiatives underscore the relevance of traditional knowledge in developing accessible, effective, and sustainable healthcare solutions and contribute to strengthening the innovation and public health ecosystem. ■

Shri Rameshwar Prasad Yadav is an outstanding traditional knowledge healer from Bihar. He is custodian of herbal patent grant for his knowledge on management of high blood pressure.

Dr Panchsheela Nogia is Research Associate–III at NIF-India. She holds PhD in Biological Sciences from Birla Institute of Technology and Science [BITS], Pilani and was awarded with Dr. D. S. Kothari Postdoctoral Fellowship.

Dr R K Ravikumar is Scientist 'F' at National Innovation Foundation – India. He holds doctorate degree from the Indian Veterinary Research Institute [IVRI] and is recipient of NASI – Platinum Jubilee Award in Biological Sciences, 2022. Dr Ravikumar leads Value Addition Research and Development (VARD)- Human Health & Veterinary Division.
Email: ravikumar@nifindia.org

# Cooling with Nature

## - The Natural Water Cooler Redefining Access to Cool Drinking Water

Abhishek Verma, Rakesh Maheshwari


## Summary

**Ensuring access to cool and safe drinking water remains a major challenge in many parts of India, particularly in regions with unreliable electricity and extreme summer heat. Addressing this gap, grassroots innovator Shri Arvindbhai Patel, with further modifications and commercialisation by his son Mr. Jaymeen Patel, has developed the Natural Water Cooler—an affordable, energy-efficient solution.**

**This innovation employs viscose fibre wrapped around copper coils to enable evaporative cooling, enhanced by a solar-powered DC fan. The base model functions entirely without relying on grid electricity, making it ideal for off-grid and low-resource environments. An advanced hybrid version incorporates a low-energy vapour compression unit for greater cooling performance.**

**Significantly more energy-efficient than conventional coolers, this system aligns with India's sustainability and self-reliance goals. With successful deployment in schools, health centres, and public institutions, this innovation exemplifies how grassroots ingenuity, rooted in scientific principles, can deliver scalable, community-focused solutions.**


## 1. Introduction

Access to clean and cool drinking water is a daily struggle in many rural and semi-urban parts of India, especially during the scorching summer months. Conventional electric water coolers are often unsuitable due to intermittent power supply and high operating costs.

To address this need, grassroots innovator Shri Arvindbhai Patel introduced the Natural Water Cooler - a system that avoids conventional refrigeration. It combines passive evaporative cooling with copper's thermal conductivity and viscose fibre's absorbency. A solar-powered DC fan boosts airflow and enhances cooling performance. His son, Mr. Jaymeen Patel, further refined and commercialised the innovation. In its advanced version, the system integrates a compact vapour compression unit, resulting in a hybrid, cost-effective, and eco-conscious cooling solution.

## 2. Design and Working Mechanism

### 2.1 Core Cooling Principle

The system is based on evaporative cooling. At its core is a copper coil through which drinking water flows. This coil is wrapped in multiple layers of viscose fibre - a material derived from regenerated cellulose with excellent moisture retention. When the fibre is moistened, it retains water for prolonged periods. As warm air passes over the damp surface, the water evaporates, drawing latent heat from the copper tube and cooling the water inside.

### 2.2 Enhancement through Forced Convection

To accelerate the cooling process, a low-wattage DC fan, powered by a 40–50 W solar panel, is used to increase airflow around the fibre-wrapped coil. This forced convection enhances evaporation, making the system particularly effective in hot and dry climates.


*Fig. 1. Natural Water Cooler*

## 3. Technical Composition and Functionality

### 3.1 Material Selection

- Copper Coils: Chosen for their high thermal conductivity, corrosion resistance, and bacteriostatic properties. Copper enables quick heat transfer from the water to the surrounding fibre.
- Viscose Fibre Wrap: Maintains moisture for extended durations, enabling efficient evaporative cooling. Its flexibility ensures uniform wrapping and full contact with the copper surface.
- Solar PV and Fan Assembly: Ensures off-grid operation, making the cooler ideal for remote and low-resource areas.

### 3.2 Hybrid Configuration (Advanced Model)

The advanced model integrates a compact vapour compression system. Water pre-cooled via evaporative means is transferred to an insulated storage tank, which is further cooled using a low-power compressor. This hybrid system achieves temperatures comparable to conventional coolers but with significantly reduced energy consumption.

**'Hybrid system achieves temperatures comparable to conventional coolers but with significantly reduced energy consumption'**

## 5. Community Impact and Deployment

The Natural Water Cooler has gained popularity in public institutions such as schools, temples, clinics, and community centres-settings where conventional cooling infrastructure is either unaffordable or unavailable. Key observed benefits include:

- Healthier Drinking Water: Copper tubing and the cooling effect encourage higher water intake, especially among children.
- Power Independence: The base model operates entirely on solar energy, contributing to India's renewable energy goals.

## 4. Performance Metrics and Efficiency

**Extensive field trials and third-party technical evaluations have demonstrated notable energy and cost benefits:**

**Table 1: Comparison of Conventional and Natural Water Coolers**

| Sr. No. | Parameter | Standard Cooler | Natural Cooler (Evaporative) | Natural Cooler (Hybrid) |
|---|---|---|---|---|
| 1 | Output Temperature (°C) | 10–12 | 17–20 | 8–12 |
| 2 | Daily Energy Use | 2–3 kWh | ~0.15 kWh | 0.5–1.2 kWh |
| 3 | Cooling Medium | Refrigerant | Evaporative via viscose fibre | Hybrid with VCRS (Vapour Compression Refrigeration System) |
| 4 | Grid Dependency | Full | Solar-powered | Solar-grid compatible |
| 5 | Maintenance Requirement | Medium | Low | Moderate |

**These findings highlight not only the viability of the cooler for low-income users, but also its significant environmental benefits.**

- Affordability: The system achieves payback within 1.5 years, with minimal recurring energy costs.


*The innovation aligns with multiple global and national development goals as shown/ illustrated in Fig. 2*

## 6. Broader Relevance and Policy Linkages

The innovation aligns with multiple global and national development goals:

- SDG 6 – Clean Water and Sanitation: Facilitates access to hygienic, temperature-controlled drinking water.
- SDG 7 – Affordable and Clean Energy: Demonstrates the practical use of decentralized, solar-powered technology.
- SDG 13 – Climate Action: Minimises greenhouse gas emissions by reducing dependence on conventional electricity.

## 7. Diffusion Status and Business Development

Since inception, the Natural Water Cooler has been installed in over 15 Indian states, including Gujarat, Maharashtra, Rajasthan, Tamil Nadu, Odisha, and northeastern regions such as Meghalaya and Tripura.

It is widely used in railway stations, workshops, government schools, colleges, universities, public parks, and manufacturing units.

**The product line now includes three models:**

- NaturaCool
- NaturaCool-Duo
- NaturaCool-Duo-Off Grid

**Together, over 1,500 units have been sold:**

- 1,300+ units of the standard model
- 200+ units of hybrid variants

A pilot unit has also been exported to Sri Lanka, indicating potential global applicability.

To support this growth, a dedicated fabrication and assembly unit has been set up in Gujarat with a production capacity of 50 units per month (600 annually). A reliable local vendor network ensures timely, cost-effective sourcing of copper coils and viscose fibre. The operation boasts an annual turnover of around ₹1 crore, with growing interest from educational institutions, panchayati raj institutions, and NGOs. Efforts are ongoing to integrate the cooler into government schemes, particularly those aligned with rural water access, renewable energy, and sustainable infrastructure development.

## Conclusion

From concept to deployment, the Natural Water Cooler exemplifies how grassroots innovation, scientific insight, and community empathy can converge to meet critical public needs. Its simplicity is its strength, and its growing impact provides a promising blueprint for future frugal, sustainable innovations.

**'From concept to deployment, the Natural Water Cooler exemplifies how grassroots innovation, scientific insight and community empathy can converge to address critical public needs'**

## Acknowledgements

The authors express their sincere gratitude to Shri Arvindbhai Patel and Mr. Jaymeen Patel for generously sharing insights and information regarding the innovation. ■

## Contact Information

Mr. Jaymeen Patel
Notion Technocrats India Pvt. Ltd.
92/93 Pragati Park-II, B/H Seventh Day High School,
Maninagar (East),
Ahmedabad - 380008, India
Mob: +91 9824623397 / 9096590358
Email: sales@notiontech.in, jp.notiontech@gmail.com
Website: www.notiontech.in

Dr. Abhishek Verma is a Research Associate-I at the National Innovation Foundation – India. He specialises in sustainable energy systems, thermal engineering, and grassroots innovation. His work focuses on validating and promoting inclusive technologies that address real - world challenges through science - based solutions.
Email abhishekv@nifindia.org

Er. Rakesh Maheshwari serves as Scientist – E at the National Innovation Foundation – India. He has over 19 years of experience at NIF, supporting grassroots innovations, mentoring young inventors, and fostering entrepreneurship.
Email: rakesh@nifindia.org

# National Innovation Foundations - Catalysts for Inclusive and Sustainable Innovation

Shubhamika Jha, Poonam Singh

In recent decades, the global landscape of innovation has significantly evolved, with countries increasingly recognising the value of promoting creativity and technological advancement at all levels of society. Countries like India consider the ongoing decade as a *"Techade for India"*[1]. This shift has led to the establishment of National Innovation Foundations (NIFs) and similar government agencies in different parts of the world, each with unique structures and missions but united by the common goal of maximizing innovation-based economic growth and societal progress. These foundations serve as critical nodes within national innovation systems, coordinating policy, funding, and support for a diverse range of stakeholders, including commercial enterprises, non-profit organizations, universities, and individual innovators.

## The Global Landscape of National Innovation Foundations: Growth, Diversity, and Mandates

On April 13, 2015, the Information Technology & Innovation Foundation (ITIF), USA- one of world's leading think tank for Science and Technology policy- published a report titled *"The Global Flourishing of National Innovation Foundations"*, highlighting an important global development triggered by intensifying global race for innovation advantage. The report noted that by 2015, approximately 50 countries had established national agencies or organisations dedicated to promoting innovation at various levels[2]. India was no exception as it established its National Innovation Foundation (NIF) as early as in the year 2000. Interestingly, the paper's title draws inspiration from the terminology adopted by India for its Innovation Foundation. However, the report didn't emphasise enough India's unique approach of inclusivity in innovation landscape, rather than merely focusing on conventional national innovation strategies. The unique and futuristic mandate of NIF - India brought innovations by people at the grassroots level - who aren't formally educated (either dropped out or never been to school or educated in a non - scientific discipline) - to the forefront to contribute through need - based frugal innovations out of their wise thinking and creativity.

## The Indian Experience: NIF's Grassroots-Centric Model

These organisations are found across economies of all sizes and stages of development, from advanced economies like Japan, South Korea, and Norway, to emerging markets such as Kenya, Colombia, and India[3]. The establishment of National Innovation Foundation was crucial for India, because in the year 2000, when NIF was established, the size of Indian economy was modest of worth approximately. 0.476 USD Trillion[4] and to grow and be a proper emerging market, one thing which India needed most was innovative technologies at multiple levels, not just in Tier 1,2,3 cities but from across the nation, especially rural India where 75% of the population was living.

To bring the supply of innovative technologies from rural setups, a mechanism was needed to scout new producers of innovations and also spot fresh ways to disseminate them, leading to their adoption. Also, it was important to ensure that the technologies scouted are value - added suitably so that their use cases are not merely for a name sake or superficial or serving a visibility purpose, but instead have an inherent ability to deliver value to the end - user upon deployment.

The aforementioned is an edge that India's NIF has vis-à-vis other countries' NIFs. While every NIF has defined the eco - system locally for the country in terms of innovation, more often serving those who were educated enough to find a way for themselves. India's NIF stood apart as it was serving those who were mostly at the bottom of the pyramid in terms of income levels, but their innovations were in no way behind the rest of the world. It reinforced the popular phrase that *"Minds at the margin are not marginal minds"*.

## Redefining Innovation: India's Inclusive Approach

A common thread identified across the innovation foundations is that innovation is about creation of new value for society. For standardization

## Table: Global innovation agencies and their broad strategic focus

| Mandate Category | Countries, Agencies and their year of establishment | Major Focus Area |
|---|---|---|
| R&D Promotion | **Taiwan** – Industrial Technology Research Institute (1973)<br>**Spain** – Ministry of Science and Innovation - Centre for the Development of Industrial Technology (CDTI) (1977)<br>**Japan** – New Energy and Industrial Technology Development Organization (NEDO) (1980)<br>**China** – Ministry of Science and Technology (1998)<br>**Peru** – National Council for Science, Technology and Technological Innovation (CONCYTEC) (2004)<br>**Poland** – National Centre for Research and Development (2007)<br>**Czech Republic** – The Technology Agency of the Czech Republic (2009)<br>**Lithuania** – Agency for Science, Innovation and Technology (2010) | Funding R&D projects, applied research, industry-research linkages |
| Innovation & Entrepreneurship Ecosystem Building | **Croatia** – Business Innovation Croatian Agency (1998)<br>**India** – National Innovation Foundation (grassroots focus) (2000)<br>**Sweden** – VINNOVA (2001)<br>**South Korea** – Industrial Technology Foundation (2001)<br>**Thailand** – National Innovation Agency (2003)<br>**Uruguay** – National Research and Innovation Agency (ANII) (2008)<br>**United Kingdom** – Department for Business, Innovation and Skills (2009)<br>**Malaysia** – Agensi Inovasi Malaysia (2010)<br>**Kenya** – Kenya National Innovation Agency (2013)<br>**Slovenia** – SPIRIT Slovenia (2013) | Startups, SME Innovation, commercialization, entrepreneurship, Grassroots innovations (India specific) |
| Competitiveness & Industrial Development | **Finland** – SITRA (1967)<br>**Portugal** – Agency for Competitiveness and Innovation (1975)<br>**Norway** – Innovasjon Norge (2004)<br>**Netherlands** – SenterNovem (2004)<br>**Chile** – National Innovation Council for Competitiveness (2005)<br>**Slovakia** – Slovak Innovation and Energy Agency (2007)<br>**Slovenia** – SPIRIT Slovenia (2013) | National competitiveness, SME and industry growth, sustainability |
| Policy Advisory & Strategic Coordination | **Ireland** – Forfás (State Agency of the Department of Enterprise, Trade and Employment) (1994)<br>**Peru** – National Council for Science, Technology and Technological Innovation (CONCYTEC) (2004)<br>**Denmark** – Agency for Science, Technology and Innovation (2006)<br>**South Africa** – National Advisory Council on Innovation (2006)<br>**Hungary** – National Innovation Office (2010)<br>**Romania** – Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) (2010)<br>**New Zealand** – Ministry of Business, Innovation and Employment (2012) | National innovation policies, strategic foresight, cross-sector coordination |
| Hybrid (Multiple Mandates) | **Brazil** – Finep (1967)<br>**Uruguay** – National Research and Innovation Agency (ANII) (2008)<br>**United Kingdom** – Department for Business, Innovation and Skills (2009)<br>**Romania** – Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) (2010)<br>**Lithuania** – Agency for Science, Innovation and Technology (2010) | Mixed mandates combining R&D, entrepreneurship, policy advice |

of this concept, many referred the definition given by Organization for Economic Cooperation and Development (OECD) i.e. *"the implementation of a new or significantly improved product (that is, a physical good or service), process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations"*[5]. True to this, different NIFs have delivered on their mandate with varying levels of success and adopted bespoke criteria best suited for nurturing innovations of their respective territories.

For example, NIF - India has adopted a dynamic and inclusive definition of innovation, which is *"Any product, process, service or system which improves at least one of the three dimensions of existing solutions, i.e. material, method or application, in a novel, useful and sustainable manner. Innovation also includes new alternatives addressing hitherto unmet societal needs, maintaining the above conditions, combining frugality, affordable excellence, and circularity"*.

This allows NIF - India to consider not only novel technologies but also existing solutions based on their affordability, sustainability, or practical usefulness. For instance, a technology that isn't precisely new but is more affordable than the existing technologies qualifies to be innovative for the affordability element, where it scored better than the rest. Similarly, if a new version of a technology enhances sustainability, even while solving the same problem, it qualifies as an innovative solution under NIF's framework.

So, NIF has adopted a dynamic approach where non - negotiable elements gained an edge as far as attributing a technology as an innovative technology is concerned.

## Evolving Roles and Future Priorities of National Innovation Foundations

The effectiveness of national innovation foundations often depends on their ability to remain lean and adaptable. The best agencies/foundations are quick, shifting their priorities and operations in response to rapid technological change and evolving societal demands. They recognize the global nature of innovation value chains and actively seek to build international partnerships. Many countries have also approached national innovation strategies to coordinate the work of various government agencies and ensure a cohesive approach to innovation policy.

Despite their varied structures, national innovation foundations share a commitment to encouraging creativity, supporting risk - taking, and raising collaboration across sectors. They play a crucial role in translating innovative ideas into tangible benefits for society through economic growth, improved quality of life and enhanced global competitiveness. As the world continues to grapple with complex challenges - from climate change to social inequality - the importance of strong, well - supported national innovation systems will only grow. These foundations should increasingly adopt a partnership approach, collaborating with one

another to foster mutual learning and growth. The experiences of India, Finland, Brazil, Kenya, and others offer valuable lessons for countries seeking to build or strengthen their innovation foundations, ensuring that the benefits of innovation reach every corner of society. Ultimately, the goal should be for every nation to have its own dedicated innovation institute, like it maintains a defence institute, and this institute could be called the NIF. As a friendly, non - aligned nation, India is well - positioned to play a pivotal role in supporting and scaling up these innovation institutes globally. ■

## References:


1. **https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=2095961**
2. **https://www2.itif.org/2015-flourishing-national-innovation.pdf**
3. **https://www.imf.org/en/Publications/WEO/weo-database/2023/April/groups-and-aggregates**
4. **https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=IN**
5. **https://www.oecd.org/content/dam/oecd/en/publications/reports/2014/11/oecd-science-technology-and-industry-outlook-2014_g1g356f4/sti_outlook-2014-en.pdf**



Ms. Shubhamika Jha is a Project Associate I at the National Innovation Foundation (NIF) – India. She works in the field of Impact Assessment and Public Policy and holds a Master's degree in Mathematics.

Email: shubhamikajha@nifindia.org

Dr. Poonam Singh is a Research Associate I at the National Innovation Foundation (NIF) – India. She works in the field of Impact Assessment and Public Policy and holds a Ph. D. in Biotechnology.

Email: poonams@nifindia.org

# Strengthening Grassroots Innovations Through Institutional Collaborations

Mahima K

India, one of the fastest-growing economies and home to a large rural population, has long recognised the importance of innovation within the informal sector. The grassroots innovation movement initiated by Prof. Anil Kumar Gupta decades ago laid the foundation for identifying, documenting, and promoting local innovations developed by creative individuals and communities. These efforts have led to initiatives aimed at empowering grassroots innovators who often lack formal institutional support.

The National Innovation Foundation - India (NIF) plays a crucial role in identifying and supporting grassroots innovations (GIs) across the country, refining them through scientific validation, and helping innovators bring their ideas to the public via commercial or online platforms. This is made possible through strategic partnerships with research institutions, businesses, and government organisations, creating a strong bridge between traditional knowledge and modern science (Gupta, 2003; Joshi et al., 2015; Maurya et al., 2014).

## The Role of Institutional Collaborations in Supporting Grassroots Innovations

Institutional collaborations are critical for effectively supporting and strengthening grassroots innovators. These partnerships assist innovators in refining their ideas, securing financial backing, obtaining patents, and scaling their products to reach larger markets. Stronger connections between informal knowledge systems and formal scientific research enable grassroots innovations to evolve into viable businesses.

Many grassroots innovations emerge from real-life experiences but require scientific testing and refinement to become more efficient, reliable, and scalable. Universities and research institutes such as the IITs and IISc can provide vital support in this process. Scientists and experts work closely with innovators to develop improved versions of their products and processes.

NIF plays an essential role in enabling such institutional collaborations by building a robust support system. It has established an extensive collaborative network comprising academic institutions, government bodies, and research organisations across India. These partnerships are formalised through Memoranda of Understanding (MoUs), through which universities and research institutions contribute their scientific and technical expertise to the value addition of grassroots innovations.

Institutions such as the Indian Institutes of Technology (IITs), the Indian Institute of Science (IISc), Indian Council of Medical Research (ICMR) institutions, National Institutes of Technology (NITs), Council of Scientific and Industrial Research (CSIR) laboratories, and Agricultural and Veterinary Universities play a pivotal role in validating grassroots technologies through scientific methods. This validation is an essential precursor to technology transfer and commercialisation, enabling grassroots innovators to scale their solutions for broader markets.

**'NIF has established an extensive collaborative network comprising academic institutions, government bodies, and research organisations across India'**


*NIF and ICAR-Central Coastal Agricultural Research Institute (CCARI), Goa has signed MoU on March 9, 2023*

**Some of the recent Memoranda of Understanding (MoUs) signed by NIF with various Institutions and Organisations are listed in Table 1.**

| S. No. | Institution/Organization | MoU Initiated | MoU Expiry | Purposes |
|---|---|---|---|---|
| 1 | Jharkhand Council on Science, Technology and Innovation (JCSTI), Jharkhand | March 11, 2024 | March 10, 2029 | Scouting, documentation & dissemination of grassroots innovations |
| 2 | Academy of Scientific and Innovative Research (AcSIR), Uttar Pradesh | September 21, 2023 | September 20, 2028 | Validation of GRI through joint doctoral program |
| 3 | Bharatiya Engineering Science and Technology Innovation University (BESTIU), Andhra Pradesh | August 18, 2023 | August 17, 2026 | Scouting, documentation & dissemination of grassroots innovations |
| 4 | Department of Agricultural and Farmers Empowerment, Govt. of Odisha (Institution/Organisation) | August 5, 2023 | August 4, 2028 | Scouting, documentation, validation and diffusion of grassroots innovations in farm implements and tools |
| 5 | Assam Agricultural University (AAU), Assam | August 2, 2023 | August 1, 2026 | Validation or farm trials & dissemination of agricultural innovations |
| 6 | Madhya Pradesh Council of Science & Technology, Madhya Pradesh | July 19, 2023 | July 18, 2026 | Scouting, documentation & dissemination of grassroots innovations |
| 7 | Maharana Pratap University of Agriculture and Technology (MPUAT), Rajasthan | July 19, 2023 | July 18, 2028 | Documentation and value addition of grassroots innovations |
| 8 | Institute of Horticulture Technology (IHT), Uttar Pradesh | April 7, 2023 | April 6, 2028 | Incubations and support of grassroots innovations |
| 9 | ICAR-Central Coastal Agricultural Research Institute, Goa | March 9, 2023 | March 8, 2028 | Validation and value addition of indigenous agri-technologies |
| 10 | National Institute of Technology (NIT), Kerala | January 27, 2022 | January 26, 2027 | Scouting, Documentation activities & mentoring students under INSPIRE MANAK |
| 11 | National Institute of Pharmaceutical Education and Research (NIPER), Telangana | January 27, 2022 | January 13, 2027 | Research collaboration in pharmaceutical and grassroot technologies |
| 12 | Kamdhenu University, Gujarat | January 14, 2022 | January 13, 2027 | Validation & research of veterinary science and animal husbandry |
| 13 | Sher-E-Kashmir University of Agricultural Science and Technology (SKUAST-J), Jammu & Kashmir | ctober 26, 2021 | October 25, 2026 | Validation & value addition of indigenous agri- technologies |
| 14 | Gujarat Biotechnology Research Centre, Gujarat (GBRC) | March 17, 2021 | March 16. 2026 | Research & validation of herbal formulations |
| 15 | Dabur Research Foundation, Uttar Pradesh | May 17, 2016 | May 16, 2026 | Research & validation of herbal formulations |

## Financial Support, Market Access, and Capacity Building

Access to funding and markets continues to be a major challenge for grassroots innovators. While many possess ingenious ideas, they often lack formal business skills. Training, mentorship, and education are necessary to enable their success.

NIF facilitates access to grants, low-interest loans, and investment opportunities by connecting grassroots entrepreneurs with funding agencies and institutions. Institutional collaborations with industry have also helped bring many grassroots innovations to market. NIF further supports this process by offering training programmes in financial management, marketing, product development, and regulatory compliance. Large corporations contribute by supporting production and distribution, while digital platforms and e - commerce websites extend the reach of grassroots products to global audiences. The NIF Incubation and Entrepreneurship Council (NIFientreC), a Technology Business Incubator of NIF, assists innovators in connecting with investors, entrepreneurs, and mentors, fostering a dynamic innovation ecosystem.

## Intellectual Property Rights and Market Integration

NIF plays a vital role in intellectual property (IP) protection and technology licensing. Many grassroots innovators are unfamiliar with IP laws and related procedures. NIF assists them in securing patents, trademarks, and licensing agreements to safeguard their inventions. Establishing robust IP protection ensures that innovators receive recognition and fair compensation for their work.

Another key area of focus is enabling market access and establishing policy frameworks that facilitate the international scaling of grassroots innovations. NIF connects grassroots entrepreneurs to trade networks, ensuring their products reach a wide array of buyers and users across sectors. E-commerce platforms, international trade fairs, and business conferences provide critical exposure, helping grassroots innovations gain traction globally.

## Future Directions and Conclusion

In the coming years, the National Innovation Foundation (NIF) aims to further strengthen institutional collaborations to provide grassroots innovators with enhanced access to research, funding, market opportunities, mentorship, and policy support. Expanding partnerships with research institutions will help refine innovations to meet national and international standards, while specialised funding programmes will offer financial support to grassroots entrepreneurs.

**'NIF connects grassroots entrepreneurs to trade networks, ensuring their products reach a wide array of buyers and users across sectors'**

Additionally, improving intellectual property frameworks and establishing clear pathways for market integration will allow grassroots innovations to achieve wider recognition and adoption. NIF is

*NIF and Academy of Scientific and Innovative Research (AcSIR) has signed MoU on September 21, 2023*

particularly committed to reaching underserved rural areas, ensuring that creative minds across India have the opportunity to contribute.

By integrating emerging technologies, NIF seeks to make the innovation process faster, more efficient, and inclusive - from ideation to market readiness. Through this comprehensive approach, NIF aims to support India's journey toward self - reliance by transforming local ideas into practical, scalable solutions that benefit communities nationwide. ■

## References


1. **Gupta, A. K. (2003). Conserving biodiversity and rewarding associated knowledge and innovation systems: Honey bee perspective. Intellectual Property: Trade, Competition and Sustainable Development, 373–402.**
2. **Joshi, R. G., Chelliah, J., & Ramanathan, V. (2015). Exploring grassroots innovation phenomenon through the lived experience of an Indian grassroots innovator. South Asian Journal of Global Business Research, 4(1), 27–44.**
3. **Maurya, N., Kumar, V., Patel, R., Mahanta, H., & Gupta, A. (2014). ICTs in support of grassroots innovation. Information Technologies & International Development, 10(1), 21–29.**



Dr Mahima K holds a Ph.D. in Biotechnology and is currently associated with the Inspire - Manak Division at the National Innovation Foundation - India.

Email: mahimak@nifindia.org

# Assessing Impact, Spread and Shared Learning in Eastern Region

Rahul Prakash, Kiran Rawat

The two-day workshop on "Grassroots Innovations: Assessing Impact, Spread and Shared Learning in Eastern Region," held at the NIF Bhubaneswar Office on 5-6 May 2025, served as an essential forum for evaluating the progress and challenges of six grassroots innovations introduced across 30 implementation sites in 10 districts across Jharkhand (Sahibganj, Khunti, Chaibasa, Dumka), Odisha (Bolangir, Angul, Jharsuguda, Rayagada), and Chhattisgarh (Bijapur, Dantewada) through National Innovation Foundation - India (NIF)/NIF Incubation and Entrepreneurship Council (NIFientreC). The event brought together 30 participants, one from each site, including beneficiaries, innovators, regional nodal officers, and livelihood experts. The workshop's primary objectives were to ensure comprehensive evaluation, community engagement, and lateral learning. These objectives encompassed conducting a comparative technology assessment to analyse the advantages and limitations across different sites, documenting challenges and devising solutions, and evaluating the implementations' economic, social, and environmental impacts. A participatory, multi - stakeholder methodology was employed, featuring technology-specific breakaway sessions, peer-to-peer learning, expert mentoring, individual consultations, collaborative problem - solving, and real - time documentation.

The following six grassroots innovations were introduced at the project sites, namely the Multipurpose Food Processing Machine by Shri Dharambir Kamboj (Haryana), Sal Leaf Plate and Bowl Making Machine by Shri Jogendra Patra (Odisha), Low - Cost Sanitary Napkin Pad Making Machine by Shri Abdul Gaffar Sheikh (Maharashtra), Bamboo Incense Stick Making Machine by Shri Paresh Panchal (Gujarat), Solar Powered Rice Puff Making by Smt. Madhuri Das Adhikari (Odisha), and the Banana Fibre Processing Unit by Shri P. Murugesan (Tamil Nadu). These innovations were implemented at project sites with the support of various partners, including Forest Divisions, Watershed Development Departments, District Skill Development Authorities, ORMAS, KIIT Technology Business Incubator, BIHAN (State Rural Livelihood Mission - SRLM; Chhattisgarh), and JSLPS (Jharkhand State Livelihood Promotion Society).

**'The Multipurpose Food Processing Machine unit showed an average daily income of ₹150–₹200 per person for 3–4 hours'**

The technical sessions commenced after the introductory session, where the objectives of the workshop and expectations were explained to all the participants. The technology - specific breakaway sessions began with a detailed assessment of each innovation. For the Sal Leaf Plate and Bowl Making Machine, current performance showed daily earnings of ₹200-₹250 for 3-4 hours of work, with production costs of ₹0.70 -₹0.80 per unit and a selling price of ₹1-₹2. Critical challenges included seasonal raw material availability, quality variations, electricity billing issues, high user-to-machine ratios, and competition from plastic alternatives.

*Beneficiary Interaction*

The Sanitary Napkin Making Machine demonstrated high performance in some locations, with 1,000-1,100 pads produced daily, yielding a peak daily profit of ₹1,350 at the Dantewada implementation site. The machine facilitated employment for 8 to 29 women per unit at various locations (depending on the machine's variants viz. manual, semi - automatic and fully automatic), successfully competing with commercial brands and ensuring high community acceptance (e.g., 60-65% of women in the Jharsuguda implementation site adopting sanitary pads).

The Multipurpose Food Processing Machine unit showed an a verage daily income of ₹150-₹200 per person for 3-4 hours. It demonstrated diverse applications, from juice processing and Neem essence extraction in Angul to Mahua extract for biscuit production in Sahibganj. The machine is also being used for Khajur jaggery processing in Dumka.

The Solar - Powered Rice Puff Making Machine processes 5 kg of rice in 2 hours, utilising a hybrid solar and wood - fired heating system. Currently, efforts are in process to achieve the machine's optimal output, which is 10 kg per hour.

The Banana Fibre Processing Unit at ORMAS Angul showed promise in

*Expert Interaction*

converting agricultural waste into handicraft materials, textiles, and ropes, with strong market demand. The Solar Powered Rice Puff Making Machine and Banana Fibre Extraction Unit were almost at their break-even points.

Qualitatively, the innovations enhanced technical and entrepreneurial skills, improved economic independence for rural women, enabled sustainable utilisation of local resources and waste, strengthened community networks, and increased awareness of technology adoption.

On the second day, the workshop concentrated on two key mentoring sessions. Prof. Ballav Kar from KIIT University, Bhubaneswar, delivered insights on "Marketing and Product Development on Limited Budget." Emphasising creativity and strategic planning, he noted that failed products spread negative reviews eight times faster than successful ones; thus, efforts towards technology implementation should be carefully considered. Key takeaways included the significance of audience targeting, a service - dominant logic focusing on value delivery, and cost - effective digital channel utilisation (WhatsApp, social media, blogs, video). He stressed the necessity of developing independent brand identities, compelling storytelling, defining a unique selling proposition, and low-cost marketing strategies such as referral programmes and community engagement.

Souravmaya Das, Joint CEO of ORMAS, shared his experiences on "Supply Chain Management in Product Commercialisation," highlighting value chain integration concepts like waste-to-wealth transformation (banana plant waste to handicrafts), direct corporate partnerships, quality infrastructure, and technology integration. He emphasised success factors such as end-to-end integration, community participation, leveraging governmental institutional support, and continuous quality monitoring.

The workshop concluded by consolidating challenges and outlining actionable steps. Impact assessment revealed significant benefits. Over 200 women directly benefited across the six technologies, generating a monthly income of ₹5,000-₹9,000 per person for 3-4 hours of daily work.

Key recommendations also emerged across several areas. Quality control standardisation, local technical support establishment, reliable raw material supply chain partnerships, and comprehensive training programs were emphasised for technology enhancement. In business development, strengthening market linkages, creating strong independent brand identities, implementing robust financial management systems, and leveraging cost-effective digital marketing were crucial. The upscaling strategy focused on replicating high-performing installations, systematically assessing and reviving non - functional units, integrating complementary technologies, and strengthening grassroots participation.

In conclusion, the workshop achieved its objective of comprehensive impact assessment and challenge identification for grassroots innovations in the Eastern Region. The systematic evaluation highlighted both notable successes and areas requiring immediate intervention. The collaborative environment fostered valuable insights for technology improvement and scaling. If implemented systematically, the identified action items can significantly enhance the impact and sustainability of these innovations. The workshop laid a strong foundation for continued collaboration and shared learning among stakeholders, demonstrating the potential of this intervention assessment model for replication in other regions and technology domains, thereby contributing to the broader goal of grassroots innovation promotion and rural development. ■

Mr. Rahul Prakash holds an MBA in Information Technology Management and is currently associated with the Dissemination and Social Diffusion (DSD) Department at the National Innovation Foundation – India.
Email: rahulp@nifindia.org

Dr Kiran Rawat holds a PhD in cancer biology and is currently associated with the Dissemination and Social Diffusion (DSD) Department at the National Innovation Foundation in India.
Email: kiranr@nifindia.org

# Unlocking India's Ingenuity
## - A National Workshop on Scouting and Documentation of Grassroots Innovations

India has long been a cradle of creativity, and thousands of examples from across the country and beyond have shown that people at the grassroots - farmers, artisans, mechanics, and others - have relied on their own ingenuity to solve local problems. In the absence of external aid, they are often compelled to devise their own solutions, many of which have the potential to address similar challenges elsewhere.

Since time immemorial, traditional communities have optimally utilized available bio-resources for medicinal and other purposes. There is an urgent need to properly identify and document such unique herbal practices and innovations. Beyond preserving biodiversity and promoting a culture of creative thinking, such documentation plays a vital role in safeguarding fast - eroding knowledge related to the optimal use of bio-resources and contemporary technological innovations.

Scouting or searching for such knowledge and innovations - the first step towards achieving this goal. It involves discovering and recognizing grassroots innovations and traditional knowledge practices from both rural and urban areas.

To strengthen efforts in scouting and documenting grassroots innovations nationwide, a two-day National Workshop on Scouting & Documentation of Grassroots Innovations and Outstanding Traditional Knowledge was organized at the NIF Headquarters, Grambharti, Gandhinagar, Gujarat, on February, 2025. The workshop saw the participation of around 55 individuals from 23 states, reflecting the broad - based commitment to this important mission.

The workshop was meticulously designed to cover all aspects of scouting and documentation, with intensive training and discussions on both the ethical principles and practical considerations involved in nurturing India's hidden talent. Various scouting methods were discussed, along with new strategies to be adopted in the search for innovators. Special emphasis was laid on the paramount importance of Prior Informed Consent (PIC) to safeguard the rights of innovators.

The documentation forms developed for capturing innovations across various categories were discussed in detail. The importance of collecting plant samples and the process of drying them for herbarium preparation was also addressed and demonstrated. Guidance and suggestions were provided on capturing effective photographs and videos of innovators and their innovations, acknowledging the power of visual documentation in conveying the essence of innovation.

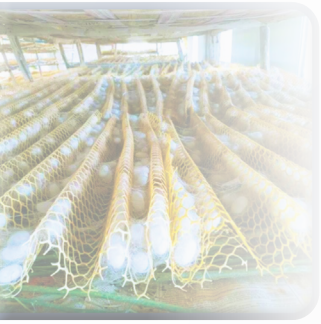
Participants were also introduced to the steps involved in the incubation of innovations and outstanding traditional knowledge identified through their scouting. Discussions included filing patent applications, completing the associated documentation, obtaining approvals from the National Biodiversity Authority (NBA), and understanding its role.

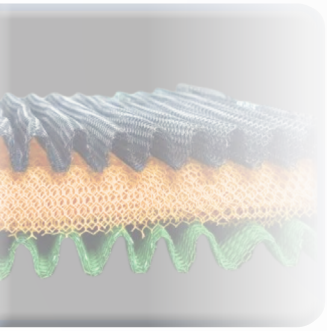
Practical guidance was also offered on the collection and processing of plant samples for scientific validation of herbal practices.

As part of the workshop, participants visited the herbarium and crude drug repository, the Fab-Lab, and an exhibition of noteworthy innovations, gaining valuable insights from these resources.

In the concluding session, an interactive mock documentation exercise was conducted, during which participants enthusiastically roleplayed as innovators and scouts, applying their newly acquired knowledge. This hands-on activity consolidated their learning and prepared them for fieldwork. The enthusiastic feedback and eagerness to translate their understanding into action further reinforced NIF's capacity to uncover countless unsung innovators.

This national workshop marks an important step in NIF's unwavering commitment to fostering a culture of inclusive innovation, ensuring that the ingenuity residing at India's grassroots is not only recognized but also becomes a driving force for major government initiatives such as Atmanirbhar Bharat, Swachh Bharat, and others. ■









**National Innovation Foundation - India ( Headquarters )**
Grambharti, Amrapur, Gandhinagar-Mahudi Road, Gandhinagar, Gujarat, India – 382650
**Regional Office :** Bhubaneswar (Odisha), Guwahati (Assam), Jammu & Kashmir (Srinagar), NOIDA (Uttar Pradesh).
**Phone :** 02764-261131,32,34,35,36,38,39 | **Email :** info.nif@nifindia.org | **Website :** www.nif.org.in