Photo by Alina Paul-Bossuet, ICRISAT

CGIAR SCALING FOR IMPACT

ICRISAT INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

Innovation Name
Promoting dietary diversity through Nutri-Food-Basket and nurturing nutri-sensitive local food-systems

Location (Country/Region)
India

Lead centre
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Contributing Initiative/s/ Bilateral project/s
Improving dietary diversity through the introduction of Nutri - Food basket in tribal households of Telangana State - Transitioning tribal households from nutrient-deficient diets to diverse nutritional foods

Innovation Type
Practice

Current Innovation Readiness Level

Prototype

Current Innovation Use Level

Partners (II)

Scaling Dimensions Achieved
Scaling Out

Challenge Addressed
Institutional Capacity
- Limited institutional capacity or mandate
Access to Finance & Markets
- Limited market access for innovations

Enabling Environment Methods
Stakeholder mapping, baseline and endline surveys,FGDs, day-to-day monitoring, product acceptability and sensory testing with beneficiary groups to refine formulations; a cluster-based, GIS-mapped (Google Maps) approach, reducing confounding and ensuring like-for-like inclusion, and a structured stakeholder Convergence Model for multi-actor coordination

SDG Targets

CGIAR Impact Areas

SUCCESS STORY

Promoting dietary diversity through Nutri-Food-Basket and nurturing nutri-sensitive local food-systems

Malnutrition and anaemia remain major public health challenges in India's tribal regions. To address these issues, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) launched the Nutri-Food Basket (NFB) project in Telangana in 2017, promoting sustainable, food-based nutrition using locally accepted millet- and pulse-based products. Following community consultations, ready-to-cook and ready-to-eat foods were developed and distributed through 157 anganwadi centres to approximately 5,000 children, adolescent girls, pregnant women, and lactating mothers over nine months. The intervention combined supplementary feeding with nutrition, sanitation, and hygiene awareness, resulting in reduced wasting, stunting, and undernutrition, alongside improved haemoglobin levels. Building on these outcomes, the programme expanded through the Giri Poshana initiative, reaching over 29,000 beneficiaries across multiple districts. Women-led enterprises were established to locally produce the food products, strengthening livelihoods and food systems. The programme has evolved into a scalable, nutrition-sensitive value chain model integrating agriculture, nutrition, entrepreneurship, and government support, with potential for adaptation in Africa through South-South cooperation.

The Context and Ambition

Although millets and other nutrient-dense crops are traditionally grown and consumed in tribal regions, several enabling environment barriers constrain the large-scale adoption of millet-based nutrition interventions. First, local millet production has remained limited and inconsistent, resulting in an inadequate and unreliable supply of raw materials for sustained programme


Photo by Alina Paul-Bossuet, ICRISAT

Photo by Harshavardhan Mane, Associate Manager, ICRISAT

"I previously worked on a daily wage, earning INR 150 per day despite hard work. Balancing the costs of my family and my son's education was never easy. As a result of the establishment of this FSSAI licensed food processing facility, I am assured of 25 days of employment at a wage of INR 400 per day."

- **Ms. K Ramamma**, President of "Sri Lakshmi Ganapathi Drymix unit", Bhadrachalam, Telangana

implementation. Second, there is a lack of appropriate processing infrastructure, value-addition technologies, and locally adapted product formulations to transform millets into convenient, acceptable, and affordable food products. Third, the absence of assured procurement mechanisms and the Government of India's Minimum Support Price (MSP) incentives has reduced farmers' motivation to cultivate millets at scale, thereby limiting the development of a robust supply chain. Finally, the low per-child allocation under government nutrition programmes creates cost constraints, making it difficult for nutrient-rich millet-based products to compete with rice, the country's primary staple, which is available at highly subsidized prices through the public distribution system. Together, these challenges have restricted the sustained integration of millet-based foods into institutional feeding programmes and hindered the scaling of nutrition-sensitive food system interventions.

Creating Enabling Environment for Scaling

Several practical solutions and strategies were implemented to address bottlenecks related to millet consumption, availability, and integration into nutrition programmes.

A key challenge was the declining consumption of millets, particularly among younger generations. Traditionally, millets were consumed as *rotis* and *gatka* (a thick porridge), both of which required considerable time and skill to prepare. In particular, millet *rotis* are difficult to make because millets lack gluten, unlike wheat. To overcome this barrier, a range of value-added, energy- and nutrient-dense millet-based products was developed that were acceptable to different age groups and easier to incorporate into daily diets.

Another challenge was that *anganwadi* workers had limited time and capacity to prepare millet-based foods within existing feeding programmes. Traditional millet recipes were therefore standardized and converted into ready-to-cook (RTC) formulations that could be prepared with minimal effort through simple boiling, similar to rice. This reduced cooking time and facilitated their inclusion in supplementary nutrition programmes.

The limited local availability of affordable millet-based products was addressed by establishing local enterprises, creating opportunities for crop diversification, assured market linkages, and improved livelihoods.

Recognizing that these challenges could not be addressed by a single sector, a multi-stakeholder approach involving government departments, research institutions, community organizations, women's groups, farmers, and local entrepreneurs was adopted to create a local ecosystem linking agriculture, nutrition, and entrepreneurship. Capacity-building programmes were conducted for farmers on millet cultivation, for women's groups and MSMEs on processing and entrepreneurship, and for frontline workers on the preparation and use of millet-based products. These efforts strengthened local linkages among agriculture, nutrition, and livelihoods, thereby enhancing the sustainability of the intervention.

Scientific evidence on the nutritional effectiveness, acceptability, and operational feasibility of the model was disseminated through multiple policy and stakeholder platforms. This facilitated wider recognition of the approach, and the model was subsequently adopted by the Government of Odisha, demonstrating its scalability and potential for replication in other regions.

The Intervention and Actions

The intervention adopted a transformative Convergence Model that links agriculture, nutrition, and entrepreneurship to foster sustainable food and nutrition security among tribal communities through the following interventions:

Convergence across government ministries and departments: The model brought together the Ministry of Tribal Affairs, the Ministry of Women and Child Development (Government of India), the Tribal Welfare Department, the Scheduled Tribes Cooperative Finance Corporation Limited (TRICOR), the Integrated Child Development Services (ICDS), the Integrated Tribal Development Agency (ITDA), and the Girijan Cooperative Corporation (GCC) to collaboratively implement nutrition-sensitive interventions.

Development of affordable value-added food technologies: Nutrient-rich food products were developed using locally available crops such as millets and pulses and formulated into convenient ready-to-cook (RTC) products (jowar meal, multigrain meal, and multigrain sweet meal) and ready-to-eat (RTE) products (peanut-sesame brittle bars, locally known as *chikki*, and fried gram–peanut *chikki*), tailored to the taste preferences of local tribal communities.

Promotion of local production capacities: The intervention empowered 80 tribal women and youth to operate FSSAI-licensed food processing units. ICRISAT facilitated the establishment of eight Micro, Small and Medium Enterprise (MSME) units to produce these nutritional products in selected ITDA areas of Telangana.

Capacity building: Tribal women received training in business management, food processing operations, food safety management systems, and Hazard Analysis and Critical Control Points (HACCP), ensuring the sustainability of women-led MSME units.

Strengthening farmer organizations and value chains: Tribal farmers were trained and organized into sustainable Farmer Producer Organizations (FPOs), facilitating their integration into the value chain and strengthening linkages with local women-led MSME units.

Results and Impact

The table below presents a brief summary of the beneficiary population in the pilot and scale-up phases:

The Nutri-Food Basket intervention had a positive impact on nutritional outcomes, reducing stunting and wasting among children and lowering the prevalence of anaemia among both children and women. Although the planned feeding duration was nine months, implementation was not continuous due to interruptions caused by local festivals, public holidays, and social unrest, which constituted a limitation of the study. These interruptions highlighted an important lesson: improving the nutritional status of vulnerable populations through dietary diversification requires sustained, long-term interventions.

Based on this experience, the scale-up programme was extended to a 12-month feeding cycle. Efforts were made to ensure uninterrupted implementation throughout the intervention period, with the exception of a few major festivals. Notably, the distribution of Nutri-Food products continued even during the COVID-19 pandemic, with supplies delivered directly to beneficiaries' homes.

The following outcomes were recorded from the scale-up project (Datta Mazumdar et al., 2024[1]):

Wasting (Weight-for-Height): In the intervention group, the prevalence of severe wasting and wasting decreased by 72.7% and 51.6%, respectively, while the proportion of children with normal nutritional status increased by 22.2%. In contrast, the control group showed increases in severe wasting (25%) and wasting (50%), accompanied by a 10.8% decline in the proportion of children with normal nutritional status.

	Phase-I (Nutri-Food Basket) - pilot	Phase-II (Giri Poshana)	Phase-III (Giri Poshana for PVTGs)
Number of districts	Three (3)	Four (4)	Ten (10)
Number of mandals	3	12	69
Number of Anganwadi centres*	157	414	585
Number of beneficiaries	5,000	13,000	16,468

*Anganwadi centres operate under ICDS scheme, one of the world's largest and most comprehensive early childhood care programs launched by the Government of India in 1975. The primary goal of ICDS is to address the interrelated needs of young children, pregnant and lactating mothers, and adolescent girls in rural and underserved areas by delivering a package of essential services.

Photo by H.Mane, Sr. Officer- Partnership Development, ICRISAT

"My expectations from this unit are high. Within the next five years, we hope to supply our food products to all of the Anganwadis in the state. The training at ICRISAT is helping us achieve sustainable livelihood and income"

- **Ms. Leelavathi,** a women entrepreneur from Kolam tribe

[1]Reference: Saikat, D.M.; Victor, A.-S.; Aravazhi, S.; Priyanka, D.; Anitha, S.; Tamilselvi, N.; Divya Nancy, G.; Harshvardhan, M.; Suchiradipta, B.; Nedumaran, S.; et al. Effectiveness of Millet–Pulse–Groundnut Based Formulations in Improving the Growth of Pre-School Tribal Children in Telangana State, India. Nutrients 2024, 16, 819. https://doi.org/ 10.3390/nu16060819

'Transforming tribal women into entrepreneurs– A new paradigm for inclusive growth.'

Photo by ICRISAT India

Stunting (Height-for-Age): A significant reduction in stunting was observed. The proportion of children with normal growth increased by 73.8% in the intervention group, compared with 29.8% in the control group.

Underweight (Weight-for-Age): A significant reduction in underweight was also observed. The proportion of children with normal weight-for-age increased by 66.5% in the intervention group, compared with 25.5% in the control group.

Haemoglobin (Hb) levels: Mean Hb levels in the intervention group increased from 9.70 ± 0.14 g/dL to 11.08 ± 0.13 g/dL, shifting participants from moderate anaemia to normal Hb status. In the control group, Hb levels increased from 8.36 ± 0.26 g/dL to 10.35 ± 0.24 g/dL, indicating an improvement from moderate to mild anaemia.

In addition, Focus Group Discussions (FGDs) were conducted with anganwadi teachers and mothers of beneficiary children to assess awareness and perceptions of the intervention. The discussions indicated an improved understanding among mothers of the nutritional benefits of millet- and pulse-based foods and their role in supporting child growth and overall health.

Reflection and Learning

Sustained and Uninterrupted Implementation. Nutrition interventions require an uninterrupted feeding period to achieve measurable improvements in nutritional status. Interruptions due to festivals, holidays, or other local events can reduce programme effectiveness, highlighting the need for careful planning to ensure continuity.

Multi-sectoral Partnerships. Engagement of stakeholders across sectors—including government departments, anganwadi workers, community leaders, processors, farmer groups, women's collectives, and local implementation partners—is critical for successful scale-up. Such collaboration improves coordination, strengthens local ownership, and enhances long-term sustainability.

Community Sensitization and Ownership. Continuous community sensitization is essential to raise awareness of the nutritional benefits of the intervention and encourage regular consumption. Greater community understanding and participation can significantly improve acceptance, adherence, and overall programme impact.

Strengthening Local Enterprise Ecosystems. Supporting local enterprises to process and supply nutritious foods can facilitate sustainable scale-up by reducing costs, improving accessibility, and creating local economic opportunities. Access to affordable technologies, technical support, and business development services is crucial for establishing viable enterprises.

The project also demonstrated that enterprise sustainability depends on strong and continuous market linkages. While Joint Liability Groups (JLGs) successfully operated processing units during the project period, production levels declined after project completion because of limited market demand. Developing stable commercial markets and institutional procurement mechanisms is therefore essential to ensure continuous business operations, maximize the utilization of processing units, and sustain local enterprises beyond the project lifecycle.

Adapting to Local Preferences. Interventions are more likely to be adopted at scale when products align with local tastes, food habits, and cultural preferences. Providing a diverse range of products also helps maintain beneficiary interest and encourages long-term consumption.

Affordability for Users

The innovative Nutri-Food products developed under the project were more affordable than comparable products available in the commercial market. The ready-to-cook (RTC) products were priced between INR 85 and 150 per kg, whereas similar commercial products typically retail at prices starting from INR 300 per kg. The ready-to-eat (RTE) products were priced at approximately INR 250 per kg, compared with similar commercial products, which generally cost more than INR 400 per kg. Overall, the locally developed products offered a cost-effective option without compromising nutritional quality.

The implementation cost varies depending on factors such as the geographical area, the number of implementation blocks, the number of beneficiaries, and the scale of the programme.

Financial Sustainability

Economies of scale were realised as the programme expanded across three phases—from 5,000 beneficiaries (Phase I, 2017–18) to 13,098 (Phase II, 2019–20) and 16,468 Particularly Vulnerable Tribal Group (PVTG) beneficiaries (Phase III, 2021–23). Production was consolidated across eight FSSAI-licensed, tribal women-led MSME units using standardised formulations, with a documented cost structure (for example, jowar meal at approximately Rs 85–95/kg, multigrain meal at Rs 103–110/kg, and multigrain sweet meal at Rs 128–130/kg) that included a 15% profit margin for the producing units. Backward integration with tribal Farmer Producer Organizations (FPOs) for raw material supply further stabilised input costs. As a result, the production and supply ecosystem became financially self-sustaining at the MSME level while generating income and employment opportunities for tribal women.

The feeding component itself, however, depended on continued funding from the Department of Tribal Welfare. Long-term sustainability of beneficiary access would have required institutionalising procurement within recurring government nutrition programmes, such as ICDS, rather than relying on project-specific grants.

Although economies of scale were achieved during the project period and the innovation remained sustainable with continued government support, long-term implementation became challenging because of the absence of millet-specific procurement and pricing policies comparable to those for rice, together with fixed per-child, per-day funding allocations under government nutrition programmes. In addition, expanding into commercial markets posed challenges, as rural production units had limited capacity to meet the growing demand from urban consumers.

Temporal & Environmental Sustainability

SAA institutionalized functions via university partnerships, farmer cooperatives, and policy alignment with policy makers, ensuring longevity. Input intensification and processing risked degradation and waste but were mitigated with regenerative practices (e.g., minimum tillage, biochar and Bokashi) and eco-friendly technologies. Trade-offs were acceptable, aligning with climate-smart goals.

Photo by Priyanka Durgalla, Associate Manager, ICRISAT

> ***"Everyday, I serve the Giri Poshana food to my children. It is nutritious and keeps them healthy...the children also find it tasty"***
>
> - **Ms. Sudi Gowthami,** mother of beneficiaries

Inclusivity and Responsible Scaling (GenderUp Framework):

Key functions were institutionalised through a Multi-Stakeholder Convergence Model that embeds implementation within existing government systems, including the Ministry of Tribal Affairs, the Ministry of Women and Child Development, the Department of Tribal Welfare, TRICOR, ICDS/anganwadi centres, ITDAs, and the Girijan Cooperative Corporation, with ICRISAT serving as the knowledge and technical partner. Production capacity has been localised and strengthened by training 80 tribal women and youth to operate eight FSSAI-licensed processing units. Capacity-building programmes covered food processing, food safety management systems, and Hazard Analysis and Critical Control Points (HACCP), while tribal farmers were organised into FPOs linked to these units. Recognition by NITI Aayog as a best practice for the "Inclusion of Millets in ICDS" further reinforces the model's institutional sustainability and potential for replication.

From an environmental perspective, the intervention is based on millets and sorghum—hardy, low-water, climate-resilient crops well suited to the semi-arid tropics—and promotes local sourcing of raw materials. Consequently, the intervention offers important environmental benefits, including lower water and agricultural input requirements than rice- or wheat-based systems, shorter supply chains, and the revival of traditional crop biodiversity. No significant adverse environmental trade-offs were identified during the project.

In addition, participating groups were sensitized to the long-term environmental impacts of unsustainable raw materials and production practices and were encouraged to adopt more environmentally responsible alternatives, even where these involved slightly higher short-term costs. For example, bulk packaging was promoted over individual retail packaging when supplying institutional buyers, thereby reducing packaging waste and improving resource efficiency.

Partners

- Ministry of Tribal Affairs, Government of India
- Tribal Welfare Department, Government of Telangana
- Scheduled Tribes Cooperative Finance Corporation Limited (TRICOR)
- Ministry of Women and Child Development
- Department of Women Development and Child Welfare, Government of Telangana
- Women-led MSME entreprises

For more information, please contact:

- Priyanka Durgalla, ICRISAT, *priyanka.durgalla@icrisat.org*
- Dr. Aravazhi Selvaraj, World Vegetable Center, *aravazhi.selvaraj@worldveg.org*
- Dr. Victor Afari-Sefa, ICRISAT, *Victor.AfariSefa@icrisat.org*

Stage 1 & 2: Exploring User Diversity: The intervention adopted an inclusive approach that addressed social diversity by targeting different tribal groups, particularly PVTGs), while considering life stage, age, and geographic access to ensur equitable programme coverage. Decision-making and implementation actively engaged tribal communities, anganwadi staff, ICDS supervisors, Self-Help Groups, Tribal Joint Liability Groups, women-led MSMEs, and FPOs, fostering strong community ownership and participation.

Stage 3: Anticipating Differentiated Consequences: The intervention identified potential risks related to the exclusion of underserved populations, variations in product acceptability, and increased workload and food safety responsibilities for anganwadi staff and women-led MSMEs. At the same time, it created opportunities to economically empower tribal women and youth, strengthen market linkages for tribal farmers, and promote the consumption of traditional, nutrient-rich millet-based foods.

Stage 4: Mitigating Risks and Embracing Opportunities: To ensure equitable access, the intervention trained Self-Help Groups to deliver feeding services in remote habitations, strengthened coordination through a multi-stakeholder Convergence Model, and established women-led MSMEs and farmer producer organizations to generate local livelihood opportunities. Product formulations were refined based on beneficiary feedback, while baseline, midline, and endline evaluations with matched control groups confirmed that nutritional benefits reached the intended tribal and PVTG beneficiaries.

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