

Diversifying the Food System for Improved Nutrition: Transforming Program to Practice

TECHNICAL ASSISTANCE AND RESEARCH FOR INDIAN NUTRITION AND AGRICULTURE

TATA-CORNELL INSTITUTE FOR AGRICULTURE AND NUTRITION COLLEGE OF AGRICULTURE AND LIFE SCIENCES | CORNELL UNIVERSITY 2019

TARINA CONSORTIUM PARTNERS



BAIF Development Research Foundation
 CARE India
 Cornell University
 Emory University
 Tata-Cornell Institute
 Grameen Development Services
 International Food Policy Research Institute
 Tata Trusts
 Tata Institute of Social Sciences

TABLE OF CONTENTS

		Page No.
1.	MESSAGE FROM THE TCI DIRECTOR	03
2.	TARINA GOALS: ENABLING A NUTRITION-SENSITIVE FOOD SYSTEM THROUGH AGRICULTURE	04
3.	TARINA STRUCTURE: FROM EVIDENCE-BASED INTERVENTION TO ENABLED POLICY PLATFORM	05
4.	TARINA TO DATE: UNFOLDING THE EVIDENCE	07
5.	DIVERSIFYING THE LOCAL FOOD SYSTEM: INTENSIFIED DIVERSIFICATION OF PRODUCTION	09
	5.1 Increased nonstaple crop diversification	09
	 5.2 Promoting Livestock: Strengthening the income pathway for enhanced food system diversity 5.3 Reducing seasonal food deficit and ensuring better availability of diversified food: 	16
	Expanding household access to food diversity by promoting kitchen gardens	21
	 5.3.1 Enriching the body of knowledge: Reducing postharvest loss and enhancing food safety by managing mycotoxins 5.3.2 Enriching the body of knowledge: Longitudinal market assessment of food availability 	25 27
6.	POWERING NUTRITION-SENSITIVE FOOD SYSTEMS BY EMPOWERING WOMEN IN AGRICULTURE	29
7.	IMPROVING POSITIVE NUTRITION BEHAVIOR THOUGH SOCIAL AND BEHAVIORIAL CHANGE COMMUNICATION 7.1 Enriching the body of knowledge: Sweet Nutrition: Promoting the	36
	orange-fleshed sweet potato to address micronutrient deficiencies in Uttar Pradesh	40
8.	INFORMING FOOD POLICY IN INDIA	44
9.	BUILDING CAPACITY OF LEADERSHIP IN NUTRITION AND AGRICULTURE	49
10.	SCALING UP SUCCESS	50

ACRONYMS AND DEFINITIONS

AI Artificial Insemination

BCC Behavior Change Communication

BMGF Bill & Melinda Gates Foundation

BUG Buck User Group

CHC Custom Hiring Center

FFS Farmer Field School

FPC Farmer–Producer Company

FPO Farmer–Producer Prganization

GDS Grameen Development Services

GOI Government of India

IFPRI International Food Policy Research Institute

M&E Monitoring and Evaluation

NGTK Nutrition Gender Toolkit

NHRDF National Horticulture Research and Development Foundation

PHLM Postharvest Loss Management

PoP Package of Practices

PPR Peste des Petits Ruminants

SBCC Social and Behavioral Change Communication

TARINA Technical Assistance and Research for Indian Nutrition and Agriculture

TCI Tata–Cornell Institute for Agriculture and Nutrition

TISS Tata Institute of Social Sciences

WASH Water, Sanitation, and Hygiene

WUG Water User Group

Kharif Season Manson cropping season during June to September

Cucurbit A plant of the gourd family (Cucurbitaceae), which includes melon, pumpkin, squash, and cucumber

Poshan Abhiyan Government of India's Multisectoral Mission to Fight Malnutrition

Poshan Mela An agriculture mass event, during which street plays are performed, with themes of kitchen gardens and cultivation of pulses, nutritious fruits, and vegetables

Wadi A Hindi word that means small orchard, which is actually a tree-based farming system that consists of fruit trees suitable to the area or a combination of trees

Zaid Season Summer cropping season during March to June

02

Message From the Director of the Tata-Cornell Institute for Agriculture and Nutrition

For the last four years, the Technical Assistance and Research for Indian Nutrition and Agriculture (TARINA) program has worked to diversify local food systems to best tackle the complex malnutrition problems in India. I am happy to report that, through this pilot intervention, TARINA has demonstrated positive changes in people's lives, impacting 119,000 individuals in 23,000 households, across 162 villages in four districts of three critical states of India: Bihar, Odisha, and Uttar Pradesh.

TARINA has not only successfully reached more households than the number targeted, and done so before the estimated time projection, but the intervention strategies have resulted in a shifting of the measures around food systems, including: (1) a more than doubling of the diversification of crop production; (2) an almost fourfold increase in the practice of cultivating kitchen gardens to reduce seasonal deficits in diversified food at the household level, thereby translating into a more than threefold increase in the consumption of vegetables and other homestead produce; (3) a 20 percent increase in the addition of new households that practice livestock rearing for an improved income pathway and better accessibility to animal-sourced food, leading in turn to a 28 percent rise in the consumption of animal-sourced food at the household level; (4) an almost doubling of the collectivization of women farmers through self-help groups at the village level to facilitate more gender empowerment in agriculture, and thus, contribute to a significant increase in women's involvement in the decision-making process around agriculture; (5) an almost twofold increase in market access, not only critical for improved access to diversified foods, but also key to strengthening farmers' income, by more than doubling farmers' income from agricultural products; and (6) a demonstrated success in bringing improved positive nutrition behavior at individual, household, and community levels by TARINA's social and behavioral change communication (SBCC) interventions, which have brought about more equal access to intrahousehold resources and increased consumption of more diversified food at individual and household levels.

TARINA's Centre of Excellence (CoE) is also creating critical evidence that unfolds more nuanced questions around the strengthening of food systems. The Tata–Cornell Institute (TCI)–TARINA–CoE and TARINA's consortium partners have completed or are currently engaged in eight different research studies, including agri-market dynamics on farmers; the feasibility of diversifying the public distribution system; intensification of goat production through a sustainable feeding system; promotion of orange-fleshed sweet potatoes to address micronutrient deficiency; improved sanitation through community mobilization; postharvest loss management by addressing mycotoxin contamination; and measurement of empowerment among women farmers of livestock. TARINA–CoE has also translated the evidence into more than 20 policy-informing research products and engaged policymakers and key stakeholders at more than 12 policy-relevant events in India.

I am also pleased to share that in Year 5, TARINA will be working closely with national and state governments for a vertical scale-up of its pilot intervention models. TARINA has been engaged to integrate select TARINA best practices into existing government initiatives and offer technical assistance in implementing the models on the ground. I am excited by the thought that TARINA, with the evidence of its positive impacts on the ground and experienced technical expertise, will make high-value contributions in India's fight against malnutrition.

Prabhu Pingali

TARINA's Goals: **Enabling a Nutrition-Sensitive Food System Through Agriculture**

Founded in December 2015, Technical Assistance and Research for Indian Nutrition and Agriculture (TARINA) is a consortium, which connects policyfocused research partners with community-level, impact-focused implementation partners, to address the complex problem of malnutrition in India. Led by the Tata-Cornell Institute for Agriculture and Nutrition (TCI), TARINA merges the evidence-generating capabilities of Cornell University, Emory University, the International Food Policy Research Institute (IFPRI), and Tata Institute of Social Sciences (TISS) with the technical capabilities of leading nongovernmental organizations (NGOs) and development partners: BAIF Development Research Foundation, CARE India Solutions for Sustainable Development, Grameen Development Services (GDS), and Tata

Trusts. Collectively, the Consortium aims to promote a more diversified food system that enhances the availability and affordability of nutrient-rich foods for India's rural population and creates a sustainable platform to mitigate malnutrition. The program is largely centered on agricultural pathways to improving nutrition outcomes using a food systems approach. Three main objectives of the program are: (1) making agriculture interventions nutrition sensitive; (2) informing policies through the generation of evidence for better availability and accessibility of diversified foods; and (3) building leadership in food and agriculture by improving the capacity to underwrite the program's goal of creating a more nutrition-sensitive food system in India (Figure 1).



TARINA's Structure: From Evidence-Based Intervention to Enabled Policy Platform

Objective 1 of the TARINA program (Figure 1) focuses on field-based implementation—specifically, on redesigning agricultural projects to ensure positive nutritional outcomes at scale. This objective is achieved through the integration of nutrition-focused objectives, actions, and metrics into agricultural projects implemented by NGOs and development partners in three Indian states—Bihar, Odisha, and Uttar Pradesh (Figure 2).

Objectives 2 and 3 are more research- and policyoriented. Both of these objectives focus on evidence generation, advocacy, and capacity building for the design and implementation of nutrition-sensitive agricultural programs and policies. TARINA draws upon its ground-level interventions through its implementing partners (BAIF, CARE, and GDS) at various locations, and from evidence based on research done by TCI scholars and TARINA research partners (IFPRI and Emory University), as well as micro-level studies undertaken by implementing partners. TARINA continues to strengthen its knowledge base for making the rural food system more nutrition sensitive in the intervention districts. TARINA utilizes the collective evidence to influence policy through various advocacy platforms: by disseminating innovative research products through peer-reviewed publications, policy briefs, and manuals; and through engaging in discourses, such as roundtables, workshops, and consultations with impact makers. The Center of Excellence (COE), within TARINA, leads and supports the generation of the evidence, the translation of the findings into the high-value research products, and the utilization of the research products for building capacity and influencing policy around the food system and for nutrition in India.



Figure 2: TARINA's intervention locations and implementing partners

TARINA's structure enables a connection between evidence generation, intervention, and policy advocacy (Figure 3). The field-level programs are continuously informed by TARINA's program monitoring, field learning, and thematic evaluation system. The robust qualitative and quantitative program monitoring through Quarterly Progress

Reports (QPRs) from TARINA partners and the realtime Management Information System (MIS), coupled with strategic evidence-generating activities, such as the baseline and other surveys, process documentation (PDs), and thematic research studies by TARINA partners and scholars, all inform and guide the intervention to assure its effectiveness.



Figure 3 : TARINA's intervention-evidence-advocacy loop

TARINA to Date: Unfolding the Evidence

During the last four years, TARINA has sought to create a model of best practices for an improved food system that is more diversified and nutritionsensitive. While piloting the program, TARINA has created evidence of success and also gathered knowledge. The current report represents TARINA's model of increasing diversification of agricultural production, improving the availability and accessibility of diversified foods, enhancing better accessibility of diversified foods, enhancing better consumption patterns, and promoting positive nutrition behavior at individual and community levels for sustainable change. The data used in the report are derived from various sources, including TARINA's program monitoring, interviews with program implementers, narrative data of success stories, and two rounds of surveys that followed 1,642 households from 2016 to 2019.



Figure 4: Multiple sources of data gives a better triangulated evidence



Diversifying the Local Food System: Intensified Diversification of Production

Increased nonstaple crop diversification

Adequate availability and accessibility of micronutrient-rich foods, together with calories from staples, is the pathway for strengthening the diversified food system. TARINA is engaged with local communities to diversify local crop production by adding pulses, vegetables, and oilseeds to staple grain cultivation in the intervention villages in Bihar, Odisha, and Uttar Pradesh.

During the last four years, the TARINA program has intensified the promotion of the cultivation of nonstaples by facilitating **timely seed supply**, **strengthening market linkages**, **enhancing capacity with training on recommended packages of practices (POPs)** for farmers, and **addressing local constraints** that affect diversification of agriculture. The four-year intensive effort on the ground has translated the program inputs into positive change in agriculture production toward a diversified agriculture. In the past four years, of the total of **24,173** households, TARINA has empowered **15,315** households, covering **5,325** acres, to practice diversified agriculture in intervention villages in the Munger district of Bihar, Kalahandi and Kandhamal districts of Odisha, and the Maharajganj district of Uttar Pradesh (Figure 5). This result exceeded what was targeted for achievement in four years.

The survey data from the 1,642 households of the survey panel, from 2016 to 2019, **show a more than doubling in the number of households growing nonstaples,** including pulses, vegetables, and oil seeds, among those practicing agriculture at the time of the survey (Figure 6). In 2016, every fifth household in the TARINA intervention villages, who were practicing agriculture, were growing nonstaples; the survey data in 2019 shows **more than every 2nd household** in the TARINA intervention villages, who practiced agriculture, were growing nonstaples.



Figure 5: TARINA achieved the program target of supporting households for crop diversification



Figure 6 : Increased production of nonstaples is the key to diversifying crop production

In the Munger district of Bihar, the villages demonstrated a **156 percent increase** in crop diversification, whereas in the Maharajganj district of Uttar Pradesh and in the Kalahandi and Kandhamal districts of Odisha, there were **68 percent and 150 percent increases** in adding nonstaples to the cropping pattern, respectively.

The integrated approach of technical inputs, capacity building, and contextual constraint reduction interventions created a strengthened pathway for increasing adoption of nonstaples in the intervention districts. The critical technical inputs and capacity building are umbrella inputs, whereas the interventions to reduce contextual constraints are designed to address the local agroclimatic challenges

The voices of change:

"We could feel the difference in people's interest in trying new crops than the rice... a greater number of farmers are reaching out to us and asking for input supports..."
– Senior program implementer, Bihar

"It is not that we have never thought about growing other crops... we tried in the past a few times, but we did not get success... the trainings, the support we received helped us..." *—Farmer field school member, Odisha* The household-level critical inputs, like seed provision, insecticide, pesticide, and fertilizer support, were combined with the package of practices (POPs), such as land preparation, sowing techniques, seed treatment, and integrated pest management, which were provided through community platforms, like self-help groups (SHGs) and farmer groups.

The POPs are designed to build the capacity of the farmers on comprehensive components of cultivating pulses, vegetables, and oil seeds. The community-level trainings and workshops are one of the key components of the intervention model.

Apart from the umbrella interventions, TARINA also addressed the local constraints that were challenging the intensification of the nontraditional, nonstaple cropping pattern. These context-specific interventions range from irrigation constraints in Bihar, small land management in Uttar Pradesh, and piggybacking on the cash crop cultivation in Odisha, as examples.

In Bihar, to address water constraints and reduce the fallow season, TARINA engaged the community in the creation of women's collectives, such as the water user (WUG) group in Munger, supporting the WUG in the construction of water structures, such as bore wells, shallow wells, and pumps. The WUGs consist of 10–12 members who promote collective use of water structures. The water structures were constructed with a community participation approach to ensure that ownership belongs to the local community.

Group members provided unskilled labor for the construction work, and TARINA supported their efforts with skilled labor and materials. The group not only collectively controls and shares the water structures, but allows other farmers to use water for a fee. The WUG-led intervention to minimize the seasonal water scarcity not only demonstrated the intensification of diversified agriculture, but the model also collectivized and empowered the community platform. In the Munger district, TARINA has helped with the construction of **69 such water structures in the last four years**.



The additional irrigation support system has helped **500 households to cultivate green gram in the Zaid season on 125 acres**. This was not possible in Munger before the water structures came into operation in 2017.

In Odisha, TARINA developed a strategy to create a synergy between the existing preferred cash crop cultivation and promotion of nonstaple crops, through a model of intercropping.

Cotton is one of the long preferred crops in the intervention districts of Odisha. TARINA developed an innovative idea of cultivating pulses along with the cotton.

The coexistence of both the crops is easy to manage, as the cotton allows space for the pulses to grow in between, and the pesticide used for one crop can be useful to others. Both the crops have long harvesting periods.

In the last four years, TARINA has enabled 378 farmers to grow red gram alongside cotton over 412 acres of land. In the intervention district of Uttar Pradesh, to address low per capita landholdings, TARINA introduced trellis-based cultivation for adding vegetables into the existing cropping pattern in 2016.

Popularly known as *Machan* cultivation, the piloting of the intervention gained success within a short period of time.

Within two years of introduction of the trellis-based cultivation, 60 percent of the farmers in the intervention villages adopted this method. Within the past four years, **851 households** adopted the land optimization method to add cucurbita and other vegetables, along with pulses.

In Uttar Pradesh, TARINA's attempt to promote oilseeds such as groundnut in the fallow seasons, gained success in intensifying the oilseed cultivation in the intervention districts. Though groundnut is not alien to the intervention district in Uttar Pradesh. Traditionally groundnut was always a *Kharif* crop.

TARINA's intervention of introducing a better variety of groundnut seeds, trainings on improved cultivation practices, and motivation of farmers through their peers, known as *"Krishi Sakhi"*, to cultivate the groundnuts in the *Zaid* season, has been successful in diversifying the cropping patterns and increasing the income of local farmers.



Face of Change: Water Availability Built the Pathway from Poverty to Prosperity For Mamata Devi

Mamata Devi, a mother of four children and a family size of six, is the primary earner for her family. She was depending only on the monsoon-driven Kharif maize cultivation from her small patch of land, which once fetched her no more was struggling to add income to the locality. Mamata Devi learned about the TARINA program when she met one of the TARINA peer leaders from the same part of the Gangotri WUG, a collective that brought together 10 women, with farmlands close to one another, who were also dependent on monsoon-driven agriculture. With the input support of TARINA, the group constructed a shallow well capable of irrigating the farmlands of the members. With the irrigation support and the trainings on better cropping patterns, Mamata is now growing multiple crops throughout the agricultural seasons. Within a period of two years, Mamata's income has stopped buying most of the family's food from the market by growing her own, but she is now a popular supplier of vegetables, onions, potatoes, pulses, and rice to the local market. Her husband is now busy helping her with the growing production. "I paid the debt, which was long due to one of my relatives ... within these two years..." she said with pride. She is planning to expand her agriculture production by renting adjacent farmlands and intensifying her cultivation. Mamata is just one example of successful members of Gangotri WUGs, who have similarly happy stories



Promoting Livestock:

Strengthening the Income Pathway for Enhanced Food System Diversity

Promoting livestock—including poultry, dairy production, and small ruminants like goats—is another strategy of TARINA for promoting a more diversified food system through a strengthened income pathway. Interventions for improved health services and advanced livestock management through a community-owned platform have been the key activities of TARINA's livestock promotion program.

Table 1: TARINA's target to enable villages to intensify livestock

Intervention states	Targeted	Achieved
BIHAR	40	39
ODISHA	42	60
UTTAR PRADESH	50	49
ALL LOCATIONS	132	148

TARINA had targeted 132 villages in the four districts within the states of of Bihar, Odisha, and Uttar Pradesh for promoting livestock over the last four years. By the end of Year 4, TARINA was engaged in **148 villages** to promote poultry, goat rearing, and dairy production, exceeding the program's target.

While following the 1,642 households over a period of three years, the survey data demonstrate the increased livestock production (Figure 7), including goat rearing, poultry, and dairy production in the intervention villages. Overall, there is a **20 percent increase** in the households adapting to the rearing of poultry or goats or to dairy production across four districts of the three intervention states. The intervention district of **Bihar experienced a 22 percent increase** in rearing livestock. In **Odisha**, **livestock rearing increased 27 percent**, and in **Uttar Pradesh**, the increase in the households rearing livestock was **around 9 percent**.

Figure 7: Increased livestock rearing at the household level can improve diet diversity and strengthen income



The evidence from the survey data further reveals the increased availability of animal-sourced food at the household level. There has been a **28 percent increase in availability of either milk, eggs, or meat at the household level** over the period of three years.

The intensification of the promotion of livestock in the intervention districts of Bihar, Odisha, and Uttar Pradesh is visible through the increased consumption of animal-sourced food at the household level (Figure 8).

The survey data show that the household-level consumption of milk, eggs, or meat has increased from 20 percent in 2016 to 31 percent in 2019, across intervention districts of the three states. In Bihar, there is a 15 percent increase in the consumption of animal-sourced food at the household level; in Odisha, the increase is more than 100 percent.

Though Uttar Pradesh has demonstrated an increase in the rearing of livestock, the consumption patterns show a marginal decline. The sociocultural and political landscape of food could be a possible explanation for this disparity.

Along with improving the diversified diet at the household level, **strengthening the income pathway for better nutrition** is also one of the major goals of TARINA's intervention to promote livestock.



Figure 8: Increased household consumption of animal-sourced food indicates improved diet diversity and strengthened purchasing power



The survey suggests an increased income from livestock sources at the household level over the period of time of the intervention. **The average income from livestock at the household level has increased from INR665 to INR1,126** over the last three months, prior to the survey, across the intervention districts of Bihar, Odisha, and Uttar Pradesh. **In the intervention district of Bihar, the average income from livestock increased from INR1,171 to INR2,025; in Odisha, the increase was from INR434 to INR560, and in Uttar Pradesh, the average income increased form INR632 to INR1,391.**

The integrated approach of input support and building the capacity of advanced livestock management has directed the program effort toward bringing change in availability and consumption of more diversified food at the household level, along with the increased income from livestock rearing. Trainings and linkages with animal health care for vaccination and deworming, empowerment of the community for market interface, and transmission of livestock-specific technical knowledge are some of the key components of advanced livestock management.

Apart from the umbrella interventions, TARINA has also intensified livestock rearing by identifying the cultural compatibilities and potential of TARINA's implementing partners to design innovative interventions accordingly. In Bihar, the technology enabled innovation of breed improvement by artificial insemination.

The community platform-driven back yard poultry, in Odisha, and dairy promotion with improved fodder, in Uttar Pradesh, are some of the novel approaches that have enriched TARINA's livestock promotions.

Figure 9: Increased income from livestock can lead to a strengthened pathway for better nutrition



18

Face of Change: Livestock Rearing Not Only Empowers Rural Women Economically but Also Collectivizes the Community

Khopwar is a village with an underserved community; it is one of the most remote villages in the Munger district of Bihar. Economic access for the women in the community was very limited until TARINA worked with the community and motivated 16 women to come together to adopt the TARINA-supported goat rearing. The group named themselves "SONA," which translates to "gold" in English. With program support, like breed improvements, health care trainings, advanced methods of goat rearing, and market awareness, the collective of women in the village was able to rear 70 bucks. The group has generated a revenue of INR59,200 by selling 15 bucks and investing the profit to procure more bucks. Meena Devi, the leading member of the SONA buck user group (BUG), recalls her days when the women from the community were dependent on men for their basic needs. She proudly tells how the shared profit has empowered her, and how she is a part of the economic contribution to the household.

In Odisha, the "Mahima" SHG in the Dakedi village of the Kandhamal district is very excited about their new chick-rearing unit and is busy planning and meeting with different support platforms on how to move forward to intensify their endeavor. In less than a year, the 10-member SHG from the community of a tribaldominated region of the G. Udayagiri block in Odisha was lacking motivation for staying together and thinking collectively. Namita Nayak, one of the oldest members of the "Mahima" SHG, recalled how TARINA helped the group, not only in enabling the group members to have access to income, but in giving them a reason for strengthening the collectivity. Namita says, "I heard about the poultry business opportunity in a farmer field school session organized by CARE under the TARINA project... that excited me and my fellow members... TARINA program staff trained us on how to manage a chick-rearing unit, including connecting us with the block-level veterinary services for the health care of the poultry farm... the team worked with us from scratch... It gave us a reason to be more connected between the members... and finally, our dream came true.... We have a growing chick-rearing unit... and we have started selling our first batch of products at a good rate..." She added, with a wide smile, "We are not only adding income to our household resources but the chick-rearing unit gives us enough reason to spend more time with each other."



Reducing Seasonal Food Deficit and Ensuring Better Availability of Diversified Food

Expanding household access to food diversity by promoting kitchen gardens

TARINA has invested in expanding homestead horticulture to ensure the increased availability and accessibility to diverse foods across seasons at the household level.

TARINA's innovative model of promoting kitchen gardens is part of a complete package starting with the encouragement of households to include kitchen gardens in their food production system, and then, enabling the community with technical knowledge and input support to ensure the increased awareness for improved consumption patterns. Input supports, like seed supply and trainings on a critical PoP, which includes land preparation, method demonstrations, pest management, and awareness campaigns on the importance of vegetables and fruits in daily diet are some of the key components of TARINA's intervention to promote smart kitchen gardens. TARINA had targeted 8,840 households to work within the four intervention districts of Bihar, Odisha, and Uttar Pradesh to promote kitchen gardens during the intervention period.

By the end of 2019, TARINA had interacted with **11,890 households** in TARINA intervention villages to motivate and provide support for kitchen gardens. The kitchen garden has been one of the most encouraging interventions within TARINA.

The survey data suggest there is a significant increase in adopting and adhering to the TARINAdriven smart kitchen gardens in the intervention villages between 2016 and 2019 (Figure 11).

When TARINA was initiated, a little more than one in 10 households had kitchen gardens. By the end of the four-year TARINA intervention, more than one in three households in the intervention villages had functional, smart kitchen gardens.



Figure 10: TARINA covered more households than targeted in promotion of kitchen gardens



Figure 11: TARINA's effort to promote homestead crops resulted in increased numbers of households practicing kitchen gardens (N = 1,642)

TARINA's comprehensive intervention for promotion of kitchen gardens has not enabled more households to adopt and practice the cultivation of smart kitchen gardens, but the effort of increasing productivity also brought significant successes. The two rounds of survey data suggest a significant increase in the average production from the TARINA-driven smart kitchen gardens between the years 2016 and 2019 (Figure 12). Across the intervention districts, the average production from kitchen gardens at the household level increased more than a 220 percent increase in last three months prior to the surveys.



Figure 12: Increased practice of kitchen gardens also intensified by enhanced production (N = 1,642)

In the intervention district of Bihar, an average household reported an increase of kitchen garden production from 8 kg in 2016 to 29 kg in 2019, which translates to a more than 250 percent increase; in Odisha, the intervention districts demonstrated a more than 210 percent increase in the average production from kitchen gardens. In Uttar Pradesh, although there is a 150 percent increase in the kitchen garden production, the absolute kg are still below the program expectations.

One of the major goals of TARINA's better food system, as envisioned, is to improve the consumption of more diversified foods through the increased availability and accessibility of micronutrient-enriched food. TARINA's comprehensive PoP for the kitchen garden intervention has increased not only the adoption of kitchen gardens and production, but it also ensures that better consumption patterns will also result. The survey data suggest a significant increase in consumption of products from kitchen gardens during the last three months prior to the survey, between 2016 and 2019 (Figure 13).

There is a more than threefold increase in consumption of the products from kitchen gardens at the household level across the four intervention districts in the three states. In the intervention district of Bihar, the household consumption from kitchen gardens increased more than threefold. The survey data suggests almost fourfold and twofold increases in household consumption from kitchen gardens in the intervention districts of Odisha and Uttar Pradesh, respectively.



Figure 13: TARINA promoted intensified practices of homestead food production but the production also led to increased consumption of produce from kitchen gardens (N = 1,642)

Face of Change: Well Strategized Input Support Can Bring Big Changes

Jayamanti from the Boraguda village of the Kalahandi district of Odisha has a motivating story to share. She and her husband once grew monsoon-dependent paddy on their small area of land. She had long accepted the marginal income from the production of rice from their small patch of land as the optimal income that she and her husband could generate for a family of five. It was July 2017, when Jayamanti learned about the TARINA's farmer field school (FFS) to collectivize women farmers and empower them with better agricultural practices. She was excited about the possibilities from agriculture. She became an active member of the TARINA FFS. "I came to know about the possibilities of growing different crops in the other seasons of the year and how it can be profitable... I came to know about the better variety of seeds... better way of land preparation... correct use of fertilizers and pesticides. And I learned about who to go for any support in agriculture." TARINA assisted Jayamanti and a few more farmers to overcome the major constraint of irrigation by providing support for a gravity-based drip irrigation system with a solar nano pump. Gravity-based drip irrigation through a solar nano pump is TARINA's low-cost, sustainable, energy-based intervention in the highlands of Kandhamal and Kalahandi of Odisha, where irrigation is a challenge. The intervention support transformed Jayamanti's agricultural practice. She is now growing more than seven types of vegetables and tubers in her field, across all the cropping seasons. When she was asked about her journey in late 2019, she shared how the TARINA kitchen garden intervention has not only increased accessibility to diversified food in her household but also increased her income. "I have saved INR10,000 in the last Rabi seasons and INR20,000 in the Kharif seasons by selling the vegetables from the field.... I am now thinking of putting my child in the school... to get a better education," tells Jayamanti with a big smile. "The story of Jayamanti is one of many examples of how the kitchen garden has brought changes in the lives of local farmers," emphasizes a village-level program implementer of TARINA.

Enriching the Body of Knowledge: Reducing Postharvest Loss and Enhancing Food Safety by Managing Mycotoxins

Fungal toxins, or mycotoxins, are not only associated with postharvest loss that reduces productivity and profitability of smallholder agriculture, but the exposure to mycotoxins in the diet can lead to cancers, immune deficits, and growth impairment in vulnerable populations. Mycotoxins, such as aflatoxin and fumonisin, are abundant in Indian food systems, but rural, resource-poor communities in the region are rarely equipped with the tools and capacities required to adequately assess food safety. Spearheaded by TCI scholar Anthony Wenndt, TCI is working to address mycotoxin management in Unnao, Uttar Pradesh, by exploring the potential for participatory research for monitoring and mitigating mycotoxin exposures in communities underserved by formal regulatory infrastructure.

Since 2017, TCI has engaged 10 at-risk village communities in designing, testing, and evaluating preharvest and postharvest mycotoxin intervention strategies. A comprehensive, yearlong longitudinal survey of mycotoxin contamination in 184 participating farmers' grain stores was conducted, testing paddy (rice), wheat, pearl millet, groundnut, and maize for several major mycotoxins.

Participatory research, a co-learning approach that engages communities in designing and conducting investigations on their own terms, was used to guide target communities in diagnosing sources of exposure in the food system and identifying locally accessible intervention opportunities. Survey results indicate that there is substantial mycotoxin contamination in local food systems. Among the commodities commonly stored in the study sites, 44–75 percent of samples had detectable aflatoxin, with mean levels in maize and groundnut far exceeding the Indian legal limit of 15 parts per billion.

For fumonisin—a toxin associated with esophageal cancer and other ailments—84 percent and 91 percent of maize and pearl millet samples, respectively, were contaminated, with means for both commodities exceeding the regulatory limit of 2 parts per million. In conjunction with the longitudinal survey, the participatory diagnostic process in village communities identified storage improvement as a top priority for food safety intervention.





Wenndt conducted a trial of hermetic storage bags, which protect grain from pest infestation and microbial contamination. After 5–7 months of storage, 91 percent of households reported that the technology effectively prevented infestation and grain spoilage.

After the first season, all participating households reported that they would continue using hermetic storage in subsequent seasons, with 90 percent selfreporting that they were "very confident" of their understanding of the technology's principles. Drawing upon the evidence of the postharvest storage technique for minimizing mycotoxinassociated food loss, TARINA has promoted hermetic bags for agricultural product storage across the intervention districts of Bihar, Odisha, and Uttar Pradesh. With input support for procurement of hermetic bags, there is increasing awareness toward shifting the storage practices from traditional methods to modern methods, as has been implemented, covering **more than 2,000 farmers** across the locations.





Powering Nutrition-Sensitive Food System by Empowering Women in Agriculture

TARINA's food system approach is based on the strong belief that a sustainable mitigation of malnutrition can be effectively achieved through engaging and empowering women in agriculture. Though women contribute a major share of agricultural labor force, they are largely missing from accessing the resources.

TARINA worked toward breaking this cycle and empowering women in agriculture. TARINA also envisioned how empowering women at the household level could ensure better nutrition security, in a cultural landscape in which food within the family is largely a gendered domain. The intervention programs within TARINA were delivered through the engendered community collective platforms. The collectivization of women not only empowers women's networks but ensures an effective transfer of the program effort to desired outcomes. TARINA targeted the creation and strengthening of 450 community-based platforms, such as SHGs in the intervention districts across Bihar, Odisha, and Uttar Pradesh. By the end of 2019, TARINA has created or strengthened 448 SHGs across the intervention districts (Figure 15). However, TARINA has also tried to collectivize women, based on the common need and local context, such as in 40 WUGs and 11 BUGs.

The survey data between 2016 and 2019 show there is almost a twofold increase in strengthened collectivization by formation of SHGs across the intervention districts (Figure 16). In Bihar, there is a 33 percent increase in the membership in SHGs, whereas in Odisha there is a 140 percent increase in SHG membership. In Uttar Pradesh, the membership in SHGs increased from 6 percent to 21 percent within the three years of intervention.



Figure 15: TARINA achieved the target of motivating and empowering women long before the deadline



Figure 16: Increased membership in self-help groups indicates more collectivization of rural women in agriculture

The Voice of Change

The community-level campaigning by TARINA program implementers and a peer-led, door-to-door outreach to individuals for generating awareness about collectivization, identifying common constraints in agricultural production, and motivating the community for an organic development of collectivization made an impact in bringing more women to SHGs and other collectives. "Initially, it was difficult to convince and motivate people to come together and form a self-help group, which can be functional ... women in the community generally have time constraints ... there is a caste ... other social group factors can also play a critical role ... but with time it became easier.... when a common challenge is felt by the community or they see other successful examples, there was spontaneous motivation to come together and find a solution collectively," said a senior program implementer in Bihar.

Creating a cadre of agents of change and diffusing the knowledge to the community through already trained peer leaders is one of the objectives of empowering SHGs. TARINA not only promoted women in agriculture by empowering collectivization, it also enabled the SHGs to reach out and train the community on different aspects of women's empowerment.

The panel data suggest the TARINA-led SHGs trained three times as many women in the community as the number of women trained before the intervention. In Odisha, there was a 300 percent increase in TARINA-led SHGs training of women of the community (Figure 17).

Similarly, in Bihar and Uttar Pradesh, the SHGs demonstrated significant increases in the training of women in the community over the time period of the interventions.



Figure 17: TARINA encouraged the groups of women to change, further empowering the community

Promoting women's participation in agriculture, training, and empowerment for better agricultural practices; supporting women with required inputs to help them in agriculture; and enabling the community to accept and support the enhanced empowerment of women in agriculture were some of the TARINA's strategic interventions to make a better space for women in agriculture and allied economic activities.

Women's participation in the critical decisionmaking processes is one of the key indicators on which to measure the increased space for women. The evidence from the two rounds of survey data across the intervention districts suggests a change in women's participation in the decision-making process over a period of time. More women now have a say in the decisions related to sale of crops in market, in decisions regarding buying or selling livestock, and in decisions regarding buying or selling kitchen garden products. It is clear that the women who are members of the SHGs participate more in the decision-making processes than do nonmembers. The figures between two time points among the nonmembers also reveals that there is a significant increase of women's decision making power at the community level in the TARINA intervention villages over a period of time (Figure 18).

Strengthening market linkages for women producers is not only a vital pathway for increasing the income of the women, but it is also critical to achieving a more nutrition-sensitive food system. It encourages better availability and accessibility of more diversified food at the community level. Traditionally, women from underserved rural communities of intervention locations were less empowered and lacked an adequate access to the market.

31



Figure 18: TARINA engendered the decision-making at the household level

TARINA, through its intervention components, like the formation of local producers' groups, empowerment of women's collectives through different training programs on market interface and price information, and facilitation of buyer-seller meetings, has attempted to enable a strengthened market linkage in the intervention districts of Bihar, Odisha, and Uttar Pradesh. The evidence from the two rounds of surveys demonstrates an increase in market access for different agriculture and allied products in the intervention districts.

There is an almost twofold increase in better access to markets, either for crops, products from kitchen gardens, or livestock, across all locations (Figure 18).



Figure 19: Strengthened market access is a key for empowering women in agriculture



Figure 20: Doubling the income of women in agriculture can boost women's empowerment

TARINA has tried to increase the income for the women in agriculture, not only by enabling farmers with a better production system, but also connecting the last miles of improved market linkages. The survey data from 2016 and 2019 show an increasing trend of average income from agricultural and allied products at the farmer's level (Figure 20).

Across locations, the income from the production of agriculture, livestock, and dairy products has doubled over the period of the intervention. This is a significant success of TARINA's program, which aligns with the Government of India's goal of doubling farmers' income.¹

¹ The Indian Government has set a policy level target to achieve doubling the farmers in the country by the year of 2022. More on the goals and strategies for doubling farmers can be read at NITI Policy Paper No. 1/17 and be accessed at: https://niti.gov.in/writereaddata/files/document_publication/DOUBLING%20FARMERS%20INCOME.pdf

Enriching the Body of Knowledge: Longitudinal Assessment of Market Availability

Diversified food consumption is important for improving the nutritional status of the population in all age groups. Several factors like price, availability, traditional tastes, and preferences play key roles in determining how households allocate their food budget to different food groups and food items. Although recent literature has highlighted the role that production diversity can play in improved nutritional outcomes, the association is increasingly being challenged in regions where households are better integrated into local markets. For such households, markets play an important role, not just as a source of income but also as source of diverse, nutritious, and affordable foods throughout the year. It is in this context that TCI's TARINA program introduced a Market Diversity Study (MDS) in its four program locations-Munger (Bihar), Maharajganj (Uttar Pradesh), and Kandhamal and Kalahandi (Odisha).

In 2018-19, monthly data was collected on availability and prices of nearly 250 food items, across 12 weekly markets. This was complemented with data on women's dietary intake and householdlevel food purchases, also on a monthly basis, from a sample of 120 households across the four program districts. Taken together, the monthly data on the MDS and women's diets will provide us with a comprehensive picture of the availability (in terms of diversity), affordability (in terms of market price and household food purchases), and utilization (in terms of dietary intake) of foods from local markets in smallholder farming households. Preliminary results indicate that food availability and food purchase vary across seasons (Figure 21). The team is engaged in further analysis, which includes the computation of the cost of recommended diets, to assess the degree to which local markets are able to provide diverse, nutritious foods to these communities.









Improving Positive Nutrition Behavior Though Social and Behavioral Change Communication

Improving positive nutrition is an essential component to strengthening the nutrition-sensitive food system. TARINA's social and behavioral change communication (SBCC) interventions (Figure 22) aim to shift the individual-, household-, and community-level behaviors toward better nutrition practices and create an enabling social landscape for the sustainability of the changed positive behavior. The two-tiered SBCC intervention of TARINA target individual- and household-level behavior through the nutrition gender toolkit (NGTK), which is a strategic, tool-driven, communication package centered around gender empowerment, improved dietary consumption, sanitation, and WASH behavior (Figure 23). For better cultural acceptance, the messages in the NGTK are designed around the life story of a peer character from the community. The NGTK is implemented though the platform of SHGs and other collectives, which include men.

The community-level interventions, such as mass campaigns; workshops; exposure visits; peer-led, door-to-door outreach; and village-level meetings, on themes like improved cooking demonstration, awareness about nutritional security, and WASH behavior, have been targeted to create an enabling community that accepts and encourages individual behavior change.





Figure 23: "Vimla", the peer leader of TARINA's NGTK is an effective role model for individual-level positive nutrition behavior

TARINA targeted 162 villages to implement the SBCC intervention across four TARINA districts within states of Bihar, Odisha, and Uttar Pradesh. By the end of the Year 4, TARINA covered 157 villages in the intervention districts. Four hundred seven SHGs and 51 other community members were trained with capacity building on different themes of positive nutritional behavior over the four years. The TARINA SBCC intervention trained more than 20,000 individuals in the community across all the intervention districts, of which 80 percent were women.

The experience of women from rural communities not having equal access to intrahousehold resource allocation is, culturally, a deep-rooted phenomenon and widely visible.

Table 2: TARINA's targets for social and behavioralchange communication

States	Targeted	Achieved
BIHAR	40	39
ODISHA	72	72
UTTAR PRADESH	50	46
ALL LOCATIONS	162	157

Recently, in the TARINA intervention locations, a change in such norms has begun showing a shift. Along with many intended behavioral changes, gendered distribution of food among family members is one such tough practice that TARINA has targeted through its SBCC intervention.

Figure 24: Social and behavioral change communication intervention targeted to reduce the gendered access of resources within households

The practice of women putting themselves in the lowest priority when distributing food at the household level is closely linked to the normalization of gender marginalization. While eating at the end of meals, after all the others members of the household have had their food, women usually are left with inadequate or no food at all. As a part of the TARINA's SBCC intervention of breaking the cycle of unequal access and control of intrahousehold resources, the program worked with the women and their family members to improve women's food intake practices.

The recent survey, conducted in the intervention districts in 2019, suggests that more women who have participated in the SBCC intervention of TARINA

report eating together with other household members than do those who have not participated in the intervention. However, it is not the perfect comparison group, as there is the possibility of diffusing the information and awareness, even though a section of women have not participated in the program directly (Figure 24).

Increasing demand for nutritious food is one of the major efforts of TARINA's SBCC. Increased diversity in the diets of individuals and households indicates not only enhanced availability, accessibility, and affordability of diversified food, but also improved nutrition awareness. The SBCC intervention has tried intensively to increase the intake of diversified diets

at the individual and household levels through the targeted NGTK tools and the community-level awareness campaigns.

The survey data show an increase of more than one food group in the diets of women (Figure 25), as well as in the household diets.

Enriching the Body of Knowledge Sweet Nutrition: Promoting the Orange-Fleshed Sweet Potato to Address Micronutrient Deficiencies in Uttar Pradesh

The Indian food system's heavy focus on staple grains, like rice and wheat, alongside stubbornly high poverty rates, leaves many diets lacking important nutrients such as vitamin A, which plays an important role in eye, lung, and immune system functions. TCI is working to address vitamin A deficiency by promoting the cultivation and consumption of vitamin A-rich orange-fleshed sweet potatoes (OFSPs). These efforts show that the crop has potential to catch on with adequate behavioral change education for producers and consumers, as well as institutional investments in developing varieties suitable for the region. Led by scholar Kathryn Merckel, TCI embarked on a project in Uttar Pradesh to improve diet diversity in mothers and children through the introduction of OFSPs and behavioral change educational messages for parents

on proper diets for young children. Data collected in the region before the project began suggest that children may not be eating diets adequate in vitamin A. Fewer than 2 percent of parents reported their children had received vitamin A supplements in the past year, and knowledge about healthy diets was lacking, with only 7 percent of parents reporting that they believed fruits or vegetables were good foods for infants. Working with TARINA Consortium partner, Grameen Development Services, TCI motivated farmers to grow OFSP and provided training on how to cultivate the crop. The program also provided input support of the vines to the farmers willing to cultivate OFSPs.

The program also imparted behavioral change messages on health and diet during the monthly trainings.

Figure 26: Percentage of households knowing facts about vitamin A

The program provided input support of the vines to the farmers willing to cultivate OFSPs. The program imparted behavioral change messages on health and diet during the monthly trainings. Half of the villages included in the study were randomly selected to receive monthly, intensive nutrition education programs, including behavioral change messages designed to target the most common troubles that parents had when trying to ensure that their children ate healthy, age-appropriate foods.

The study findings show that, compared to control villages that received no interventions at all, parents in either set of intervention villages could name, on average, one additional strategy to improve child health at the end of the study, such as providing a diverse diet. The percentage of households in intervention villages that reported being aware of vitamin A jumped from 10 to 27 percent over the course of the study, while control villages saw no change. At the end of the study, respondents who had heard of vitamin A could list an average of 1.5 more food sources of vitamin A than respondents at the outset.

Nearly every respondent in intervention villages had heard of OFSPs by the end of the study, and 85 percent of households in both sets of intervention villages reported that they would buy them if they were available in their markets. This study demonstrates potential for OFSP in the region.

Many households reported enjoying the taste of sweet potato leaves, which are edible and rich in vitamin A. Price premiums were also attractive to farmers wishing to sell tubers in the market, provided that customers were educated about their health benefits.

Future interventions with OFSP will require varieties better suited to the North Indian agroclimate, continued parental education about the importance of vitamin A-rich foods for child health, and ongoing promotion of the agricultural and nutritional benefits of the crop.

Informing Food Policy in India

TARINA has been engaged with policymakers, stakeholders, and sector leaders at state and national levels to develop discourse around nutritionsensitive agriculture. In the last four years, TARINA has initiated and led 11 high-value policy engagement events in the form of roundtable discussions, conferences, and policy dialogues.

Special Session: Engendering Food Systems for Improved Nutrition, December 2016

TARINA and IFPRI jointly organized a special session at the Agricultural Economics Research Association's 24th annual conference to discuss linkages between gender, agriculture, and nutrition. The session focused on crop diversification and technological choices for engendering agriculture, as well as behavioral change among women for improved nutrition.

India's National Food Security Act and Beyond: Challenges and Opportunities, February 2017

With the collaboration of the Indian Institute for Food Security (IFS), TARINA jointly organized a seminar to initiate dialogue on expanding the mandate of India's National Food Security Act to enhance availability and affordability of nutrientrich foods for the poor.

Toward a Diversified Food System: Emerging Opportunities in Odisha, July 2017

TARINA, with its partner CARE India, collaborated with Xavier School of Rural Management to hold its first state-level policy forum in Odisha to deliberate on factors that constrain diversification of agricultural production and consumption in the context of local food systems and the way to address these challenges.

Redesigning Food Policy for Nutrition Security, July 2017

TARINA, along with the Tata Institute of Social Sciences and National Institute for Agricultural Economics and Policy Research, jointly organized a special session, opening with the lecture of TCI Director -Prabhu Pingali, who talked about nutritional security and Indian food policy.

Green Revolution in Eastern India: Constraints, Opportunities, and the Way Forward, October 2017

In collaboration with IFPRI and the Indian Council of Agricultural Research, TARINA held a two-day workshop that brought researchers, policymakers, and administrators together at the international conference to discuss the constraints and opportunities for promoting a Green Revolution in eastern India.

Roundtable Discussion on Nutrition-Sensitive Budgeting in India, February 2018

TARINA, along with the National Institute of Public Finance and Policy (NIPFP), jointly organized a roundtable on budgeting for a diversified food system for improved nutritional outcomes in India. The discourse aimed to shine more light on the pattern of government expenditure on agriculture and assess how sensitive it is toward a diversified food system, which is essential to mitigating malnutrition.

Advocacy Dialogue to Encourage Agricultural Diversification in Bihar, March 2018

In order to discuss the policy issues affecting the food system in Bihar, TARINA, in partnership with the Asian Development Research Institute (ADRI), held an advocacy dialogue on "Toward Developing a Diversified Food System in Bihar, for Improving Nutritional Outcomes" The advocacy dialogue was well received by high-level delegations involved in the state policy formulation of Bihar.

Policy Dialogue on Small Farm Aggregation Models, August 2018

TARINA, along with its partner IFPRI, jointly organized a policy workshop on "Small Farm Aggregation in India" to assess the challenges faced by farmer-producer organizations in governance, management and market linkage, vertical coordination, and larger private sector participation in linking small farmers to markets.

Developing Biofortified Crops Value Chains in South Asia, January 2019

TARINA, in collaboration with IFPRI and Institute of Economic Growth (IEG), conducted a workshop on "Developing Biofortified Crops Value Chains for Nutritional Security in South Asia."

The deliberation focused on how to prioritize the policy agenda for moving forward with biofortified crops in India/South Asia for better nutritional security.

India Achieving SDG2 by 2030, January 2019

TCI Director Prabhu Pingali delivered the 11th Foundation Day Lecture of the Trust for Advancement of Agricultural Sciences (TAAS) on "Can India Achieve SDG2-Eliminate Hunger and Malnutrition by 2030," on January 24 in New Delhi.

First Nutrition Spectrum, November 2019

TCI participated and disseminated TARINA's vision for prioritizing food policies for promotion of a nutrition-sensitive food system among the top policymakers, researchers, and other stakeholders.

TARINA has extensively published evidence-based policy briefs and informative, high-value products in different platforms, including peer-reviewed journals, edited books, leading newspapers, and magazines, as well as on the program website. TARINA has produced 51 policy-informing publications.

TARINA in the News

TCI works to ensure better nutrition for women initiative will build awareness through interactive sessions to enable action

in the approach of moment towards vertice, a unique

in fligship of Technical

for in antique landse

semultise apricultural internage through gender programmers and prices. "Dataging Scharing: Fire tudiveloat, becasehold, interneting. edices, address Genera such a social laddress help pa rampt: habit avareness eather and suchrabity of RI-

almound tion Spectation TCL G Sectored by Sectored Sectored

बढावा देगा तरीना **पद्यजनेनः**। बहरातत्रंज में शकरकंद को कहा क देने के लिए लगेन ने पहल

शकरकंद को

शुरू कर ही है। कर्मचाने पांचे में लकरकंद की खेलें को खड़ाव देने के लिए किसानों को जनस्वक करेंगे। "This two-factod or and holization charage or instalgations of TO-DM Parameters an enhanceing or manify-feed capacity offy-mical bacowhelge and ran शनियम को कई नांवों में लोगों को शकरकेद के पीष्टिकल के जाने में बतायाः रीआईसे के निदेशक प्रेपेनन प्रयुग्धिताली ने अलग्ध कि तरीवा विश्वताने के साथ जिल्लबर सानराफंट की खेले को असूरका देखा है। सावराफंट की असल जन्म पार्ग्यांच प्रसन्ते के मुकावले ज्याच मजकूत और पेडिक डोत है। इसमें बीटामिन ए व अन्य महक्री न्तुरेशियन प्राया जाता है। यह प्राय्वी,

Mission to crack the malnutrition puzzle ମହିଳାଙ୍କ ସ୍ୱାସ୍ଥ୍ୟକର ପୋଷଣ

गर्भवती महिला औ, बुझी के लिए बहुत लाभवती होता है।

nervedere Theirer Tester patient, that is guide the guide. "More tring to do thing to a cost, and a short is doubd at the part data of the par

ellentre orean alcoli ellentre orean alcoli ellente con a mon trè gince que ante aucosi i tro acés eelige an gijne ne iigeens (Misses ge uigeens ceage adge 5420 Miller, qu'u anaya

climing atom menu ar aga amila da 46 offai oon consetta reare ena ogn din: 76ni-olfaio offe

ଉପରେ ଟିସିଆଇର ଗ୍ରତ୍ତ

change nutrition behaviour EXPRESS NEWS SERVICE

TATA Cornell Institute for Nutrition and Agriculture (TCI) is undertaking a unique experiment in 72 vil-lages of Kalahandi and Kandhamal districts to bring about change in be haviour of women towards nutrition.

The institute has developed an innovative tool kit under its flagship pro-gramme Technical Assistance and Research for In-dian Nutrition and Agriculture (TARINA) for achieving better nutritional outcomes through empower-ment of women. The tool kit utilises methods like inter-active flip books and board games to impart training through gender-based dia-logues to build awareness and translate it into action.

Director of TCI, Cornell University Prof Prabhu Pingali said changing behav iour at the household and

TARINA was featured 86 times in leading national, regional, and local newspapers.

शकरकंद की खेती को मिल रहा बढावा

वहाराजनीज (पुरस्तुम्बरी)। आनित गुनिवर्तिते के दीत्री आई (पोसे के रोजन के लिए ठाड भार जिल परंजना) ने अभी प्राप्ता आवित्राज जाल पेलन और सेती के लिए जमनीवी सारापत और सेता। में साराजनेत के कई नावी में अवगर्वन्द की प्रोप्ते की महात्रा दिस है।

निधरनिवाद्यमध्य स्वाप्तान्त और योगना पर हानके स्वयात्मालक प्रथम को निद्धा रहा है । चेन्द्रे राजे विदेशक प्रभु निगमाने ने बात कि किस्तानी के ताल प्र ब्राजानी को बहुएक हैंने और पेमल के लिए ब्राज करना है से कुल्हानक की पर अगरे प्रीमीचे हो , का संक्रेजन ही और उन्द्र प्रथम देव ही । साथ ही अवतावट के मीन्यू उन्द्रेन के वर सीची पर की संप्र देवा है तबि उन अगरों की मामजी और स्वर्थी के नेतन में लुनिल किया जा गर्क । जनेते तना पर कई कार्यक्रायों के जीता बताद कि लाखी देती की कारणपूर्व हे और यह किस प्राप्त में उनके लगा कर्तान करना है। पेराव आई की लेग साम नामती है कि हमें सांस्कृतिक की पर अधिक स्वीकार करते के दिन होरे सांस्कृतिक की पर अधिक स्वीकार करते के

ताता हो (१९८८ तमार) हा एक मान का नाराइमन (१२८२८ का अपलंग) तमा थे हर एक उन्हु मार्ग का वा वाउनाकी पर मारितान (१२८ का अपलंग के लिए बेहार जानते हैं । तमाजंदन में विद्यतिन ए प्रमु वाचा में दीता है की रुवेवार पुरुष केवल के बन्दर का ता है और उन्होंने, उपलंग की से विद्यति का कि हि रहा का दीता में की राजा की रहा के स्थान को रिपोर्ट जाता है कि उन्हा परी हैं। राष्ट्रीय केवल को कि रिपोर वा का की रिपोर जाता है के प्रमुख कर दू को स्थान विद्यतिन ए के लिए का स्थान की कामा से कर कहती है ब्राहमाठन इन्हा का प्रमान का कि and there is an upt & great pr to and this is a state

सीलगर पुरावणपर वर्तित से अवस्थित को काने और स्वाने के कठेंगे. बताते हैं : अपेशिय की करील पुनियोंकी के एक प्रवेल में दिखाया. विक्रियन फेट फेला में करी को प्रायति के एक प्रवेल में दिखाया. है कि एक सेने- नेपाने राजनी के साल कियों का प्रायं कमें साले. काम की परियेणकार राजनी त्रेला साल कियों का प्रायं कमें साले.

'Government must focus on production of non-staple food'

A Theoremplan ity and poor natrition surport in Punjah, but witural policies of the pustil not focusing solving them, mid data Pingali, an oxport

rofessor at Charles H School of Applied somiles and Ma t at Cornall Univer

addent. Skoso the Utility, Purrjah played na Important role in national food socurity by producing large amounter w fawtand rice. Batt, now, the state mode to furtache y end increasing production of crops as, currently, the country olds around 61 million disodstocks amounting to

HUGE POTENTIAL FOR DEVERSIFICATION preaks on the rise," he said. "Ropid increases in the con-sumption of processed food, and he wrapps and mare-dependence on staple food-prains such as wheet and rice has led to an increased previ-

BIVUESDPCATION The expert said these is interess potential & recyc-diversification in Vargish - Tile the only way to solve the pool-iesen of decining grounshwiter received sail iteritity, and the increases in any solution beech dast to enable functions. Any the solution of the dast we enable functions dast we enable functions dast to enable functions dast to enable functions dast to enable functions dast to enable functions and the policies so that functions shall for engressing fund. "To usail. City losseling/solutione icrossed to an increased previously increased previous of these problems. "he added.

Gity-based agriculture extension worker PPSP angli state abies previously ountry tespos

ଷ୍ଟିହୀନତା ରୋକିବ ମାଣ୍ଡିଆ, ଡା

है कि किसानी को गेहंच धान के प्रसाली चक्र से बाहर निकाल कर ही पंताब का

ା the TOT I CAN PARTY PARTY ପ୍ରେସର ପୁରୁ ପିତ୍ରରି କହିଛନି ଯେ, 'ବ୍ୟଣିବିଶେଷ, ଗଡ଼ ୫ ଗମାକରେ ବ୍ୟବହାର ମସିବର୍ଗନ ଗରିବା ଏହଂ

बकरियों के कुत्रिम गभार्धान से मुंगेर के भूमिहीन हो रहे हैं सशक्त

(आज समाचार सेवा) पटना। बिहार के मुंगेर जिले के

सैंकडों भूमिहीन परिवारों को एक अमरोको विश्वविद्यालय द्वारा किए जा रहे बकरी प्रजनन प्रयोग से फायदा हो रहा है। कॉर्नेल यूनिवर्सिटी द्वारा बकरियों के कत्रिम गभार्धान का एक प्रोजेक्ट चलाया जा रहा है, जो न केवल बेहतर नस्ल की बुक्तियों के प्रजनन

द मिल नवेशियों र बेहतर ਕਿਸਾਨ ਫ਼ਸਲੀ ਚੱਕਰ 'ਚੋਂ ਨਿਕਲ ਕੇ ਤੇਲ ले में भी ਬੀਜਾਂ ਤੇ ਦਾਲਾਂ ਦੀ ਖੇਤੀ ਕਰਨ-ਪੰਗਿਆਲੀ

किसान, सत्ता

who available are some suitue are solds all other their

योषण की राह

दिसम्बर (सल्वा)ः विषय प्रसिद्ध अर्थशास्त्री प्रोपेसर प्रभु चिंगली ने कश

बातचीत करते हुए प्रोकेसर प्रमु विंगली।

ୀକପୁର୍କ କଂରୋଗ ମାଧ୍ୟମରେ ଏକ ସକ୍ରିୟ ସ ୩ ଲକ୍ଟମ ପୋଷଣଯୁକ୍ତ ଫଳାଫକ ହାବର କରିବ ଏକ କରିକ ଜପାବାନମାନଙ୍କଠାକୁ ସୋଡିଏ ଅଟେ। । ଅଂଶାଦାର କେଆର ଇଷିଆ ସମ୍ଭିତ ରାଜମ ପୋ ଆ ନିମରେ ମହିଳା ସଣଗ୍ରିକରଣ ମାଧ୍ୟମରେ ଏକ ସ୍ୱ । କର୍ବାହାଣି ଓ କାମୋନକ ମିହିକାମାନେ ଏହି କ

ାତି ଏବଂ ଏହା ପୋଷଣଯୁକ୍ର ଖାଦ୍ୟ ପ୍ରହଣ କରିବା ନି

Artificial Insemination in goats is empowering landless in Munger

by an American University, is giving them reasons to cheer. Cornell University is naming a project on antificial meanimation in goats, which is not avily being produce befor versity of goats but also reducing month-bity rates and initigating diseases. All this is giving better returns dependent landless families and helping achieve the goal of better nutrition.

br Rephile Possell, Reproduce Director of TCI and, "The initiative is driven in Teta-Cornell Institute of Agriculture & Nutrition (DCI) program Technical Assistance and Research for Indian Nutrition and Agriculture (TARDNI), TARDNA is focused on adding guits into the production system of the farmers in india. The challenge is not just in improving livestock

productivity. But also in developing and promoting value chains.

TARINA's initiative helps change nutritional dynamics in Munger

Patua, Feb on (UND In a first of its kind initiative, Cornell University has introduced shallo and hore wells in 40 villages of Bihar's Munger district to address the irrigation constraints and to promote diversification of cropping pattern.

With the use of these water structures, farmers are now able to cultivate patritional non-staple. Rahi and Zaid season. This unique project has not only triggered the change process in g pattern but is also helping in adding nutritional value into the food system. So far, ster structures have benefited more than 450 poor households in the district. of the box initiative is being spearhended by the Tata-Cornell Institute of Agriculture & ध्यान की प्राप्तनी n (TCI) program, Technical Assistance and Research for Indian Natrition and को किसानी की तरफ ure (TARINA). TARINA's partner BAIF Development Research Foundation has been में जाग लगाने के

से जाग लगाने के estal in the implementation of the construction of shallow wells in Munger. मुद्दे चर पुष्ठे गए, valis have been constructed in private land where Water User Groups (WUGs) of 20-12 सवाल के जवाब में have been formed to promote its collective use. This is not only empowering प्रोपेरमा, शिगली में sities but is also essuring collective ownership of the resources कहा कि पहली ing the objectives behind the project, Dr Prabhu Pingali, Founding Director of TCI बलाने से स्मॉन जैसे

US VARSITY PROJECT TO IMPROVE NUTRITIONAL STATUS IN STATE

The second secon

and community seves. A -scape is thus crossed throug constrainticolor, and Posts Physicil. Deschor TCL Correl The projection-developeds its through its partner CAI

ing are beloing partic

भी घटा

गरों को

अमेरिका की कॉलेंज यूतिवर्सिटी महाराजमंज में दिखा रही है

Building leadership in food, nutrition, and agriculture is one of the pathways of TARINA towards sustainability

Improving the capacity of the key players in nutrition-sensitive agriculture and creating a cadre of leadership is one of three objectives of TARINA. With the expertise and research products of its Center of Excellence, TARINA has worked toward building capacities of partner organizations, grassroots-level frontline coworkers, and various stakeholders.

TARINA has conducted several workshops and training programs on the monitoring and evaluation of agriculture-related intervention programs and utilizing various metrics in agriculture and food systems, as well as a monitoring and evaluation workshop for senior program implementers.

Scaling Up the Learning

Based on the impact stories and learning from real, ground-level interventions, TARINA aims to vertically scale-up its successful models for making the local food system more nutrition sensitive. In Year 5, TARINA is intensifying engagement with local-, state-, and federal-levels of government for integrating TARINA knowledge into the state programs. Some of the key areas of engagement with national and state government departments are:

• TARINA is engaging at the national level to provide technical assistance to Poshan Abhiyan, which is India's national movement for mitigating malnutrition through multiple departments of the Government of India. TCI-TARINA-CoE is assisting the Poshan Abhiyan on developing the strategy of convergence between different departments, for a common goal of mitigating malnutrition and transferring the strategy to the state levels.

• In Odisha, TARINA plans to assist the Department of Agriculture in strengthening the linkages between agriculture and nutrition, by integrating the evidence of success from TARINA programs on production diversification.

• TARINA also aims to share and advocate for the integration of its best practices around strengthening the engendered community platform for empowering women in agriculture with the Odisha state government's Mission Shakti (state livelihood mission), which works toward optimizing the SHGs for livelihood empowerment.

• In Bihar, TARINA is working to provide technical assistance to the Jeeivka Special Purpose Vehicle (livelihood mission in the state of Bihar) for enhancing the capacity of the frontline workers and the program implementers in the areas of crop diversification, livestock promotion, and behavior change

• In Uttar Pradesh, TARINA is working toward integrating TARINA learning and successful models of diversifying local food systems for nutritional layering onto the agriculture work plan of the state.

• TARINA is also planning to work with Uttar Pradesh's state rural livelihood mission (UPSRLM) to share TARINA's success around empowerment of women in agriculture and to integrate learning to strengthen the program.

• Apart from attempting a vertical scale-up of TARINA success stories and learning, TARINA is also working with policy implementers at the district level for making district-level actions more nutrition sensitive and strengthening program delivery.

• TARINA will also intensify its policy advocacy efforts at the national and state levels to provide an adaptable roadmap for making the food system more nutrition sensitive.

Staff and Partners:

Steering Committee

Dr. Prabhu Pingali, TCI Director and Professor at Cornell University (Chair)

Mr. S. K. Dwivedi, Executive Director, GDS (Co-Chair, 2018-19)

Mr. Manoj Gopal Krishnan, India Managing Director and CEO, CARE India (Co-Chair, 2017-18)

Dr. Shaidur Rahaman, Director for South Asia, IFPRI

Dr. Purvi Mehta, Senior Adviser & Head of Agriculture for South Asia, BMGF

Dr. Usha Ramakrishnan, Vice Chair and Professor, Hubert Department of Global Health, Emory University

Mr. Girish G. Sohani, President & Managing Trustee, BAIF

Mr. R. Venkataramanan, Managing Trustee, Tata Trusts

Dr. Bhaskar Mittra, TCI Associate Director (Ex-officio Member & Secretary)

Management Committee

Dr. Nikhil Raj, Director, TARINA

Ms. Laura Birx, Senior Program Officer, BMGF

Dr. Rajashree Joshi, Thematic Program Executive, BAIF

Dr. Avinash Kishore, Research Fellow, IFPRI

Ms. Nidhi Banshal. , Executive Director, Program Operations, Quality and Learning, CARE India

Mr. Amitabh Mishra, Program Director, GDS

Mr. Rakesh Singh, Program Officer, Tata Trusts

Dr. Shubh Swain, Assistant Director-TARINA and Gender & Nutrition Specialist (Ithaca)

TARINA Program and Administrative Staff

Dr. Prabhu Pingali, TCI Director (Ithaca)

Dr. Nikhil Raj, Director, TARINA (Delhi)

Dr. Shubh Swain, Assistant Director, Tand Gender & Nutrition Specialist (Ithaca)

Dr. Mark Constas, M&E Advisor (Ithaca)

Ms. Mary-Catherine French, Administrative Assistant to the Director of TCI (Ithaca)

Ms. Maya Nair, Administrative Assistant to the Associate Director of TCI (Mumbai)

Ms. Brenda Jordan Daniels-Tibke, TCI Administrator (Ithaca)

Ms. Nikita Tiwari, Assistant Program Officer (Delhi)

Ms. Ruchira Boss, Assistant Program Officer (Delhi)

Mr. Naveen Sridhar, Assistant Program Officer (Delhi)

Dr. Dhiraj K. Singh, Researcher & Data Analyst (Delhi)Mr. Manoj Kumar, Administrative Assistant (Delhi)Ms. Reena Devi , Office Assistant, (Delhi)

TARINA Researchers and Scholars

Dr. Soumya Gupta, Research Economist (Delhi)

Dr. Mathew Abraham, TCI Assistant Director (Ithaca)

Dr. Shubh Swain, Assistant Director and Gender & Nutrition Specialist (Ithaca)

Dr. Andaleeb Rahman, Postdoctoral Associate (Ithaca)

Dr. Sunaina Dhingra, Postdoctoral Associate (Delhi, Ithaca)

Ms. Kathryn Merckel, PhD Candidate, International Nutrition (Ithaca)

Mr. Anthony Wenndt, PhD Candidate, Plant Pathology (Ithaca) The report is written by Dr. Shubh Swain, with data analysis support from Dr. Dhiraj Kumar Singh, Mr. Naveen Sridhar, and Mr. Bharath Chandran.

Contributors for the research sections: Mr. Anthony Wenndt (Page 25), Dr. Soumya Gupta (Page 34), and Kathyrn Merckel (page 40),

Services

Copy Editor: Patricia Mason Design Support: Sidharth Printers

Photo CREDITS

- Kathryn Merckel Keira Crowley
- Dr. Maureen Valentine
- Qi Liu •BAIF •CARE GDS

Inter

000

Office Address Shaheed Jeet Singh Marg New Delhi, India 110016 Phone: +91 11-41065138 Email: tarina.tci@cornell.edu Follow TARINA: Website: tarina.tci.cornell.edu Twitter: @TCI_TARINA Follow TCI: Website: tci.cornell.edu Twitter: @TataCornell