

# TECHNICAL ASSISTANCE AND RESEARCH FOR INDIAN NUTRITION AND AGRICULTURE (TARINA)

2017 AT A GLANCE



**TATA-CORNELL INSTITUTE FOR  
AGRICULTURE AND NUTRITION (TCI)**  
College of Agriculture and Life Sciences | Cornell University



## YEAR 2: GAINING GROUND IN THE FIGHT AGAINST INDIAN MALNUTRITION

Technical Assistance and Research for Indian Nutrition and Agriculture (TARINA) is a consortium that connects policy-focused research partners with impact-focused implementation partners to address the complex problem of malnutrition in India. Led by TCI, TARINA merges the evidence-generating capabilities of Cornell University, Emory University, the International Food Policy Research Institute (IFPRI), and the 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 (Figure 1). 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 poor.

TARINA was founded in December 2015, with a US\$13.4 million grant awarded to TCI from the Bill & Melinda Gates Foundation (BMGF). The grant is largely centered on agricultural pathways



Figure 1. TARINA Consortium Partners

to improving nutrition outcomes using a food systems approach (Box 1 - see p. 4). Three main objectives and nine intermediate results underwrite the grant’s overarching goal to create a more nutrition-sensitive food system in India. Together, these components comprise TARINA’s Results Framework. This framework is depicted in Figure 2, which shows the link between each of the components and how they align with the grant’s primary goal.

Objective 1 of TARINA’s Results Framework focuses on field-based implementation, specifically, on redesigning agricultural projects to ensure positive nutrition outcomes at scale. This 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. District locations and lead implementation partners in each state are as follows:

LOCATIONS AND PARTNERS		
STATE	DISTRICT(S)	PARTNER(S)
Bihar	Munger	BAIF
Odisha	Kalahandi and Kandhamal	CARE India
Uttar Pradesh	Maharajganj	GDS and Tata Trusts

Table 1. Locations and Implementation Partners

Objectives 2 and 3, in contrast to Objective 1, are more research oriented. Both of these objectives focus on evidence generation, advocacy, and capacity building for the design and implementation of nutrition-sensitive agricultural programs and policies. Research under these objectives is also used to inform field-based initiatives carried out under Objective 1. Each of TARINA’s three objectives is realized through a set of intermediate results, which serve as the foundation for planning and focusing grant activities, as well as for monitoring and evaluating progress.

# TARINA RESULTS FRAMEWORK

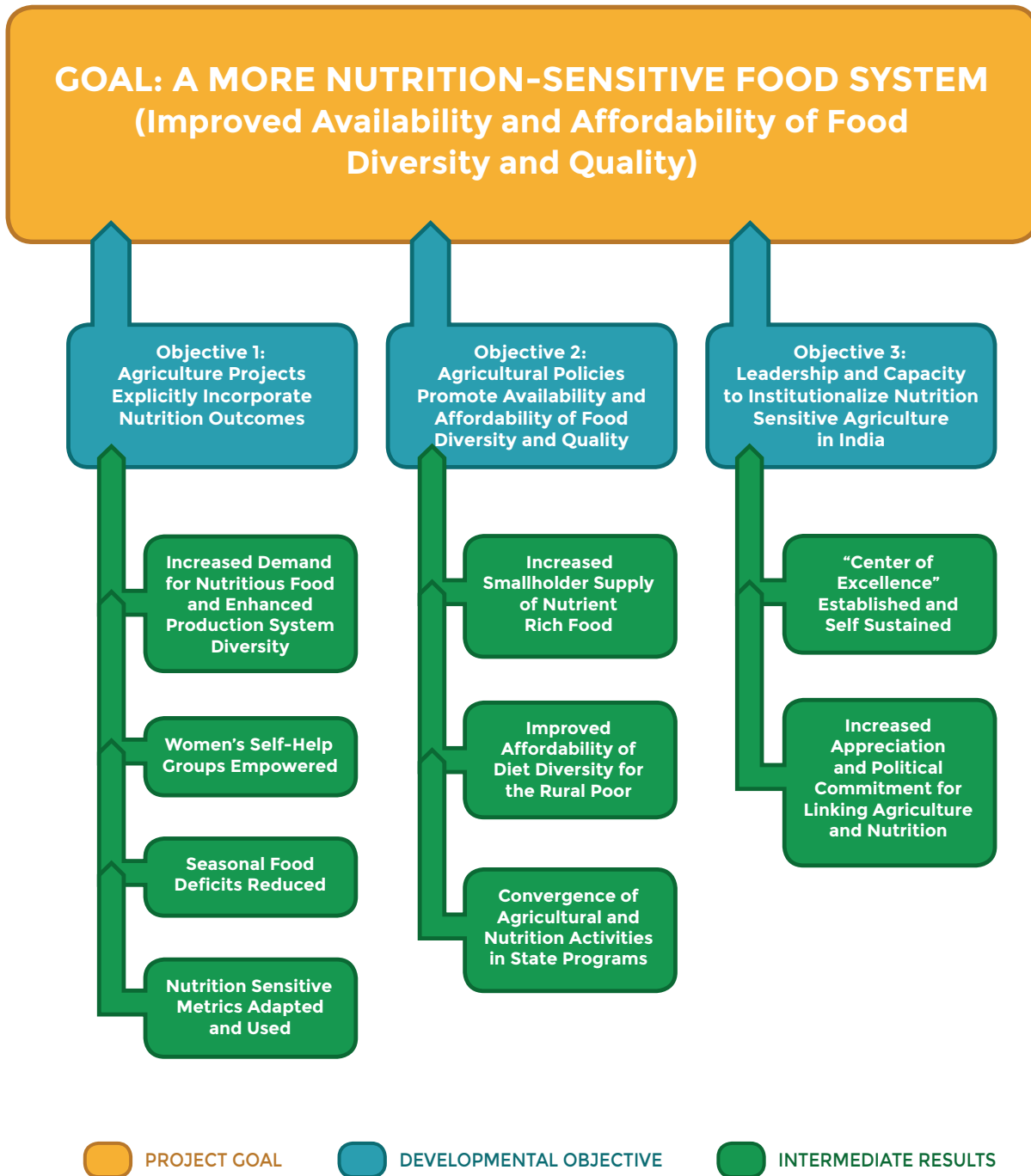


Figure 2. TARINA Results Framework

## HOW TARINA TACKLES MALNUTRITION: A FOOD SYSTEMS APPROACH

India’s agricultural policy has been slow to respond to persistent problems of malnutrition. Much of the country’s rural population suffers from undernutrition and micronutrient deficiencies. Consequently, childhood stunting and wasting, as well as anemia in both women and children, persist at stubbornly high rates.

Over the past several decades, India’s policy agenda has focused on improving staple grain productivity to meet national food security requirements and reduce hunger. While significant progress has been made toward this end, the food security challenge has evolved. It is no longer simply a matter of ensuring that sufficient calories are available, but rather an issue of enhancing food diversity and quality to address malnutrition in its many dimensions. Agricultural policies biased toward staple grains have limited ability to achieve positive nutrition outcomes in the context of the need for dietary diversity.

TARINA aims to redirect agricultural policy away from “staple grain fundamentalism” toward a much broader food systems focus, which considers the need to build better

connections between agriculture and nutrition. More specifically, it emphasizes agricultural pathways to improving the rural poor’s year-round access to affordable, diverse, and high-quality foods that are rich in micronutrients. A food system includes all individuals, enterprises, and institutions that influence the supply, demand, consumption, and absorption of food and micronutrients. The interconnected components of a food system are depicted in Figure 3. TARINA’s food systems approach examines factors that influence both agriculture and nutrition within and between stages of the food supply chain, as well as among households, villages, districts, and beyond.

TARINA’s food systems approach is twofold. It involves not only ground-level interventions at various stages of the food supply chain, but also policy reforms to support the diversification of agricultural production. Establishing a “crop-neutral” policy environment that ensures a level playing field for the production and marketing of nutritious non-staples, such as fresh fruits, legumes, and livestock products, is critical to creating a more robust and diversified food system.

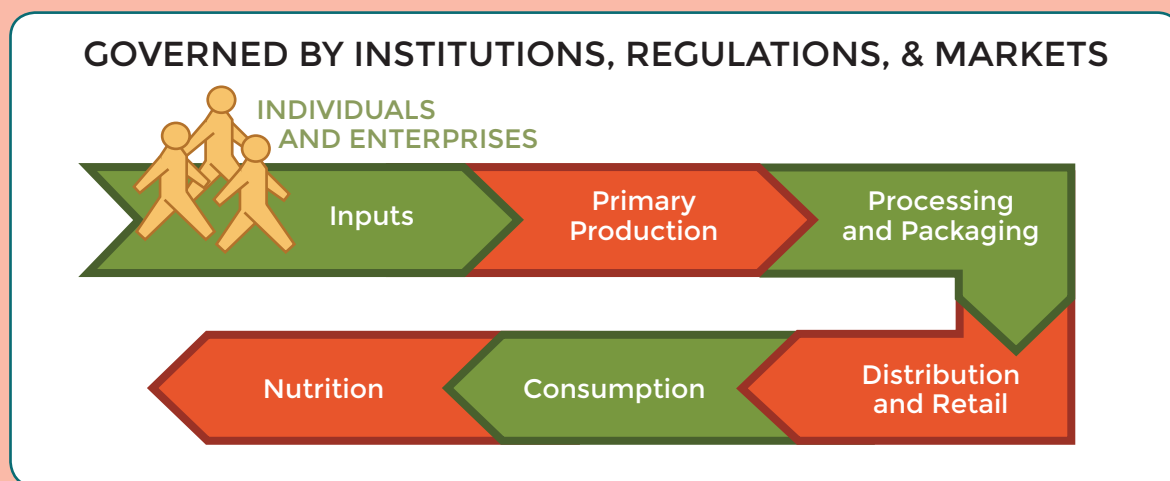


Figure 3. Interconnected Components of a Food System

Box 1. How TARINA Tackles Malnutrition: A Food Systems Approach



The second year of the four-year TARINA grant ended in November 2017. In Year 2, both implementation and research partners successfully broke ground on many of their initiatives planned in Year 1. Ongoing activities and progress achieved by TCI and consortium partners are summarized across key thematic areas of TARINA in the following sections.

## THEMATIC AREAS: ONGOING ACTIVITIES AND PROGRESS ACHIEVED

### Moving the Dial on Nutritional Status with Innovative Behavior Change Communication Tools and Methods

Implementation partners are working at the village level to increase consumption of nutritious food through behavior change communication (BCC). During the first year of TARINA, CARE's Gender Transformation Toolkit was identified as an effective and potentially scalable approach to empowering women through gender-based dialogue, awareness building, and behavioral change. It was agreed, therefore, that CARE would expand this toolkit to include nutrition BCC tools that aim to improve the diets of women and children. Thus far, CARE has completed five new tools (Figure 4) and is finalizing four more for integration into what is now called the Nutrition-Gender Toolkit (NGTK). In Year 2 of TARINA, these tools have been tested and implemented in 51 villages in Odisha. CARE has also trained BAIF and GDS staff on how to use these tools for BCC in their respective locations.

Meanwhile, in Year 1 of TARINA, BAIF and GDS launched nutrition BCC campaigns, which emphasize the importance of diverse diets and encourage households to improve their diets through the maintenance of kitchen gardens. BAIF's campaign also covers other critical topics related to nutrition, such as Water, Sanitation, and Hygiene (WASH) and Reproductive Child Health (RCH). Similarly, GDS' campaign promotes the cultivation and consumption of pulses. In Year 2 of TARINA, both BAIF and GDS have incorporated elements of CARE's NGTK into their existing BCC campaigns and have reached a total of 15 villages in Bihar and 15 villages in Uttar Pradesh, respectively.

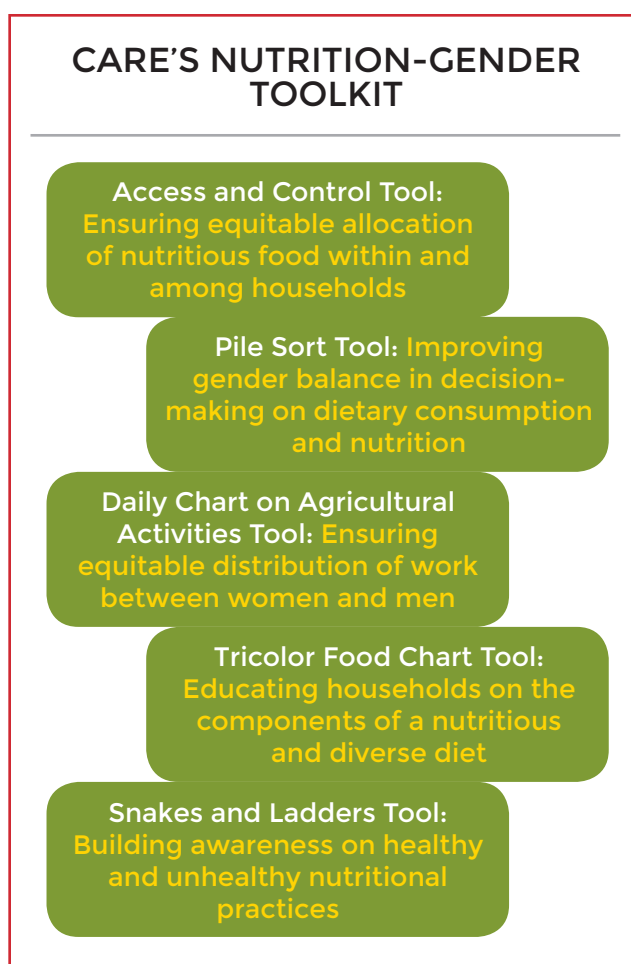


Figure 4. Five New Behavior Change Communication Tools in CARE's Nutrition-Gender Toolkit

Over the past two years, implementation partners have organized regular training sessions and workshops with Self-Help Groups (SHGs) and other women's interest groups, in which nutrition BCC tools are used to build awareness. Handouts and posters have also been used for general educational messaging about nutrition. Furthermore, partners have held mass events to broaden their reach and generate interest among a larger community. For example, GDS held a mass event called Poshan Mela, during which street plays were performed on the themes of kitchen gardens and cultivation of pulses.

### Linking Sanitation and Nutrition: Changing Minds and Changing Behavior to Reduce Open Defecation

In Uttar Pradesh, TCI and GDS have joined forces to design and implement a targeted BCC campaign for reducing open defecation. Evidence suggests

that open defecation, which is practiced by one-third of India's population, can lead to diarrhea and other health conditions that limit the body's ability to absorb micronutrients in food. Hence, behavioral change initiatives must also consider sanitation practices to effectively improve an individual's nutritional status.

Despite many efforts by the Government of India (GOI), the problem of open defecation persists. It has been widely documented that the root cause is not a lack of toilets, but rather the unwillingness of people to change their behavior. Thus, social norms, habits, and sentiments need to be altered if open defecation is to be eliminated.



TCI is partnering with GDS to scale up its existing Community-Led Total Sanitation (CLTS) program, which has been extremely effective in reducing open defecation. In fact, many villages where it has been implemented are now considered open defecation free (ODF). The CLTS approach not only focuses on the construction of toilets, but also on bringing about behavioral change in the community to increase their use.

As the CLTS program is being scaled up, TCI is conducting a study to measure the contribution of the program's behavioral component toward the increased use of toilets. Tata-Cornell Scholar, Payal Seth, is spearheading TCI's efforts in this area, as part of her doctoral research. Over the past year,

she has worked with GDS to initiate BCC and toilet construction in selected sample villages, following a baseline survey. Next year, she plans to complete a subsequent survey in the same sample villages, after fully implementing both components of the CLTS program.

### Increasing Production and Consumption of Orange-Fleshed Sweet Potatoes to Address Micronutrient Deficiencies

In partnership with GDS, TCI is designing and implementing a targeted BCC campaign for increasing the adoption and consumption of orange-fleshed sweet potatoes (OFSP) in Uttar Pradesh. OFSP is rich in nutrients, namely vitamin A, which is essential during late pregnancy and lactation for a child's immunity, eyesight, and lung function. Due to its nutritious properties, OFSP is often considered a strategic crop for addressing vitamin A deficiency, particularly among women of reproductive age.

However, the crop is not traditionally grown in India, and therefore is neither widely nor commonly consumed. In fact, much of the population is unfamiliar with the crop. Lack of knowledge about OFSP, including how to cultivate and prepare it for consumption, can limit its adoption among households. In the first two years of TARINA, GDS has introduced OFSP by providing planting material and extension services to farmers. In addition, TCI and GDS are developing a BCC program that provides educational messaging about OFSP and its health benefits, particularly for women and children. Messages will be delivered via street plays and recipe trials. From February to May 2017, the BCC messages were designed and tested and are now being refined.

Once the BCC program for OFSP is finalized, TCI will conduct a study to assess its impact on consumption and nutrition, particularly for women and children. Tata-Cornell Scholar, Kathryn Merckel, is leading TCI's study on nutrition BCC for OFSP and will complete this research as part of her doctoral studies in International Nutrition. She plans to implement the BCC program in selected sample villages and households that receive OFSP planting material and extension services from GDS in the coming year, following the completion of a baseline survey.



IFPRI has also undertaken research on sweet potato and has completed an analysis of existing sweet potato value chains in four selected districts of Odisha—Koraput, Kalahandi, Kandhamal, and Ganjam. The purpose was to better understand the role of sweet potato in increasing food security and income for poor farmers. The study assesses the price spread across various actors in the value chain. It also identifies factors constraining both the production and marketing of sweet potatoes. The analysis and findings have been summarized in a paper, entitled “Economic Analysis of Sweet Potato Farming and Marketing in Odisha,” which was published in the *Journal of Root Crops* in December 2016.

## PUBLICATION

Prakash, P., Avinash Kishore, Devesh Roy, and Debdutt Behura. “Economic Analysis of Sweet Potato Farming and Marketing in Odisha.” *Journal of Root Crops* 42, no. 2 (December 2016): 163-67.



## Diversifying Staple Grain Production Systems by Adding Vegetables and Legumes

Implementation partners are promoting the cultivation of vegetables, pulses, and other legumes to diversify staple grain production systems. Although methods used to achieve this objective vary across partners and locations, they all involve the provision of seeds and a recommended Package of Practices (PoP), which include input support, as well as training on relevant technologies and best practices for cultivation.

In Bihar, BAIF is working to diversify agricultural production through the integration of vegetables and pulses into existing cropping systems. Village meetings are held to recruit interested farmers. Participants must have a minimum of 0.25 acres of suitable land and consent to accepting a recommended PoP. Participants must also agree to use their production for household consumption. However, if a surplus is produced, then BAIF assists participants in marketing their surplus through a collective approach to increase their bargaining power.

In Year 1 of TARINA, BAIF promoted the cultivation of lentils and chickpeas during Rabi (winter) season. In Year 2, it introduced green gram as a Zaid (summer) crop and pigeon pea during Kharif (rainy) season. BAIF also initiated vegetable cultivation during Kharif season in Year 2 through the promotion of okra, cucumber, bitter gourd, ridge gourd, and bottle gourd.

Additionally, BAIF is introducing models for cultivating a mixed crop of maize and pulses (pigeon pea or lobia) under its Sustainable Multi-species Agricultural Resource-use Trials (SMART) project. SMART develops mixed, sequential cropping models for intensifying production on small, resource-constrained plots. Cropping models are designed and tested in consultation with farmers on their fields, which are used as demonstrations for dissemination to other farmers. Group action is a key component of SMART. Participants benefit from collective investment in irrigation, procurement of seed and other inputs in bulk, aggregation of produce for marketing, and group management of pests and diseases.

CARE is also working to increase adoption of vegetables and pulses in Odisha. This is achieved through the formation of large demonstration plots in each village, which are comprised of smaller contiguous plots contributed by interested farmers who are willing to participate. Farmer



Field School (FFS) sessions are conducted on the demonstration plots to educate farmers about best practices for cultivation and to attract other farmers in the community. Follow-up extension services

are provided to farmers who express interest in participating. Over the past two years, CARE has used this approach to introduce red and black gram during Kharif season, as well as OFSP. GDS is promoting pigeon pea, mustard, and a new variety of groundnut in its locations in Uttar Pradesh.

Through the combined efforts of BAIF, CARE, and GDS, a total of 5,077 farmers across all locations have diversified their staple grain production systems. In Year 2 of TARINA, 6% of farmers have diversified by adding vegetables (only), 64% by adding pulses (only), 30% by adding other legumes (including oilseeds), and less than 1% by adding both pulses and vegetables, as shown in Figure 5.

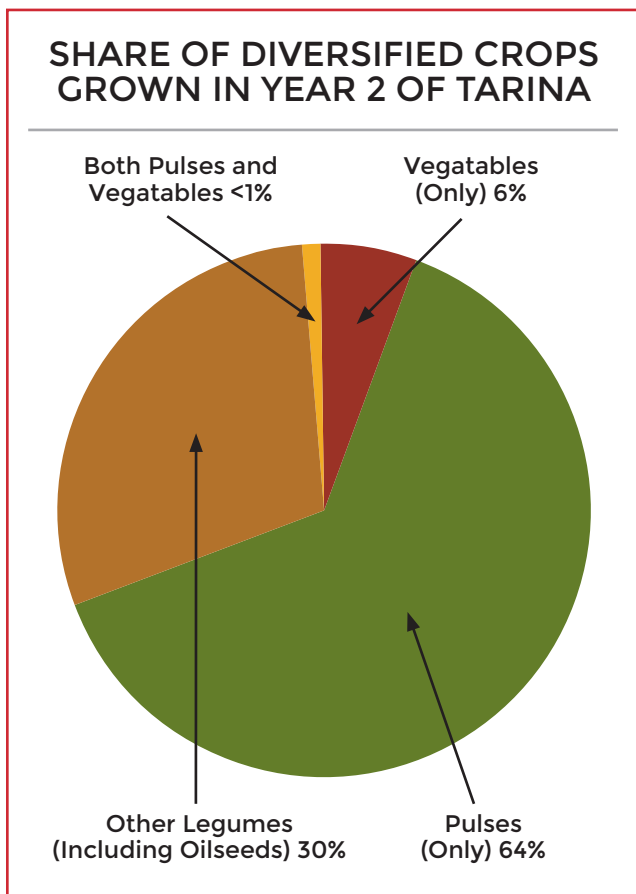


Figure 5. Share of Diversified Crops Grown in Year 2

### Catalyzing Producer Supply Response to the Rising Demand for Pulses

TCI has placed pulses at the top of its research agenda, given their important role as a non-animal source of protein, fiber, amino acids, and vitamins for India’s population, which is largely vegetarian.

India is currently the largest producer, consumer, and importer of pulses in the world. However, pulse yields have stagnated, and the land under pulse production has decreased since the 1960s. At the same time, the demand for pulses continues to increase, due to rapid growth in population and per capita income. This has led to recurring shortages in domestic pulse production.

Tata–Cornell Postdoctoral Associate, Dr. Mathew Abraham, is leading TCI’s research on pulses. He aims to better understand why producer response to the rising demand for pulses is so low and how markets can incentivize production. More specifically, he is examining existing aggregation models and private value chains to assess how they can potentially reduce high transaction costs, which result in poor price realization for producers. He is also examining the structure of international trade and import markets for pulses in India to determine their scope and limitations for increasing domestic supply. Dr. Abraham plans to synthesize his findings in various papers over the coming year. His research will be instrumental in devising policy recommendations and scalable initiatives to streamline marketing for pulses and to increase pulse production, thereby enhancing the diversity of food systems.

IFPRI is also contributing to the research on pulses and has undertaken three studies. The first study is an assessment of seed availability for pulses and an evaluation of the GOI’s Pulse Seed Hubs Program in the four districts where TARINA is operating. The study aims to provide timely feedback to implementation partners, so that they can improve the efficacy of their field-based initiatives to promote pulse production. As part of this study, a national-level analysis of the pulse seed replacement rate was completed. In the coming year, IFPRI will conduct a survey to collect data on the certified seeds that the government has distributed to the Krishi Vigyan Kendra (KVK, i.e. government agricultural extension centers) within or near TARINA district locations. Scoping and design of the study is being done in consultation with the Indian Institute of Pulse Research (IIPR).

The second and third studies undertaken by IFPRI focus on the impact of the minimum support price (MSP) for pulses on producers and on the supply response of pulse production in India, respectively. Data collection and analysis for these studies are near completion, and IFPRI plans to publish both in the coming year. Preliminary results were shared



with the GOI in 2016, as inputs for its report on “Incentivizing Pulses Production through Minimum Support Price and Related Policies.” Furthermore, the main findings from both studies have been published in an article in *Economic and Political Weekly* entitled “Making Pulses Affordable Again: Policy Options from the Farm to Retail in India,” on January 7, 2017, and in a policy brief released by TCI in May 2017.



## PUBLICATIONS

Joshi, P. K., Avinash Kishore, and Devesh Roy. “Making Pulses Affordable Again: Policy Options from the Farm to Retail in India.” *Economic and Political Weekly*, January 7, 2017, 37-44.

Kishore, Avinash, P. K. Joshi, and Devesh Roy. May 2017. “Making Pulses Affordable Again: Policy Options from the Farm to Retail in India.” TCI-TARINA Policy Brief No. 8.

## Promoting Livestock and Livestock Products to Enhance Food System Diversity

Implementation partners are promoting goat, poultry, and dairy production through the provision of animal health and management services. Partners provide training to livestock producers and producer groups on best practices for breeding, feeding, marketing, and reducing morbidity and mortality. They also provide paraveterinary services, including vaccination and deworming.

In Bihar, BAIF is supporting dairy production by encouraging farmers to cultivate nutritive green fodder. Participants must own at least one cow and 0.25 acres of cultivable land that can be allocated to fodder production without significantly affecting their regular food crop production. Fodder seed and a recommended PoP are provided to selected farmers, along with training and follow-up extension services. In Year 2 of TARINA, BAIF introduced green fodder into the production cycles of 600 farmers.

In addition to dairy, BAIF is promoting backyard poultry farming and goat rearing. In Year 2 of

TARINA, it has introduced new breeds of exotic and egg-laying chickens in about 50 households. BAIF has also initiated breeding services for goats. Black Bengals were identified as the most suitable breed for the region, given their large number of offspring (two to three) per gestation. Pure Black Bengal bucks have been procured and provided to selected villages through Buck User Groups. In May 2017, a total of 15 pure bucks were distributed to seven villages for breeding.

In the coming year, BAIF plans to introduce artificial insemination (AI) for goats to eliminate the cost of buck maintenance and service fees for producers. A center for research on goat AI has been established in Pune. Systems for semen collection, freezing, and delivery to households are being developed, building on BAIF’s experience with AI for dairy cattle.

CARE is promoting goat rearing, backyard poultry farming, and dairy production in Odisha. Training and support is provided to producers through FFS sessions held at the village level. In Year 2 of TARINA, a total of 60 FFS sessions were held for goats, 25 for poultry, and 30 for dairy.



In Uttar Pradesh, GDS is organizing health camps in villages to teach livestock producers how to improve their feeding and management practices. After the camps, deworming and vaccination services are provided to interested participants for a fee. These services are offered for cows, buffalo, bullocks, and goats.

Collectively, implementation partners have promoted livestock production in a total of 58 villages, across all locations. Goats have been promoted in 47 of these villages, poultry in 13, and dairy production in 55 (Figure 6). Partners have also dewormed and vaccinated 5,141 livestock and 3,797 livestock, respectively (includes cows and goats only).

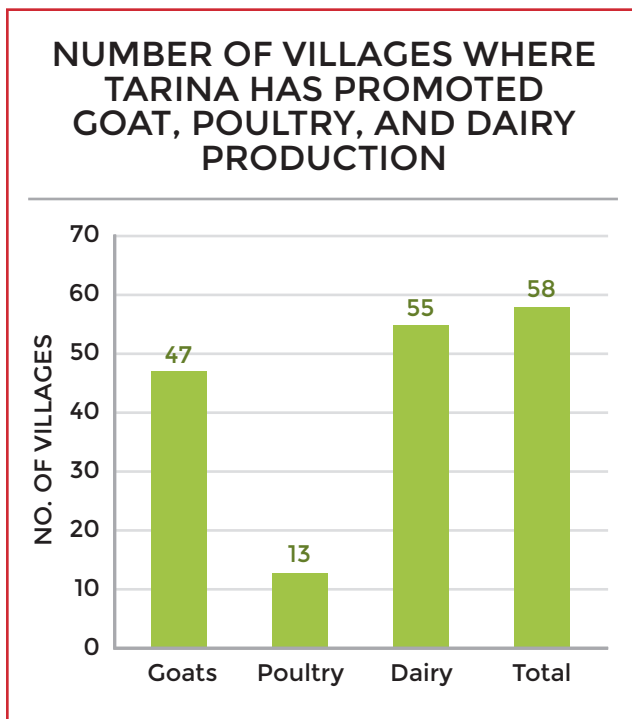


Figure 6. Number of Villages where TARINA Has Promoted Goat, Poultry, and Dairy Production

### Intensifying Goat Production through Sustainable Feeding Systems

Goats are a vital source of food and financial security for the resource poor in India, particularly those living in marginal rural areas. Despite their importance, the goat sector is constrained by feed shortages because of limited fodder cultivation, insufficient crop residues, and dependence on common land resources that are becoming increasingly degraded in terms of their vegetative and soil quality. As human and livestock populations continue to grow and put pressure on common property, the availability and productivity of grazing lands are expected to decrease, resulting in fewer feed resources for goats and other animals.

TCI is exploring ways to address the scarcity of feed often faced by goat producers. Maureen Valentine, Tata–Cornell Scholar and PhD candidate in the field of Animal Science, is conducting an experimental study to assess the extent to which transitioning goat producers from extensive, open grazing to semi-intensive, stall-feeding can improve goat health and nutrition while reducing land degradation from grazing. Additionally, she aims to assess the factors that affect producer adoption of semi-intensive, stall-feeding in feed-scarce regions. Ms. Valentine carried out her study on tribal farms in the Kandhamal District of Odisha from May to December 2016, and is currently working to analyze the data collected. She plans to write up her findings and results in the coming year.

### Strengthening Women’s Leadership in Producer Groups and Access to Agricultural Services

Implementation partners are empowering women through the formation of new and revitalization of existing women’s SHGs and interest groups. Given the important role that women play in agriculture and in determining household diets, women’s groups are frequently used as platforms for increasing awareness, building capacity, and changing behavior to ensure positive nutrition outcomes. Hence, efforts to educate and mobilize women’s groups are critical to the implementation and success of TARINA initiatives in all field locations.

Partners are training women’s SHGs and interest groups to increase their understanding of nutrition-sensitive agriculture and practices. CARE and BAIF are also working with these groups to increase women’s entrepreneurial skills and access to banks, credit, and working capital. Typically, partners select one individual from each group to be the leader who motivates and teaches others. Leaders are then trained to carry out BCC activities and to set an example for the group. In some cases, they are also taught to do record-keeping, develop business plans, and strengthen group cohesion.

In the first two years of TARINA, partners have mobilized 107 women’s SHGs and interest groups across all locations. This includes 29 SHGs, 13 Water User Groups, and 7 Buck User Groups mobilized by BAIF, in addition to 20 SHGs and 38 SHGS mobilized by CARE and GDS, respectively.





### Promoting Labor-Saving Technologies for Reducing Women's Drudgery

The purpose of this initiative is not only to reduce women's drudgery in agriculture, but also to reduce their time spent on agricultural activities. Long hours in the field mean that women have less time to spend on personal health and childcare. This trade-off can negatively impact the nutrition of women and their households. To address this challenge, implementation partners are scoping, piloting, and scaling up labor-saving technologies (LSTs) for women in each of their respective locations.

BAIF is engaging with various groups and institutions, such as the International Agricultural Research Institute, the KVK, SHGs, and private companies, for assistance in identifying LSTs that are most suitable for the region and for women. It is also establishing Custom Hiring Centers (CHCs) managed by women's SHGs to handle the maintenance and rental of technologies. In Year 2 of TARINA, BAIF has tested automatic and manual paddy transplanters during Kharif season, with technical support from the DHAN Foundation. It has also started to identify SHGs that are both interested in and capable of managing CHCs. BAIF plans to carry out more demonstrations during the next paddy season and assess the utilization of these technologies.

CARE is developing the overall value chain for LSTs in Odisha by building the capacities of local fabricators, SHGs, and female farmers to customize, use, repair, and maintain LSTs for women. It

is identifying suitable LSTs and fabricators to customize these technologies for women. So far, CARE has purchased and tested six LSTs—seed treatment drum, power sprayer, Naveen seed dibbler, sapling transplanter, solar-powered nano pump, and drip irrigation.

In Year 2 of TARINA, CARE has conducted five demonstrations with the seed treatment drum, two with the power sprayer, eight with the Naveen seed dibbler, and two with the sapling transplanter. In addition, it has designed three training modules on low-cost LSTs that are being delivered to female farmers through FFS sessions and have integrated messaging on LSTs into BCC tools developed for its NGTK. A study on LSTs involving various stakeholders is also underway. Potential technologies have been identified, and their suitability is being evaluated against field level requirements.

CARE has also introduced a new gravity-based, micro-irrigation system on collective kitchen gardens in Odisha, which are typically managed by three to four female farmers. Since results have been positive, CARE is generating evidence to promote this technology for integration into existing government schemes.

GDS is promoting direct seeding of rice (DSR) to reduce women's drudgery and time spent on sowing. Drum seeder and zero till machines were introduced in Year 1 of TARINA. Several demonstrations were conducted, and 65 female farmers used the technologies to cultivate paddies. In Year 2, GDS has reached 307 female farmers. Of this total, 298 female farmers are new participants, using the technologies for the first time.



### Expanding Homestead Horticulture to Prevent Seasonal Food Deficits

Many Indian farmers cultivate vegetables and other nutrient-rich crops to sell at the market and use a portion of their production for home consumption, but this supply is only available seasonally.

Implementation partners are working to bridge the seasonal gap in the supply of micronutrients by promoting household kitchen gardens for growing fruits and vegetables year-round. Having a continuous supply of fresh and nutritious foods available nearby allows households to easily integrate them into their daily diets.

Village and community group meetings are held by partners to recruit households interested in establishing kitchen gardens. Selected participants are then given seeds with a recommended PoP. Field demonstrations are conducted and training on the PoP is provided, along with follow-up extension services. Partners also provide support for fencing to protect gardens from livestock, since open grazing is common in most villages. Through the combined efforts of BAIF, CARE, and GDS, a total of 1,581 households have established kitchen gardens across all locations.

In addition to kitchen gardens, BAIF is promoting year-round cultivation of nutritious foods by intensifying production under its existing WADI project. WADI is a cropping model for tree-based farming that combines several high-value, nutritious, and perennial fruit crops. Selected beneficiaries of the project are given seeds and

saplings with a recommended PoP, along with other essential inputs, training, and follow-up extension support. In Year 2 of TARINA, BAIF provided 161 WADI farmers with 13 types of seeds and saplings—papaya, banana, mango, jackfruit, guava, lemon, drumstick, ber, bael, custard apple, aonla, turmeric, and elephant foot yam.

### Reducing Postharvest Losses through Improved Practices and Storage Technologies

Postharvest losses can occur within and between stages of crop value chains, from harvest to processing and final consumption. However, a large portion of losses tend to occur during the period between harvest seasons, when seeds are stored for planting in subsequent seasons or when crops are stored for future consumption or sale in the market. This is largely due to a lack of adequate and affordable storage technologies available to farmers. Poor storage facilities can compromise the safety and quality of crops, as well as reduce the productivity of seeds, resulting in health risks and/or economic loss for households.

Implementation partners are addressing this constraint by training farmers on postharvest loss management (PHLM), as well as scoping, piloting, and scaling up improved storage technologies across all locations. In Year 2 of TARINA, BAIF has trained several SHGs on best practices for cleaning, sun-drying, and storing pulse grains. It has also provided 20-piece grain storage drums to SHGs in two villages.



Meanwhile, CARE has designed three training modules on PHLM that are being delivered to farmers through FFS sessions and have integrated messaging on PHLM into BCC tools developed for its NGTK. Additionally, it has piloted hermetic bags for storing grain seed. A total of 15 bags have been distributed to ensure seed quality is preserved for the next season.

Similarly, GDS has piloted superbags to retain seed quality and increase the life of stored grains, mainly for wheat and pulse grains. Superbags have been distributed to 19 households in three villages.

In the coming year, implementation partners plan to identify and pilot storage technologies that are geared more toward perishables. They also plan to scale up storage technologies introduced in Year 2 of TARINA, depending on results achieved during the pilot phase.

### Compiling Better Data on Mycotoxin Incidence and Identifying Control Options

TCI has embarked on an intensive research effort to assess the extent of and contributors to mycotoxin contamination in village food systems in India. To date, there has been little effort in the Indian context to profile factors associated with mycotoxin risk at the community level. Anthony Wenndt, Tata–Cornell Scholar and PhD candidate in the field of Plant Pathology and Plant Microbe Biology, has taken on the challenge of addressing this information gap. Through his research, he aims to establish a scalable protocol for food system-wide surveillance of mycotoxin risks, identify tractable mitigation strategies for addressing contributors to mycotoxin risk, and empirically demonstrate the efficacy and scalability of a community-driven model for mycotoxin intervention via experimental trials in selected locations.

In 2016, Mr. Wenndt conducted a survey of aflatoxin and fumonisin contamination in key staple food commodities in nine spatially and socioculturally distinct villages across four Indian States—Uttar Pradesh, Bihar, Odisha, and Telangana. The survey integrated lab results on mycotoxin contamination in household- and market-derived food commodities with data on food management practices and other behavioral risk factors obtained via questionnaire-guided interviews. The survey also included focus group

discussions and participatory community resource mapping to elucidate the spatial distribution of food safety risks across villages. It yielded 811 samples of toxin-susceptible food commodities, and established a baseline data set of risk factors that will guide further investigation. Based on findings from this survey, preliminary policy recommendations for promoting safe village food systems have been developed and are highlighted in a policy brief, entitled “Addressing Mycotoxin Exposure across Village Food Systems in Rural India,” which was published by TCI in October 2017. Subsequent survey activities are planned to collect longitudinal data that will allow for an analysis of spatiotemporal trends in mycotoxin contamination.

### PUBLICATION

Wenndt, Anthony. October 2017. “Addressing Mycotoxin Exposure across Village Food Systems in Rural India.” TCI-TARINA Policy Brief No. 10.



In September 2017, Mr. Wenndt initiated a year-long experiment that focuses on reducing mycotoxins in the household grain storage environment. Guided by the hypothesis that promoting proper postharvest storage practices can lead to a reduction in the overall food toxin burden, he aims to demonstrate the effects of a community-based, participatory storage intervention trial on the status of mycotoxin risk indicators. The study is being implemented in the Unnao District of Uttar Pradesh, with logistical support from GDS.

### Evaluating and Informing Agri-Marketing Policies to Incentivize Year-Round Production of Nutritious, Non-Staple Foods

IFPRI is conducting a study on the repeal of the Agricultural Produce Market Committee (APMC) Act in Bihar and its impact on farm-gate prices, consumers, and food commodity markets. The APMC Act was passed by the GOI in 1960 to protect smallholder farmers from exploitation by traders and moneylenders. However, research suggests the act had the reverse effect, as it enabled traders to form cartels while prohibiting



farmers from directly doing business with private companies. This limited farmers' options on where and to whom they could sell their produce. It also discouraged private investment in commodity markets and contract farming. To address these challenges, the State Government of Bihar completely abolished the APMC Act in 2006, expecting that deregulation would attract private investment in agri-markets and create more options for farmers, thereby improving prices for both producers and consumers.

IFPRI has completed an assessment of the immediate effects of the APMC Act repeal in Bihar and is currently examining the long-term effects of this reform on all market players, including farmers. Based on initial findings from this study, IFPRI prepared a report entitled "Ease of Doing Agribusiness in Indian States." The report was presented to the National Institute for Transforming India (also referred to as NITI Aayog), which used the key findings to devise and support evidence-based agri-marketing reforms throughout India.

### Exploring Feasible Options for Diversifying the Basket of Foods Included in India's Public Distribution System

India's Public Distribution System (PDS) is the world's largest food-based social safety net program. Under the PDS, the GOI procures staple grains (mainly, wheat and rice) and redistributes them to poor households in the form of food rations. In recent years, expansion of the PDS food basket to include more nutritious non-staples, as a means of increasing the production of these foods and diversifying the diets of low-income households, has been widely debated. Pulses have been at the center of this debate, and the government has been exploring their potential for inclusion in the PDS basket.

In light of this trend, IFPRI completed a demand assessment of the PDS, which focused on the three states where TARINA is operating—Bihar, Odisha, and Uttar Pradesh. The aim was to better understand communities' needs and preferences with respect to the PDS food basket. Findings indicate that needs and preferences vary significantly across states and socioeconomic groups. For instance, households in Odisha generally do not want to trade subsidized rice for

subsidized pulses, while the opposite is true for a large share of households in Bihar and Uttar Pradesh. Moreover, findings highlight how the PDS could be more effective and sustainable if it is better aligned with the preferences of the intended beneficiaries.

Based on this research, IFPRI has published two op-eds in leading Indian newspapers. The first one, entitled "Policies Based on Demonstration Effect Could Have Suboptimal Outcomes," was published in the *Financial Express* on August 8, 2017. The second one, entitled "Canteens vs. PDS: The Jury is Still Out on Food Subsidy," was published in the *Hindustan Times* on August 20, 2017. IFPRI is also working on several reports and a policy brief to outline the main messages and recommendations for policymakers.

## PUBLICATIONS

Pradhan, Mamata, Devesh Roy, Avinash Kishore, and Vinay Sonkar. "Policies Based on Demonstration Effect Could Have Suboptimal Outcomes." *Financial Express*, August 8, 2017.

Pradhan, Mamata, and Devesh Roy. "Canteens vs PDS: The Jury is Still Out on food subsidy." *Hindustan Times*, August 20, 2017.



## Developing, Adapting, and Using Nutrition Metrics for Food Systems-Level Monitoring and Evaluation

TCI is spearheading the monitoring and evaluation (M&E) component of TARINA. As part of this effort, we are developing overall food systems metrics, which are currently lacking from the body of literature available on metrics for food-, agriculture-, and nutrition-related projects and programs. Much of our work on metrics contributes to bridging this knowledge gap.

From April to September 2017, TCI has implemented a baseline survey across all locations, which was designed with a nutrition lens and included metrics on various aspects of local food systems to assess overall changes in TARINA outcomes during the project period. The survey consisted of three components: a household-level

survey, a village-level survey, and measurement of anthropometric outcomes for women and children. Data was collected in 30 (15 control and 15 treatment) villages within each of the 4 districts where TARINA is operating. The village-level component included market-level metrics related to the supply of nutritious foods in the community, such as indicators of market diversity, market access, and seasonal availability. Partners have also undertaken baseline surveys that focus on specific TARINA interventions in their respective locations. Follow-up surveys at the project level and at the intervention level will be conducted in Year 4 of the project. The final panel data set will be used to assess the impact of field-based interventions and the extent to which project objectives are achieved.

In addition, TCI has published two training manuals that focus on how to adapt and implement nutrition metrics and indices within the Indian context. The first manual, entitled Guidelines for Incorporating Dietary Diversity Metrics in Agriculture–Nutrition Surveys, discusses key dietary diversity metrics that are commonly used and how they can be modified for incorporation into a larger household survey in India. The second manual, entitled Guidelines for Assessing Women’s Empowerment in Agriculture, discusses how the Women’s Empowerment in Agriculture Index (WEAI) can be operationalized in field research, drawing from TCI’s experience of adapting and implementing the WEAI via a survey in Maharashtra, India, in 2013–14. This was the first time that the WEAI was used in the Indian context.

## PUBLICATIONS



Gupta, Soumya. June 2016. “Guidelines for Incorporating Dietary Diversity Metrics in Agriculture–Nutrition Surveys: Operational Manual for Using Dietary Diversity Indicators in Field Research.” TCI-TARINA Training Manual No. 1.

Gupta, Soumya. September 2016. “Guidelines for Assessing Women’s Empowerment in Agriculture: Operational Manual for Using the Women’s Empowerment in Agriculture Index (WEAI) in Field Research.” TCI-TARINA Training Manual No. 2.

## Building Capacity and Increasing Political Commitment for Institutionalizing Nutrition-Sensitive Agriculture in India

TCI is actively engaging with the government and other stakeholders to increase awareness and political commitment for linking agriculture and nutrition in India. In collaboration with partners, TCI has held several national- and state-level fora to disseminate evidence and facilitate dialogue on strategic policy issues related to nutrition-sensitive agriculture.

TCI has also held seminars and workshops to strengthen the capacity of institutions to design and implement agricultural projects and programs that ensure positive nutrition outcomes. Events held in Year 2 of TARINA include the following:



### Agricultural Economics Research Association 24th Annual Conference: Special Session on Engendering Food Systems for Improved Nutrition • December 16, 2016

TCI 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 behavior change among women for improved nutrition. Panelists included female academics from various national and international research institutes.

### India's National Food Security Act and Beyond: Challenges and Opportunities • February 3, 2017

TCI and the Indian Institute of Food Security (IFS) jointly organized a seminar to initiate dialogue on expanding the National Food Security Act's mandate to enhance the availability and affordability of nutrient-rich foods for the poor. Discussions focused on the diversification of agricultural production across India, the diversification of crops included in the PDS, and reforms in agri-marketing. Participants included senior officials from the GOI, academia, donor agencies, and civil society organizations.



### Monitoring and Evaluation Systems for Organizational Effectiveness: Why Organizations Should Care and Strategies for Engagement • February 24, 2017

TCI and TISS co-hosted an M&E strategy workshop for senior and mid-level managers of various organizations interested in advancing data-based solutions for development effectiveness. The workshop emphasized the importance of establishing M&E systems for measuring performance, informing decisions, and showcasing results. It also covered the essential components of well-designed M&E systems and the latest technical innovations in evaluation that can improve the efficiency, accuracy, and utility of results.

### Toward a Diversified Food System: Emerging Opportunities in Odisha • July 19, 2017

TCI, in partnership with CARE India and the Xavier School of Rural Management, held its first state-level policy forum in Odisha. Deliberations

focused on factors that constrain diversification of agricultural production and consumption in the context of local food systems and ways to address these challenges. Recommendations emerging from this event will inform TARINA's ongoing policy advocacy in Odisha.

### Redesigning Food Policy for Nutrition Security: Emerging Contours • July 25, 2017

TCI, TISS, and the National Institute of Agricultural Economics and Policy Research (NIAP) co-organized a lecture by Dr. Prabhu Pingali, Director of TCI, based on his publication "The Bumpy Road from Food to Nutrition Security – Slow Evolution of India's Food Policy." This was followed by a detailed discussion on ways to create and promote a crop-neutral policy environment in India. Panelists included Mr. Amaresh Kumar, Director of the IFS, and Dr. Pratap S. Birthal, National Professor at NIAP.

## PUBLICATIONS

Pingali, Prabhu, Bhaskar Mitra, and Andaleeb Rahman. "The Bumpy Road from Food to Nutrition Security – Slow Evolution of India's Food Policy." *Global Food Security*, May 2017.

Lee, Jenny and Megan Witwer. October 2017. "Crop-neutral Agricultural Policy: Creating a Level Playing Field for More Nutritious, Non-staple Foods in India." TCI-TARINA Policy Brief No. 9.

### Green Revolution in Eastern India: Constraints, Opportunities, and the Way Forward • October 9–10, 2017

In collaboration with IFPRI and the Indian Council of Agricultural Research, TCI held a two-day workshop that brought together researchers, policymakers, and practitioners to discuss the constraints and opportunities for promoting a Green Revolution in Eastern India. Deliberations focused on a wide range of interrelated issues, such as production system constraints, technology adoption, climate change and resilience, institutions and their effectiveness, the role of Farmer Producer Organizations (FPOs), agricultural markets and





agribusiness, food security, gender and efficiency, and policy reforms. The workshop resulted in a set of clear priorities and strategies for achieving accelerated and sustainable agricultural growth in Eastern India.

## LOOKING AHEAD

TCI and consortium partners have made significant progress toward the grant's overall goal and three main objectives (Figure 2 - see p. 3) in Year 2 of TARINA. Field-based interventions and activities implemented by partners will continue into Year 3 of the grant. Additionally, data collected through baseline surveys completed in Year 2 will shed light on various aspects of the local food system in each location. This information will enable partners to

strengthen and refine their interventions before scaling up in subsequent years.

Furthermore, many ongoing research studies will be completed in the coming two years. Findings from these studies will help support the efforts of consortium partners, as well as inform the design and implementation of nutrition-sensitive agricultural projects, programs, and policies. TCI and other research partners will translate the findings into concrete policy recommendations and action. Thus, we plan to continue generating policy briefs and initiating dialogue around strategic policy issues, by engaging with the government and other stakeholders at the state and national levels, through various policy fora, seminars, and workshops in the coming year.

## PARTNERS

BAIF Development Research Foundation  
 Bill & Melinda Gates Foundation (BMGF)  
 CARE India Solutions for Sustainable Development  
 Cornell University  
 Emory University  
 Grameen Development Services (GDS)  
 International Food Policy Research Institute (IFPRI)  
 Tata Institute for Social Sciences (TISS)  
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