# TABLE OF CONTENTS

- **FROM THE DIRECTOR** ............................................. 2
- **FROM THE CHAIR OF THE BOARD** ......................... 3

### OVERVIEW
- Overview ............................................................. 6
- The Puzzle of Malnutrition in India .......................... 6

### 2013-2014 TCI RESEARCH HIGHLIGHTS
- Innovations in Clean Drinking Water Systems ............ 12
- Agricultural Policies for Improved Nutrition .............. 14
- Filling the Agriculture-Nutrition Data Void ............... 16
- Convening an Indian Working Group on Smallholder Aggregation Models for Improving Nutrition ........... 19
- Engaging with Students in India: Joint Courses Held Between the TCI and the Tata Institute of Social Sciences . 21
- Visualizing Shifts in Agriculture and Nutrition: TCI’s Spatial Analysis Work ................................. 22

### BEYOND 2014: PLANNED RESEARCH AND ACTIVITIES
- Developing New Tools for Optimizing Soil Health in India .... 26
- Identifying Iron-Fortification Opportunities in India: Pursuing Iron-Fortified Wheat Flour .................................. 26
- Exploring Women’s Self-Help Groups as Conduits of Change ................. 27

### TCI PERSONNEL AND PARTNERS
- TCI Personnel ....................................................... 32
- Partners ............................................................. 33
FROM THE DIRECTOR

I am honored to be the Founding Director of the Tata-Cornell Agriculture and Nutrition Initiative (TCi). I began my work at Cornell University in early June 2013 and have had a very productive and exciting year and half while setting up the program, establishing a vision and strategy, and overseeing the start of several promising field-based initiatives for addressing malnutrition in India.

Currently, agriculture and nutrition are at the top of the policy debate and political agenda in India. The global crisis in food prices of 2008 focused the world’s attention on agriculture and the need to ensure stable food supplies. Global food markets have remained tight since then, and upward pressure on food prices is shifting the policy focus away from short-term measures such as the rice export ban implemented in 2008 towards long-term productivity improvement strategies. At the same time, and as shown in this report, the TCi offers an excellent opportunity for generating such evidence and it is on its way to doing just that. As shown in this report, the research is closely linked to another important TCi goal, namely postgraduate training.

Spurred primarily by the food price increases of 2007 and subsequent food price volatility, more action to improve nutrition through changes in the food and agricultural system is being pursued by national and international organizations. However, although much is being written on the subject and many conferences are being held, the conceptual relationships must be understood in order to generate the appropriate empirical evidence needed to guide action, but the evidence must be generated through field-level analyses. The TCi offers a unique opportunity for generating such evidence and it is on its way to doing just that. As shown in this report, the research is closely linked to another important TCi goal, namely postgraduate training.

It is always a pleasure to be associated with a successful program. Since its inception the TCi has taken off in the direction visualized by the Advisory Board. As stated in its in its report last year, “The Board is very impressed by the progress made during the short period of time since Prabhu Pingali has taken over the leadership and management of TCi.” Since then, and as shown in this report, the TCi has initiated a series of important research and training activities guided by the five priority areas identified in the TCi’s vision and strategy.

From the outset, the TCi has set a high bar for itself and its partners. It has been extremely generous with financial support. The same is true for the Director of the Division of Agricultural and Life Sciences. The TCi is based at the Charles H. Dyson School of Applied Economics and Management, where the Director and the staff could not have been more welcoming and generous with their support. The same is true for the Director of the Division of Nutrition Sciences, where I hold a joint appointment.

Setting up a field-based action research program in India can be enormously challenging. Fortunately, our partners in India have helped make that task easier with their strong support for the program and for the students and faculty visiting from Cornell University. Tata Trusts have been extremely generous with financial support as well as helpful advice on setting priorities and managing operational realities in rural India. The Tata Institute of Social Sciences (TISS) and the International Center for Research in the Semi-Arid Tropics (ICRISAT) have provided us with strong support and valuable expertise. Senate of institutions such as the Indian Council of Agricultural Research (ICAR), the National Institute of Nutrition (NIN), the Indian Council of Medical Research (ICMR), the Indian Council of Traditional Medicine (ICTM), and the Indian Council of Social Sciences (ICSS) have been extremely generous with resources.

It is always a pleasure to be associated with a successful program. Since its inception the TCi has taken off in the direction visualized by the Advisory Board. As stated in its in its report last year, “The Board is very impressed by the progress made during the short period of time since Prabhu Pingali has taken over the leadership and management of TCi.” Since then, and as shown in this report, the TCi has initiated a series of important research and training activities guided by the five priority areas identified in the TCi’s vision and strategy.

Spurred primarily by the food price increases of 2007 and subsequent food price volatility, more action to improve nutrition through changes in the food and agricultural system is being pursued by national and international organizations. However, although much is being written on the subject and many conferences are being held, the debate and policy recommendations suffer from a lack of the solid empirical policy-relevant evidence that policymakers need. Conceptual relationships must be understood in order to generate the appropriate empirical evidence needed to guide action, but the evidence must be generated through field-level analyses. The TCi offers a unique opportunity for generating such evidence and it is on its way to doing just that. As shown in this report, the research is closely linked to another important TCi goal, namely postgraduate training.

In view of the strong interest among national governments, international organizations and donor institutions to make food and agricultural systems more nutrition-sensitive as well as the great demand for solid, field-based, policy-relevant evidence, I believe the TCi will help to fill the current void in international leadership by expanding its funding base and gradually extending its field-based research and training beyond India over the next couple of years. I fully appreciate that one usually crawls before walking but I believe the TCi will soon be ready to run.

Per Pinstrup-Andersen, Chair of the Board

FROM THE CHAIR OF THE BOARD

It is always a pleasure to be associated with a successful program. Since its inception the TCi has taken off in the direction visualized by the Advisory Board. As stated in its in its report last year, “The Board is very impressed by the progress made during the short period of time since Prabhu Pingali has taken over the leadership and management of TCi.” Since then, and as shown in this report, the TCi has initiated a series of important research and training activities guided by the five priority areas identified in the TCi’s vision and strategy.

Spurred primarily by the food price increases of 2007 and subsequent food price volatility, more action to improve nutrition through changes in the food and agricultural system is being pursued by national and international organizations. However, although much is being written on the subject and many conferences are being held, the debate and policy recommendations suffer from a lack of the solid empirical policy-relevant evidence that policymakers need. Conceptual relationships must be understood in order to generate the appropriate empirical evidence needed to guide action, but the evidence must be generated through field-level analyses. The TCi offers a unique opportunity for generating such evidence and it is on its way to doing just that. As shown in this report, the research is closely linked to another important TCi goal, namely postgraduate training.

In view of the strong interest among national governments, international organizations and donor institutions to make food and agricultural systems more nutrition-sensitive as well as the great demand for solid, field-based, policy-relevant evidence, I believe the TCi will help to fill the current void in international leadership by expanding its funding base and gradually extending its field-based research and training beyond India over the next couple of years. I fully appreciate that one usually crawls before walking but I believe the TCi will soon be ready to run.

Per Pinstrup-Andersen, Chair of the Board

FROM THE CHAIR OF THE BOARD

It is always a pleasure to be associated with a successful program. Since its inception the TCi has taken off in the direction visualized by the Advisory Board. As stated in its in its report last year, “The Board is very impressed by the progress made during the short period of time since Prabhu Pingali has taken over the leadership and management of TCi.” Since then, and as shown in this report, the TCi has initiated a series of important research and training activities guided by the five priority areas identified in the TCi’s vision and strategy.

Spurred primarily by the food price increases of 2007 and subsequent food price volatility, more action to improve nutrition through changes in the food and agricultural system is being pursued by national and international organizations. However, although much is being written on the subject and many conferences are being held, the debate and policy recommendations suffer from a lack of the solid empirical policy-relevant evidence that policymakers need. Conceptual relationships must be understood in order to generate the appropriate empirical evidence needed to guide action, but the evidence must be generated through field-level analyses. The TCi offers a unique opportunity for generating such evidence and it is on its way to doing just that. As shown in this report, the research is closely linked to another important TCi goal, namely postgraduate training.

In view of the strong interest among national governments, international organizations and donor institutions to make food and agricultural systems more nutrition-sensitive as well as the great demand for solid, field-based, policy-relevant evidence, I believe the TCi will help to fill the current void in international leadership by expanding its funding base and gradually extending its field-based research and training beyond India over the next couple of years. I fully appreciate that one usually crawls before walking but I believe the TCi will soon be ready to run.

Per Pinstrup-Andersen, Chair of the Board

FROM THE CHAIR OF THE BOARD

It is always a pleasure to be associated with a successful program. Since its inception the TCi has taken off in the direction visualized by the Advisory Board. As stated in its in its report last year, “The Board is very impressed by the progress made during the short period of time since Prabhu Pingali has taken over the leadership and management of TCi.” Since then, and as shown in this report, the TCi has initiated a series of important research and training activities guided by the five priority areas identified in the TCi’s vision and strategy.

Spurred primarily by the food price increases of 2007 and subsequent food price volatility, more action to improve nutrition through changes in the food and agricultural system is being pursued by national and international organizations. However, although much is being written on the subject and many conferences are being held, the debate and policy recommendations suffer from a lack of the solid empirical policy-relevant evidence that policymakers need. Conceptual relationships must be understood in order to generate the appropriate empirical evidence needed to guide action, but the evidence must be generated through field-level analyses. The TCi offers a unique opportunity for generating such evidence and it is on its way to doing just that. As shown in this report, the research is closely linked to another important TCi goal, namely postgraduate training.

In view of the strong interest among national governments, international organizations and donor institutions to make food and agricultural systems more nutrition-sensitive as well as the great demand for solid, field-based, policy-relevant evidence, I believe the TCi will help to fill the current void in international leadership by expanding its funding base and gradually extending its field-based research and training beyond India over the next couple of years. I fully appreciate that one usually crawls before walking but I believe the TCi will soon be ready to run.

Per Pinstrup-Andersen, Chair of the Board
to achieve self-sufficiency and record remarkable gains in per-hectare productivity for staple grains, resulting in a few commercially successful crops has led to low per-hectare productivity for staple grains, resulting in high rates of stunting for children under five years of age have also persisted. This condition of chronic malnutrition can condemn one to a lifetime of physical and cognitive disability, with implications for generations to come. The TCi is positioning itself to become a leader in understanding the complex conditions that lead to hunger, poverty, and malnutrition in India, and in developing collaborative, system-wide solutions to these challenges.

A long-term research initiative launched in 2013 with a generous gift from the Tata Trust, TCi brings together students, visiting scholars and researchers from fields spanning several disciplines—nutrition, economics, engineering, human ecology, horticulture and resource management—to develop innovative technological and policy solutions capable of improving human health and nutrition in India. Working on issues ranging from access to clean water and smallholder farmer cropping patterns to soil health, dietary diversity and rural access to iron-rich foods, a team of nearly 50 faculty, staff and students spent their inaugural year as TCi Scholars, Fellows and Interns working on projects and research efforts that have yielded diverse insights into how agriculture and rural realities contribute to nutritional outcomes.

On the following pages we highlight the TCi’s 2013-2014 activities as well as its plans for 2015, including projects that apply the latest technological advances and social science insights in conjunction with on-the-ground observations and efforts to deliver practical solutions to persistent problems.
absorbing and metabolically utilizing nutrients more
difficult. The income pathway and the food supply pathway have
the most obvious connections to agriculture, given the
dependency of the poor on these activities for
income as well as their ability to influence the quality.

The income pathway and the food supply pathway have the most obvious connections to agriculture, given the dependency of the poor on these activities for income as well as their ability to influence the quality, quantity, and diversity of the overall food supply. These same women tend to have high rates of micronutrient deficiencies; in particular, iron-deficiency, which is responsible for 50 percent of the global burden of anemia. In India, devastatingly high incidences of anemia have marked it as a global epicenter.

Nutrition is multidimensional and capable of promoting and affecting multiple facets of life, and development across these areas must occur simultaneously. Focusing on agriculture is only one critical dimension of the policy puzzle for improving nutrition. Other mediating factors influence household income, micronutrient availability, nutrient absorption and utilization, and household food allocation.

Designing, implementing and monitoring a survey from scratch was a challenge. Initially, it was overwhelming to work with collaborating institutions in India and to manage a large survey team of Indian men and women. I faced numerous logistical challenges while moving staff, materials and tools around rural India. But learning how to manage and monitor quality data was invaluable for me as a researcher. I’m grateful for the knowledge I gleaned and I’m looking forward to sharing the results of this study in 2015.

OVERVIEW

SEVERE STUNTING AMONG CHILDREN UNDER 5

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Stunting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 3%</td>
<td>Above 3%</td>
</tr>
<tr>
<td>10 - 19.9%</td>
<td>10 - 19.9%</td>
</tr>
<tr>
<td>Below 10%</td>
<td>Below 10%</td>
</tr>
</tbody>
</table>

Source: TCi 2014

SCHOLAR SPOTLIGHT

Soumya Gupta, TCi Scholar and Applied Economics and Management Ph.D Candidate

Women in smallholder farming households divide their time between agricultural labor, child-care and other household chores. Those same women tend to have high rates of micronutrient deficiencies; in particular, iron-deficiency, which is responsible for 50 percent of the global burden of anemia. In India, devastatingly high incidences of anemia have marked it as a global epicenter.

My research revolves around exploring linkages between agriculture and nutrition as I try to understand how different types of farming systems influence women’s empowerment, dietary diversity and iron-deficiency anemia status. My field site is within Chandrapur, a district of Vidarbha in Maharashtra, India. I spent 2013-2014 collecting data from 960 households (1,920 individuals), on household economics, agricultural production, access to food, and women’s health, empowerment and dietary intake.

Upon completing my Ph.D, I plan to continue my research on agriculture and nutrition. I hope to understand how different types of farming systems influence women’s empowerment, dietary diversity and iron-deficiency anemia status.
INNOVATIONS IN CLEAN DRINKING WATER SYSTEMS: AGUACLARA

Inadequate supply of clean water and sanitation in India continues, despite longstanding efforts at various levels of government to improve the access and affordability of safe drinking water. Clean water is directly associated with adequate nutrition; intestinal inflammation and infection due to drinking water contaminated with worms, parasites, viruses and bacteria can lead to partial or complete malabsorption of essential nutrients and calories, in addition to life-threatening dehydration.

AguaClara, a clean drinking water technology system developed at Cornell University and supported by the TCi, is currently being piloted in the Jharkand villages of Gufu and Ronhe. The technology comprises a filtration unit for removing suspended matter and a chemical dosing unit for removing fecal contamination that releases a precision dose of chlorine in the water, making it safe for drinking and cooking. The use of solar-powered pumps allows water to move from lowland wells to elevated tanks and then into village homes without electricity or consumption of fossil fuels.

Ensuring Successful and Local Operation

Working with the local Indian non-governmental development organization PRADAN, AguaClara hopes to demonstrate that these technologies can be owned, operated and maintained independently in Indian villages. Operators are trained to reliably run the treatment system so that tap water is always safe to drink in their villages. In 2015, we hope to show that the system can be maintained through an affordable tariff paid by every household.
AGRICULTURAL POLICIES FOR IMPROVED NUTRITION

Despite growing demand from a burgeoning middle class, crop production trends in rural India are not reflecting changes in urban India’s consumer preferences. Demand for meat, milk, and processed and packaged foods would seemingly point to new and growing opportunities for agriculture producers in rural areas. However, significant barriers and market failures keep rural farmers from diversifying beyond staple grain production and meeting new market demand for micronutrient- and protein-dense fruits, vegetables and animal products. In addition to the lost rural income that could otherwise be realized by leveraging these new market opportunities, the relative prices of fruits, vegetables and animal products remain disproportionately high for rural families in comparison with staple grain prices. Obtaining dietary diversity has thus remained a challenge over much of India.

Agricultural policies can play a significant role in facilitating change and enabling access to diverse and nutritious food. Price supports, input subsidies, and research investments have biased producers towards cultivating staple crops rather than encouraging movement into emerging markets for micronutrient-dense foods. Targeted investments in market infrastructure, access to credit, and reductions in transaction costs can ultimately encourage market entry and sustain participation on the part of many farmers who could benefit from the opportunity to expand the supply of micronutrient- and protein-dense foods and reach hungry urban and rural communities.

Despite these synergies in health and wealth, agricultural interventions have rarely been defined.
or driven by nutritional goals, even though a strong connection exists between stages of economic transition and population-level nutrition patterns. Investments capable of "getting agriculture moving" or incentivizing farmer diversification can have a direct impact on the quantity, quality, and affordability of available food, all while mobilizing greater economic development. Public investment in agriculture, if targeted correctly, can be instrumental in ensuring positive nutrition outcomes as well as economic growth. TCi researchers have been working to understand these connections between a country's stage of economic transition and the resulting population-level nutrition patterns. By developing a typology of agricultural systems that reflect a particular stage of economic transformation, TCi research highlights initiatives that can be undertaken in India for reducing undernutrition and micronutrient malnutrition. Beyond publishing this research for policymakers and practitioners, the TCi has participated as a technical expert in preparatory meetings of the Second International Conference on Nutrition (ICN2), which was convened by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) of the United Nations.

FILLING THE AGRICULTURE-NUTRITION DATA VOID: ESTABLISHING A MINIMUM SET OF NUTRITION INDICATORS

For decades, agricultural surveys have focused on tracking household income and employment patterns, food supply and prices, and farm management and agronomy practices. This has provided valuable insight into the availability and affordability of certain types of foods in rural communities. However, understanding how agricultural changes or interventions affect nutrition status has largely remained a mystery. Nutritional data are rarely collected alongside large-scale, long-term agriculture datasets such as those compiled by the World Bank in Africa or the International Center for Research in the Semi Arid Tropics (ICRISAT) in India. A better understanding of the links between agriculture and nutrition will require new thinking about how agriculture and nutrition surveys can collect the same critical data needed for meaningful comparison and analysis of nutritional trends.

Enter the Minimum Nutrition Dataset for Agriculture (MINDA), a TCi project seeking to achieve consensus on the most essential nutrition metrics and ultimately develop a short (1-2 page) module for current and future longitudinal agriculture surveys. In consultation with other experts, the TCi has identified five distinct categories, or modules, for obtaining information on an individual's nutrition status:

1. Dietary diversity
2. Anthropometric and clinical indicators
3. Biochemical markers
4. Metrics around intra-household allocation
5. Metrics around early childhood care

The modular nature of this framework will allow survey administrators to choose indicator categories that are useful for addressing the types of nutritional questions about which they want to gather information.

Beginning with Dietary Diversity

The process of building the MINDA began with a workshop at Cornell University in December 2013, during which experts from nutrition, economics, sociology and natural resource management came together to outline the basic components and indicator categories.
A practitioner meeting was convened in early 2014 to understand the operational challenges posed by the MNDA modules, and the dietary diversity module was selected as the first module for development and testing.

Dietary diversity information can be difficult to gather, expensive to undertake, and time-consuming to consolidate. As a result, such information is often not included in surveys that are not focused solely on nutrition. Lack of dietary diversity is a particularly severe problem among poor populations in the developing world, as starchy staples and grains dominate diets, with little or no animal products and few fresh fruits and vegetables. There is strong evidence linking low dietary diversity to a number of micronutrient inadequacies. By targeting women between 18–45 years of age (women in their childbearing years) and asking them to recall three days of food intake, the MNDA dietary diversity module was designed to consolidate information that would yield, but in less than 30 minutes.

The women were asked to recall what they had eaten over the past three days. We collapsed the foods into nine food groups for individuals (yielding an individual intake score) and 12 food groups for households (yielding a household access score) as outlined in the Food and Agriculture/FANTA Dietary Diversity Guidelines—the same categories used in the ICRISAT administered intensive nutrition survey. Findings from this MNDA pilot survey showed that the mean and distribution of dietary diversity scores were not significantly different from those found in the intensive ICRISAT survey, but the results were achieved in less time—an average of 27 minutes—and with fewer questions. The MNDA also captured additional information that is useful for contextualizing diets and better understanding how access might be shaped by the overall food system. These include: atypical eating patterns, such as days when women fasted or went to special events; eating that occurred outside the home; and the origin of the food items that were procured. In each case of atypical eating patterns, we discovered that fasting was dramatically altering our results, once we controlled for this variable, we saw strong connections between BMI and dietary diversity scores. When we controlled for this variable, we saw strong connections between BMI and dietary diversity scores.

Pilot Testing the First MNDA Module: Preliminary Results

Pilot testing for the dietary diversity module began in the summer of 2014 with a team comprised of TCi staff, interns, and ICRISAT researchers. Four villages in Telangana and Maharashtra were surveyed and more than 140 households participated. Our participants, women between 18–45 years of age, were randomly drawn from a larger group that had previously taken part in an ICRISAT-administered intensive nutrition survey.

Participants in this spirited discussion included a select number of academics and NGO participants in addition to representatives from an eager private sector.

Biofortified Pearl Millet: Expanding Production and Enabling Access

Pearl millet is a staple consumed in much of Rajasthan, Gujarat, and western Maharashtra. Biofortification of the crop requires increases in seed production and widespread adoption of hybrid varieties in order to decrease relative prices and increase local demand. Yet millets are grown on marginal lands, with farmers who
are unable to access inputs, credit, or other technologies, including the iron-biofortified varieties. Access to services that can help improve productivity will be crucial in generating farmer interest in cultivating the crop. Developing certification programs for differentiating the product and generating price premiums. In order to justify a slightly elevated price, consumers also need assurance that they are buying an improved product. The development of certified supply chains and marketing efforts to explain price premiums, boost consumer confidence, and highlight the benefits of biofortified pearl millet for both urban and rural markets will be crucial in generating farmer interest in cultivating the crop, as will certification programs for differentiating the product and generating price premiums. In order to justify a slightly elevated price, consumers also need assurance that they are buying an improved product. The development of certified supply chains and marketing efforts to explain price premiums, boost consumer confidence, and highlight the benefits of biofortified pearl millet for both urban and rural markets will be crucial in generating farmer interest in cultivating the crop, as will certification programs for differentiating the product and generating price premiums. In order to justify a slightly elevated price, consumers also need assurance that they are buying an improved product. The development of certified supply chains and marketing efforts to explain price premiums, boost consumer confidence, and highlight the benefits of biofortified pearl millet for both urban and rural markets will be crucial in generating farmer interest in cultivating the crop, as will certification programs for differentiating the product and generating price premiums. In order to justify a slightly elevated price, consumers also need assurance that they are buying an improved product. The development of certified supply chains and marketing efforts to explain price premiums, boost consumer confidence, and highlight the benefits of biofortified pearl millet for both urban and rural markets will be crucial in generating farmer interest in cultivating the crop, as will certification programs for differentiating the product and generating price premiums. In order to justify a slightly elevated price, consumers also need assurance that they are buying an improved consumption of protein-dense pulses, which are already key ingredients in many traditional dishes, can encourage inexpensive access to this key macronutrient. Despite increased demand for pulses in urban and rural areas (and the clear nutritional benefits increased consumption could provide), domestic pulse production has struggled to keep up. The meeting convened by the TCG discussed how, in recent years, expanding and inexpensive pulse imports have led many Indian farmers unable to compete on price. Farmers now find greater farm profitability in cultivating alternative crops, especially as irrigation expands and marginalized, non- fed lands that were once good only for pulses transition to higher-value crop cultivation. To meet this growing demand and improve local supplies in rural communities and beyond, investments in research (genetic and productivity improvements) farm management strategies, and market access are needed to make pulse production more profitable. Such initiatives could provide income opportunities that could benefit poor, marginalized farmers who depend on rain-fed lands where little else, other than pulses, can grow. Moving Ahead The TCG will focus future efforts in this area on developing key partnerships, supporting product development and expanding research. By alleviating some of the farmer constraints and exploiting opportunities for new markets, the TCG will attempt to expand pulse and iron-biofortified millet production and consumption. TCG director Sulabha Parasuraman and TCG professors Madhushree Selodier and B. Ramakumar Academics from other institutions also participated, including Dr. Mahendra Dev, current director of the Indira Gandhi Institute of Development Research (IGIDR) and ex-chair of the Commission for Agricultural Costs and Prices (CACP) of the Government of India; Dr. J. Mohan Rao, University of Massachusetts Amherst; Dr. J. V. Meehlhol, Delhi School of Economics; Dr. Sukhpal V. Meenakshi, Delhi School of Economics; Dr. Sukhpal

Eating Pulses: Focusing on Raising Per Capita Consumption

Many Indians are consuming less than 50 percent of their required daily protein. Close to half of Indian women are anemic, and many in this group are anemic due to diet-related iron deficiency. Greater consumption of biofortified pearl millet, which contains twice the iron of regular pearl millet and half the iron of rice, could benefit poor, marginalized farmers who depend on rain-fed lands where little else, other than pulses, can grow. Moving Ahead The TCG will focus future efforts in this area on developing key partnerships, supporting product development and expanding research. By alleviating some of the farmer constraints and exploiting opportunities for new markets, the TCG will attempt to expand pulse and iron-biofortified millet production and consumption. TCG director Sulabha Parasuraman and TCG professors Madhushree Selodier and B. Ramakumar

Eating Pulses: Focusing on Raising Per Capita Consumption

Many Indians are consuming less than 50 percent of their required daily protein. Close to half of Indian women are anemic, and many in this group are anemic due to diet-related iron deficiency. Greater consumption of biofortified pearl millet, which contains twice the iron of regular pearl millet and half the iron of rice, could benefit poor, marginalized farmers who depend on rain-fed lands where little else, other than pulses, can grow. Moving Ahead The TCG will focus future efforts in this area on developing key partnerships, supporting product development and expanding research. By alleviating some of the farmer constraints and exploiting opportunities for new markets, the TCG will attempt to expand pulse and iron-biofortified millet production and consumption. TCG director Sulabha Parasuraman and TCG professors Madhushree Selodier and B. Ramakumar
Singh, Indian Institute of Management in Ahmedabad and Dr. Subhada Pararasuranam, International Institute of Population Sciences. Dr. Ashok Gulati, ex-chairman of CAPF and ex-director of the International Food Policy Research Institute (IFPRI) in Asia, and Bajri Patilak, who is currently the principal adviser to the Supreme Court commissioners on the Right to Food Act, also added insights from the policy world.

The course outlined the evolution and current transformations of the greater global food system, with a particular focus on implications for health, trade, and agricultural development across India. The course outlined the key drivers that are contributing to the persistence of malnutrition in rural India despite growth in Indian agriculture and advancements made over the last 50 years.

**VISUALIZING SHIFTS IN AGRICULTURE AND NUTRITION IN INDIA: THE TCi’S SPATIAL ANALYSIS WORK**

This year TCi researchers charted new territory and launched a research effort focused on mapping agricultural production trends across space (i.e., regions) and time. Thanks to district-level time-series data from a TCi partner organization, the ICRISAT, 50 years of Indian agricultural data were analyzed. By mapping out agricultural production trends across these five decades, new insights into Indian population and state-level nutrition patterns have come to life.

TCi scholars involved in this work, including Hilary Byerly, a masters student in Applied Economics and Management, began by identifying a baseline in the late 1960s. More than 50 years later, agricultural production patterns—indicating what crops were grown and where—illustrate some dramatic trends. Beginning in the 1960s, much of India’s rural population practiced subsistence agriculture, cultivating coarse cereals, rice, and pulses.

In the 1970s, however, crop production patterns began to shift dramatically towards intensive rice and wheat cultivation as the technological advancements of the Green Revolution took hold. During this time, high-yield varieties of rice and wheat and improved access to essential inputs such as fertilizer expanded production across the country. Following this era, the late 1980s ushered in a period of declining staple grain prices due to increased supply. Many farmers responded by moving into cash crops such as cotton and oilseeds. The TCi’s spatial maps from the late 1980s indicate a surge in oilseed production—a trend that has continued into the present day.

By late 2000, pulse production had shrunk and India remains one of the world’s largest producers of vegetable oils. Increasingly, cropping trends in the country are beginning to show diversification into fruits and vegetables. Pumed by a growing urban middle class that’s demanding greater dietary diversity, new market opportunities seem to be changing agricultural production patterns yet again.

The adjoining two maps are the first in a series of maps that can help to connect the dots between agricultural production patterns, current nutritional realities, and potential health challenges ahead. The TCi will continue to use this and other seasonal, climate, and socioeconomic data to illustrate the current and changing rural landscapes of India.
BEYOND 2014: PLANNED RESEARCH AND ACTIVITIES
DEVELOPING NEW TOOLS FOR OPTIMIZING SOIL HEALTH IN INDIA

As the population of one of the largest countries in the world continues to rise, India will need to produce more food with fewer resources. A prerequisite to enhancing crop production is optimum soil health.

A first step in protecting soil resources is to quantitatively establish baseline values for the characteristics and current health status of the soil. In India, to date, efforts to assess soil have generally directed their attention to the chemical characteristics and current health status of the soil. In 2015 to develop a “soil assessment framework” for soil health. Together with researchers in the Section of Crop and Soil Sciences at Cornell’s School of Agriculture, TCi researchers will work to develop a soil lab in a box” for direct testing in remote, infrastructure-poor regions throughout India. Soil and land use surveys will also be combined with GIS and GPS mapping to construct digital soil maps, providing new opportunities for communicating and reporting on soil health throughout India.

The Government of India has also placed a priority on soil health. Together with researchers in the section of Crop and Soil Sciences at Cornell’s School of Integrative Plant Science, TCi researchers will work in 2015 to develop a “soil assessment framework” for Indian agricultural land. This framework will use basic physical, chemical and biological indicators to assess soil functioning, identify constraints, and develop new management practices based on actual conditions to improve soil functioning. They will use the mobile Cornell Soil Health Test and SoilDesk, developed at Cornell and the University of Maryland, respectively—tools that will enable them to develop a “soil lab in a box” for direct testing in remote, infrastructure-poor regions throughout India.

The TCi and the Micronutrient Initiative (MI) made an exploratory trip to the Melghat region of Maharashtra to evaluate possibilities and innovations for fortifying flour with iron and folic acid. The TCi and the MI are exploring new possibilities for designing fortification methods that could be realized at both the national and village levels. Based on discussions during these trips, the following two options have emerged as opportunities for research and investment:

1. Centralized wheat flour fortification and supply through the Public Distribution System (PDS). This seems to be the most realistic and low-cost option in the short term, as it is already active in several regions in India. The Public Distribution System (PDS) is a country-wide system of distribution of food grains through a network of Fair Price Shops (FPS) run by the government. The TCi and the MI are exploring potential partnerships with companies such as DSM, which is a fortificants manufacturing company based in the Netherlands, to supply pre-mixed iron-fortificant to PDS for 2015.

2. Decentralized wheat flour fortification using a food mill (a small-scale wheat flour mill) at the local village level.

To develop and eventually implement village-level and national plans for flour fortification with iron, the TCi has been working with numerous Indian and global partners, including the BAIF Development Research Foundation, DSM, a fortificants manufacturing company based in the Netherlands, has shown interest in participating as the iron-fortificant supplier. Together, a pilot for next year in the state of Gujarat is being planned. The Health Systems Studies unit at the TISS will support the project in analysing and evaluating changes in participants nutritional status (levels of hemoglobin testing).

On discussions during these trips, the following two options have emerged as opportunities for research and investment:

1. Centralized wheat flour fortification and supply through the Public Distribution System (PDS).

The pilot will be carried out on a cluster of 30 villages in the Tapi district of Gujarat. BAIF has been working in this region for several years and retains strong connections within the community. By generating awareness of the benefits of fortified wheat flour and nutrition education training, the project aims to effectively integrate fortification management to the local women’s self-help group.

The TCi will continue to conduct research with the aim of evaluating and understanding the opportunities and challenges that makes an SHG flounder or flourish?

Initially set up for facilitating microfinance activity, SHGs are now playing an important role in overall empowerment of rural women in India, giving them the strength to create change they would not have been able to achieve individually, in terms of access to finance, environmental stewardship, and politics. However, not all groups are able to take on broader development and local governance challenges. So what makes an SHG work, or not? 

EXPLORING WOMEN’S SELF-HELP GROUPS AS CONDUITS OF CHANGE

With around three million registered groups across the country, women’s self-help groups (SHGs) are becoming ubiquitous across rural India, and integral to the lasting resilience of its food systems and communities. They can also provide some useful lessons for the rest of the developing world.

White rice is a staple component of the daily diet in India, especially in rural India. Women’s self-help groups (SHGs) are becoming ubiquitous across rural India, and integral to the lasting resilience of its food systems and communities. They can also provide some useful lessons for the rest of the developing world.

High levels of anemia are rampant across India. Women in their childbearing years, and young children, can help ensure that proper iron intake is available for local and regional consumption. In early 2014, a team comprising representatives from the TCi and the Micronutrient Initiative (MI) made an exploratory trip to the Melghat region of Maharashtra to evaluate possibilities and innovations for fortifying flour with iron and folic acid. The TCi and the MI are exploring new possibilities for designing fortification methods that could be realized at both the national and village levels. Based on discussions during these trips, the following two options have emerged as opportunities for research and investment:

1. Centralized wheat flour fortification and supply through the Public Distribution System (PDS).

To develop and eventually implement village-level and national plans for flour fortification with iron, the TCi has been working with numerous Indian and global partners, including the BAIF Development Research Foundation, DSM, a fortificants manufacturing company based in the Netherlands, has shown interest in participating as the iron-fortificant supplier. Together, a pilot for next year in the state of Gujarat is being planned. The Health Systems Studies unit at the TISS will support the project in analysing and evaluating changes in participants nutritional status (levels of anemia through hemoglobin testing).

The pilot will be carried out on a cluster of 30 villages in the Tapi district of Gujarat. BAIF has been working in this region for several years and retains strong connections within the community. By generating awareness of the benefits of fortified wheat flour and nutrition education training, the project aims to effectively integrate fortification management to the local women’s self-help group.

The TCi will continue to conduct research with the aim of evaluating and understanding the opportunities and challenges that makes an SHG flounder or flourish?
challenges surrounding the use of SHGs as a method for facilitating female-led development. In an attempt to track the activities and effectiveness of SHGs as they reach higher levels of economic achievement, TCi team members reviewed a volume of reports and concluded that much remains to be discovered about how best to harness the change that these groups promise.

Throughout 2014, TCi team members also traveled across India to acquaint themselves with SHGs firsthand. What they saw in the field mirrored much of what they gleaned from the literature: that SHGs were diverse in every sense. Some seemed cohesive, effective, and united behind a common mission, moving beyond microfinance and small-scale entrepreneurial activities into governance, such as managing a village's natural resources or participating in local decision-making committees. Others lacked leadership and were factitious.

Future work will attempt to bridge a critical knowledge gap regarding what characterizes successful SHGs. All too often, in their eagerness to see change, external organizations have elected to channel projects through SHGs without fully understanding how they function, what kinds of group dynamics are at play and whether they are already responding to other demands. As a result, the splintering of limited time and resources available to women's SHGs might undermine their capacity to manage their own affairs—a fundamental dimension for change.

FROM THE TCI BLOG

Women's Groups as Conduits for Resilient Communities
Author: Prabhu Pingali, TCi Director

Women's self-help groups (SHGs) are becoming ubiquitous across rural India. There are currently around 5 million registered women's SHGs in the country. Institutions, donors and organizations looking to leverage the power and potential of SHGs should be optimistic about the potential for using these groups to leverage positive change.

Earlier this year a leader of an SHG in Jharkhand told me proudly: “We now have a bank account and I go to the bank to manage the account. I never went into a bank before I started with this group. I always thought banks were for people with money. We have money now.” This new sense of confidence has women increasing their participation in village-level meetings and even encouraged them to participate in local government offices and natural resource management. Yet not all groups are able to mature and take on broader development and local governance challenges: so what makes a SHG flourish or flounder?

As development agencies, researchers, or practitioners, we need to proceed with caution so as not to undermine the potential of SHGs. Equipping SHGs with the financial and managerial resources they need to meet goals determined by the group and forgoing projects that could highlight the differences amongst women (educated versus non-educated; young versus old) will remain critical principles of practice…” read more at www.tatacornell.tumblr.com!
TCI SCHOLARS

Amit Anshumali, Ph.D candidate, Development Sociology. Research: The effect of off-farm employment on women’s relative autonomy in rural India.

Hilary Byerly, M.S., candidate, Applied Economics and Management. Research: Spatial analysis of agriculture and nutrition shifts in India.

Phil Frost, Ph.D candidate, Crop and Soil Sciences. Research: Developing a soil health assessment framework for Indian agriculture.

Soumya Gupta, Ph.D candidate, Applied Economics and Management. Research: Cropping patterns and women’s iron status in Chandrapur.


Maureen Valentine, Ph.D student, Animal Science. Research: Widespread deficit of biomass for animal consumption in India.

Shiuli Vanaja, Ph.D student, Applied Economics and Management. Research: TBD

Vidya Vemireddy, Ph.D student, Applied Economics and Management. Research: TBD

Gargi Wable, Ph.D student, Department of Nutritional Sciences. Research: TBD

TCI POST-DOCTORAL FELLOWS

Julia Felice, Post-Doctoral Associate. Research: Nutrient availability and accessibility

Asha Narayan Sharma, Post-Doctoral Associate. Research: Agricultural impacts of climate change

TCI INTERNS (SUMMER 2014)

Amrita Rao, B.S., Applied Economics and Management

Nithiyanth ‘Alex’ Cordova, M.P.A., Cornell Institute for Public Affairs

Andrew Pika, B.S., Applied Economics and Management

Christian DiRado-Owens, B.S., Development Sociology

Alexander King, B.S., International Agriculture and Rural Development

TCI VISITING FELLOWS

Yaping Liu, Associate Professor from NanKai University, China

Jocna Srinivasan, Fulbright Scholar and Associate Professor, Centre for Economic and Social Studies, India

ROBERT W. LOUISIANA STATE UNIVERSITY

CORNELL FACULTY FELLOWS

Robin Bellinder, Section of Horticulture, School of Integrative Plant Science

Mark Constas, Dyson School of Applied Economics and Management

Jere Haas, Division of Nutritional Sciences

Michael Walter, Department of Biological and Environmental Engineering

Monroe Weber-Shirk, School of Civil and Environmental Engineering

TCI STAFF

Prabhu Pingali, TCI Founding Director

Mary-Catherine French, Administrative Assistant

Kate Merkel, Research Support Specialist (and 2014 TCI Summer Intern)

Bhaskar Mittra, Associate Director

Katie Ricketts, Research Associate/Program Manager

TCI ADVISORY BOARD

Dr. Per Pinstrup-Andersen (Chair)

Dr. Rameshwar Kanwar

Dr. Stephen Kresovich

Dr. Reynaldo Martorell

Mrs. Emmy B. Simmons

Dr. Ajit Singh Dhatt

Prof. Tushaar Shah

Dr. Girish Solanki

Dr. Sudha Nair

TCI PARTNERS

AguaClara LLC.

BAIF Development Research Foundation

Digital Green

Harvest Plus

International Crops Research Institute for the Semi-arid Tropics (ICRISAT)

International Food Policy Research Institute (IFPRI)

KEEP UP TO DATE WITH TCI

Website: tci.cals.cornell.edu

Twitter: @TataCornell

Tumblr: tatacornell.tumblr.com (Blog)

CREDITS

PHOTOS

• Vinay Bhaskar (TCI scholar): Page 2

• Christian DiRado-Owens (TCI intern): Cover, Inside front cover, Pages 4, 17, 19, 24, 26, 27 and 29

• Nancy Chen (TCI Photo Contest Winner): Back cover

• Soumya Gupta (TCI scholar): Page 9

• Bhaskar Mittra (TCI staff): Page 27

• Alina Paul-Bossuet (Communications specialist): Pages 4 and 28

• Prabhu Pingali (TCI staff): Page 15

• Katie Ricketts (TCI staff): Pages 10 and 20

• Soumya Gupta (TCI scholar) and TCI Photo Contest Finalist: Page 30

• Monroe Weber-Shirk (AguaClara): Page 13

DESIGN

• Bill Atkinson Jr. Design/Photo Studio - www.dragonfishstudio.com

Nirmal Seeds Ltd.

Professional Assistance for Development Action (PRADAN)

Tata Institute for Social Sciences (TISS)

Nirmal Seeds Ltd.

Professional Assistance for Development Action (PRADAN)

Tata Institute for Social Sciences (TISS)

CREDITS

PHOTOS

• Vinay Bhaskar (TCI scholar): Page 2

• Christian DiRado-Owens (TCI intern): Cover, Inside front cover, Pages 4, 17, 19, 24, 26, 27 and 29

• Nancy Chen (TCI Photo Contest Winner): Back cover

• Soumya Gupta (TCI scholar): Page 9

• Bhaskar Mittra (TCI staff): Page 27

• Alina Paul-Bossuet (Communications specialist): Pages 4 and 28

• Prabhu Pingali (TCI staff): Page 15

• Katie Ricketts (TCI staff): Pages 10 and 20

• Soumya Gupta (TCI scholar) and TCI Photo Contest Finalist: Page 30

• Monroe Weber-Shirk (AguaClara): Page 13

DESIGN

• Bill Atkinson Jr. Design/Photo Studio - www.dragonfishstudio.com