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CIPT
Centers for International Projects Trust

CIPT Sandesh

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Editorial

Dear Friends,

We are happy to present the third issue of Centers for International Projects Trust (CIPT) newsletter – CIPT Sandesh. We thank our readers for their suggestions in making the content of our newsletter relevant to the expectations of our target audience. CIPT will continue to develop new approaches and practices to address the challenges of food and water security in the country.

The last quarter brought some relief, with the monsoon showing improvement and bringing down the overall deficit for the current year. Barring the states of Andhra Pradesh, Punjab, Haryana, Himachal Pradesh, Telangana and Uttar Pradesh, the rest of the country has seen normal rainfall during the year. The Government of India is keen to take up the Clean Ganga Programme in a mission mode and we welcome its initiatives. It is important to note that the river supports all users – agriculture, industry and domestic, and efforts to revive the river will need engagement of all such users in the basin.

Prof. Upmanu Lall, Director, Columbia Water Center, New York, USA visited India during August and participated in programmes across Delhi, Punjab and Jharkhand. The programmes organised as part of his visit helped us in reaching out to partners and organisations working in the sector to identify areas of common interest and develop opportunities for collaboration.

The current issue of CIPT Sandesh provides a snapshot of our work. We have enlisted our interventions across different areas – research, development, implementation, advocacy and outreach. We believe in developing partnerships with stakeholders and in the past few months have worked towards engaging with the government and the private sector.

This is in addition to our engagement with the farmers and agricultural universities which have helped us spread our interventions across different regions. The tensiometers which were so far tested in Punjab have now been installed in Gujarat and we look forward to documenting the results in the days to come.

We hope you find the content of the newsletter useful and look forward to your comments and suggestions.

Kamal Vatta and Romit Sen
Editorial Team

India's water: A reflection of a nation's soul?

Upmanu Lall and Naresh Devineni

India is a secular nation with deep religious and cultural roots. Every one of the religions, Hindu, Sikh, Muslim, Buddhist, Jain, Christian or Animist, sanctifies water in some aspect of its beliefs and practices. Many of the nation's rivers are named after goddesses. The Holy Ganga is said to purify all, and pave the path to heaven for departed souls.

Today, a road or rail journey across the country presents watercourses and lakes that are a turgid black. Where once there were rivers, there are traces of water. Where life abounded along water courses, with river dolphins, turtles, crocodiles, and birds, one sees a vestige of life, a few water birds, diminished in stature, hunting for food that may not exist. Rivers are polluted and have withered due to diversion and falling groundwater levels that historically recharged them and kept them flowing in the dry season.

The population tripled to over 1.2 billion in the last 40 years and the next 40 years will likely see the addition of another billion. Economic development has led to improved standards of living for many, and higher consumption per capita nearly across the board. The rate at which the ecosystems are being impacted is quite spectacular. Nearly a 100 species are now on the endangered list. Perhaps, consistent with Hindu beliefs these species are being reincarnated as the higher life form, humans. More realistically, the trend signals the collapse of the aquatic ecosystems, and eventually of humans.

For an outside observer, it appears that the state of India's water parallels the state of India's governance. Rampant corruption and ineffectiveness of the political and bureaucratic process marks a black era for Indian society. The rise of the Aam Aadmi Party and perhaps the sweeping victory of Prime Minister Modi in the general elections signals the growing public concern with the state of the nation.

The aspirations of India's youth are said to drive the current wave of political and economic change. Unless these aspirations are also mapped to a civic movement to address the state of India's water, the future of the nation appears bleak. It is inconceivable that a water system as stressed as it is today will support the needs for food, electricity, manufactured goods, domestic use and sanitation for another billion, unless drastic changes in the way water is used and managed become part of the national fabric.

There are many concerns with water. Water is a public policy issue. The governments seek ways to enhance the supply. Build check dams and groundwater recharge zones; install treatment systems to treat fluoride and arsenic contamination; link rivers to divert 'surplus' flows and store them for 'beneficial use.' However, water, for most part is not priced. It is inefficiently used, and there seems to be little attention to send price signals to improve water use characteristics, or to institute effective demand management strategies or to reduce and manage storm water and wastewater generation.

The Modi government has re-awakened the Ganga Clean-up and river linking projects. These are mega-infrastructure projects that may be needed. However, in the absence of a coherent national strategy on water that addresses the agriculture, energy and climate connections to water, as well as urban and industrial use which lead to wastewater generation, water will continue to be the single most significant constraint for the sustainable development of the nation.

Water is a state subject in India, as it is in many other countries. The Central Government provides approval and financing for large infrastructure projects in the States. External agents, such as the World Bank and the Asian Development Bank also provide financing and assistance on governance principles. The financial outlay on water related activities by the Center and by the States is not small, yet the state of India's water is already critical.

Take for instance, the Ganga. To restore the functioning of this sacred river, one needs to remove or reduce the sources of pollution by enforcing wastewater treatment in cities and at factories. This could be achieved with significant capital and operating expense. However, this is only the first line of attack. One that is conceptually obvious, yet challenging to implement. The West was successful in reducing urban and industrial pollution of rivers and groundwater, and the Chinese are making advances in this direction. Thus, one can hope that India could make some progress. Agricultural pollution and urban non-point source pollution related to storm water will subsequently emerge as a challenge. The many years of pollution have also contaminated the sediments of the river, which will continue to release pollutants into the river.

The level to which one will need to treat the wastewaters and other sources of pollution will also depend on the flows in the river. The lower the flow, the lower the dilution of the pollution and the higher the degree to which one needs to treat the waste streams. To increase the flow in the river, one needs to reduce the diversions of water from the river for agriculture and to cities and other users. This begs an examination of how effectively the water diverted from the rivers is being used. The answer is not very well known. There is considerable scope for improving water use in agriculture, which accounts for over 85 per cent of the diversion of water. A 10 per cent improvement in water use in agriculture could nearly double the water available to all other users. Yet, there is little incentive for farmers to effect such improvements since they typically do not pay for water, and improving water use efficiency does require capital and labour expense.

The significance of improving water use efficiency is underscored by our analysis that shows that current water use in many parts of India translates into the need for 2 to 5 years of storage of average annual rainfall to deal with persistent drought. Of course, in states

like Punjab and Haryana, the water use exceeds the average annual rainfall, and the situation in the grain belt of the country is critical. The climate risks associated with drought could be managed better with better pre-monsoon forecasts and their use to manage food and water storage, and better crop selection.

Water use efficiency in other sectors is not much better, but since they don't account for nearly as much volume, agriculture stands out as an important target for improvement. Water diverted to agriculture and not used efficiently is evaporated and is a net loss to the system, while water used for thermal electric generation and for urban/industrial use is typically contaminated but not lost to the system. This reinforces the need to address water efficiency improvements in agriculture and improved treatment of urban wastewater.

Higher flows at one point in the river also mean more water available to downstream users. If urban users were to treat their wastewater to a standard where they could re-use it, then the amount of water they would need to divert would be drastically reduced, and higher flows of higher quality could be maintained throughout in the streams. Ultimately, one needs to grapple with the cycle of water, and how it intersects the cycles of life and the economy.

Should we pay to treat wastewater only to discharge it into the river, or should we treat it so we can re-use it? Should we pay to capture urban stormwater as our own cherished resource and treat it and use it, or let it flow down to the river, with all the waste it picks up on the streets, and then let someone downstream pay to treat it and use it? Does the water saved by efficient agriculture help us generate more electricity, so we can promote the treatment of water for drinking purposes, and support the industrial economy that places us among the developed nations? How does one provide incentives to the agricultural sector to achieve higher water use efficiency, or reduce water use through more climate appropriate crop selection and improve access to water and energy for all? What role can corporations play to facilitate the transition of agriculture through better extension, procurement and technologies? Should the government offer water/energy credits to corporations that help achieve better water efficiency in agriculture?

Of course, cleaning up the Ganga is symbolic. The questions raised above signal the need to examine the basic water issues across the land, in the context of India's moral, economic and physical future. An enlightened citizenry needs to shape this future. To do this, the governments need to make all data and information as to the availability and quality of water public, and help facilitate a national debate on the directions to take, by supporting credible, evidence based research on the costs, benefits and impacts of different strategies and designs for meeting our water needs while living with nature. Information on water use and how it can be improved needs to be collected and made available. Yes, climate change is a concern and will likely exacerbate the situation. However, the discussion needs to focus on water, clean and dirty, its variable supply and its use within the limits of our living harmoniously with nature. Simply building more infrastructures and seeking ways to increase the supply is not an option.

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Making our voices heard: Outreach initiatives of CIPT

Seminar on Water Risk and Water Stewardship in India

Water risks in India are on the rise. Not only businesses, but the communities, customers, suppliers, and governments are also exposed to water risks along with pressures on freshwater ecosystems. Climate change impacts on freshwater are increasing these risks and generating greater uncertainty about future conditions. This collective risk calls for collective action and a robust policy framework. Collaborative cross-sectoral efforts to reduce shared water risks can emerge through common understanding, strategies, solutions and well-aligned incentives. These are often the most effective ways towards sustainable water management.

To contribute towards positive action on India's agenda of water policy reform, the Organisation for Economic Co-operation and Development (OECD), the Federation of Indian Chambers of Commerce and Industry, (FICCI), the Asian Development Bank (ADB), and the 2030 Water Resources Group (WRG) organised a joint seminar on Water Risks and Stewardship in India on August 20-21, 2014. Centers for International Projects Trust (CIPT), WWF, and WBCSD were supporting partners to the seminar.

The seminar was inaugurated by Sushri Uma Bharti, Union Minister for Water Resources, River Development and Ganga Rejuvenation, Government of India. Speaking on the occasion, the minister asked representatives of the industry to take measures to control pollution and work with the government in their mission to clean River Ganga. She indicated that the government will interlink 31 rivers in the next 10 years.

Prof. Upmanu Lall made a presentation on Water Risk Model to inform India's Development during the session on 'Building a common understanding of water risks and risk sharing.' Explaining the Water Risk Model developed by Columbia Water Center, Prof. Lall called for focussed analysis at the user level for better decision making. While demand management is important, it is equally important to enhance understanding of the supply side in light of changing climate and its impact. There lies an opportunity for effective water use and efficiency credits and trading in the days to come, remarked Prof. Lall.

The seminar provided an opportunity to collate the experiences of the government, the private sector and CSOs and to share challenges for driving the water stewardship agenda in the country. It was noted by all participants that robust analyses, including economic analysis can support policy discussions and highlight policy options that contribute to growth and poverty alleviation, in an equitable and sustainable way. International experience can also contribute, to inspire policy options and the accompanying measures that can make reform happen. The seminar provided a basis for future collaboration in India, with the partners and participants reaffirming their commitment to join hands for strenthening various ongoing policy initiatives of the government.

Stakeholder Consultation: Towards Sustainable Water Use in Punjab Agriculture: Roadmap for Collective Action

CIPT organised a stakeholder consultation titled 'Towards Sustainable Water Use in Punjab Agriculture: Roadmap for Collective Action' in Chandigarh on August 28, 2014. The workshop was organized under the USAID funded project on Water-Agriculture-Livelihood Security (WEALS) in India. The deliberations focused on the challenges and collaborative action, involving various stakeholders – government, civil society, academia and farmers. It saw the participation of the Financial Commissioner Development, Government of Punjab; Chairman, Punjab State Farmers Commission;Vice-Chancellor,Punjab Agricultural University and senior officials from various departments, Government of Punjab, and The World Bank.

Dr. Kamal Vatta, Director CIPT outlined the initiatives carried out by CIPT in the state of Punjab, CIPT in association with PAU has reached out to close to 13,000 farmers through its intervention on water saving technologies, extension and outreach programme. Dr. Vatta pointed out the strong and bi-directional connection between water and energy. While water is required for energy generation and transmission, a large chunk of energy is utilized in pumping out the groundwater, water treatment and its transportation.Such complex relationship leads to fierce inter-sectoral competition for water and energy reflecting the need for optimal allocations added Dr. Vatta. He indicated that CIPT aims at long-term sustainability of the water-energy-food nexus by maximizing the synergies and minimizing the trade-offs and by working closely with various stakeholders.

Shri. Suresh Kumar, Financial Commissioner Development, Government of Punjab in his Key Note Address highlighted the important role played by Punjab and its farmers in addressing the food security goals of the country and remarked that the challenges are well understood in respect of the environmental degradation. He called for developing a broad-based agriculture sustainability programme for Punjab.

Dr. B.S Dhillon, Vice Chancellor, Punjab Agricultural University enumerated the challenges faced by the agricultural sector in Punjab. Elaborating on the role of water in Punjab especially with respect to the agriculture in the state, he opined that water was scarce and also critical in sustaining the agricultural production process. He called for some bold policy decisions which look at development and implementation of sustainable operations in the agricultural sector.

Prof. Upmanu Lall, speaking on the impacts of climate change in Punjab laid stress on the need to increase water supply in light of changing climate and its impact on availability. He called for a mix of demand and supply side management measures to adapt to the impacts of climate change. Climate informed forecasts of near-term rain and flow can inform many instruments for supply and demand management, he added. Price signals and incentives timed to the forecast can induce positive behaviour and demand changes, remarked Prof. Lall.

Dr. G.S. Kalkat, Chairman, Punjab State Farmers Commission called for strengthening extension services for making a meaningful impact with respect to the interventions undertaken by various agencies. Stressing on the need for crop diversification, Dr. Kalkat called for enhancing the market linkages and provisioning of better economic returns if diversification is to succeed.

Mr. Sanjiv Nair, Director General, NECTAR enumerated the technology interventions undertaken by NECTAR in collaboration with CIPT. Both the organisations are engaged in development and pilot testing of technologies that reduce the use of inputs such as water and fertilizers in agriculture. Low cost innovations have the potential for wide-spread reach and adaptation and the scientific community needs to work on developing these further concluded Mr. Nair.

Ms. Apurva Chaturvedi, Program Management Specialist, USAID speaking about the close water-energy nexus in agriculture indicated that farmers have no incentive in the current scheme of high inputs driven agriculture. She called for investments in agricultural demand side management which makes a sound business case in addition to saving resources – mainly water and energy; simultaneously improving the health of the utilities.

Dr. Genevieve Connors, Program Leader, Water and Sustainability, The World Bank, enumerated the initiatives undertaken by the World Bank Group in areas of water, agriculture and rural development. The Bank as a group has so far made an investment of USD 20 billion in the areas of water and agriculture. The overall objectives of The Bank's initiatives are to enhance water security, improve water use efficiency and agricultural productivity.

The workshop identified the following areas for future action -

- CIPT will interact with the different stakeholders to explore the possibility of setting up of a water and agricultural sustainability centre at the state level. This will include as assessment on what could be the mandate of such a centre, how this centre will be institutionalised and who all could be approached for support in developing the centre.
- CIPT will undertake research on relooking at options for power subsidy based in the state of Punjab based on calculating energy consumption per unit of grain or land.
- Pilot testing of low cost technologies developed by NECTAR.

Roundtable Meeting: India Water Action Network

Centers for International Projects Trust (CIPT) and Columbia Water Center, New York launched an India Water Action Network (IWAN) in 2008 to engage leaders in industry, government and non-government organizations to develop and communicate a clear scientific assessment of the key water issues and opportunities from a broad set of user and developer perspectives. A roundtable meeting was organised at India International Center, New Delhi on August 22, 2014.

In his remarks to the group, Prof. Lall stressed upon the need to bridge the lack of data and information gap in areas we work. While there are numerous institutions undertaking research across different regions in this country, there is no credible mechanism to collect the information asymmetry and access, opined Dr. Lall.

Dr. Kamal Vatta, Director outlined the initiates of CIPT in the area of sustainable agricultural development and highlighted the need for effective partnerships.

Deliberations during the roundtable helped in identifying potential areas for collaborative action with different stakeholders for CIPT to engage in the days to come. Developing a better understanding of the water-energy-food-climate nexus, building the information gap in the sector, demonstration at scale and engaging with policy makers as a coalition were some of the major areas highlighted by the participants.

Consultative Workshop: Towards Sustainable Water Management in Jharkhand

A consultative workshop titled Towards Sustainable Water Management in Jharkhand was organized on August 25, 2014 in Ranchi involving different stakeholders like Department of Agriculture, Drinking Water and Sanitation, Energy, Mines, Geology, Ground Water Board and Water Resources. The purpose of the workshop was to discuss the issues related to water management in the State and share progress of the R&D project being undertaken by CWC and CIPT in collaboration with Govt. of Jharkhand.

There was a presentation on the progress of Multi-purpose R&D pilot projects for assessing the feasibility of cost effective and sustainable technologies for drinking water storage and distribution in rural areas. Later, intense discussions were held amongst officials of various departments to identify areas for future actions. Some of these include:

- Local institutions like Central University of Jharkhand (CUJ), Indian School of Mines (ISM) and Jharkhand Space Application Centre (JSAC) will have to come forward and work in collaboration with Drinking Water and Sanitation Department (DWSD) to develop a data bank for the state.
- There was a suggestion for the creation of a research cell with dedicated staff that can be trained by academic groups (ISM, CUJ, BAU, CWC and North East Centre for Technology Application and Reach (NECTAR) in various areas of research design, hydrological analysis and modelling work.

Sustainable agricultural practices: Creating gains for the community and environment

The importance of agriculture can never be over-stated for our economy and the society. However, intensive agricultural practices have resulted in over-exploitation of natural resources. Groundwater based irrigation is prominent in many states. Unregulated use of groundwater coupled with highly subsidised or free power has encouraged over-exploitation of aquifers impacting the availability and quality of water.

Multiple strategies such as crop diversification and use of water saving technologies have been envisaged for achieving long-term sustainability of groundwater use in the country. CIPT has implemented and promoted the use of water saving technologies to reduce the consumption of water and energy in water intensive crops like paddy.

Improving water use efficiency: The use of tensiometers

The use of tensiometer has been promoted by CIPT across the past few years. Working with the Punjab Agricultural University, Ludhiana close to 13,000 tensiometers has been installed across 350 villages of Punjab spanning the nine districts of Amritsar, Barnala, Jalandhar, Kapurthala, Ludhiana, Moga, Patiala, Sangrur and Tarn Taran.

During 2014, CIPT started promoting the use of tensiometer in the state of Gujarat as well. Working with Krishi Vigyan Kendras in Kheda and Devataj, about 500 tensiometers have been installed in rice crop across the districts of Anand and Kheda in Central Gujarat.

A comprehensive approach is followed for promoting the use of tensiometers and estimating the extent of water and energy savings. Various steps involved in this process are outlined below:

- Farmers' awareness and trainings: The farmers are made aware about the issues of water depletion in their states and are trained effectively on the use of tensiometers. Resource persons from partner organizations are engaged during the training programmes
- Installations: The tensiometers are installed at the farmers' fields by well-trained field workers.
- Regular monitoring and supervision: The field workers conduct regular monitoring of the farmers' fields and regularly address the problems in the use of tensiometers. Information on water use, energy, yield and other important parameters is also collected.
- Estimating the water and energy savings: The water and energy use is compared with the adjoining plots, where farmer irrigates in a conventional manner, not using the tensiometer.

The use of tensiometers in paddy has resulted into water saving of about 20 per cent and corresponding energy savings of about 24 per cent. At an aggregate level, these water and energy savings turn out to be huge. In addition, there was no adverse impact on the yield of paddy owing to the use tensiometers. Table below indicates the impact of tensiometers on water and energy savings.

Impact of tensiometers on water and energy savings

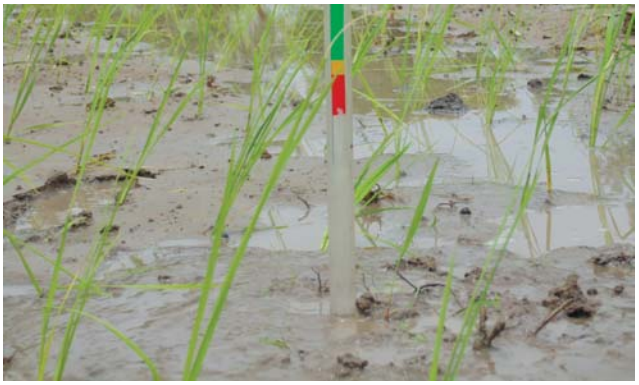
Particular	Value
Water saving per acre (%)	20
Water saving per acre (litres)	419,062
Energy saving per acre (%)	24
Energy saving per acre (Kwh)	90

Promoting System of Rice Intensification (SRI)

CIPT in collaboration with the Society for Promotion of Wastelands Development (SPWD) is engaged with 700 farmers across 20 villages in Ranchi district. There was one lead farmer for each group of 20 farmers to guide the fellow farmers on routine SRI practices and methods. In all, there were 35 lead farmers, who supported the successful promotion of SRI with 700 farmers during 2014.

The entire process of promotion of SRI is divided into four phases:

1. Identification of farmers and lead farmers: In the begining, CIPT and SPWD identified 20 villages where the SRI was to



be promoted. The villages were identified on the basis of the preliminary surveys and past experience of SPWD's working in these villages. Camps were organized in each village to identify the potential farmers who could opt for SRI and 35 farmers were identified in each village. All the farmers were organized in homogeneous groups of 20 farmers and a lead farmer was identified for each group in its first meeting. Apart from generating awareness on SRI amongst member farmers, group meetings also helped in making the lead farmers aware of their responsibilities towards fellow farmers in the group and their training needs.

2. **Farmer trainings:** These trainings were conducted in two steps. First, a one-day training programme was conducted for all the 35 lead farmers to equip them with necessary information and skills on SRI and to help them to lead their respective group. The lead farmer training focused on various issues of SRI, package of practices (PoP), integrated pest management, integrated nutrient management and supportive supervision. In addition, the lead farmers were also trained on how they could provide regular support to the group farmers and ensure continuous supervision and monitoring of the farmers' activities from transplantation to disease control and finally till harvesting the crop.

   After successfully conducting the lead farmer training, 35 farmer group trainings were organized in the respective villages to train the farmers on various aspects of SRI. These trainings further strengthen the capacity of lead farmers. The farmers were trained and made aware about the cultivation and other practices related to the SRI. All the necessary information related to the member farmers was also compiled during these trainings.

3. **Transplantation of rice:** Farmers transplanted less than 15 day old rice seedlings using SRI techniques under close observation of lead farmers and expert teams. CIPT and SPWD made provisions for developing a rice nursery for the farmers. The farmers were also provided some fertilizers as an incentive to remain motivated throughout the experiment and follow the recommended package of practices for better results.

4. **Crop management:** This constitutes the last and longest phase of the experiment starting after the transplantation of rice in the farmers' fields. The major focus in this phase was on management of diseases and pests, promote plant health for optimum yield productivity and gather all the relevant information on the experiment from the farmers. Another round of farmers' trainings will be carried out to build their capacity to follow the recommended package of practices and maintain optimal plant health.

The success of System of Rice Intensification in Jharkhand is expected to improve rice productivity and bring significant reduction in the use of seed, irrigation water, fertilizers and pesticides. Increase in productivity along with reduction in input use will enhance profitability and will lead to an increase in farm incomes. Reduction in water usage per unit of land may increase the availability of irrigation water and may bring more area under cultivation, which ultimately will add to more food production and farm income. The successful demonstration of SRI during this experiment will feed into a comprehensive strategy to promote the SRI in Jharkhand and other parts of India. The necessary information on all the required parameters for scientific evaluation of the benefits of SRI is of utmost importance and CIPT has devised a comprehensive strategy for this purpose.

Towards sustainable agriculture: Fostering effective partnerships

India has been an agrarian country. Agriculture has remained fundamental to the growth and development of our country. Steady investments in research, technology development, irrigation infrastructure, emphasis on modern agricultural practices and innovative low-cost high-impact technologies and provision of agricultural credit and subsidies are the major factors contributing to agricultural growth in the country.

CIPT is a research and development organization providing rigorous, research based knowledge as the foundation for various field based initiatives involving the local communities, government, non-government and private partners. Working in India for the past seven years, CIPT has built partnerships with various organizations to promote water-energy-agriculture and livelihood sustainability.

These partnerships relate to the following specific areas:

Agricultural research and development

Achieving natural resource sustainability and improving rural livelihoods requires an in-depth understanding of water-energy-agriculture nexus of a given region and a thorough analysis of the livelihood and adoption patterns. To formulate effective strategies for ensuring agriculture sustainability in the long-run, CIPT has partnered with the State Agricultural Universities, other institutions and government departments. Prominent partners in Punjab include Punjab Agricultural University (PAU) and the Department of Cooperation. In Jharkhand, we have partnered with Birsa Agricultural University (BAU), State Agricultural Management and Extension Training Institute (SAMETI) and Central University of Jharkhand (CUJ). In Gujarat, the major partners are Uttar Gujarat Vij Company Limited (UGVCL) and Krishi Vigyan Kendras (KVKs). Efforts are underway to partner with State Agricultural Universities and other departments in Gujarat.

The major focus of these partnerships is to examine the relationships between food production, energy use in agriculture and natural resource conservation under changing climate in India. There is emphasis on conserving water and energy resources and improving rural livelihoods. The State Agricultural Universities and KVKs support in conducting an in-depth analysis of such nexus and promoting strategies for sustainability. These organisations are also providing relevant information to develop decision support systems for the farmers. The Department of Cooperation and SAMETI provide basic platforms for scale up strategies for better coverage. The CUJ is involved in mapping the water resources in Jharkhand to plan drinking water treatment and distribution strategy in the long-run.

Developing low-cost technologies and applications

CIPT has partnered with North East Centre for Technology Application and Reach (NECTAR) and Technology Outreach Foundation (TOF) to develop and promote low-cost technologies for enhancing resource-use efficiency (especially with respect to water and fertilisers) and conserve natural resources and environment. We are working together for:

- Developing soil moisture sensor;
- Developing chlorophyll sensor;
- Using remote sensing techniques for mapping natural resources and topography to encourage better resource use planning.

Developing business viable value-chains

There is a strong need to establish the value-chains in agriculture that can serve the interests of the farmers as well as of intermediaries and can also improve the efficiency of the markets in the medium and long-term. The value chains should integrate the aspects of export potential, domestic markets, opportunities for processing, food safety standards, research and development needs for promoting value addition in agriculture and effective integration of the stakeholders to ensure business viability of value chains which can ensure equitable distribution of benefits to all the stakeholders, especially the farmers.

CIPT has partnered with the Field Fresh Foods Private Limited and academia to develop a framework for the development of business viable value chains in agriculture. The partnership will help in gathering inputs on the essentials of food processing, food safety, marketing and other research and development needs for such value chains. It will also help in pilot testing of the business viable models. The partners will attempt to develop market outlook for alternate commodities by exploring the regional, national and global markets and will devise strategies for scaling up of the business viable chains. The success of such partnership may contribute to the success of crop diversification efforts in the country.

Innovative insurance products to promote technology adoption

There exist many technologies such as laser land levelling and tensiometers, which have the potential to bring significant improvement in the water-use efficiency. Despite scientific evidence of significant water savings with the use of such technologies without any adverse impact on the crop yields, the rates of adoption are very slow, especially during the initial years of introduction and promotion.

The farmers usually look at such technologies with suspicion till they are fully convinced of their usefulness. Relatively less adoption during the initial years coupled with incomplete following of the recommendation makes large scale adoption of such technologies a relatively slow process. The smallholders, who have less risk bearing capability, don't prefer to venture into such adoptions or do it quite late and are thus left out of the benefits of such development process.

Unlike the yield or weather insurance, which are more prevalent forms of crop insurance, the insurance for promoting the adoption of technologies must be looked upon differently. While the scientific evidence may usually point to no significant risk in the adoption of

such technologies, farmers may perceive some risk based on their own understanding. The insurance product must cover only that marginal risk of loss in productivity rather than covering the entire output in the crop.

CIPT, Punjab Agricultural University (PAU) and Agriculture Insurance Company (AIC) of India have partnered to develop and pilot test innovative insurance products to promote adoption of technologies. Under this collaboration, AIC is expected to develop insurance products suitable for pilot testing in different parts of India. CIPT and PAU are expected to design the pilot of these insurance products and will also support in supervision and monitoring of the technology usage and resulting losses, if any.

The first such initiative is the product named PAUTITIS being pilotted with 500 paddy growers in Punjab using the tensiometers for the first time in 2014.

The PAUTITIS provides insurance against the yield loss ranging between 75 kg and 250 kg per acre owing to the use of tensiometers in their paddy fields. The insurance is expected to boost the rate of adoption and the extent of water saving in paddy crop due to the use of tensiometers.

About Centers for International Projects Trust

The Centers for International Projects Trust (CIPT) is the India Office of the Columbia Water Center. Affiliated to the Earth Institute at Columbia University in New York, the Center is uniquely positioned to apply rigorous, multi-disciplinary research to solve difficult on-the-ground water resources and climate-related water risk problems. In collaboration with government agencies, civil society and private sector partners, CIPT is developing new models and research paradigms for effective water and energy management. We work towards providing rigorous, research-based knowledge as the foundation for various field based initiatives involving the local communities, government, non-government and private partners.

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