



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

Background

Punjab is known as the food bowl of India. It accounts for 18 per cent wheat, 10 per cent rice and 5 per cent cotton production of the country. Agriculture sector is an important driver of growth for its economy, especially in the rural areas. Riding over the success of green revolution, the agricultural economy of Punjab showed a remarkable growth with the introduction of high yielding varieties of wheat and paddy during mid-1960s and early-1970s. The food production in Punjab grew annually at more than 9 per cent during 1960s and between 4 and 6 per cent during 1970s and 1980s. The farm household income also increased by around 8-9 per cent per annum during 1970s and 1980s. The farming systems in Punjab still exhibit the highest levels of productivity in the country with the combined productivity of paddy and wheat at more than 11 tonnes/ha. With the cropping intensity of almost 191 per cent, fertilizer use at 250 kg/ha, almost entire area under assured irrigation (3/4th of which is irrigated by groundwater) and the number of tractors touching almost 0.5 million, Punjab agriculture exhibits one of the most intensive forms of agriculture which also contributed profusely towards the reduction of rural poverty.

Major issues

There has been a significant slow-down in the farm sector with the growth rate in Punjab agriculture falling to almost half of the national average in the last decade. The dominance of paddy-wheat monoculture, occupying almost 80 per cent of the total cultivated area, has resulted into deterioration of soil health and steep fall in the ground water resources. The current cropping pattern in Punjab annually requires 6.15 million hectare meter of water against the sustainable availability of 3.66 million hectare meter, resulting into a huge deficit of 2.49 million hectare meter. Such an imbalance has resulted into severe depletion of groundwater resources with the fall in ground water table averaging around 70 cm per annum during the past few decades. Almost 80 per cent of the blocks in Punjab are categorized as over-exploited.

The policy of free water has not only encouraged the wasteful use of irrigation water in agriculture but has also added to the power subsidy burden of the state government. The depletion of groundwater necessitated the shift from centrifugal to submersible pumps on most of the farm holdings, adding to the debt burden of the



farmers. The marginal and small holders (operating less than 2 hectare) are the worst sufferers as their struggle to overcome the unviability of their holdings got a further jolt. Without any significant change in the cultivated area, the power consumption in Punjab has more than doubled from 5,105 million Kwh during 1990-91 to 10,898 million Kwh during 2010-11. The subsidy burden has gone more than 8 times from Rs. 421 crore in 1990-91 to Rs. 4,778 crore in 2013-14.

In the light of over-exploitation of groundwater resources, steep fall in the groundwater table and ever-increasing burden of power subsidies, it become pertinent to have a detailed insight into the causes of over-exploitation and converge on the strategy to check such depletion. Conservation of groundwater resources may involve multipronged strategies in the form of crop diversification, promotion of water saving technologies and the use of innovative approached to reach a large number of farmers faster and more frequently. More efficient use of water in agriculture is not only expected to have a positive impact on crop productivity but will also have positive implications for industry and households sectors as more water and energy will become available to these sectors to enhance their productivity in the long-run.

CIPT's work in Punjab

The Centers for International Projects Trust is working in close collaboration with the Punjab Agricultural University (PAU) since 2008. Apart from carrying out a deeper analysis of the water-agriculture-livelihood nexus in Punjab, it has focused on three broad aspects to ensure long-term water sustainability in Punjab agriculture. CIPT has focused on promoting the development and use of low-cost water-saving technologies and practices such as tensiometers, soils moisture sensors and the direct seeding of rice. The collective efforts of CIPT and PAU have resulted in savings of millions of litres of groundwater

and thousands of kilowatt hours of energy every year. We are working towards developing business viable models for value chains working with corporates and strengthening information access to farmers through the development of robust decision support systems. The major outcomes of our work in Punjab are indicated below:

- Promoted the use of tensiometer for irrigation scheduling in paddy with approximately 13,000 farmers since 2009;
- Around 3 billion litres of water and 200,000 units of power saved;
- Partnered with the North East Center for Technology Application and Reach to develop low-cost soil moisture sensors for irrigation scheduling in various crops;
- Developed an interactive information portal and decision support system for farmers to enhance more rational use of inputs in agriculture;
- Developed mobile application for application of nitrogenous fertilizers; and
- Bulk messaging for faster information dissemination to the farmers.

Objectives

CIPT organized a stakeholder consultation titled 'Towards Sustainable Water Use in Punjab Agriculture: Roadmap for Collective Action' in Chandigarh on August 28, 2014. This Workshop was organized under the USAID funded project on Water-Agriculture-Livelihood Security (WEALS) in India. The workshop aimed to deliberate on the challenges and work towards identifying collaborative action involving various stakeholders – government, civil society, academia and farmers. The key questions which were deliberated during the workshop included:





- What are the major issues of groundwater availability and use in Punjab agriculture and its long-term sustainability?
- What have been the State initiatives for sustainable water use in agriculture with special reference to some success stories? How various stakeholders can converge to increase success of such initiatives?
- What are the strategies to improve water use efficiency in Punjab agriculture with respect to water-saving technologies, crop diversification and government policy?
- What are the current capacity building needs of the farmers and other stakeholders to ensure long-term sustainability of natural resources in Punjab? How to design a comprehensive capacity building programme for these stakeholders?

Discussion Summary

Dr. Kamal Vatta, Director, CIPT in his welcome remarks outlined the initiatives carried out by CIPT in the state of Punjab. CIPT has reached out to close to 13,000 farmers through its intervention on water saving technologies, extension and outreach programmes.

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 ground water, 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 a change in the policy response through better understanding of the needs and aspirations of the farmers through a bottom-up approach. He called for a comprehensive re-assessment of the water resources available in Punjab for better resource planning and allocation across states. Speaking about power subsidy, Shri Kumar remarked that the state is looking for innovative approaches to address the concerns relating to the increasing subsidy burden. The subsidies will remain, he added but called for a pragmatic approach of calculating energy consumption per unit of grain or land.



To conclude with, Shri Kumar called for developing a broad based agriculture sustainability programme for Punjab. This will have to include the participation of various arms of the government and farmers working with academia, civil society organisations and community at large, added Shri. Kumar.

Dr. B.S Dhillon, Vice Chancellor, Punjab Agricultural University enumerated the challenges faced by the agricultural sector in Punjab. The food grain production increased from 32 lakh tons in 1960-61 to 285 lakh tons in 2012-13. Other parameters such as cropping intensity, irrigated area, fertilizer use, insecticide/pesticide and number of tractors saw a sharp rise during this period, remarked Dr. Dhillon. He further added that excessive



input use in agriculture coupled with subsidies and higher pricing for paddy/wheat have led to current scenario.

Elaborating on the role of water in Punjab especially with respect to agriculture in the state, he opined that water was scarce and also critical in sustaining the agricultural production process. This had its effect on the water scenario in the state, wherein against a demand of 4.93 m ha meter the supply was 3.48 m ha meter. Thus, the deficit was 1.45 m ha meter. The increase in area under crops especially paddy and the growing number of electricity operated pump-sets were the chief cause of depleting water table. In central Punjab, 96 per cent of the blocks were exploited where in the state around 80 per cent of the blocks were exploited. However, Punjab played a leading role in ensuring the national food security and now was ridden with severe water concerns.

Dr. Dhillion highlighted the attempts being made to increase the use of technology for improving water use efficiency and reduction in input use. He called for strengthening micro-irrigation, fertigation, and its automation. According to Dr. Dhillion mapping of water resources under climate variability is crucial for bringing out the real picture in terms of water resource availability and future use. Development of decision support systems for water management and user friendly water saving technologies such as sensor based soil moisture probes would improve water use efficiency, added Dr. Dhillion. There are concerns relating to the adoption of technology and one needs to address these through a socio-economic lens, he remarked. To conclude Dr. Dhillion called for some bold policy decisions which look at development and implementation of sustainable operations in the agricultural sector.

Prof. Upmanu Lall, Director, Columbia Water Center, New York spoke on the possibility of Punjab adapting to the climate change. Prof. Lall indicated that based on empirical data that there are several multi-year to multi-decadal cycles of wet/dry climate scenarios possible in the region and there was a strong need to be prepared for any such



repeated occurrences. The rainfall did show long term variations and multi-year cycles and a part of the recent ground water depletion could be attributed to the recent drying trend i.e more dry spells.

Speaking on the impacts of climate change in Punjab, Prof. Lall 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 behavior and demand changes remarked Prof. Lall. He further remarked that in order to adapt to a changing climate, Punjab needed to manage its total water and energy resource i.e. renewable river and groundwater. Development of models for ground water and energy response for crop choice and energy response was stressed upon to support the analyses and decision making on water-demand management options.

Mr. A.S Dulet, Chief Engineer (Canals) gave a historical perspective of irrigation in Punjab. The irrigational infrastructure in Punjab was more than a century old, being set up in 1849. The state now has a 14,500 km long network of canals. Punjab's replenishable ground water resources were estimated to about 2.032 Million Ha-m against this total withdrawal was estimated at 3.417 Million Ha-m, which showed an annual over draft of ground water of around 172 per cent.



Mr. Dullet mentioned that over the years, upkeep and maintenance of various canals suffered for want of funds and utilization of water has dropped to 70 per cent. The state faces a problem of water logging and there are losses due to seepage as well. Canal system in the Punjab needs rejuvenation and modernization for optimum utilization of available surface water. The state will have to look at a comprehensive plan for augmenting surface water planning through better decision support systems, remarked Mr. Dullet.



Dr. Balwinder Singh, Commissioner Agriculture, Govt. of Punjab indicated the changing trends towards greater use of groundwater for irrigation in the state leading to the depletion of groundwater aquifers. The current model of development is non-equitable mainly benefitting the big farmers and there is an urgent need to address the concerns of the small landholders, he remarked. Dr. Singh shared some of the state initiatives to address the water resource availability problem in the state which include a mix of legislative, institutional and financial measures. Some of the measures include enacting Punjab Preservation of Sub-soil Water Act, 2009 to ensure timely planting of paddy keeping in mind the progress of monsoon; crop diversification by shifting about 1.2 million ha from paddy to alternate crops viz. maize, cotton, basmati rice, fruits, vegetables, sugarcane and agro-forestry; stress on resource conservation technologies; efficient use of available supplies and adoption of water saving technologies.

He called for developing better crop production technologies to address the problems and improving the water governance to meet the aspirations of the people. According to him, there was a need of a new vision for water management. Increased investment along with continued efforts in improving water productivity and water use efficiency were required to tackle the problem, he remarked.

Mr. Sanjiv Nair, Director General, North-East Centre for Technology Application and Reach enumerated the



technology interventions undertaken by NECTAR and the association of CIPT and NECTAR. Both the organisations are engaged in development and pilot testing

of technologies that reduce the use of inputs 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.

Prediction on local weather scenarios was also stressed upon by Mr. Nair as farmer often remain clueless about local weather patterns. By building a network of local climate data, integrated with other parameter such as humidity and temperature, there is a need to give a weather forecast of 2-3 days. Enumerating about initiatives of NECTAR, Mr. Nair said that his organisation is working towards developing affordable instruments to assess the NPK requirement based on the soil conditions and construction of greenhouses using bamboo which has a potential to save around 30 per cent of the cost incurred in traditional green houses.

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. Given the fact that around 55-60 per cent of the population was



dependent on ground water, agricultural demand side management was absolutely essential. She remarked that demand side management measures had the potential to save water, electricity, reduce carbon emissions, help in rural development, and save on subsidies.

Enumerating the approaches of the WENEXA project undertaken by USAID she called for better market based approach for scale up and spread across regions.



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 areas of water and agriculture. The overall objectives of The Bank's initiatives are to enhance water security, improve water use efficiency and agriculture productivity. Agriculture had the potential to generate growth and shared prosperity and agriculture had a strong multiplier effect on the growth of the services and manufacturing sectors by supplying for urban consumers, creating consumer based demands for other sectors and creating off-farm jobs, opined Dr. Connors.

Low labour productivity in agriculture remains a major challenge to be addressed, remarked Dr. Connors. She called for technology innovation and measures for replication of pilots if we are to achieve long lasting impacts for making our agricultural practices sustainable. Looking ahead, she elaborated on a new agenda of 'more crop per drop,' precision agriculture like poly /green houses, drip irrigation, diversification to non-cereal crops like fruits and vegetables, improving rain fed agriculture and improving water use efficiency in sectors.



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. He also advocated the need for close collaboration between the state and the central government for implementation of schemes, monitoring and evaluation.

Outcomes

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 at Punjab Agricultural University.

Picture Gallery



List of Participants

Name	Designation	Organization
Dr. Kamal Vatta	Director	CIPT
Prof. Upmanu Lall	Director	Columbia Water Center
Mr. Sanjeev Nair	Director General	NECTAR
Mr. Suresh Kumar	Financial Commissioner Development	Government of Punjab
Ms. Apurva Chaturvedi	Program Management Specialist	USAID
Dr. B.S. Dhillon	Vice Chancellor	Punjab Agricultural University
Dr. R.S. Sidhu	Director- Extension Education	PAU, Ludhiana
Mr. Aseem Narain	Director (F&A)	NECTAR
Mr. Ajay Kumar	Director	NECTAR
Mr. K.S. Sangha	MD	Punjab State Coop. Bank
Mr. A.S. Miglani	Registrar	Dept. of Cooperation, Govt. of Punjab
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Dr. Sukhdev Singh	Professor of Sociology	PAU, Ludhiana
Mr. Sanjay Kumar	Agri-Economist	PAU, Ludhiana
Mr. Kuldip Singh Takshi	Chief Engineer	Irrigation Dept., Govt. of Punjab
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Dr. P.S. Chahal	Associate Director of Research	PAU, Ludhiana
Dr. Genevieve Connors	Program Leader	World Bank
Dr. H.S. Sidhu	Engineer	BISA
Dr. M.S. Toor	Professor of Economics	PAU, Ludhiana
Dr. M.S. Sidhu	Senior Economist	PAU, Ludhiana
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Mr. Neeraj Pandit	Geologist	Dept. of Agriculture, Govt. of Punjab
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