Partnership for Better Agriculture Water Management

Proceedings of the First India Irrigation Forum
7 April 2016, New Delhi

International Commission on Irrigation and Drainage
A Journey Towards Food Security!

"There is an immediate need of Second Green Revolution in the country and it should now start in eastern India.

Prime Minister Narendra Modi

"When I read "Irrigation and Power" it excites my mind..... And how the development of irrigation has affected human progress.

Pt. Jawaharlal Nehru

ICID established as an international organization with headquarters in Delhi in 1950 with the approval of Government of India. The first International Executive Council (IEC) meeting was held at Shimla on 24 June 1950 and Chaired by Padma Vibhushan Dr. A.N. Khosla (First President of ICID)."
Partnering for Better Agriculture Water Management
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First India Irrigation Forum was organized by International Commission on Irrigation and Drainage (ICID) as a side event at the 4th India Water Week, 6-9 April, 2016 in New Delhi. ICID took the initiative to explore the possibility of setting up a platform for interaction amongst various professionals engaged in agriculture water management in the form of India Irrigation Forum (IIF), which aims at:

- providing a platform for networking, interaction and sharing of knowledge and experiences amongst various professionals;
- facilitating interdisciplinary understanding and dialogue; and
- bringing advances in research, development, technology and successful innovations in the sector within the easy access of field level professionals.

Experts were invited to share various perspectives of Indian irrigation and drainage scenario. Perspectives covered included the challenges faced by irrigation and drainage in light of the increasing water and food security concerns; climate change; the opportunities provided by the new technologies; progress achieved through the years; and the constraints faced. The participants discussed how these constraints could be unshackled, and explored the feasibility and mechanism for establishing a forum to provide an opportunity to various stakeholders for networking, exchanging experiences and sharing knowledge.

Many experts from international organizations (ADB, IWMI, World Bank, Israel) involved in the irrigation sector in India and veterans and current irrigation experts from different states shared their experiences. Papers were presented on the various facets of the irrigation and drainage sector in the country to provide a backdrop for discussions on the desirability, scope and mechanism of the proposed India Irrigation Forum.

The final session saw national experts divided in two panels discussing the issues related to capacity development. First panel articulated the capacity
development needs which addressed the following questions: (i) what are the capacity development needs of the irrigation and drainage professionals? (ii) What are the capacity gaps in WUAs to meet their objectives? (iii) Is there a need for a forum at the state level to address these issues?

The second panel, looked at ‘The way forward to India Irrigation Forum’ and addressed the following questions: (i) what are the capacity development opportunities and facilities available in the country? Are they meeting the needs? (ii) How can the IIF meet these requirements? and (iii) what mechanism should be there for IIF to be sustainable?

The present report is based on the presentations made by the invited experts, the panellists and the participants at the Forum. On behalf of ICID, I am thankful to the organizers of the 4th India Water Week for providing the opportunity to organize the Forum. The contribution of the international and national experts who shared their perspectives on Indian irrigation and drainage sector and participated in the panel and general discussions is acknowledged.

I am hopeful that this report will help India Irrigation Forum take a definite shape in order to enhance the science based approach in policy making and implementation for sustainable agriculture water management in India.

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Secretary General, ICID
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I. Background

1. Irrigated agriculture contributes to about 40 percent of the global food production from an estimated 20 percent of agricultural land, or about 300 million hectares globally. It also has a very long historical tradition of irrigated crops. Some of the Indian irrigation systems are more than ten centuries old. India has the largest irrigated area in the world. Irrigated farmland typically generates three times the production of an equivalent area farmed under dry-land systems. Lessons from the past and from the new modernised irrigation networks in India need to be analysed and shared with the newly emerging communities of enlightened and empowered organised irrigators.

2. As India’s population grows and nears 1.6 billion by 2050 (present about 1.28 billion), rapid urbanization, industrialization and pollution of water sources will put pressure on limited and scarce water resources. India faces a daunting task of feeding population requiring about 380 metric tons (MT)\(^1\) food grains as against the present food production of about 260 MT.

3. The irrigation sector, which presently withdraws a major share of freshwater (about 80 percent), is expected to face a stiff competition from other sectors like domestic industries, environment etc. and its share is likely to reduce to 68% by 2050. Under finite land and water resources, increased agricultural production will have to come from the limited net sown area by increasing productivity with an optimal use of available water resources. In order to achieve this target, an improved irrigation management and agronomical practices will be required.

4. At the same time, profitability of agriculture as an enterprise in India is steadily on decline. Uncertainty due to increasing variability of climate is making the occupation risky, leading to increasing financial losses to farmers, particularly the small and marginal farmers. Realising that farming community cannot be left behind in the overall national development, the government plans to double the farm income in the next 5 years.

\(^1\) Carrying capacity of Indian agriculture: issues related to rainfed agriculture, B. Venkateswarlu and J.V.N.S. Prasad, Central Research Institute for Dryland Agriculture, Hyderabad - 50009, India
II. Emerging challenges in irrigation and drainage sector

5. Increasing climate variability due to the impacts of climate change – monsoon patterns are indefinite – is likely to adversely impact the availability, dependability and quality of water as a resource both in space and time. Many parts of the country, experience seasonal water scarcity on a regular basis. In order to overcome regional and seasonal water scarcity and ensure the assured food production and increased farmer income, it is necessary to conserve and store water through creation of all kinds of storage. The per capita surface water storage, which is about 210 m\(^3\) per person, is very low as compared to other developed and fast emerging economies.

6. Given the numerous challenges and the large share of water withdrawn for agriculture, irrigation and drainage, management has to address emerging climatic, technical, economic and organizational aspects through a holistic and integrated approach. In addition, increasing the surface water storage and its use has to be optimized by improving efficiency of delivery, increasing productivity and expanding irrigated area without withdrawing additional water. Measures need to be adopted in order to do this. Some of these measures are to conserve, reuse and recycle water; to adopt improved water management and agronomical practices including water saving micro irrigation technologies such as drip irrigation, sprinkler irrigation, etc.; to reclaim degraded land; and to promote participatory irrigation management.

7. The contribution of irrigation and drainage as an essential tool deployed for ushering in Green Revolution and achieving food self-sufficiency in the country is fully recognized.. The past few years saw a decline in the investment towards the irrigation and drainage sector; also, there has hardly been any expansion of irrigated areas. Growing emphasis needs to be placed on improved management of irrigation schemes already constructed in order to improve their performance and ensuring that they provide multiple benefits such as conserving limited water supplies, reducing the impact of irrigation on water quality, and enhancing net returns for the farmers. The performance of major surface irrigation systems in our country is caught in the vicious cycle of neglect, deferred maintenance and rehabilitation. This issue needs to be addressed.

8. At the same time it has to be recognized that the expansion of irrigated agriculture is essential as a strategy for meeting the demands of future food security of India’s galloping population. Irrigated agriculture will also improve the livelihood opportunities in rainfed agriculture by providing the farmers with irrigation facilities, wherever feasible. This calls for innovative strategies for improving efficiency of water use and productivity.
9. Groundwater irrigation in India developed during the later years of Green Revolution and contributed significantly towards increasing the gross irrigated area of the country expanding it from 5 million hectares to 35 million hectares over a period of 50 years. However, due to unregulated groundwater withdrawals supported by faulty policies, many states are experiencing a fast decline in groundwater level leading to lower productivity of water and causing a decrease in irrigation intensity. Irrigation intensity is lower among southern states where the groundwater depletion problem is severe.

10. There is little realization among the policy makers, that the lack of capacity to absorb new technologies in the irrigation and agriculture departments is one of the major impediments in providing equitable and reliable irrigation and drainage services. Lack of utilization of the emerging technologies is posing a constraint in the sustainable growth and productivity of irrigated agriculture. There is need for a well-informed, skilled and technology savvy contingent of agriculture scientists, irrigation engineers, and extension service workers to support this effort.

11. There is an urgent need for capacity assessment of irrigation institutions to deliver the mandate that is assigned to them. Systematic efforts towards capacity development at the institutional as well as individual level cannot be given a secondary thought. An enabling environment needs to be created by encouraging networking and knowledge sharing. The irrigation staff should be exposed to the new technologies and latest techniques of management.

III. Improving irrigation performance

12. Doubling the income of farmers in the next five years, as recently announced by the Finance Minister of India in his budget speech of 2016, will require the transformation of irrigated agriculture – to become a responsive, service oriented, component of the agricultural production enterprise.

13. There is ambiguity in understanding and evaluating irrigation performance among the irrigation specialists, policy makers and general public. Hence, a scientific understanding is called for. Irrigation efficiency, defined in terms of estimated water requirement (m$^3$) relative to water applied or withdrawn (m$^3$) from a source, is a useful indicator of the “losses” in the distribution, conveyance, and application of irrigation water. This type of an indicator is appropriate for farm-scale irrigation investment and management decisions; design of irrigation conveyance and application systems and “real-time” monitoring and evaluation of irrigation system operational performance. However, it does not account for the capture and reuse of water within broader hydrologic systems (e.g., basins) and can lead to incorrect
water allocation and investment decisions and faulty public policy at the basin scale.

14. On the other hand water productivity is defined in terms of output – quantity of crop in kg; nutrition in kcal; or net income to farmer in, $ vis-à-vis per unit of water use (water withdrawn, applied or consumed). Productivity can be used as a criterion as it is appropriate for water allocation decisions between uses (basin and farm scale) and post-season performance assessment of irrigated agriculture. It is not applicable for operational management decisions and is more complex to evaluate. But it provides an answer to the question of how well the irrigated agriculture is performing.

15. Irrigation provides the essential moisture to the plants for photosynthesis and transportation of essential nutrients for the growth of plants. It also aids in leaching and diluting salts in the soil. However, the objective of improving irrigation and drainage services is not limited to its technical scope. Irrigation systems impact the rural community, not just the farmers, by providing an effective source of drinking water and access to outside world. Irrigation also supports the increase of off-farm employment.

16. Performance of surface irrigation is often poor. Improving performance in irrigation requires capacity at farms and fields; technologies to improve operation of canals and drains; enhanced management of irrigation services; and leadership and integrated actions. Improving performance of irrigation systems requires strengthening links between the main system and farmers' fields. Poor irrigation services result in expansion of groundwater use and local storage and consequent poor cost recovery.

17. Improved farmer knowledge and simple tools and processes can improve water productivity. For example, laser grading and levelling can transform performance and reduce energy costs. Sprinkler, drip and trickle irrigation systems can reduce labour, fertilizer and water requirements. On-farm storage and/or access to groundwater help meet farmers’ requirement for reliable irrigation water supply as and when it is required. This also enables farmers to get higher crop productivity. However, to achieve these goals, capacity building of farmers is essential.

18. Modernization is the process of upgrading infrastructure, operations and management of irrigation and drainage systems to sustain the water delivery service requirements of farmers as well as optimize production and water productivity. It is important, therefore, to first analyse and understand the real ground situation such as what level of water delivery service does the system currently provide; what hardware (infrastructure) and software (operational procedures, institutional setup, etc.) features affect the level of service; what improvements in the various components could make a significant difference in service delivery to users. Once rehabilitated, or otherwise, it is essential to manage irrigation assets for long-term performance. The current practice that tends towards deferred maintenance (build-ignore-rehabilitate-ignore) needs to be avoided.
IV. Reforms in Indian irrigation sector

19. Way back in 1869, Col. W. Greathed, Chief Engineer, Upper Ganga Canal, in a statement said “The development of irrigation has outrun its administration …” The fact that this statement came within 15 years of the establishment of the Ganga Canal Irrigation system indicates that the management of irrigation is a complex endeavour and needs to be adjusted according to the technology, societal aspirations and economic expectations.

20. Low performance of public irrigation systems in the country can be attributed to the dilapidated infrastructure; low productivity; low recovery of irrigation charges; domination of water intensive crops (sugarcane) in command areas; non-equitable distribution of water resources among upstream and downstream stakeholders; lack of participation of farmers in irrigation management; and lack of modernization of irrigation systems leading to low water use efficiency. However, the biggest factor in the inefficiency of public irrigation systems is the use of outdated administrative and management structure and practices.

21. It has almost been two decades since structural adjustment and sector reform processes were implemented in India. Under these sectoral reforms, legal, institutional, financial and regulatory changes have been undertaken in the water sector through water sector loans/grants provided by international financial institutions. The irrigation reforms in various states are at various stages of implementation. Evaluation of the degree of success of these reforms has been isolated owing to little exchange of experiences across state boundaries. There is no formal or informal platform at the national level to share and deliberate on these experiences.

22. Benchmarking as a systematic process for securing continual improvement through comparison with relevant and achievable internal or external norms and standards has been deployed by Maharashtra since 2002, largely as a mechanical exercise. The overall objective of benchmarking to improve the performance of the system, has not been achieved as no systematic analysis of benchmarking results have been carried out.

23. Maharashtra Water Resources Regulatory Authority (MWRRA), the first regulatory body established in water sector in India was established by a statute in June 2005 and became operational in August 2006 as one of the components of ‘Institutional Restructuring and Capacity Building’ under the Maharashtra Water Sector Improvement Project. The authority facilitates and ensures judicious,
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equitable distribution, and sustainable management, allocation and utilization of water resources. It fixes the rates for use of water for agriculture, industrial, drinking and other purposes. It also acts as the state groundwater authority, and supports the enhancement and preservation of water quality. MWRRA has done some pioneering work in the bulk water tariff, equitable distribution of water in a sub-basin and dispute resolution.

24. Unfortunately, the success and challenges faced by the regulatory authorities have not been analyzed and debated. As a result, no other state has ventured to replicate or adopt this important component of irrigation reforms.

V. Water saving at farm level

25. Drip and sprinkler irrigation are extensively and successfully being used to improve the application of water at farm level. Despite their cost, use of drip and sprinkler irrigation is spreading fast. But surface irrigation will remain the predominant irrigation method for the next 30-40 years. Although this is the oldest method of farm application, current level of scientific understanding of the method of application and knowledge of measures to improve surface irrigation is poor. Education and training of a large number of farmers is required along with the training of field staff. Improving surface irrigation is essential if water use efficiency and productivity of water are to be improved.

26. There is an absence of simple scientific knowledge of irrigation water application practices at the farm level amongst farmers and professionals. Some of the questions that should be asked but are often ignored are how much water is applied in each irrigation; what flow rates are used and what duration of irrigation is and should be; what is the depth and uniformity of each irrigation relative to crop rooting depth; and what improvements can be made.

27. Most of the project operational staff is unaware of the infiltration characteristics of the method of application of irrigation water. Farmers do not check how far the water infiltrates into the soil. Application efficiency and uniformity of distribution can be increased by simple, practical measures. Canal lining is beneficial in reducing travel time and improving distribution, but in the absence of flow control and measurements, it is not feasible to supply water on demand.

28. There is need for a radical change in the thinking and study of how farmers use water and change design procedures for on-demand irrigation, not proportional distribution. Awareness and knowledge of ways to improve water management at field level needs to be raised among all stakeholders. There is an urgent need for
the observation and measurement of farmers’ practices by agency staff as well as the identification and application of simple measures for improvement.

29. There is a need for training and capacity building for both farmers and field staff. It is important to provide training and guidance to farmers on appropriate field application practices. For example, laser land levelling and grading can increase the productivity of water by 12% (kg/m³) and increase in land productivity by 11% (kg/ha). Seeing is believing so in addition to the training being practical and field-based, it also needs to be visual... There is need to develop suitable training approaches and training material. Computer models of field irrigation, such as BASCAD, with visual displays can be very valuable.

VI. Partnering with farmers

30. India has a long history of State owned Community Managed Irrigation with National Water Policy of the GoI (1987) which advocates farmers’ participation in the management of irrigation systems, particularly in O&M and MoWR issued Model Act of 1998. PIM as a concept is easy to understand but difficult to implement as it cuts across several entrenched interests. Sustainable WUAs require an enabling environment, clear political will with clarity of objects, accountable partnerships, incentives and long term capacity building. Crafting community based organizations/collectives of whatever nature (WUAs, Farmer Interest Groups, Self Help Groups or Panchayats) or purpose (managing water, livelihoods or village governance) is difficult but necessary for the holistic management of water. Therefore, there is a need to invest time, money and human resources for building their capacities.

31. Till January 2015, about 84,779 WUAs were formed. However there is not much data on their performance. Gujarat, Maharashtra, Madhya Pradesh, Rajasthan, Andhra Pradesh and Bihar have developed many effective WUAs that serve as demonstration platforms. The areas that had fully functional WUAs, reported an increase in irrigated area varying from 10% to 36%; increase in food crop area such as wheat and paddy; introduction of cash crops such as onions, grapes and sugarcane; change in crop productivity such as wheat, soybean, maize, cotton and pulses; increase in fodder availability and income; and increase in employment generation and wage rates.

32. The factors that have not allowed PIM to fulfill its potential benefits range from societal (increasing fragmentation in the community, value-based leadership, lack of political will to implement PIM, lack of incentives to promote WUAs) to institutional (no clear water allocation rights to WUAs, hardly any autonomy to WUAs, ad-hoc capacity building support to WUAs) to physical (dilapidated physical
system, water logging at head reach while high tail end deprivation and ground water development).

33. There is a need for government policies and entitlements that give proper incentives and autonomy to the WUAs for better performance; institutional development through capacity building and hand-holding for 3-5 working years of preparation, formation, growth and autonomy.

34. Capacity development should be undertaken under a framework plan for development of human resources at national, state and village level. It must not be merely viewed as a training program aimed at bridging gaps in knowledge and skills among farmers and agencies but also as facilitating the change process. The capacity development should encompass legal, technical, financial, administrative, institutional and agricultural aspects. There is a need for capacity development of WRD field functionaries and encouragement to the involvement of NGOs for close facilitation of WUAs and promotion of other allied activities. The training framework should include strengthened WALMIs as a key resource for training in PIM and agriculture water management.

35. Continuous engagement of civil society organization requires the development of the package of incentives for all stakeholders including government officers, farmers and other facilitators. There is a need to establish state-wide PIM support units with field training centres with funding for at least 10 years. It is important to select a few competent and committed NGOs in each state and provide funding on the lines similar to that of the watershed programme. The role of each stakeholders should be well-defined. Awareness creation at all levels, through the use of IEC and mass media; capacity building-exposure visits and hand-holding at various stages are essential for long-term sustainability.

VII. Emerging technologies

36. Satellite imageries, aerial imageries, GIS, GPS, automated sensors, UAV/Drones, LIDAR and high tech machineries are some of the technologies that are being extensively deployed in agriculture. New technologies excel through their ability to provide improved access to information including real-time data; remote operations and processing of large data. They also offer new tools for accurate assessment, optimized on-farm decision making for automation as well as manual system operations.

37. Timely data acquisition and data in a centralized database helps better visualization of options and optimizes use of input resources like water, seeds, fertilizers, agrochemicals. Efficient management of resources and techniques for agriculture activities, better analytical capabilities, easy dissemination of data all over the globe through web capabilities and interoperability services, accurate field mapping and measurements, real time monitoring and management of farm operations.
38. Satellite imageries provide enhanced planning tools as the data provides the basis for the identification of water supply source (both surface and groundwater) and helps in the identification of the irrigation infrastructure: canals, dams, pipe lines, weir, etc in the field, GIS based identification of water flow direction, area, slope and drainage. GPS based smart sensors and water supply instruments – sprinklers and sprayers together with the aerial application of pesticides make most of the processes automatic. High resolution satellite imagery validated through ground verification provides opportunity to ascertain crop water productivity and undertake comparative analysis of why certain areas may perform better than others.

39. Drip irrigation with application of water at the root is the most efficient method of irrigation which enhances infiltration, reduces runoff, and improves water quality on a wide range of irrigated soils. With efficiencies of water application ranging between 90%–95%, it has the fastest growing market. It also presents best management practices for irrigation using waste water. Soil moisture sensors monitor on a continuous basis and detect water stress and assist with decisions on irrigation amounts. The in-situ measurement of net evapotranspiration (ET) is undertaken through various pan evaporation methods such as Penman–Monteith. Dendrometers provide continuous measurement of leaf/stem water potential that detect water stress and mostly assist with decisions on irrigation amounts. Through remote sensing, based on thermal imaging, plant temperature and ET can detect water stress in space and assist with decisions on irrigation amounts.

40. Combining the existing technologies with auxiliary technologies which are used to support decisions on irrigation amounts and scheduling based on continuous monitoring of plant and soil through a variety of sensors, enables the precision of irrigation systems for site- specific management of high-value crops. The methodology requires calibration to crop type but is able to detect in-field variability, thereby enabling precision of water application. These methods provide information that is continuous in time and in the case of remote sensing can also reflect in-field variability. Decision on irrigation scheduling is based on monitoring the requirements of the plant based on in-situ sensors or remotely-sensed devices. Recent developments have introduced close-loop irrigation systems where the amounts and scheduling of irrigation can be automated, based on these monitoring devices and set certain thresholds of plant health parameters.

41. Efficient irrigation management requires knowledge of where water is needed, and for what duration and what quantity. Transporting water to the extraction points to meet the demand in a gravity powered large distribution network is a complex task. In order to simplify the distribution process, the irrigation systems
are operated in a supply oriented approach since historic times. A supply oriented
distribution process constrains farmers to grow certain types of crops and only
supplies water in accordance with a rigid roster.

42. Automation of the operation of various flow controls provides high level of
service to the farmers – consistent flow of the rate, time and duration required
for crops and in a transparent manner resulting in equitable level of service to all
farmers. It results in improved water delivery efficiencies, on-farm water application
due to high flow application at optimal time and improved crop productivity with
use of less water.

43. The canal irrigation systems are getting retrofitted with piped transport and
distributed in many advanced countries for water and energy savings, besides other
advantages. But in the Indian context where population pressure on farmland is
high, pipelining can reduce the need for much of the productive land that surface
canal networks require. The most important benefit of pipelining in the Indian
context may be saving land. In a semi-arid climate with high wind speeds, which
is the case in most of Gujarat, surface storages and canal networks suffer high
non-beneficial evaporation from open surfaces. Reducing evaporation from open
surfaces can be a big boost to basin water productivity in the state. However,
pipelining can also contribute greatly to the irrigation productivity of water applied.
Piped distribution of water from the Sardar Sarovar Project (SSP) will encourage
farmers to use canal water as efficiently as groundwater.

44. Against all these advantages of pipelining, its chief disadvantage is its energy
requirement. For a gigantic project such as SSP, the real issue is whether a
pipelined SSP can have a favourable influence on Gujarat’s overall irrigation
energy balance sheet. Micro-irrigation can be integrated far more easily in a piped
distribution system than in a gravity flow distribution system.

45. We are in a new era where water resources are increasingly getting scarce
and demands are ever increasing. Improved productivity requires sound messaging
on how technologies can contribute, an understanding of intricacies of sound
financing models and incentives. The latter requires the expertise of the finance
sector.

VIII. Capacity needs at various levels

46. Private sector has not developed in WR sector and the irrigation and drainage
industry essentially remains under the control of governments. In most of the
irrigation departments in the state governments, the human resources management
remains unplanned, ad-hoc and ill-managed. There is utter lack of career planning
and development policies, and the strength in the departments is highly unstable
with no planned recruitment policies.
47. As a result, the industry suffers from erratic job opportunities thus creating disinterest in fresh graduates, who are recruited from fields such as civil engineering and structural engineering. The disinterest in irrigation and drainage industry also stems from the fact that the working conditions in the irrigation and drainage sector are much tougher as compared to the other engineering professions. To make things worse, IT industry and management professions wean away the best civil engineering talent as students prefer office jobs to field work.

48. The recruitment in state irrigation departments specify the basic qualification as civil engineering. Most of the educational institutions include “irrigation” as an optional course at best. In most cases, drainage as a topic is ignored in the educational institutions. The apathetic student inflow, with little or no demand affecting the inflow of students also results in lack of resources allocated to water resources departments within the educational institutions that fail to recruit appropriate faculty to teach. Outcome based experiential education is the key in such cases.

49. As such, the newly recruited engineers are generally equipped neither with the theoretical aspects nor with the practical complexities of irrigation management. At best they may have the expertise in structural designs. This makes it imperative to bridge the skill gap between UG learning and the essentially professional requirement. The newly recruited cadres are provided compulsory, comprehensive, multi-disciplinary and evaluated induction training that includes a good mix of theoretical background, field work, lab work and knowledge sharing. As part of the field work, the new recruits should be made to work with agriculture and revenue departments, WUAs, and other service providers/recipient.

50. There is lack of human resource development policies within irrigation sector for fostering long-term work related to learning capacity at individual, group and organizational level. With the irrigation and drainage sector in dire need of adopting new technologies within the country, it is imperative that comprehensive HRD policies are developed. Peer to peer learning through group dynamics, job enrichment, scientific interactions, exchange of experiences and enhancing managerial and behavioural skills are essential for a motivated irrigation manager.

51. As already brought out in section 7, WUAs lack the desired capacities to take up responsibilities that the new legislative mechanism require them to undertake. There is also an acute shortage of skilled/trained manpower to adopt latest technologies and practices in the field of irrigation and drainage in agriculture sector.
IX. Mechanism to share experiences in the past

52. During the British colonial rule the emphasis was mainly on state’s administrative control and enhancing revenue collection machinery. Efforts for increasing productivity of irrigated areas were largely guided by this limited objective. As such there was little scope for promoting scientific and systematic growth of irrigation.

53. After independence, agriculture was conceived as a vehicle to fuel rural development and brings self-sufficiency in food. Rapid expansion of irrigated areas was envisaged as one of the essential components in driving the Green Revolution in the 1960s-1980s. India initiated a global effort in sharing knowledge and experiences in the sector and offered to serve as a host for the International Commission on Irrigation and Drainage (ICID) with the hope that interactions between countries promoting irrigation will benefit all member countries. ICID played an important role in the development of science and art of irrigation management. Starting with the irrigation experts, the Commission, through its broad based National Committees, has extended its outreach to other stakeholders, including the private sector, and has been encouraging multi-disciplinary approaches to meet its objectives and goals. Through its multi-disciplinary knowledge exchange and sharing, it has been reasonably successful in supporting the member countries making irrigation and drainage serve the objectives of integrated water resources development.

54. Central Board of Irrigation and Power (CBIP) established in 1927 by the Govt. of India, now operating as a society has State Irrigation or Water Resources Departments, State Irrigation Research Institutes, WALMIs, Central Water Commission, Jain Irrigation System Limited, etc. as its members. It also works with ICAR, Water Technology Centers, IARI and other research institutes under the Ministry of Agriculture and provides a platform for networking, interaction and sharing of knowledge and experiences amongst various multi-discipline professionals. CBIP is the pivotal organization in meeting the needs of professional engineers in water resources, power and renewable energy sectors. CBIP also serves as a contact point for the Indian professionals in various water and power related specialities with international professional organizations. National chapters of ten international organizations have their secretariats in CBIP.

55. Within India itself, the irrigation sector has moved at a relatively slower pace since it has remained mostly governmentalized. Unfortunately, CBIP with all the state irrigation departments as its members, with the national responsibility for reforms in the irrigation sector, did not prove to be effective enough for guiding and inspiring the sector. It remained more as a collective ceremonial platform
rather than as a systematic pace settler and promoter of modern approaches to
development and management of irrigation.

56. Indian National Committee on Irrigation and Drainage (INCID) was established for utilizing international linkages in the sector as the national representative body. It could invite organisations outside the government fold to work as members of the committee. It was supposed to encourage the involvement of manufacturers of irrigation equipment as well as irrigators cooperatives. But that arrangement also proved to be only a partial remedy.

57. Considering the growing expectations from the irrigation sector in terms of enhanced productivity per drop of water in the era of competition for water, there is an urgent need to have a comprehensive organisational set up at the national level, at the basin level and at the water shed level. It is hoped that the India Irrigation Forum will facilitate the growth of the irrigation sector in that direction and encourage the different actors related with irrigation to work together under those institutional set ups.

58. ICID is expected to facilitate the transfer of international experience in that respect to the Indian organisations so that they are able to bring about the desired transformations in an innovative manner.

59. Within India, Maharashtra has the experience of a widespread voluntary movement in irrigation sector under the banner of Maharashtra Sinchan Parishad (i.e. Maharashtra Forum for Irrigation) for over 16 years. It has active district level units. An annual irrigation conference is organised by the Parishad in different regions of Maharashtra to address the prevalent issues. India Irrigation Forum should be able to draw strength from such initiatives in different parts of India and push the desired reforms in the field of irrigation throughout India on a wider scale expeditiously.

60. State government organizations are already imparting training at state and local levels through their organizations like WALMIs. However, there is a need for having a national level forum which can provide the latest know how on the developments at both the national and international level.

X. Recommendations: IIF a potential mechanism

61. Irrigation and drainage sector needs rejuvenation by addressing the basic understanding of farmer’s and national expectations, scientific evaluation of the present policies through participation of all stakeholders, enabling use of emerging technologies and multi-disciplinary collaboration and capacity development at various levels. This can be made possible through interaction among various stakeholders and sharing experiences. India Irrigation Forum is the mechanism which provides these opportunities. First India Irrigation Forum made the following recommendations.
(a) India Irrigation Forum is envisaged as a partnership of institutions involved in Agriculture Water Management. It should evolve into a multi-stakeholder’s dialogue platform with representatives of water users (agriculture, municipality, industry, etc.), local communities, water governing institutions, other relevant government and non-governmental organisation and civil society organisation. It should have forums at state level and possibly at district levels.

(b) The Forum should be able to bring together the scientific knowledge to develop industry position on policy issues and to develop new approaches. It should serve as an independent voice on irrigation and drainage issues, outside the government, forecasting and identifying the potential problems and should act as a trusted advisor.

(c) India Irrigation Forum could grow or project itself as the irrigation sector’s 'national voice'. It should help steer the policy discourse in a logical and realistic level driven by science and be able to bring a conceptual change in thought processes through critical and unbiased analyses of issues.

(d) The Forum should be able to facilitate multi-disciplinary research, evaluation and assessment, providing necessary policy inputs.

(e) The Forum should work towards making irrigation sector service oriented, which increases the agricultural productivity and income thereby bringing millions of farmers (rural population) to better living standards by raising their income level.

(f) The Forum should collaborate with global leading partners to share experiences in emerging problem solving and share new technologies, approaches and governance models. It should serve as the link to the international irrigation and drainage community.

(g) Some of the suggested areas of activities are:

(a) **Policy Research**

1. Develop integration and drainage prospective plans
2. Support monitoring and evaluation in irrigation and drainage sector
3. Evaluate irrigation reforms in different states analysing success and failures
4. Evaluate performance of irrigation systems across the country
(b) Governance

1. Develop regulatory framework
2. Redefine the role of public irrigation and drainage agencies
3. Make irrigation cost effective
4. Enabling PPP approach

(c) Capacity Development

1. Undertake skill gap assessment in the irrigation and drainage institutions
2. Prepare a roadmap for manpower requirement for Irrigation Management
3. Prepare/support Standards and guidelines
4. Develop strategy for capacity development in Irrigation Departments
5. Facilitate holistic training and capacity development at all levels
6. Assess the need and facilitate inclusion of water saving practices in farmer field schools
7. Develop a knowledge base for all ranks of officers
8. Assess quality and impact of training
9. Introduce and enhance e-Learning for skill development at all levels
10. Introduce certification process in irrigation and drainage sector

(d) Mechanism

1. Facilitate multi-stakeholder dialogues
2. Introduce and exchange cutting edge technologies through international exchange
3. Organize international expert level meetings in the country
4. Enhance networking among existing institutions
5. Encourage multi-disciplinarily in Irrigation Departments
6. Confer recognition to the excellent performance of irrigation systems
(e) Research and dissemination

1. Bridge gaps between research and practice
2. Support policy research
3. Identify research needs on the legal aspects of land tenure with a view to facilitate technology adoption at the farm level.
4. Disseminate advances in research, technological developments, innovations to field level professionals
5. Popularize and adapt use of new technologies
6. Raise public awareness
Appendix 1

Brief Report on Presentations
07 April 2016, New Delhi, India

1. Fully realizing the importance of knowledge sharing and capacity development for attaining sustainable developments in irrigation, drainage and flood management sectors, ICID took initiative to set up India Irrigation Forum (IIF) to provide a platform for networking, exchanging experiences, sharing of knowledge and interaction amongst various professionals engaged in agriculture water management. The IIF was modelled based on ICID’s World Irrigation Forum (WIF) at the global level and Asian Development Bank’s Asian Irrigation Forum (AIF) at the regional level to address the pertinent issues related to irrigation sector.

2. ICID organized the First India Irrigation Forum on 7th April 2016 addressing the theme “Innovative Techniques for Improving Water Use Efficiency (WUE) of Irrigation Systems and Farm Application” as part of 4th India Water Week in New Delhi held on 4-8 April 2016. The Forum also aimed to provide a platform for networking, interaction, exchanging experiences and sharing of knowledge amongst professionals engaged in agriculture water management which included staff of irrigation department, experts from irrigation utilities, extension staff, professional bodies involved in area of irrigation and water resources development, management and research, professionals of allied disciplines related to agriculture water management.

3. The Inaugural Session of the Forum was chaired by Dr. Takashi Matsuo, Director, Environment, Agriculture and Natural Resources and Agriculture Division, South Asia Department of ADB. The Chair provided a brief introduction of the session and the importance of the themes being addressed by IIF. He then invited Er. Avinash Chand Tyagi, Secretary General ICID to provide further insight into the organization of IIF1.

4. Er. Avinash Chand Tyagi, Secretary General, ICID welcomed the participants to the IIF1, saying that you may ask questions like

   (i) What is India Irrigation Forum?
   (ii) What should IIF aim to be?
   (iii) Is such a Forum needed?
   (iv) What it will be looking like in Future?

5. He emphasized that the answers to these questions should be formulated in the backdrop of Agenda 2030 recently adopted by world leaders. He pointed out that sustainable development refers not only to provision of just jobs and prosperity, but addresses social equity, conservation of nature and improvement of irrigation and other water services. Development is associated with a number of complexities and one complexity being water-food-energy nexus. He emphasized the importance
of irrigation as agriculture cannot be made solely dependent on rain water alone, citing Kautilya’s thoughts many centuries ago. He also recalled that irrigation has played important role in the Green Revolution in 60s. The irrigation outlook is again changing with people realizing its importance and potential in agricultural water management. Now we are moving towards 2nd Green Revolution and prospect of increase in the total irrigated area could be foreseen with the adequate allocation in the Indian national budget. Issues like challenges in sustainable food production, lack of infrastructure, weak institutions and poor water governance in large irrigation systems, climate variability, and lack of institutional and individual capacity prompted ICID to organize an India Irrigation Forum, Er. Tyagi said.

6. He pointed out that the focus of irrigation was shifted over the years from the delivery of water in 1950s to 70s focussing on sound irrigation management to 90s with emphasis on sustainable agriculture, and at present to sustainable development goals to achieve water and food security. This can be done by working towards sustainable agricultural water management through inter-disciplinary approaches, economically viable, socially acceptable and environmentally sound irrigation, drainage and flood management. For that he said that all section of people should come together like engineers, professionals, environmentalists, farmers, climate experts, social scientists etc. in a unique platform where all stakeholders could interact each other. This has prompted ICID to think of an irrigation Forum at country level, as already initiated in its member countries like Malaysia, Indonesia, China and Iran etc. India Irrigation Forum plays its part and that is what ICID has visualized by initiating this process (http://www.icid.org/prsnt_iif_2016_welcome.pdf).

7. Delivering the inaugural address, Dr. M.A. Chitale, former Secretary of Ministry of Water Resources, Govt. of India and Honorary Secretary General, ICID in his inaugural address congratulated ICID for initiating the discussion towards the shape, nature and future of an institutional approach like India Irrigation Forum which has been very much overdue. He said that there are many new irrigation communities emerging, but they do not have a National Platform to interact and share their experiences and expectations in the future. He felt that there was a missing link between the activities at international level and at grassroots level.

8. In India at national level, there was Central Board of Irrigation & Power (CBIP) which was effectively bringing together various state irrigation departments, however, they have lost their cutting edge in playing that role and became a ceremonial organization and stressed the need for reviving CBIP in this context. He also touched upon the Indian National Committee of ICID (INCID) which seemed to be an improved version of CBIP. Dr. Chitale said that the need of the hour to have set up a National Committee which is much more improved version of the earlier one, in the context of modern irrigation developments and also as a national voice. He concluded that CBIP and INCID has required that niche to provide a platform that is required at the national level to bring forth irrigation as a collective mechanism and asked the participants to give a thought about the same, particularly in the context of increasing competition in the water allocation vis-à-vis irrigation purpose.
9. He also said that it is the need of the hour to set up comprehensive organisation at the national, basin and water-shed level. He asked IIF to think beyond traditional subjects of irrigation, it should address the new challenges in the in the horizon and take corrective and preventive steps to address these issues, be distinct from what had been in the past and introduce the techniques of forecasting mechanism as India is new to this. He cited the examples of Dhan Foundation in Tamil Nadu in irrigation management and Maharashtra Sinchan Parishad (Maharashtra Irrigation Collaboration) which holds Maharashtra Irrigation Forum to address irrigation issues regularly for the last 16 years which is well attended by irrigators in the stage and beneficial to farmers to a large extent. He emphasized that the success of IIF depends on how it is going to be connected to real irrigators at the ground level and popularise it among the stakeholders as far as new reforms that need to be ushered into irrigation sector. He wished that ICID would succeed in this endeavour with success stories such as in Japan, France and other European countries, as this is not a new idea in the Indian context. The Chair thanked Dr. Chitale for his wise words and guidance in achieving the objective of IIF (http://www.icid.org/knote_iif_2016_chitale.pdf).

10. Mr Ian Makin Vice President, ICID in his keynote speech on the topic “Innovative Techniques for Improving Water use Efficiency (WUE) of Irrigation Systems and Farm Application” described the scenario of irrigation and drainage in different parts of the world. According to him, India and China are making the same mistake which Europe did in the past and there is an urgent need to revisit the policies related to irrigation and drainage and to strengthen the links between main system and farmer fields.

11. The people who are in desperate need of water are the poor people, thus water rights should be given to poor people as big companies can get water anytime anywhere. He also mentioned that withdrawal of labour can be seen more in women than men, as more women are leaving the agriculture sector. The main question that he raised was how to improve the performance with the growing food demand and decreasing irrigation efficiency. Farmers, although called least educated, are very good economists, as they use different technologies time to time when they see transparent profits, and thus capacity building is essential to farmers. The presentation made by VP Ian Makin is attached as http://www.icid.org/prsnt_iif_2016_ian_makin.pdf.

12. Dr. Martin Burton, Water Management Specialist (UK) made presentation on "Water Management Issues at the Farm Level". He pointed out with the help of studies that with right agronomic interventions surface irrigation can achieve higher efficiency than poorly designed and maintained drip irrigation and sprinkler systems for certain crops. There is an urgent need for water professionals and agricultural engineers who understand water and food production as water management in the country is not up to the mark. He also presented findings from the project that he did in West Bengal and Odisha. There is a need to raise awareness and then knowledge of measures to improve irrigation water management at field level.
Capacity building and training should be practical and field based, based on the Indian scenario. The presentation made by Dr. Burton is attached as (http://www.icid.org/prsnt_iif_2016_Martin_Burton.pdf).

13. The presentations were followed by question-answer session. Dr. Martin Burton replying to a question cited the Chamba System of Madhya Pradesh where the lining of main canal system benefitted in the transfer of water to the tail end. He pointed out that having lined canal the water can be moved quickly at the ground level depending on irrigation demand. Dr. Vijay Labhsetwar of ICID made an observation about the module produced by WALMI Aurangabad for Farmer’s training which is found to be quite successful. Another question was about the blend of financing that is required for providing irrigation services – whether it is private or government. The Panel responded that there is large scale private investment in agricultural sector, but not in the irrigation sector which still depends on public financing which varies from country to country and therefore do not foresee a large scale irrigation system financed by the private sector and informed that the World Bank and ADB has publications on financing of irrigation systems.

14. Second Session was chaired by Vice President Ian Makin and which included three presentations. Dr. Suresh Kulkarni, Secretary, Maharashtra Water Resources Regulatory Authority, spoke about the “Institutional Reforms in Maharashtra”. He felt that there is no water scarcity in India, but the scarcity caused by inefficient bureaucratic policy and lack of vision. He brought some very interesting facts about Maharashtra into light. Maharashtra being a highly urbanised state is facing acute water shortages. Both groundwater and surface water is being used for irrigation. The main system which delivers the water to the fields is in a bad state. About 60-85% money spent is being recovered. There is an urgent need of rational approach for water pricing. The people upstream are not ready to lose their water rights and the socio political system is dominated by the government. The presentation made by Dr. Kulkarni is given at http://www.icid.org/prsnt_iif_2016_Kulkarni_MWRRA.pdf.

15. Dr. Rama Raju, Ex-Engineer in Chief, Andhra Pradesh, made presentation on the topic “Status of Irrigation and Drainage Education in India”. In his presentation, he spoke about the Krishna Cauvery basin is able to fully harness water. Around 40-50% of food security is provided by irrigation. He also mentioned that the usage of water has increased six times while population has increased three times since independence, given the fact that India is a water-stressed country. But he also pointed out that there are fewer opportunities for the students to study agricultural engineering as most of the universities are not offering such areas of expertise. Also education regarding this field should be given at elementary school level to generate interest amongst children. He stressed the need for reforms in curricula and syllabus giving due importance of irrigation and drainage management which is presently missing in most of the university curricula. The presentation of Dr. Rama Raju is attached as http://www.icid.org/prsnt_iif_2016_Ram%20Raju.pdf.
16. Mr Mohan Sharma, Program Director, Development Support Centre, Gujarat introduced the topic “Water Users’ Associations: Need for Institutional Strengthening”. It was informed that as of January 2015, around 85000 Water Users Associations (WUA) have been formed, out of which only 500-1000 WUAs are functioning properly and their functions vary from state to state. Lessons can be learnt from the WUA’s in Maharashtra, Gujarat, Rajasthan, Bihar and Andhra Pradesh where they are very active. However there are many hindrances for WUA’s such as no clear water allocation rights; lack of incentives to promote WUA; the availability of funding is mostly nil etc. WUAs could play a greater role in increasing the irrigated area which results in greater productivity. He said that there is lack of political will and legal issues that plague the functioning of WUAs. The poor government funding is another cause of WUAs are not able to sustain themselves financially. To sustain WUAs, one needs to focus on the benefits that could be garnered by farmers through WUAs. WUAs are necessary for holistic management of water. The presentation made by Mr. Mohan Sharma is given at http://www.icid.org/prsnt_iif_2016_MohanSharma.pdf.

17. The Chair thanked the presenters and called for discussions with the remarks that exactly this is the platform IIF is expected to be providing the platform to discuss issues at national, state and ground level and the next generation engineers and farmers are going to come from and how they are to be moulded. Dr More enquired from Mr. Mohan Sharma whether in other states the water is delivered to the WUAs on volumetric basis or area basis. It was informed that generally, in most of the states it is on Area basis. Mr. Sharma informed that in most of the states, it is done on crop area basis. Dr Yella Reddy observed that the farmers should be made aware of the importance of water allocation in the volumetric basis to increase the efficiency in agricultural water management and better returns for their crops. Dr Kulkarni responded that volumetric measurement is a must as all farmers are not at the same level and the water pricing should be done on volumetric basis.

18. Dr Yella Reddy, Director, WALAMTARI, Telangana, observed that irrigation and drainage should be part of school curricula and not at college level. Dr Rama Raju informed that the school curricula at CBSE and NCERT level adequately cover the topics of irrigation and drainage. And the drainage is looked after by the irrigation department and most of the irrigation departments does not recruit agricultural engineers, except quite recently the Govt. of Andhra Pradesh has started recruiting a few of them in irrigation department.

19. Dr. Martin Burton supported that agricultural engineers are a must in irrigation department, and in that respect there is a fundamental change is required in India as pointed out by Dr. Rama Raju so that there should be link between agriculture and engineering, the engineers who could understand crop production, farmer’s needs, etc.
20. Third Session of IIF1 was chaired by Dr. Martin Burton. The first presenter of the session, Ms. Jyotsna Chuchra spoke on the topic of “Application of GIS and Remote Sensing in Irrigation and Drainage”. She began with an introduction of her Company and then brought out some very interesting technical advancement in the field of irrigation and drainage through the application of GIS and remote sensing. With the help of GIS, satellite and sensors data on various aspects of irrigation and drainage: sources of water supply, water flow direction, irrigation infrastructures, soil characteristics and cropping pattern and yield can be monitored. For example, satellite navigation can guide aerial application of pesticides. She said the need of the hour is efficient, wise and responsible use of resources with good management and application of latest technologies. She informed how the modern irrigation systems could benefit with the application of geospatial technologies. She pointed out the challenges being faced in introducing new technologies in irrigation and drainage sector. The presentation made by Ms. Chuchra is given at http://www.icid.org/prsnt_iif_2016_Jyotsana.pdf.

21. Dr. Yafit Cohen, Researcher, Agricultural Research Organization, Volcani Center, Israel, spoke on the topic “Innovative Irrigation Technology towards improving irrigation efficiency in the field”. She made very interesting insights about the future of irrigation with remote sensing and sensor based irrigation and how can the efficiency improve with the help of these technologies. She spoke about various sensor-based irrigation management measures by placing the sensors in plants to measure plant-water potential and in soils to measure, evaporation and evapo-transpiration which result in reductions in water use by as high as 70% compared to normal practices with no negative impact on crop yields. She also talked about sensor-based systems with remotely-sensed maps. She pointed out that by simple use of evaporation measurements and crop coefficients irrigation efficiency can be significantly improved. Her presentation is given at http://www.icid.org/prsnt_iif_2016_Cohen.pdf.

22. Mr. Sumith Choy, Director, Rubicon Water, Australia, presented “Global experience in automation of irrigation systems”. He was of the view that people are the most challenging aspect in irrigation management. He highlighted the main benefits of automation in irrigation systems such as high level of service; improved water delivery efficiency; higher water saving; improved crop productivity; constant flow of water anytime anywhere amongst many others. He emphasized that automation requires motivation. As irrigation consumes 70% of freshwater, automation can play a significant role in supplying right amount of water at right time at right place for right duration. He talked about water distribution challenges and limitations of supply-oriented distribution and how these can overcome with automation of water supply systems. He introduced various components of automation in irrigation systems. Through a couple of case studies from all over the world, he presented the advantages on account of automation of on-farm irrigation management and proposed the future steps in this direction. He concluded his presentation with a video on ‘automation is a journey. The presentation made by Mr. Choy is given at http://www.icid.org/prsnt_iif_2016_Sumith.pdf.
23. Dr. M.B. Joshi, General Manager, Sardar Sarovar Narmada Nigam Ltd. Gujarat presented the case study on “Closed Pipe Irrigation Distribution Systems implementation in Narmada Command”. He introduced the issues related to the gigantic task of transferring 11.7 billion m$^3$ of water annually over a distance of more than 700 km and how it has benefitted the states of Gujarat and Rajasthan, the main beneficiaries of Sardar Sarovar Project. He pointed out that the conventional system of open gravity channels has been completed but the major challenge was the last link of connectivity which considerably reduced the irrigation potential created and the irrigation potential utilized. He also talked about the benefits and limitations of conventional system of open gravity channels in the backdrop of the case study presented. The differences between open gravity channel and underground pipe line were presented and the benefits and drawbacks were discussed keeping the efficiency, land availability, implementation period in mind. The presentation made by Dr. Joshi is given at http://www.icid.org/prsnt_iif_2016_Joshi.pdf.

24. In his message, Mr. G.S. Jha Chairman, Central Water Commission (CWC), Govt. of India congratulated ICID for initiating and organizing IIF. He said that the world is changing and one needs to keep pace with that changes in technology or else be branded as outdated. He cited how the technology, particularly computer application has already changed the water management practices. He recalled WUAs in Warabandi which was earlier met by using old methods of ringing the bell, circulating notices. The WUA members are now holding their meetings through mobile application technologies like WhatsApp, etc. He talked about transformation in on-farm technologies and how they have benefitted the farmers which made the WUAs to pay back for the services they have received. He stressed the need of research and application of technology in each area of farming sector.

25. In reply to a question from the audience, it was pointed out by Mr Joshi that in Narmada 70% of the 70000 km of canal and distribution network are minors and sub-minors. There is an initiative of converting initial reach of the Narmada canal command into micro irrigation. Further, in the case of minors and sub-minors for the command area is developed stage by stage through pipe irrigation network at the minors and sub-minors up to distributary level and thereafter the micro irrigation network.

26. During the question answer session, it was pointed out that the scenario in India compared to the countries like Australia and USA were very different. The size of holding of one farmer in USA is equivalent to the holding of a typical WUA in India. It was pointed out that in Australia the farmers paid for the water as it is a chargeable commodity on the basis of volumetric consumption and also paid for the maintenance of infrastructure. Investments come from the government too in urban sector, as they can divert the water required for the urban area. It would take around 14 years to get return from the investments. The answer to the fourth question was that when it ends up at the distributary level, the turnout of the distributary level or offtake of the minors, that serving at the village service area level, i.e. 400 to 500 ha. Herein Gujarat farmers do take away the water with entrepreneurial spirit and in their own way and the issue is whether everyone in
the society is afford to take the water to long distances. Even if the minors and sub-minors are done away, from the distributaries passing through their area, the farmers take their own initiative to take the water to the distance of 4-5 kms which has resulted 700,000 ha of area receiving water at present. So to take care of the poorest of the poor, it is the responsibility of the govt. to bring water as closer as possible to the farming area. That was the idea behind it.

27. The Final Session followed which consisted of two panel discussions: the first one on “Capacity development needs of professionals and farmers engaged in agriculture water management’ and the second one on ‘Thy way forward for India Irrigation Forum’. The moderator of the Session, Secretary General Avinash C Tyagi requested the panellists to try to answer the following questions:

(a) What are the Capacity development needs of the irrigation and drainage professionals?
(b) What are the capacity gaps in WUAs to meet their objectives?
(c) Is there a need for a Forum at the state level to address these issues?

28. Mr. Cheluvaraju, Chief Engineer, Upper Bhadra Project, Karnataka informed about the capacity building and training programs activities that are being currently undertaken in the state of Karnataka under modernization with the assistance of FAO and with ADB in the integrated water resources management. He informed that Through CADA, Karnataka has started the formation of WUAs but they are not as effective as expected to be due to lack of capacity in undertaking the new responsibilities. At present, the efforts are being undertaken through CADA authorities with the help of training institutes like WALMI to meet the gaps in the capacity development. He was of the opinion that the Karnataka does not require a Forum as they are addressing the issues through CADA authorities even though they face staff shortage and finances which have proved to be a major hindrance in effectively utilizing the existing mechanism.

29. Mr. Bhanu Prakash began his talk with some interesting questions like what for the capacity development is required? What modernization is implied? He was of the opinions that even the command areas of projects that were established in between 50s-80s, are still to be completed. He felt that determination to complete the project on time is required. The projects should be politically feasible and economically viable, besides technically feasible, ecologically sustainable and environmentally acceptable. He has cited the examples of projects like Bhakra Nangal, Narmada, Kosi which meet all these requirements. Such projects would be result oriented and socially acceptable. He was of the view that the engineers and professionals in agriculture and irrigation sector should communicate with the farmers in the language that could be understood by them for better results.

30. Dr. A K Sikka, Deputy Director General, Indian Council of Agriculture Research, pointed out that capacity development is a wider term, not limited to just individual, but encompasses institutions too. According to him, there are ample opportunities for capacity development. However, these facilities are not enough
and are more sectoral lacking multi-disciplinary approaches. He pointed out that IWRM in agricultural water management should consider the social engineering, economic and policy aspects too. The agricultural engineers should not just limit themselves to command area development or irrigated area development, but need to have a wider approach towards IWRM issues. He said India has got a number of institutions in capacity building and training areas, but they work in an isolated manner. They need to be brought together under one umbrella to reach the benefits, as none of these institutions have a holistic approach to agricultural water management issues. A blend of engineering solutions and social and policy management is required. IIF could play the role of network coordinator or network facilitator and working mechanism could be evolved at national, regional or state level that should have a cascading approach. He emphasized the need for a modular training program in a modular structure. There should be a cascade way of thinking. Capacity development should not only be at the field but should be for everyone. Feedback is very important as the performance could be gauged and the modules remodelled, if required.

31. Mr. Rajendra Chalisgaonkar, Chief Engineer, Irrigation Department, provided the perspective of Uttarakhand being a new state where the gradual decline of the population in the hilly areas demands capacity development to a more focussed target groups. Being a hilly area, irrigation itself is a problem. Due to the topography, the existing canals and other structures are not in a good shape which leads to a problem of the restoration of these structures, as there are lot of natural calamities like landslides, etc. The state totally depends on Central Government for funding, which is another problem that plagues capacity development process. At present there is no active participation of the WUA's in the plains and none are present in the hilly areas. He advocated the need for a Forum at the state level but expressed that the sustainability could be a huge problem. He felt that therefore IIF at national level should take care of issues faced by smaller states like Uttarakhand as they do not have the financial capacity to sustain the Forum at the state level.

32. Mr. K A Patel Director, Sardar Sarovar Narmada Nigam Ltd., Gujarat was of the view that engineers are well qualified in design and construction aspects of projects but, they lack skills required for operational. Hence they need to be trained at the operational aspects through capacity development program. The farmers should be given incentives and adequately trained in the operation and maintenance of minors under PIM. WUAs are functioning, but later collapsed due to various factors such as disputes among farmers. The WUAs need to be modernized with the help of governmental and non-governmental organizations by providing them incentives, training programs, workshops, field visits etc.

33. The second panel discussion took place on the topic of ‘The way forward for India Irrigation Forum’ to address the questions such as (i) What are CD opportunities and facilities available? Are they meeting the needs? (ii) How can the IIF meet these requirement? and (iii) What mechanism should be there for IIF to be sustainable?
34. Mr. Y. Abdul Basheer, Ex Engineer-in-Chief, Irrigation & CAD Department, Andhra Pradesh recalled that the second green revolution should be based on precision agriculture. He talked about the recent flood situations in Chennai and London which could have been managed if advance warnings had been heeded by the concerned. He cited the example of huge flood in Andhra Pradesh in 2009 which was managed well with the cooperation and coordination of various government departments well in advance. He also stressed the need for contingency plan to be put in place. A sense of urgency should be displayed and flood mitigation programmes should be given priority. Corp insurance should be made mandatory and WUAs should be part of food value chain. He advocated the need for a Forum at the state level to draft a firm policy that should change with time, especially addressing the issue of sharing of river waters among the states, etc. The Chair appreciated Mr. Basheer for bringing out the issue of flood and highlighting the issue of inter-state sharing of river water through the Forums like IIF, rather than approaching them through politically or legally.

35. Mr. Ajay Pradhan, President and CEO, Cuttack Consulting Solution Services approached the topic of Capacity Development taking up the case of Uttar Pradesh where 5000 kms. of canals are fed by barrages. He pointed out that in UP, there are no standard guidelines for hydrometric equipment, etc. Hence, he felt that IIF could think of preparing standard guidelines and specifications for irrigation related activities which will result in considerable water use efficiency. There is a huge gap between the technology developed and technology applied at the field level. The creation of awareness among all stakeholders like abstraction of water, especially groundwater, for irrigation system and creation of operational rules for canal systems through IIF would be advantageous. IIF could envision a irrigation network or framework percolating down to WUAs at ground level, then district irrigation committees, state irrigation departments and finally the national level committee. He stressed the need for the involvement of all stakeholders in irrigation planning, citing the case of Pradhan Mantri Krishi Sinchai Yojana (PMKSY) where the involvement of stakeholders from all sectors are lacking which results in the poor coordination of various schemes under PMSKY. IIF could fill that role. To sustain IIF, has suggested that there should be proper administrative and financial set up, even initial funding to come from Govt. of India or donor agencies like World Bank.

36. Mr. Naresh Modi, Project Director, National Committee on Plasticulture Applications in Horticulture, supported the need for IIF and hoped that such a setup had come some 20 years back. He reminded that irrigation association in US undertake training and certification programs for farmers and other stakeholders. Thus, IIF could play an effective role in the capacity development not only canals irrigation but should include pressurised irrigation. The Forum should act as a coordinating mechanism between various agencies in irrigation sector. Drainage was equally important which adds more cultivable land for agricultural produce.
37. Dr. Yella Reddy, Director, WALAMTARI, Hyderabad, an Agriculture Engineer supported the idea of IIF as the most of the irrigation departments the drainage is not given its due importance. He was for the integration of irrigation and drainage at the state level. He emphasized the need for an institution dedicated to research in drainage like ILRI, Wageningen and Drainage Research Institute in Egypt which could serve the country as well as other countries in south Asia. He also highlighted the importance of inducting the agricultural engineers in irrigation departments for efficient water management, as at present, the responsibility of water management is left as the responsibility of irrigation engineers. He highlighted the importance of the training and capacity building of farmers in water management as they are the water users at the on-farm level. IIF could play an effective role in this background in the formation of water policies and also advocating the need for water trading in India.

38. As the panel has already appreciated the need for capacity development, Mr. Kanjlia, Executive Secretary, CBIP pointed out that the capacity development could be achieved by identifying the skills, developing the training methodologies accordingly and recognizing them through certification. IIF could play the role of standardizing the training programs for uniformity among all stakeholders in order to make the capacity development uniform. IIF could be institutionalised for data base management and for sharing the knowledge, training methodologies and devise e-learning packages which is highly cost effective and its reach is far and wide. He also stressed the importance of incentivising and recognizing the achievers through awards and recognitions.

39. Participants at the IIF made some suggestions such as: (i) the need for training of farmers in order to make them realize the importance of water and thereby encouraging water saving; (ii) need for multi-disciplinary approach in irrigation water management by induction of software engineers in today's world of automation of irrigation systems, (iii) the need for utilization of wastewater for irrigation purpose and also the provision for irrigation scheduling and secondary water storage systems for recharge during drought, (iv) an effective networking system for training programs for farmers and irrigation engineers, (v) to draw a road map for the development of irrigation managers and engineers to meet the needs till 2050 in view of increasing gap in the knowledge transfer, (vi) the training programs should be seen as an incentive and encouragement and not as a punishment, and (vii) the need for specialists in irrigation water management and develop a career path towards that purpose by bringing together the universities and field requirements, including the fundamental reforms in the Government's attitude towards the employment of engineers in public works department.

40. Dr. Chitale, the Chief Guest in his closing remarks appreciated the presence of active persons from irrigation departments and other organizations and asked them to organize state-wide irrigation forums which should serve as building blocks for IIF or else it would remain as a debating society.
41. Secretary General Avinash Tyagi thanked the Chief Guest, Panellists and Participants for making IIF in serving its initial purpose and declared the session as closed.
## Program Summary

**10.00-13.00 hours and 14.00-17.00 hours, 07 April 2016**  
**Hall No.8-V, Pragati Maidan, New Delhi**

<table>
<thead>
<tr>
<th>Time/ Hours</th>
<th>Topic</th>
<th>Speakers</th>
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<tr>
<td>10:00-11:15</td>
<td>Inaugural Session</td>
<td>Chair: Takashi Matsuo (ADB)</td>
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<tr>
<td>10:00-10:10</td>
<td>Overview of IIF and Welcome Address</td>
<td>Mr. Avinash Tyagi, Secretary General, ICID</td>
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<tr>
<td>10:10-10:25</td>
<td>Inaugural Address</td>
<td>Dr. Madhav A. Chitale, Ex- Secretary, MOWR</td>
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<td>10:25-10:45</td>
<td>Key note address on Theme - Innovative Techniques for Improving Water use Efficiency (WUE) of Irrigation Systems and Farm Application</td>
<td>Mr. Ian Makin, Vice President, ICID, Theme Leader, Irrigation Modernisation, IWMI</td>
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<td>10:45-11:00</td>
<td>Water Management Issues at the Farm Level</td>
<td>Dr Martin Burton, Water Management Specialist, UK</td>
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<td>11:00-11:15</td>
<td>Discussions</td>
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<td>11:30-13:00</td>
<td>Session II</td>
<td>Chair: Mr Ian Makin (IWMI)</td>
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<td>11:30-11:45</td>
<td>Institutional Reforms in Maharashtra</td>
<td>Dr Suresh Kulkarni, Secretary, MWRRRA</td>
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<td>11:45-12:00</td>
<td>Status of Irrigation and Drainage Education in India</td>
<td>Dr. Rama Raju, Ex Engineer in Chief, AP</td>
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<td>12:00-12:15</td>
<td>Water Users' Associations: Need for Institutional Strengthening</td>
<td>Mr. Mohan Sharma, Development Support center (DSC), Gujarat</td>
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<td>12:15-12:30</td>
<td>Case Study- Balh Valley Irrigation Project, Himachal Pradesh</td>
<td>Dr S P Jadhav, Jain Irrigation System Ltd., Jalgaon</td>
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<td>12:30-13:00</td>
<td>Discussions</td>
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<td>14:00-15:15</td>
<td>Session III</td>
<td>Chair: Martin Burton (UK)</td>
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<tr>
<td>14:00-14:15</td>
<td>Application of GIS and Remote Sensing in Irrigation and Drainage</td>
<td>Ms. Jyotsna Chuchra, Senior Research Analyst - Agriculture Division, Geospatial Media and Communications Pvt Ltd</td>
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<td>14:15-14:30</td>
<td>Innovative Irrigation Technology towards improving irrigation efficiency in the field</td>
<td>Dr. Yafit Cohen, Israel</td>
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<td>14:30-14:45</td>
<td>Global experience in automation of irrigation systems</td>
<td>Mr. Sumith Choy, Director, Rubiconwater, Australia</td>
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<td>14:15-15:00</td>
<td>Case study- Closed Pipe Irrigation Distribution Systems implementation in Narmada Command</td>
<td>Dr M B Joshi, General Manager (Technical) Sardar Sarovar Nigam, Gujarat</td>
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<td>15:00-15:15</td>
<td>Discussions</td>
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<td>15:30-17:00</td>
<td>Session IV: Panel Discussion- Moderator: Mr. Avinash C. Tyagi</td>
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<tr>
<td><strong>Panel I: Capacity development needs of professionals and farmers engaged in agriculture water management</strong></td>
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<td><strong>Agency</strong></td>
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<tr>
<td>Gujarat</td>
<td>Mr. K A Patel, Director (Civil), Sardar Sarovar Nigam Ltd, Gujarat</td>
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<td>Uttarakhand</td>
<td>Mr. Rajendra Chalisgaonkar, Chief Engineer Irrigation Department, Uttarakhand</td>
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<td>Bihar</td>
<td>Mr. Bhanu Prakash, Ex-Engineer in Chief, WR Department, Bihar</td>
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<td>Karnataka</td>
<td>Mr. Cheluvaraju, Chief Engineer, Upper Bhadra Project, KNNL, Karnataka</td>
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<td>Andhra Pradesh</td>
<td>Mr. Y. Abdul Basheer, Ex Engineer-in-Chief, Irrigation &amp; CAD Department, AP</td>
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<td><strong>Panel II: The way Forward for IIF</strong></td>
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<td>CBIP</td>
<td>Mr V.K. Kanjlia, Secretary, CBIP</td>
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<td>Ministry of Agriculture</td>
<td>Dr A.K.Sikka, Deputy Director General, ICAR, Department of Agriculture Research and Education, Ministry of Agriculture</td>
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<td>Academic Institute</td>
<td>Dr K Yella Reddy, Director (A&amp;R), WALAMTARI, Telangana</td>
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<td>Private sector</td>
<td>Dr Ajay Pradhan, President and CEO, C2S2, New Delhi</td>
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<td>Ministry of Agriculture</td>
<td>Mr Naresh Modi, Project Director, National Committee on Plasticulture applications in Horticulture, Ministry of Agriculture</td>
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ICID Vision 2030

Goals

1. Enable higher crop productivity with less water and energy
2. Be a catalyst for change in policies and practices
3. Facilitate exchange of information, knowledge and technology
4. Enable cross-disciplinary and inter-sectoral engagement
5. Encourage research and support development of tools to extend innovation into field practices
6. Facilitate capacity development

The International Commission on Irrigation and Drainage (ICID) established in 1950 with its headquarters in New Delhi, India, is a leading scientific, technical, and professional international not-for-profit organization in the fields of irrigation, drainage, and flood management. The objective of the Commission is to achieve "Water secure world free of poverty and hunger through sustainable rural development". The mission of the Commission is "Working together towards sustainable agriculture water management through inter-disciplinary approaches to economically viable, socially acceptable and environmentally sound irrigation, drainage and flood management".

For more information, please visit: http://www.icid.org
For more information on the First India Irrigation Forum, please visit http://www.icid.org/conf_iww.html