

REPORT OF THE 24th ICID Congress on Irrigation and Drainage

3 -10 October 2022
Adelaide, Australia



**Innovation and Research in
Agriculture Water Management
to Achieve Sustainable
Development Goals**



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**INTERNATIONAL COMMISSION ON
IRRIGATION AND DRAINAGE**



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**Innovation and Research in Agriculture
Water Management to Achieve
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International Commission on Irrigation and Drainage (ICID), established in 1950 is the leading scientific, technical and not-for-profit international organization. ICID, through its network of professionals spread across more than a hundred countries, has facilitated sharing of experiences and transfer of water management technology for over half-a-century. ICID supports capacity development, stimulates research and innovation and strives to promote policies and programs to enhance sustainable development of irrigated agriculture through a comprehensive water management framework. The mission of ICID is to stimulate and promote the development and application of the arts, sciences and techniques of engineering, agriculture, economics, ecological and social sciences in managing water and land resources for irrigation, drainage, flood management, for achieving sustainable agriculture water management.

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Foreword



Increasing climate change impacts and global consumption patterns are putting stress on global freshwater resources and by extension, agriculture, and food production. Higher temperatures are affecting crop yields and threatening the sustainability of agricultural systems and food security. Moreover, to complement the economic development, more water is being diverted from agriculture to other sectors. This in turn is putting pressure on agriculture to perform more efficiently, demanding more innovation and creative solutions.

The Sustainable Development Goals (SDGs) outlined by the United Nations further underline the need to achieve Goal 2 to end hunger, achieve food security and improved nutrition and promote sustainable agriculture and SDG 6 to ensure the availability and sustainable management of water and sanitation for all. The accomplishment of SDG 2 and Goal 6 of the SDGs not only realizes the food and water security goals, but they also have a bearing on other SDGs such as attaining energy security, economic growth, sustainable and inclusive development, and just climate action and ecosystems, to name a few.

Thus, understanding the need of the hour from ICID's perspective, the main theme of the 24th ICID Congress discussed 'Innovation and Research in Agriculture Water Management to Achieve Sustainable Development Goals.' As climate change is bringing unprecedented dynamics in the agriculture sector globally, apt measures need to be taken to make our agricultural systems more resilient. Through various sessions, the Congress addressed the multi-faceted aspects of irrigation management. While technology plays a critical role in suggesting pathways for higher efficiency, it alone cannot supplement water savings in agriculture. Understanding the need of the farmers, in conjunction with cognizance of the need for implementation of cutting edge-technology or traditional water-saving practices is vital in determining the optimum strategies used in irrigation. The use of ICT in agricultural water management can help farmers reduce water consumption, improve crop yields, and increase profits, while also promoting

sustainable water use practices. Apart from technical aspects, integrating the socio-economic aspects and involving stakeholders in the decision-making process of agricultural water management is crucial in irrigation development and management.

To address the issues concerning agricultural and water systems, an integrated approach to irrigation management is essential for ensuring sustainable water use and food security in the future. It requires a collaborative effort from all stakeholders to adopt modern irrigation technologies, use data-driven decision-making, promote participatory irrigation management, design climate-resilient irrigation systems, and coordinate across different sectors. Overall, an integrated approach to irrigation management is essential for ensuring sustainable water use and food security in the future. It requires a collaborative effort from all stakeholders to adopt modern irrigation technologies, use data-driven decision-making, promote participatory irrigation management, design climate-resilient irrigation systems, and coordinate across different sectors.



Prof. Dr. Ragab Ragab
President



Preface



With agriculture consuming the major share of global freshwater resources, food and water security are the two major concerns globally, converging in the sustainable management of agricultural water resources. Effective agricultural water management is essential to ensure food security, increase crop yields, and the long-term health of our planet's water resources. With this view in mind, the theme of the 24th ICID Congress was chosen as 'Innovation and Research in Agriculture Water Management to Achieve Sustainable Development Goals.' Through various sessions, the Congress addressed various aspects of agricultural water management such as irrigation, drainage and related aspects, water-efficient technologies, soil and water conservation, socio-economic aspects, and correlation with the SDGs.

Background papers were prepared by experts from member and partner organizations to deliberate on the theme 'Innovation and Research in Agriculture Water Management to Achieve Sustainable Development Goals.' For a better understanding of the key elements required to bring a new green revolution, the 24th ICID Congress was articulated in the form of two major questions. These questions were further sub divided as follows:

Question 62: What Role Can Information and Communication Technology Play in Travelling the Last Mile?

Technical - Technology Aspects

Social Side - Socio-Economic Infrastructure Context: Appropriate Technology for Appropriate Resources (For Diverse Groupings of People) including Using social media/Aspect Social

Water Trading

Question 63: What Role is Played by Multi-Disciplinary Dialogue to Achieve Sustainable Development Goals?

Social, Consumer, Supply Chain QA, Reputation and Regulatory Dialogue

Technical level dialogue vs other “levels”

Addressing the Sustainable Development Goals of Responsible Consumption and Production (SDG 12)

The 24th ICID Congress, hosted by the Australian National Committee of ICID (IACID) and Irrigation Australia, was organized in close cooperation with and in partnership with FAO, World Bank, IWMI and many other International Partners during 03-10 October 2022 at Adelaide, Australia. The Congress provided an opportunity for the policymakers, planners, farmers, youth and industry to participate in the dialogue for the need for a new green revolution. Accordingly, the Congress included sessions on Questions 62 and 63 addressing the theme of the Congress, Side Events including the International Symposium, Seminar, Workshops, and an International Exhibition.

Nearly 439 abstracts were submitted on various sub-themes. Further, 153 research articles and posters from more than 32 countries were received before Congress. These papers were presented during the 24th ICID Congress in several parallel sessions and poster sessions, and the issues emerging from the sub-themes were discussed in the plenary sessions and presented in the Adelaide Statement as the conclusions and recommendations of the 24th ICID Congress. Participants were provided with a USB containing all the full-length papers including the Background Papers of the sub-themes. These papers can also be accessed through the ICID website.

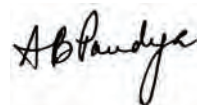
Additionally, this post-congress report briefly summarizes the outcomes of the Symposium on ‘Putting People at the Heart of What We Do’, the Symposium on ‘Integrated Approach to Irrigation Management in the Future’, Special Sessions on ‘Application of Geosynthetics in Irrigation, Drainage and Agriculture’ and ‘A Newly and Spatially Distributed Crop Water Requirement Estimation in Southern Australia’ and International Workshops on relevant topics such as ‘Managing Water Scarcity under Conflicting Demands,’ ‘Water Food Energy Nexus,’ ‘Use of Non-Conventional Water Resources for Irrigation,’ ‘Modernization and Revitalisation of Irrigation Schemes,’ ‘Institutional and Organizational Aspects of Irrigation/ Drainage System Management,’ ‘Sustainable Development of Tidal Areas’ and ‘Adaptive Flood Management’. This post-congress report of the 24th ICID Congress include information on the outcomes of both the questions and sub-themes and accompanying sessions conducted during the event.

For the organization of a successful Congress, I would like to convey my special thanks to the Australian National Committee of ICID (IACID) / Irrigation Australia for the excellent logistics arrangements during the Congress. The sincerity and tenacity of IACID is highly admirable. I extend my gratitude towards the contribution of colleagues from IACID, and other ICID fraternity members for their commitment, successful coordination and organization of the 24th ICID Congress after the covid crisis.

I would like to especially acknowledge and appreciate the efforts of the technical experts who carefully examined the abstracts and papers. Their names are mentioned under Acknowledgements.

Moreover, I would like to thank the rapporteurs of the two questions, Mr. Peter Hayes (Australia), VPH Dr. Ding Kunlun (China), VPH Ian Makin (United Kingdom) and Mr. Momir Vranes (Australia) for reviewing the papers and preparing General Reports on the two Congress Questions; Dr. Ragab Ragab, President ICID, PH Dr. Saeed Nairizi (Iran), Mr. Eddie Parr (Australia) and Mr. Geoff Harvey (Australia) for chairing the Symposium and the seminar, respectively. I would also like to acknowledge Dr. Brian T. Wahlin (USA), Mr. Momir Vranes (Australia), Dr. Rajendra S. Poddar (India), Dr. Ahmed Elsidig A. Elshaikh (Sudan), Richard McLoughlin (Australia), Mr. K.P. Bakshi (India), Dr. Kazumi Yamaoka (Japan), Ms. Claire Miller (Australia), VPH Dr. Mohamed Abd-El-Moneim Wahba (Egypt), Adj. Prof. Jeff Camkin (Australia), VP Dr. Marco Arcieri (Italy), Carl Walters (Australia) and other technical experts for chairing the sessions organized for the sub-themes.

My special appreciation is due to the ICID Central Office team consisting of Er. Harish Kumar Varma, Executive Director; Er. B. A. Chivate, Director, Mr. Madhu Mohanan, Communication Officer, Ms. Prachi Sharma, Knowledge Officer, Mr. Keshav Dev Tanwar, Assistant IT Officer and the supporting staff for their contribution in bringing out this publication.



Ashwin B. Pandya
Secretary General



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Mr. Eddie Parr, IACID - Member
Ms. Carl Walters, IACID - Member
Er. Ashwin B Pandya, Secretary General, ICID -Member-Secretary

ABBREVIATIONS

AARDO	African-Asian Rural Development Organization
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ANWC	Australian National Water Commission
ARC	Agricultural Research Council, South Africa
AWC	Arab Water Council
AWM	Agricultural Water Management
BGM	Bituminous Geomembrane
CAD	Command Area Development
CBIP	Central Board of Irrigation and Power
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CWC	Central Water Commission
DSS	Decision Support Systems
FAO	Food & Agriculture Organization
GWP	Global Water Partnership
IACID	Irrigation and Drainage and Irrigation Australia
IAIM	Integrated Approaches to Irrigation Management
ICARDA	International Center for Agricultural Research in the Dry Areas
ICID	International Commission on Irrigation & Drainage
ICOLD	International Commission on Large Dams
ICOMOS	International Council on Monuments and Sites
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communications Technologies
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGS	International Geosynthetics Society
IGSP	International Geosynthetics Society Program
IIPs	Irrigation Improvement Programmes
INSPIRE	International Network of Service Providers for Irrigation Excellence
IsDB	Islamic Development Bank
IWALC	International Water-related Associations Liaison Committee
IWMI	International Water Management Institute
IWMP	Integrated Water Management Policy
IWRA	International Water Resources Association

IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
JIRCAS	Japan International Research Center for Agricultural Sciences
MANCID	Malaysian National Committee on Irrigation and Drainage
MoWR	Minister of Water Resources
NC	National Committee
NDS	National Development Strategy
NWMP	National Water Management Plan
PAWEES	International Society of Paddy and Water Environment Engineering
PCTA	Permanent Committee for Technical Activities
PPP	Public Private Partnerships
SCADA	Supervisory Control and Data Acquisition
SDGs	Sustainable Development Goals
SIMP	Support the Irrigation Modernization Programme
SSA	Sub-Saharan Africa
TISA	Transforming Small-scale Irrigation in Southern Africa
UN	United Nations
UNESCO-IHE	IHE Delft Institute for Water Education
UNICEF	United Nations International Children's Emergency Fund
UN-WATER DPC	UN-Water Decade Programme on Capacity Development
WB	World Bank
WG-AFM	Working Group on Adaptive Flood Management
WG-IDM	Working Group on Irrigation Development and Management
WG-IOA	Working Group on Institutional and Organizational Aspects of Irrigation/ Drainage System Management
WG-M&R	Working Group on Modernization and Revitalisation of Irrigation Schemes
WG-MWSCD	Working Group on Managing Water Scarcity under Conflicting Demands
WG-NCWRI	Working Group on Use of Non-Conventional Water Resources for Irrigation
WG-SDTA	Working Group on Sustainable Development of Tidal Areas
WG-WFE-N	Working Group on Water Food Energy Nexus
WMO	World Meteorological Organization
WUA	Water Use Associations
WUG	Water Users' Group
WWAP	World Water Assessment Programme
WWC	World Water Council
YPGs	Young Professional Groups

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OPENING CEREMONY

24th ICID Congress: Innovation and Research in Agriculture Water Management to Achieve Sustainable Development Goals



The 24th ICID Congress and 73rd International Executive Council Meeting was organised by ICID with its Australian counterpart, Irrigation Australia's Committee on Irrigation and Drainage (IACID) from 3–10 October 2022, at the Adelaide Convention Centre, Adelaide, Australia. The main theme of the 24th ICID Congress was “Innovation and Research in Agricultural Water Management to Achieve Sustainable Development Goals”. The two questions identified and deliberated are Question 62 – What Role Can Information and Communication Technology Play in Travelling the Last Mile? and Question 63 – What Role is Played by Multi-Disciplinary Dialogue to Achieve Sustainable Development Goals? About 2000 delegates from 64 countries and international organizations including policymakers, irrigation and drainage professionals, exhibitors, students and Young Professionals participated in the Congress to share their knowledge and experience in sustainable agriculture water management focusing on irrigation management.

In addition, the following events were also organised in the side-line of the 24th ICID Congress. These events included an international symposium, an international seminars organized jointly by FAO and ICID, an international workshop by the World Bank and a special session on the use of wastewater in agriculture. The specific themes of each event are given as follows:

- International Symposium on Integrated Approaches to Irrigation Management in Future
- Special Session on Developing the future tools for managing uncertainty in irrigation water supply
- Special Session on Application of Geosynthetics in Irrigation, Drainage and Agriculture (International Geosynthetics Society Program)

Mr. Bryan Ward, Chairman of Irrigation Australia welcomed the delegates and highlighted the important aspects of agriculture water management and how they increased agriculture activity in Australia. Mr. Momir Vranes, Chair of IACID, provided a background on the status and relevance of irrigation and drainage for the future of food and water security. In his address, Mr. Vranes also gave a brief introduction to the theme of the Congress, the questions (Question 62 and Question 63) and associated workshops and side events.

President ICID, Prof. Dr. Ragab Ragab welcomed the participants during his opening remarks and briefly introduced the history of ICID and addressed the issues threatening sustainable development in future. The President emphasized the opportunity to spotlight where ICID – and various stakeholders of the irrigation and drainage sector as a whole – needs to come together, to promote sustainable management of water for agriculture worldwide.

South Australian Minister of Primary Industries, Hon. Clare Scriven (MLC), also welcomed the dignitaries and highlighted the regional development specifically related to water resources. Hon. Tanya Plibersek, Minister for Environment & Water who joined virtually, also welcomed the delegates and dignitaries assembled for the 24th ICID Congress hosted by the Australian National Committee on Irrigation and Drainage and Irrigation Australia (IACID) in the beautiful city of Adelaide.

Hon'ble Minister of Jal Shakti Mr. Gajendra Singh Shekhawat. Government of India addressed the august gathering and shared the experiences of India and talked about the numerous challenges the world is facing in the water sector ranging from rapidly increasing population, urbanization, climate change, ensuring water quality, rapidly depleting groundwater, etc.

Hon. Karlene Maywald, South Australian Water Ambassador presented the N.D. Gulhati lecture at the opening ceremony on the theme 'Putting People at the Heart of What We Do' providing Australian experiences. Aligning with the theme of the Congress, 'Innovation and research in agricultural water management to achieve sustainable development goals', Hon. Ms. Maywald's lecture focused on the role of the stakeholders in meeting the goals of water security globally and achieving the United Nations Sustainable Development Goals.

Hon'ble Minister of Water Resources of Uzbekistan Dr. Shavkat Rakhimovich Khamraev addressed the august gathering and talked about the irrigation and drainage facilities with its historical perspective and the main challenges of their country's irrigation and drainage sector. In his speech, Dr. Khamraev provided an overview of the current status of water resources in Uzbekistan, and the gaps for improvement of water resources management to cater to the demand of the country's population for food and water security.

During the opening ceremony, IACID arranged an instrumental performance by playing Didgeridoo on stage, the most famous Australian instrument, besides welcoming the delegates and participants with the song "We are Australian" and "Advance Australia Fair" the national anthem of Australia.



Welcome Address:

Mr. Gajendra Singh Shekhawat
Hon'ble Minister of Water
Resources
(Jal Shakti Ministry), Govt. of
India



In his welcome address, Hon'ble Minister Mr. Gajendra Singh Shekhawat thanked the organizers for inviting him to address the august gathering and share the experiences of India.

He started his speech with numerous challenges the world is facing today in the water sector ranging from rapidly increasing population, urbanization, climate change, ensuring water quality, rapidly depleting groundwater, etc. Irrigation itself is the biggest user of water, consuming more than 70% of the water used by all the sectors put together. The water use efficiency in the irrigation sector is reported to be around 40%. It is therefore imperative to bring water use efficacy, adoption of new techniques to irrigate the farmlands, sustainable use of available water resources, recharge of groundwater and rejuvenation of streams rapidly becoming extinct for addressing the challenges of the irrigation sector.

India is home to 18% of the world's population and 18% of the world's livestock population, but possess just 4% of the freshwater resources of the world. This availability also varies throughout the year as most of the rainfall that India receives is limited to the 3-4 months of monsoon.

Traditional wisdom in water conservation from India also reflects the commitment shared by the communities over centuries for the judicious management of water resources. Indian Government recognizes that sustainable use of water is only possible if water management is holistic. By recognizing the importance of this tenet, in 2019, the visionary Prime Minister of India Shri Narendra Damodardas Modi brought various activities related to water under one umbrella under the Jal Shakti Ministry. This has given greater synergy and coherence to water management in India and the government is committed to investments of more than US\$ 210 Billion by 2024 in the water sector.

He highlighted the new initiatives taken by the Government of India to improve the quality of life of its 1.3 billion people:

- Flagship irrigation development scheme 'Pradhan Mantri Krishi Sinchai Yojna' national scheme to provide 'assured irrigation to every farm' and 'more crop per drop' in a focused manner.
- The comprehensive aspects of irrigation development include farm management of water, Command Area Development and Micro Irrigation.
- Enhancing the efficiency of existing dams; focussing on the safety of dams in letter and spirit, and implementing unique Dam Rehabilitation and Improvement Program.

- Atal Bhujal Yojana – A national scheme for making invisible groundwater visible and creating water aware communities.
- National aquifer mapping and management program of India to achieve source sustainability for drinking water, sustainable groundwater management and improved irrigation facilities.
- Launching of the Jal Shakti Abhiyan in 2019 which involved millions of people in water conservation and recharge.
- The ambitious national river-linking perspective plan of India and the recent commencement of Ken-Betwa River interlinking project.
- The Namami Gange Programme with the twin objectives of effective abatement of pollution, conservation and rejuvenation of one of the largest and most sacred rivers of India, the Ganga. It has created a paradigm shift in the approach to river rejuvenation, pollution abatement and in bringing a holistic approach to river basins.
- Focus on recycling and reuse of grey water and a national framework on safe re-use of treated water.
- Efforts for achieving SDG-6 to 'ensure availability and sustainable management of water and sanitation for all'. Firstly, under the Swachh Bharat Mission, over 105 million toilets were constructed, transforming the behavioural pattern of more than 600 million Indians since 2014. Secondly, to achieve universal coverage of safe and reliable drinking water by providing Functional Household Tap Water Connection to more than 193 million households by 2024 - well before the target set by world for 2030.
- To create robust ecosystem for water management focusing on implementation of micro irrigation, pipe distribution network, Supervisory Control and Data Acquisition (SCADA) systems and IoT applications in irrigation.

Hon'ble Minister Mr. Gajendra Singh Shekhawat pointed out that ICID, in 72 years of its existence, has emerged as a global leader and a think tank in the field of irrigation and drainage. Through various Congresses, forums, workshops, conferences and seminars, ICID has enriched the knowledge of a vast range of stakeholders and motivated hundreds of professionals.

He emphasized that India truly believes in the concept of 'Universal brotherhood & Collective wisdom', and has always contributed to the betterment of humankind. India has played an active role in such collaborative scientific endeavors. Considering this very fact, India has been hosting the Secretariat and headquarters of ICID in New Delhi since its inception. ICID has been a prestigious organization to work with for many Indian Governmental officials and experts.

As the speech drew to a close, he reminded that India will be hosting the 25th ICID Congress & 74th IEC Meeting which will be organized in the beautiful city of southern India, Vishakhapatnam during November 2023. On behalf of the Government of India, he took the opportunity to extend a special welcome to his audience in advance. He mentioned that along with showcasing unique case studies in the irrigation and drainage sector, the participants will also be privy to the cultural heritage and various aspects of the world's largest democracy and ancient civilization.

Finally, he extended his sincere thanks to the Australian National Committee and Irrigation Australia for organizing the mega event and closed with speech with the salutation.

Jai Hind!!!



Address:

Hon. Dr. Shavkat Khamraev
Minister of Water Resources
Uzbekistan and
Vice President of ICID



The keynote speech was delivered by Hon. Dr. Shavkat Khamraev, Minister of Water Resources, Uzbekistan and Vice President of ICID. In his speech, Dr. Khamraev provided an overview of the current status of water resources in Uzbekistan, and the gaps for improvement of water resources management to cater to the demand of the country's population for food and water security.

Uzbekistan, ranked as the 55th country in the world according to the size of its territory (total area), has to cater to a population of 35,271,276 (as of 1 January 2022) which is 42nd in the world, with an average density of 74.1 persons/km². Almost 50% of the population lives in rural areas. In terms of economy, Uzbekistan stands at 7th place in cotton lint production, 2nd place in astrakhan fur production, 4th place in gold reserves, 7th place in gold extraction, 7th place in uranium mining, and 14th place in gas production.

The quantum of annual average water volume used in Uzbekistan is nearly 52 BCM, of which nearly 80% exists across transboundary or is generated/supplied by nearby countries and 20% exists on the territory of the country. The key agricultural products in Uzbekistan are raw cotton, wheat, vegetables, fruits, grape, melons, silk, astrakhan fur, meat, eggs, and milk. The water consumed in agriculture is nearly 90% of the total freshwater resources; however, it contributes only 25% to the total GDP in Uzbekistan generating a total production of 29.91 billion USD in 2021, including the crop sector (49.9%) and the livestock sector (50.1%).

In his speech, Dr. Khamraev focused on the forecasts and possible consequences of the water management scenario in Uzbekistan. The shortage of water in the future will be aggravated by the projected decrease in water resources, increased demand for water resources due to population growth, the development of industry and other sectors of the economy. Water scarcity and the presence of competition between economic sectors will increase the burden on groundwater and negatively affect water quality.

Dr. Khamraev emphasized that the priorities in the water sector should be the development and implementation of Integrated Water Resources Management (IWRM) principles and transboundary water cooperation, adaptation to climate change, irrigated land productivity,

food security, and ecosystem resilience. With these priorities in mind, the significant areas of focus include guaranteed water supply to the economy based on the interconnected management of all types of water resources (surface, groundwater and sewage), improving the system of water resources management and planning, improvement of the water code, creating effective mechanisms for water distribution between sectors of the economy, rational use of wastewater and maintaining strategic groundwater reserves. Overall, the implementation of a unified economic, scientific and technical water management policy aimed at the development of water management as a key priority.

Some of the implementations of environmental compensation mechanisms that Dr. Khamraev suggested include outsourcing, public-private partnership, and the introduction of market principles, meanwhile attracting private and foreign investments. He highlighted that the aim is to improve the use of the basin's water resources for energy, irrigation and ecology as well as for socio-economic development.

Looking ahead, Dr. Khamraev highlighted the Concept of Water Management Development of the Republic of Uzbekistan for 2020-2030. The concept defines the goals, objectives and priorities of medium-term and long-term development of water resources of the Republic of Uzbekistan to achieve water and food security in the face of growing water scarcity as well as global climate change. It serves as a basis for the development of the “Strategy for Water Resources Management and Irrigation Sector Development” and programs for further development of the water sector. The concept introduced creating the necessary conditions to meet the growing needs of the population, sectors of the economy and the environment for water, for instance, water use efficiency increased, saline area decreased and so forth. He further emphasised on ensuring effective management and rational use of water resources, improving the reclamation of irrigated lands such as smart water, PPP, use of water-efficient technologies etc.



Opening Remarks:

**Prof. Dr. Ragab Ragab
President, ICID**



On behalf of the International Commission on Irrigation and Drainage, President ICID Prof. Dr. Ragab Ragab welcomed the participants and thanked Mr. Bryan Ward for his dedication, commitments and cooperation for organizing the 24th ICID Congress. He also expressed his gratitude to the contributors, the reviewers, the reporters, the exhibitors, the participants, the young professionals and Secretary General Er. Pandya and the ICID Central Office staff for their excellent service to this event.

President Prof. Dr. Ragab gave a brief introduction to the history of ICID. Indian Irrigation Commission was founded in 1901 to address the food shortages and eradicate poverty and hunger in the country after the Bengal Famine of 1889. The government recognized the need for technical scrutiny of irrigation projects and accordingly created a Central Bureau of Irrigation for Establishment of Central Board of Irrigation and Power (CBIP) in 1927 as a Think Tank. Subsequently, in 1950, ICID was established as a leading scientific, technical, and not-for-profit scientific international organization. ICID ensures that agriculture water management practices are undertaken within the overall framework of integrated water resources management to achieve the overall aim of sustainable development aligning with the UN Sustainable Development Goals (SDGs). A network of professionals from over hundred countries have facilitated sharing of experiences and transfer of water management technology for over seven decades. Dedicated to enhancing the worldwide supply of food and fibre for all people and believes that food security at various levels: global, national, local and household, and provision of assured livelihood starts with stable agriculture production. Although the ICID has been established primarily for irrigation and drainage, with time it has broadened its horizon. It takes on broad pressing issues when they arise such as climate change and extreme events of flood and drought, non-conventional water resources, water governance, water-food-energy Nexus, water and food security, Biofuel, the environmental impact of Irrigation and drainage, trans-boundary water and more. ICID carries out its activities through Working Groups, Permanent Committees and Task Forces/ Task Teams to achieve its objectives.

Being a global player in the water sector, particularly in irrigation, drainage, and flood control sectors, ICID has been giving paramount importance to cooperation and collaboration

amongst like-minded international organizations. ICID partners with several international organizations such as UN-WATER DPC, FAO, WWAP, IFAD, WMO, UNESCO-IHE, WWCI, IFPRI, WORLD BANK, IWMI, AWC, ADB, GWP, ICOLD, ICRISAT, IsDB, IWALC, ICOMOS, PAWEES, ICARDA, AARDO, CSIRO, to name a few, to address the issues as well curate innovative inclusive solutions supporting sustainable agricultural and rural development. Additionally, in recognition of the need for a better-equipped future generation of practitioners, ICID has established global young professional groups (>5000 YP) to be trained and mentored by ICID seniors. This recognition of the young professionals' needs for their career development is a unique to ICID as a caring and sharing organization.

Concluding his address, President Prof. Dr. Ragab briefly addressed the issues threatening sustainable development in future. By 2050, the world population is projected to increase to 9 billion, subsequently, the food demand is expected to increase by 100% requiring more irrigation water (globally, on average, irrigation consumes 70% of fresh water resources) and the water consumption is expected to increase by 50%. Furthermore, the demand for global energy demand is expected to rise by 30-40% (as irrigation requires energy, the increased food production will require more energy). To address some of these challenges, several innovations are being recommended. Innovations could be software or hardware such as methodologies (implementation of new irrigation systems such as nano drip, variable rate centre pivot, etc.), approaches (IWM, WEF Nexus, etc.), software models and decision support systems, and instruments (cosmos, scintillometers, eddy covariance, remote sensing etc.).

Currently, there is an increasing gap between water demand and supply. Climate change has predicted increased vulnerability of the agricultural sector in developed and developing countries. By 2030, a 40% overall gap between global water supply and demand is expected and this gap will widen over time. The ICID has developed Vision 2030 and devised an implementation plan to address these challenges. President Prof. Dr. Ragab highlighted the fact that the Congress event in Adelaide will contribute to the vision and the plan through knowledge exchange as well as improved learning and sharing.





**11th N.D. Gulhati Memorial Lecture for
International Cooperation in Irrigation and Drainage on
“Putting People at the Heart of What We Do”
Hon. Karlene Maywald (South Australian Water Ambassador)**

N.D. Gulhati Lecture for the 24th ICID Congress in Australia was delivered by Hon. Karlene Maywald, South Australian Water Ambassador. Keeping in view the theme of the Congress and the significance of irrigation institutions, Ms. Maywald presented the lecture on ‘Putting People at the Heart of What We Do’ providing Australian experiences. Aligning with the theme of the Congress, ‘Innovation and research in agricultural water management to achieve sustainable development goals’, Hon. Ms. Maywald’s lecture focused on the role of the stakeholders in meeting the goals of water security globally and achieving the United Nations Sustainable Development Goals.

In her speech, Hon. Ms. Maywald also illustrated through several facts the water stress that countries are facing globally. According to UNICEF, four billion people, which is almost two-thirds of the world’s population, experience severe water scarcity for at least one month per year. Over two billion people live in countries where the water supply is inadequate. Half of the world’s population could be living in areas facing water scarcity by as early as 2025. Some seven hundred million people could be displaced by intense water scarcity by 2030. By 2040, roughly 1 in 4 children worldwide will be living in areas of extremely high-water stress. 785 million people do not have access to clean safe water worldwide, and 84% of the people who do not have access to improved water, live in rural areas, where they live principally through subsistence agriculture. The extent of water scarcity is only going to be further exacerbated by climate change, but it is not just about global warming. Water pollution and declining quality is also significant factor adding to the water scarcity picture and it is important to recognise that agriculture is a big contributor here too.

Historically, the irrigation sector has delivered great engineering feats, tamed rivers, built dams and importantly created food bowls from dustbowls by diverting our waterways for large and small-scale irrigation schemes. Through flood to micro-irrigation and everything in between, we have shown how efficient and productive water use can be. However, according to the International Water Management Institute, presently agriculture accounts for about 70% of global freshwater withdrawals, constantly competing with domestic, industrial, and environmental uses in scarce water supply conditions. This makes optimizing water resources use in agriculture extremely crucial. Improvements in irrigation must also be linked to improvements to the ecosystem in which it operates. In her lecture, Hon. Ms. Maywald outlined the fact that the goals of innovation in irrigation and water and sustainability cannot be solely achieved through an engineering approach, rather the allied aspects of sustainable environmental management, economic growth and societal behavioural change to enable our global irrigation communities to embrace the reforms are necessary to make a difference and underpin a prosperous and inclusive society for all.

It is abundantly clear that the bottleneck preventing a cohesive response is in the siloed approach that the world has traditionally taken to tackling water problems. The complexity of the challenges we are facing cannot be solved unless we embrace a more collaborative approach across government, industries, researchers and critically, the involvement of the people for whom water and food availability is a matter of survival. Hon. Ms. Maywald emphasized the multidisciplinary approach and collective responsibility of politicians, scientists, industry, consumers and the community for driving and enabling a new more collaborative approach to our present and future water challenges. Each stakeholder has an important role to play in water management. Politicians and decision-makers need to bring out better governance and policy mechanisms; farmers need to improve their resource utilization while reducing their ecological footprint and making a profit; scientists need to implement their research applied to good evidence-based decision-making; industries need to play an active role through innovation and finding pathways to market for transformative technologies; communities need to support for a better future free of poverty with fair and equitable access to good clean water and sanitation and the consumers need to contribute more to a sustainable world.

Despite the technology and the knowhow to fix issues on the ground and adapt, Ms. Maywald suggested that a connector between the problems and the on-ground solutions, with an associate absence of policy reform to accompany investment decisions, is lacking. The drive for reform usually comes from the government or institutions with regulatory power and responsibility for water who are responding to scientific evidence of a problem and/or calls from stakeholders to address their concerns. With this context, she highlighted six key principles to bring the water reform agenda to reality:

- 1. Leadership:** For inclusive, transparent, and well-resourced engagement with a wide range of stakeholders, meaningful leadership with shared responsibilities among individuals and institutions is extremely crucial. Investment in leadership capabilities at the outset will be money well spent as communities and stakeholders work through the complex array of competing interests to reach an agreement on the trade-offs necessary to achieve a sustainable future.

2. **Building Trusted Relationships:** To provide a safe environment and take the time to build trusted relationships through exploration of values, culture, and conflict – people matter.
3. **Clarity of Purpose:** Provide clarity on the reform purpose, roles, responsibilities, and accountabilities.
4. **Problem Definition and Joint Discovery:** Water reforms should be evidence-based, i.e., based on science, observations, local and cultural knowledge, economics, and social impact data. An unbiased process that clearly defines the problem and engages stakeholders in joint discovery will minimise science conflicts and ensure a sound baseline to measure progress during implementation. In addition, it is also important that stakeholders are involved in developing a monitoring and evaluation approach that will provide a feedback loop on the success or otherwise of the reform.
5. **Time, Flexibility and Windows of Opportunity:** Mechanisms should be available to allow for flexibility in time and process in the reform agenda.
6. **Decision-Making and Change Management:** Decision-making and reform implementation reflects the outcomes of the engagement process with a focus on community participation, benefits such as sustainable environment and economic growth and opportunities, equity in water distribution, and achievement of government's public policy goals.

Through all these principles, Ms. Maywald suggested that pathways for conflict resolution may become easier. Moving further, citing her experience in Australia of Murray Darling Basin reforms, Hon. Ms. Maywald provided insights into the lived experience of people in Australia to explore what went well and what did not go so well, using two case studies - the process leading to the adoption of the Murray Darling Basin Plan and the privatisation of local irrigation management schemes in Queensland.

Because of the variety of stakeholders, conflict arises in many domains. In her lecture, Hon. Ms. Maywald also enlisted some of the environmental conflicts arising in the water sector reforms:

1. **Interest or Distributional Elements:** Self-interests of the people involved leads to competition among stakeholders to exploit a resource for irrigating crops, industrial requirements or tourism.
2. **Value Elements:** Fundamental belief systems about the importance of things like our cultural responsibility for the land, water and the plants and animals that depend upon them.
3. **Data Elements:** Lack of information and knowledge to make wise decisions.
4. **Labelling Elements:** Negative labels that may introduce misconceptions and stereotypes.
5. **Structural Elements:** Conflicts arising due to the organisational structure erected to manage the resource.

6. Risk Elements: Understanding approaches to handling risks.

Bringing people with divergent, conflicting views together to work out what is fair for everyone (including external stakeholders and future generations) is not something that is traditionally done well in water. Thus, different elements require different strategies to resolve them, such as making room for people in highly contested policy areas, acknowledging the role of science and people to collectively solve the problem, and creating an engagement environment that enables people to shift from fear to trust, using political or institutional power to dictate solutions may inflame long term conflict that can take generations to unpick. We should understand that the science, the values, the cultures, and the community needs are all critically important when engaging communities to achieve agreement on the trade-offs (and there will always be trade-offs). Overall, relying on not just biophysical sciences but also economic and social sciences is necessary to arrive at the best solutions for water issues.

She concluded her lecture by recommending that we need to embrace conflicts, accepting them as part of the process of water reform and actively planning to allow diverging views to be explored and contested is critical for forming sustainable solutions. She suggested that we need to create pathways for the adoption of innovation, embrace all the sciences – technical, economic, environmental, and societal, and build capacity in our communities to empower citizens to be the driver of their better futures.



3

Theme:

Innovation and Research in Agriculture Water Management to Achieve Sustainable Development Goals



The congress aimed to provide a platform for irrigation and drainage professionals and the broad range of other stakeholders to share their knowledge and experience in sustainable agriculture water management focusing on irrigation management and its related/integrated aspects. The congress deliberated on various aspects related to the following topics:

- (i) Current status of national irrigation sectors
- (ii) Future investment in irrigation infrastructure modernization and management
- (iii) National factors affecting irrigation management, including water policy, institutions, and capacities
- (iv) Prospective areas for future management: resource management, supply and demand management, infrastructure management, on-farm water management, climate change adaptation and disaster risk reduction, institutional and policy reforms, data management, technological interventions, capacity development, gender issues, among others specific to local-contexts

Attention shall be directed to the different levels of technology and modernization practices to present a general perspective and global comparative review amongst the related organizations and institutions

Question 62: **What Role Can Information and Communication Technology Play in Travelling the Last Mile?**

General Reporter: **Mr. Peter Hayes**

Question 62.1: **Technical – Technology Aspects**

Panel Expert: **Dr. Brian Wahlin**

Question 62.2: **Social Side - Socio-Economic Infrastructure Context: Appropriate Technology for Appropriate Resources (For Diverse Groupings of People) including Using social media/ Aspect Social**



Panel Expert: Dr. Rajendra Podar and Dr. Ahmed Hayaty Elshaikh

Question 62.3: Water Trading

Panel Expert: Mr. Richard McLoughlin

Beyond the availability and reliability of irrigation water supply, the most crucial issues facing irrigation and drainage development are how to facilitate the effective, efficient, practicable and affordable uptake of research outputs. Ideally, such uptake should be accelerated and more widely applicable. Measures to define and evaluate avenues to achieve this should be attractive to players from across the sector. With this context, Question 62 focused on how Information and Communications Technologies (ICT) might facilitate the evaluation, adaptation, and uptake of research outputs rather than simply demonstrating such potential or speculating on how/ when/where such potential might be realised. The prospect of defining and quantifying both the role and the impact of both the research output and the ICT in generating greater adoption of research.

The Question focused on the “What Role Can Information and Communication Technology Play in Travelling the Last Mile?”. The Question aimed to address the role of Information and Communication Technology in the greater adoption of research outputs. It was further subdivided into three sub-topics, i.e., technology, socio-economic aspects and water trading. A total of 50 papers were received for the Question. The sub-questions focused on three major areas, namely, ‘Technical – Technology Aspects’, ‘Social Side - Socio-Economic Infrastructure Context: Appropriate Technology for Appropriate Resources (For Diverse Groupings of People) including Using Social Media/ Aspect Social’ and ‘Water Trading’. As a whole, the excellent papers in Question addressed all the relevant issues and further raised several questions for research.

The Question addressed one of the most crucial issues facing irrigation and drainage development, namely, how to facilitate the effective, efficient, practicable and affordable uptake of research outputs. Ideally, such uptake would be accelerated and more widely applicable, and measures to define and evaluate avenues to achieve this should be attractive to players from across the sector. ICT offers promising pathways to support the uptake of research outputs related to irrigation and drainage. Research, development and monitoring processes directed to implementation strategies, training and support mechanisms, and evaluation of optimal pathways for both general and the many diverse and discrete audiences and sector participants would appear to offer much promise.

Significant challenges relating to the accessibility, relevance, reliability, affordability and security of information and communications technologies persist while allowing the ongoing development of an extensive array of new technologies, software, innovative approaches and management systems relevant to the issues confronting irrigation and drainage, food and fibre production, and the underlying NRM and sustainability issues.

Thus, the Question presented an opportunity for focussing on ways in which Information and communications technologies might facilitate the evaluation, adaptation, and uptake of research outputs rather than simply demonstrating such potential or speculating on how/when/where such potential might be realised. It also offered the prospect of defining and quantifying both the role and the impact of both the research output and the ICT in generating greater adoption of research. Three sub-questions further framed the invitation for papers and were intended to elicit responses which targeted the themes of the sub-question, within the context of greater adoption, or 'going the last mile'.

Question 62.1: Technical – Technology Aspects

Technology improvements are critical to sustained improvements in the production of food and fibre but without information and communication technology its uptake is slow. These technologies also need to be researched and outputs implemented, at various levels, to ensure that water for irrigation is used most effectively. The Panel Expert noted that this question focuses on the many new technologies and innovative approaches that are becoming available to allow water users to more efficiently use irrigation water while minimizing environmental impacts. However, the gap between the development of these new and innovative technologies and the widespread use of these technologies in systems and management continues to grow. The sub-question is focused on how to reduce this gap by identifying issues or needs that are preventing researchers and practitioners (both state and non-state) from taking the step to closing the gap.

The panel expert reviewed and classified the submitted research under interesting and valuable categories, such as training, interactions with non-state entities, Internet of Things (IoT) and Artificial Intelligence, satellite technology, free and paid software program and miscellaneous aspects. During the session deliberations, most authors described their methodologies and results or experimentation and modelling in a specific trial or test framework. The authors addressed the key elements of the issues of uptake and implementation extending beyond their specific situation. However, the perspective of end-users and farmers was unavailable, although clear involvement and reflection on end-user experience were addressed within the 'Training' papers. The software side of the discussion addressed the utilisation of the technology to support adoption and 'going the last mile.' Presumably, developers of the software have grasped the importance of validating with end-users, their programming, the functionality of the interface, and the reliability of the software as key elements in ensuring adoption.

Several case studies related to an innovative technique were presented, including an introduction to broader implementation strategies, an assessment of effectiveness, understanding facilitators or barriers to adoption, or the potential to deploy in other situations. Further deliberations are required to understand the 'Interactions with non-state entities' (private companies); 'Internet of Things (IoT) and Artificial Intelligence'; and 'Satellite Technology' to address the issues of transfer, adoption, and utilisation of such technologies, by organisations and individuals in the field.

Question 62.2: Social Side - Socio-Economic Infrastructure Context: Appropriate Technology for Appropriate Resources (For Diverse Groupings of People) including Using social media/Aspect Social

Advances in irrigation technology will be adopted quicker when the human side of adoption is better understood and facilitated. The role of information and communication technology in this aspect of the adoption process needs further enhancement and experiences transferred to a broader audience.

In a sense, some recommendations related to the social side have been noted in the prior section summarising the sub-question, however, the panel experts reviewed these papers intending to assess the socio-economic aspects influencing the utilisation of social media as appropriate for diverse situations. As further guidance, questions or suggestions were raised relating to how lessons might be drawn from:

- (a) Developed versus countries-in-development and /or country regional diversity and in-country industry sector diversity
 - (i) What limitations in infrastructure, ICT training and support, reliability, cultural perspectives etc., could limit the adoption and ongoing development of ICT-based innovation and practice?
 - (ii) Do such limitations apply across all countries, regions, and cultures?
 - (iii) What measures might be taken to better support the uptake and ongoing use of modern technologies? See (b) below.
- (b) Best practices, existing and possible, including technical training and support.
- (c) Engaging women and families
 - (i) Are there means whereby the role of women and families might better facilitate the adoption of ICT-based innovations?
 - (ii) What specific limitations, blockers and support could be applied via these avenues?
- (d) Common communities/industries e.g., cotton, dairying, rice etc
 - (i) Are there opportunities in working via commodity groups such as these, and how might this be done?
 - (ii) Are such opportunities potentially shared within and between differing commodity groups?
 - (iii) If not, what measures might be applied to assist transfer and uptake?

There was little evidence of consideration for and discussion of either gender or community issues noted to be of currently elevated relevance within the sector. Panel experts noted the existence of several examples of effective treatment of these issues and others entailing community engagement, energising and empowerment, and suggested that authors may

have been aware of and could have utilised those experiences in their reportage. This further reinforces the recommendation made under Question Q62.1 relating to addressing these issues---in this case, the cultural, social, economic, and related issues--- at the outset when formulating R&D programs and projects.

Similarly, when formulating future congress themes and questions, there may be value in workshop development to assist in precisely defining the scope of the question and perhaps more so, in targeting and supporting researchers to amplify their focus on the social aspects.

Question 62.3: Water Trading

The sub-question debated specifically on the topic of water trading and the role therein of ICT. Related themes such as water pricing, the economic performance of irrigation, or the development of economic initiatives for future management of irrigation in the face of uncertain water supply were also discussed. During the deliberations, it was mentioned that the intention is to demonstrate the potential role of 'water trading' as an instrument of policy to meet multiple objectives, and not simply as a commercial enterprise or market instrument with narrow, mercantile objectives. For further guidance for future initiatives related to water trading, it must be considered as one of the interacting components of the toolkit available to optimise the triple bottom line against resource constraints and allocation challenges.

This sub-question aimed to address both the opportunities and the challenges presented by ICT in facilitating fair, equitable and transparent markets for water, in meeting complex and varying resource constraints, allocation challenges and broad policy objectives around the water resource. During the session, the concept of water trading was discussed as a tool of policy, intended to facilitate optimal water deployment for 'productivity' and other objectives. This may assist with not only better defining and designing R&D for impact but would also position ICID in better prioritising and commissioning works for wide and enduring positive influence.

Concluding Comments for the Question

The ongoing development of an extensive array of new technologies, software, innovative approaches and management systems is encouraging. Many of these are designed to address the issues confronting irrigation and drainage, food and fibre production, and the underlying NRM and sustainability issues. Significant challenges persist relating to the accessibility, relevance, reliability, affordability, trust/acceptance, and security of information and communications technologies. Information and communications technologies (ICT) offer promising pathways to support the uptake of research outputs related to irrigation and drainage. Research, development and monitoring processes directed to implementation strategies, training and support mechanisms, and evaluation of optimal pathways for both general and the many diverse and discrete audiences and sector participants would appear to offer much promise.

For any future efforts to reinforce the focus on wide, rapid, and effective uptake of research outputs, it is recommended that consideration be given to addressing these issues by engaging the end-users at the outset when formulating R&D programs and projects. This could, for example, entail specifically embedded and clearly defined objectives, related to end-user objectives and motivations, their engagement in formulating works, the description of potential pathways and mechanisms to monitor progress and the attainment of ultimate objectives and outcomes, rather than a focus on project outputs 'per se.' Such approaches would more directly involve and embrace the challenges faced by end-users in 'going the last mile' in that the works proposed are being undertaken from the outset 'with and for' the client or end-user group, rather than being 'applied to and on behalf of' that group at the end of the development process. This should deliver some excellent exemplars of end-user engagement, with the prospects of adaptation and adoption across a diversity of social, economic, and biophysical situations. Such an approach would engage others beyond simply the technical aspects of ICT and may stimulate a greater focus on the adoption process, its facilitators, and blockers. The role of multi and interdisciplinary teams likely needs much greater consideration, encouragement and active engagement.

With reference to Question 62, which also aligns with the Goal E of the ICID Vision 2030, i.e., to encourage research and support the development of tools to extend innovation into field practices, the ICID network would encourage research and provide technical support on the latest innovations available in the agriculture water domain to the government and non-governmental entities to help in the outreach into rural communities. The following strategies are being adopted to achieve this goal:

- (i) Support Improving Research Prioritization in the Countries
- (ii) Strengthening Extension and Outreach Services with AWM information
- (iii) Developing and Promoting Tools for AWM
- (iv) Research on the History of Irrigation and Drainage and Lessons Learned from the past
- (v) Compilation of Global Data Sets on Irrigation and Drainage
- (vi) Dissemination of Useful Research Outputs

Question 63: What Role is Played by Multi-Disciplinary Dialogue to Achieve Sustainable Development Goals?

General Reporter: Dr. Ian W Makin, Damien Pearson, and Varun Ravi

Question 63.1: Social, Consumer, Supply Chain QA, Reputation and Regulatory Dialogue

Panel Experts: Claire Miller and Kazumi Yamaoka

Question 63.2: Technical level dialogue vs other "levels"

Panel Experts: Dr. Mohamed Wahba and Mr. Jeff Camkin

Question 63.3: Addressing the Sustainable Development Goals of Responsible Consumption and Production (SDG 12)

Panel Experts: Dr. Marco Arcieri and Mr. Carl Walters

As set out in the call for papers, there has been a tendency in the past for the research to be undertaken by research organizations (universities, research-focused government departments, etc.), policy development and implementation (led by government and their departments) and agricultural extension (by Departments of Agriculture and Universities); meanwhile the farmers and end-users were expected to make the best of these inputs, including irrigation water, for crop production. Unfortunately, often the environmental impacts were only considered when they could no longer be catered for within the production system. The siloed approach had its downside with agronomic research not always being relevant to the needs of the end-users, and at the same time sometimes implications of policy changes are not fully understood or even anticipated. Further, adoption of new and more effective ways of crop production are often slow and farmer led research and adoption were not being recognised as pathways to improved production. The call for papers highlighted that it is now recognised and better understood that the previous approaches to industry extension and achieving sustainable development goals (SDGs) were not always effective or even compatible.

Multi-disciplinary approaches have been recognized for many years although, perhaps, more often in proposals and words rather than in practical full-scale application. Multidisciplinary dialogue, by its definition, engages more than one discipline in the design and implementation of policy, research, extension, and adoption/use of processes that lead to sustainable development. The Question sought to identify how multi-disciplinary approaches are enhanced to support the attainment of the sustainable development goals more effective approaches with improved interactions that are being used and to stimulate thoughts on further enhancements to make sustainable development more effective. A total of 39 papers were received for the Question on “What Role is Played by Multi-Disciplinary Dialogue to Achieve Sustainable Development Goals?”, had three sub-questions and the number of papers submitted as 12, 20, and 7 respectively for sub-questions 63.1, 63.2, and 63.3. The sub-questions focused on three major areas, namely, ‘Social, Consumer, Supply Chain QA, Reputation & Regulatory Dialogue’, ‘Technical level dialogue vs other levels’ and ‘Addressing the Sustainable Development Goals of Responsible Consumption and Production (SDG 12)’. As a whole, the excellent papers in addressed all the relevant issues related to irrigated agriculture and some of the papers went even beyond. Specifically, the Question was intended to identify examples of approaches that are being used and to stimulate thoughts on further enhancements to make the dialogue between all engaged in sustainable development more effective.

Question 63.1: Social, Consumer, Supply Chain QA, Reputation and Regulatory Dialogue

Agricultural water management is under increasing examination by society, with more stakeholder organizations expressing their wishes for the use of water resources. These

issues are discussed in the responses to the Sub-Question (Social, Consumer, Supply Chain QA, Reputation & Regulatory Dialogue) and examined in the discussion of agricultural water use through the framework of social licence to operate where multi-disciplinary dialogue is essential to reduce the potential for conflict.

Agriculture and irrigation are under increasing scrutiny by society because of their increased relevance to food security. Irrigated agriculture must be responsive to society's concerns about the use of public financial resources, natural resources, environmental impacts, and equity of benefits. The session debated the influence of supply-chain assurance (private, proprietary, national, international) on the production system-irrigation, drainage, water access and allocation, environmental impact including food security, at a national scale as well as social license, market access, enhance/protect reputation, managing crises. Demonstrating environmental credentials and effective sustainable development, avoiding "greenwash" etc. is crucial. Retaining the "Social license" to operate will require more and improved communication about the role of irrigated agriculture. The session concluded with recommending multidisciplinary approaches, applied constantly and more effectively, that would improve communication about the complexity of agricultural supply chains and production systems.

Question 63.2: Technical level dialogue vs other "levels"

Irrigated agriculture involves multiple disciplines at multi-levels (economic, policy, governance, legal, technology, and social safeguards) to achieve the required levels of performance. Different disciplines and levels may have competing objectives and priorities – requiring effective coordination and cooperation. Improved coordination mechanisms among stakeholders can reduce potential conflicts. Thus, apart from technological (tools, devices, systems) level interventions in agriculture, economic level, policy/government level, legal level and safeguards (environment, cybersecurity and social) level interventions are required to address the issues in agriculture holistically.

The Sub-Question emphasized the technical level dialogue, focusing on avenues to explore the multiple institutional layers where dialogue is needed to increase effective actions to achieve the SDGs. Where there has been substantive progress towards achieving the SDGs, the community played a critical role in driving actions on the ground. Stakeholders, including farmers, who were not familiar with the SDGs beforehand were able to understand and apply the underlying concepts with suitable capacity development. They note the need for greater collaboration and strengthening of partnerships as essential for achieving the SDGs and applying a systems dynamics approach to address the water, energy, food, and environment nexus. The main message from the exchange was that there is still a need for water resources management with improved coordination mechanisms among stockholders to reduce conflict in water allocation and enhance water use efficiency. A total of 20 papers on smart technologies were submitted for the sub-question from 11 countries.

Question 63.3: Addressing the Sustainable Development Goals of Responsible Consumption and Production (SDG 12)

The Sub-Question reviewed which parties should be addressing SDG12 of responsible consumption and production. During the session, a broad range of potential actions to ensure sustainable consumption and production patterns were discussed, all converging towards a single set of goals, including deliberations on supply chain, social licence and environmental credentials.

Academia, research centres, extension services, and farmer organizations must work together to establish capacity for water management. Community commitment is essential to capitalize on water management knowledge and multiple technologies available. Additionally, responsible consumption and production will require improved management of productive systems and changes in demand through dietary and other lifestyle changes. It is key to understand the issues that need to be considered, such as irrigated agriculture has the potential to contribute to achieving all 17 SDGs. More effective use of multi-disciplinary approaches is essential to communicate to all stakeholders. Experiences in one country can provide useful lessons for others when holistic or big-picture analysis engages multiple disciplines across multiple levels.

Concluding Comments for the Question

The Question opened a broad canvas of issues ranging from the roles and responsibilities of individuals across the agricultural, social, and environmental professions to the challenges to institutions and governments in creating effective and relevant policy environments to achieve the SDGs. It is, therefore, not surprising that the authors of the 39 papers present different approaches and views on the subject. Furthermore, authors from at least 24 countries contributed to the papers, representing substantially different economic situations, climates, farming systems, and water resources. The papers, therefore, reflect, to some extent, the different scale and focus of the challenges these countries face as they seek to achieve the SDGs. Some authors focussed on specific details of particular issues within the topics while others present a broader overview.

It is perhaps inevitable, given the main technical focus of the majority of organizations and individuals that make up the ICID family, that the majority of papers tended to focus on the technology, regulatory and institutional aspects of multidisciplinary approaches to agricultural water management and the SDGs. However, it is also clear that there is wider recognition that irrigated agriculture and the associated water management responsibilities are under evermore scrutiny by society. The papers reflect this recognition within the context of the socio-economic settings of the country of focus.

It is recognized that the business of irrigated agriculture has the potential to impact the full spectrum of the 17 SDGs from helping end poverty across the globe (SDG 1), ending

hunger (SDG 2), to promoting collaboration and investments (SDG 17). Crucially, to a greater or lesser extent, water resources management, water supply and sanitation, and water-related ecosystems (SDG 6) impact all 17 SDGs.

The global population is predicted to reach 9,600 million by 2050. Some estimates suggest that this population would require the natural resources of three planets to meet the needs of employment and consumption if current practices continue. Current patterns of production and consumption worldwide can involve significant waste of resources and are, in many cases, damaging vital natural ecosystems. Therefore, new approaches are required that will utilize natural resources more efficiently and enable the redistribution of resource use fairly among the population, providing everyone with access to energy, drinking water and adequate food. With agricultural water typically representing the largest water user within river basins, the implementation and management of agricultural irrigation and drainage are increasingly critical components in efforts to combat climate change and its impacts (SDG 13).

A common theme across many of the papers addressing each of the subtopics is the need for increased, and improved, exchange of information among the multiple stakeholders involved in agricultural production systems, from field level, through the supply chain, to the consumers of the food and fibre created. Growing populations, increasing economic activity, and changing climates will continue to demand and drive, changes in how agriculture will have to operate.

If we do not provide sufficient information about how agriculture works, particularly in the use of land and water resources, we will likely draw increasingly unfavourable assessment of the sector, resulting in the withdrawal of the “social license to operate” and increasing use of regulatory environments. The papers in subtopic 63.1 tended to focus on how technology, regulation and institutional drivers shape irrigated agriculture’s capacity to meet SDGs. By focusing on improving water efficiency, land and soil quality, productivity, and resilience to climate change the papers largely ignore how the wider social, political, and cultural contexts also shape the capacity to deliver SDGs. The experiences in the Murray-Darling basin are object lessons of the danger to irrigated agriculture where the perception of irrigated agriculture as a “problem” rather than a “part of the solution” to water resource constraints generates the substantial potential for conflicting views for the future use of the basin. Increasing awareness about eco-system services and sustainability is leading, in many places, to the questioning of the legitimacy of irrigated agriculture. Media and activists utilize public preconceptions about the performance of irrigation and drainage services to increase pressure on regulators and political leaders to constrain irrigated agriculture, often ignoring the substantial transformational changes that have been implemented by the sector.

Consultation with stakeholders through an open dialogue, involving farmers, irrigation department, water supply utilities, development agencies and local authorities and an

agreed monitoring mechanism enabled the reallocation of water resources from agriculture to municipal supply in a water-scarce area. There is a need for reliable and trustable processes to tackle these sensitive problems. Similar benefits can be observed from bringing together multiple stakeholders, including national and local authorities with farmers, to identify and implement short-, medium- and long-term measures to increase drought resilience and adapt to climate change as well as reduce conflicts in water allocation and as a basis for improved water use efficiency.

It is possible that legal challenges to decisions about water allocations and abstractions may decide that a duty of care is owed to future users resulting in greater allocations to ecosystems for the health of the river system. The critical roles of trusted technical information, inclusive dialogue among stakeholders, supportive policy and legal frameworks, and viable economics must not be overlooked to enable communities to have the confidence to drive changes.

Several papers in each of the sub-topics describe various tools, technologies and models designed to improve the information base that can be used to support dialogues among stakeholders. These range from models to support decisions about individual on-farm irrigation investments to regional scale crop mapping by using satellite remote sensing and machine learning for new insights for research on water resources management as well as the use of water accounting to enable improved understanding of groundwater use as the basis for greater engagement with water users.

Critical among these is the need for a continued focus on capacity development among stakeholders in the agricultural and water management sectors. This is not a new call for action on training and capacity development; however, what is new is the recognition of the need to communicate the value and challenges of agricultural water management beyond the immediate stakeholders (farmers, system operators, water sector regulators, etc.). As great attention is directed towards the role of agricultural water use in the management of water resources and related ecosystems, the irrigation and drainage profession must communicate more effectively with the broader society to maintain the “social license to operate”. Some may feel this is more of an issue for more advanced economies; however, interest in the sustainability of the environment and a desire to have access to thriving ecosystems is emerging in many countries. Whether this is for increasingly urbanized local communities, or to support the eco-tourism industry that brings new resources to communities, it is essential that the agricultural sector can communicate what the sector contributes to society.

Increased coordination among stakeholders remains a challenge and investments are required in new mechanisms to engage the multiple disciplines that have roles in the supply chain from water resources management, irrigation, drainage, agricultural production, processing, marketing, and consumption. The papers describe various elements of the mechanisms and support systems required, but few present a comprehensive overview or case study of a complete system.

New tools and technologies are providing new insights into how irrigated agriculture sits in the landscape. These tools must rapidly move from the realms of academia and research to become part of the everyday toolkit for those involved in all facets of irrigated agriculture. There is evidence this is happening; however, attention must be given to ensuring the tools provide useful information for decision-makers, whether at the level of individual farmers, water user groups, system operators or water resource managers and policymakers. ICID can play an important role in facilitating the dissemination of the new technologies that are becoming available, supporting capacity development among member organizations, and supporting the assessment of the contribution of the technologies to achieving performance goals.

Irrigated agriculture and agricultural water management will remain critical components in the actions to provide food security for the 9.6 billion people predicted to live on the planet by 2050. However, while improvement of drainage and irrigation systems would improve the economic benefits from increased yield and more effective use of crop inputs such as fertilizers and agrochemicals, civil society is seeking improved ecological performance and more sustainable farming systems. The demands for improved sustainability of agricultural systems will require the stakeholders that make up the farming supply chains, both inputs and outputs, to be effective in communicating how the sector works and the substantial contributions irrigated agriculture makes to achieving the SDGs.

Multidisciplinary dialogues are contributing to the management of irrigated agricultural systems in many locations. These dialogues often occur with the aim of addressing issues and challenges related to achieving one or more of the SDGs, even if the SDGs are not explicitly identified as objectives. However, as society increasingly recognizes the challenges to the sustainable use of ecosystems in river basins and the role of agriculture in the use of water, water management professionals must be prepared to engage with stakeholders, often with quite different interests and experiences, to ensure irrigation and drainage can retain the sector's "social license to operate" which will be critical to enabling the important contribution agriculture must make towards the achievement of many of the SDGs.

To attempt a short answer to Question 63 - What role is played by multidisciplinary dialogue to achieve sustainable development goals? – it seems the essential roles are: (i) to enable an exchange of understanding about the concerns and objectives of different stakeholder groups; (ii) to provide a venue for capacity development of the stakeholders as a basis for resolution of conflicting objectives; and (iii) a basis for creation of a shared vision of the future for the sector in the community involved, including acceptance of the trade-offs that may be required to enable achievement of the agreed goals.





4

ADDITIONAL SESSIONS

Additional special sessions were held during the 24th ICID Congress. These events included an international symposium with participation from 14 countries and regions, an international seminar organized jointly by FAO and ICID, an international workshop by the World Bank and a special session on the use of wastewater in agriculture.

**INTERNATIONAL SYMPOSIUM:
Integrated Approaches to Irrigation
Management in Future**

**SPECIAL SESSION:
Developing the future tools for
managing uncertainty in irrigation
water supply**

**SIDE EVENTS:
Application of Geosynthetics in Irrigation,
Drainage and Agriculture (International
Geosynthetics Society Program); and
A Newly and Spatially Distributed
Crop Water Requirement Estimation
(Southern Australia)**



Symposium on Integrated Approach to Irrigation Management in the Future



The ICID Working Group on Irrigation Development and Management (WG-IDM) organized an international symposium with the theme Integrated Approaches to Irrigation Management in Future during the 24th ICID Congress in Adelaide, Australia. The symposium aimed to demonstrate the global perspective of such a large interdisciplinary area of management aspects of irrigation and drainage projects for sustainable agriculture development. The symposium provided a platform for irrigation and drainage professionals and other stakeholders to share their knowledge and experience of sustainable agricultural water management (AWM) focusing on multi-disciplinary aspects of irrigation management. The growth of irrigation projects is strongly coupled with socioeconomic development in a stable political regime for poverty alleviation and growth.

For the symposium, 10 National Committees/Committee submitted their regional case studies from Australia, India, Iran, Iraq, Japan, South Korea, South Africa, Sri Lanka, Uzbekistan and Zimbabwe. The theme focused on the integrated approach to irrigation management in the future. Through the symposium, respective countries shared their knowledge and experience related to sustainable agriculture water management with a

focus on irrigation management and its related aspects. Each of the papers highlighted the current status of the national irrigation sector, future investment in irrigation infrastructure modernization and management, national factors affecting irrigation management, including water policy, institutions, and capacities and prospective areas for future management (i.e., resource management, supply and demand management, infrastructure management, on-farm water management, climate change adaptation and disaster risk reduction, institutional and policy reforms, data management, technological interventions, capacity development, gender issues, among others specific to local-contexts). The submitted papers covered the underlying practices of the institutional and organizational arrangement of the represented region of the NCs, focusing on issues, challenges, and demands for institutional structure reform on Legal Frameworks for effective participatory irrigation and drainage management, human resources development, capacity building and capacity development. Regional experiences on best practices, state of the art technologies that have been successfully implemented for possible replication to other regions are exemplified in the papers.

Climate change directly impacts the availability of water. While climate change is a direct result of anthropogenic greenhouse gas emissions, its impacts in the form of extreme events like floods, droughts, and higher temperatures, among others are not easily manageable and subsequently threaten the agricultural sector and thereby the water and food security. Hence management of water resources in agriculture becomes indispensable owing to climatic uncertainties, to mitigate the impacts and adapt to the changing climatic conditions for improved water and food security.

Smart irrigation management by the means of individual projects becomes the first and foremost requirement for sustainable agricultural development. This is carried out through multi-purpose projects based on surface or groundwater. These irrigation projects are relatively investment heavy and have a practically unlimited lifespan. They face historical changes in utilisation patterns demanding a dynamic management regime for their sustainability. With the changing climatic and demographic conditions, the operating parameters of these projects need to evolve, hence the management change will become an essential aspect of adaptation in future.

President Prof. Dr. Ragab Ragab opened the session by providing his input on the theme of the Symposium, followed by remarks from the speaker on the objective of the Symposium. Dr. Sasha Koo-oshima, Deputy Director Head of Water (UNFAO) gave a keynote speech on evidence-based lessons to increase the efficiency of future investment to move towards high-performing investment in irrigation to cater to the goals of achieving food security. Mr. Salman Maher, Team Lead-Senior Water Officer, UN-FAO, provided a brief account of exploring the main drivers of return on investment in irrigation: comprehensive assessment of irrigation modernization in Egypt. The situation of the water resources in Egypt is dire, with major dependence on cereal import, rising population, limited availability of natural resources, overt reliance on the Nile River and growing imbalance between water supply and

demand. At the same time, systematic challenges such as land fragmentation and tenure, cropping pattern, resource efficiency versus productivity, authorities over the management and the presence of integrated sectors pose difficulty in irrigation development. He asserted that the technical aspects of investment assessment such as yield productivity, water use efficiency, infrastructure, on-farm profitability, land gain and management play an important role in irrigation management. Mr. Maher also provided a brief account of Egypt's Irrigation Improvement Programmes (IIPs) aimed to improve efficiency, assure equity in distribution, increase agricultural production and income, improve institutional capacities and strengthen ownership (management transfer to farmers). He concluded by enlisting the main drivers of return on investment such as minimum technical standards for construction for increased lifespan, holistic and cross-sectoral development for income diversification, the regulated market of irrigation services to ensure profit margin and a socially enabling environment for investment absorption.

Mr. Carl Walters, Manager of Sustainable Irrigation, Goulburn Broken Catchment Management Authority provided a brief account of the status of irrigation and drainage in Australia. He informed that over the last 25 years, several policy reforms have been introduced to improve the status of water resources in the country such as the National Water Initiative, caps on Diversions (Murray Darling Basin Plan), identification of sustainable diversion limits, national plan for water security improvement, adoption of water metering and measurement changes, and adoption of water markets, ensuring primary access to water for the environment, water rights and investment to support changes. Integrated Approaches to Irrigation Management in Austria have focused on improving water use efficiency and adaption to Australia's climatic variability. He stressed the point that recognizing a healthy water system is key to sustainability or resilience and we need to find the right balance between the productive use of water for agriculture and supporting a healthy water system. Providing a brief account of the status of water resources in India, Mr. Kushvinder Singh Vohra, Water Resources Expert, Central Water Commission of India discussed the status of irrigation, challenges as well as the growth in the Indian context. During the session, he highlighted the increased need for food and water security in India by 2050 due to the increased water demands of all economic and social sectors. Some of the major challenges plaguing the irrigation sector in India are gaps in irrigation potential created and utilized, low water use efficiency (~36%) including conveyance efficiency – lining, automation, on-farm application efficiency, low values of productivity, lower yields of paddy compared to the world average for higher water consumption, inequitable delivery and service reliability, irrigation expansion to the entire command, to name a few. Other challenges impacting the irrigation performance include the absence of CAD (Command Area Development) works, no/minimal water charges, irrigation by flooding, deviations in cropping pattern, farmers in upper reaches growing water-intensive crops, effective WUAs and poor maintenance of infrastructure. Thus, with an objective to improve water use efficiency and increase crop production, several schemes have been designed to Support the Irrigation Modernization Programme (SIMP) of the government.

The presentation from Iran focused on irrigation development in Iran. The speaker informed that about 2.5 million hectares of modern irrigation networks have been constructed since 1961, but not performing very well. Execution of IMT/PIM at the national level needs a holistic plan for enhancing the institutional capacities at all levels and local managerial empowerments. Through rapid diagnosis (RD), IMRs' constraints have been reviewed and lessons learned obtained from 30 years of experience in Iran. RD indicates that the abilities and technical skills of local communities have no priority as a pre-requirement of PIM, but PIM has a high dependency on the awareness of the executive team of this approach and their skills to conducting participatory methodology, transparency of national policies and strategies for IMRs, plans for principals' evolution on community attitude to a new approach, their managing abilities, their trusts to local government, etc. He informed that in 2021, the Ministry of Energy as responsible for water resources management strategy has an enhanced organizational revolution and focused on local good governance in each watershed border. This organizational revolution is one of the started points for decentralisation and transfer of water resource management to the local communities and its formal organization.

During the session, Mrs. Nisreen Gburi, Asst. Chief Engineer, Iraqi Ministry of Water Resources shared Iraq's interventions for improvement in irrigation management, including water policies, institutions, and capacities. She informed that the Iraqi Ministry of Water Resources seeks to involve local farmers in the management of irrigation operations by encouraging the establishment of water user associations as well as switching from an open irrigation system to a closed irrigation system. She suggested that future investment in irrigation infrastructure modernization and management should be done in partnership between the Ministry of Water Resources, the farmers and other stakeholders. Looking ahead, Mrs. Gburi asserted that the strategic study of water resources and lands in Iraq (2015-2035) is the inevitable area for the future management of water resources for the next fifteen years i.e., water security, food security, energy security, environmental security and investment strategies.

Giving a brief account of the water resources landscape of Japan, Dr. Masaomi Kimura, Lecturer at Kindai University in Japan discussed the status of the irrigation and drainage sector in Japan. During the session, Dr. Kimura discussed that with the ageing of core irrigation and drainage facilities, there is a need for investment in the modernization and management of irrigation facilities to extend the service life of these facilities and reduce their lifecycle costs by systematically and efficiently repairing and rehabilitating them through monitoring, inspections, diagnoses with utilizing robots, drones, and ICT. She also asserted that smart agriculture may be utilized through advanced technologies such as robots, AI, and IoT to improve productivity and solve labour shortages. There is also a need for strengthening rural community functions and demonstrating the multifunctionality of agriculture.

Mr. Seung-won Lee, Deputy Director, Korea Rural Community Corporation demonstrated the Korean approach to the integrated development of the irrigation and drainage sector. Through various avenues such as Integrated Water Management Policy Paradigm,

Framework Act on Water Management, Government Organization Act, National Water Management Plan, Integrated Water Management Policy, and statutory top-level water management plan, South Korea is implementing strategies to combat the climate change impacts and manage water resources for agriculture adequately. The path of agricultural water in Integrated Water Management constitutes the preparation of legal and institutional reform plan, establishment of a sustainable smart rural water management system, water quality improvement for rural villages to strengthen the safety of agricultural and fishery products, reinforcement of the disaster preparedness capability of hydraulic facilities and establishment of farmer participatory water management governance.

Dr. Mohamad Radzi Abdul Talib, Chairman, MANCID in his presentation emphasised that there is a need for sustainable solutions to safeguard the availability and sustainability of water supply, ensure downstream irrigation and reduce domestic water pressure on irrigation needs in Malaysia. Strategic approaches for future food security are required such as improving irrigation operational performance and increasing efficiency in agricultural water use, development or improvement of water users' group (WUG), irrigation infrastructure development, integrated water resources management with innovative water management tools and technology research and development.

Dr. Jan Potgieter, Deputy Director, Department of Agriculture, Land Reform and Rural Development of South Africa illustrated through his presentation the irrigation development scenario in the country. He suggested that investment into water/irrigation-related research projects is required including the development of guidelines, norms and standards, the development of tools, technology innovations and Decisions Support Systems as well as increasing water storage through raising of dams to avail more water for irrigation for sustainable use and management of water by the agricultural sector. For future discourse, he suggested the development and promotion of more efficient technologies including Decision Support Systems (DSS), capacity building of government officials and farmers on the technical know-how of water and irrigation management, development strategies that give new entrants (HDIs) access to water, markets and support from better-resourced farmers, develop integrated funding for irrigation infrastructure and alignment of regulatory frameworks that may impact irrigation or water use and management in agriculture.

Mr. M.D. Janaka Priyantha Wickramasooriya, Irrigation Engineer, Irrigation Department, Sri Lanka talked about the Sri Lankan approach to irrigation management focusing on participatory management, which has been practised in the country since ancient systems and has evolved over time to align with the changes in social, cultural, constitutional, and political landscapes. Participation of all stakeholders in decision-making and management of systems has proven beneficial for the irrigation sector to ensure efficiency, productivity and sustainability.

Dr. Bakhtiyor Kamalov, Director of the Centre for Implementation of Water Sector Projects of Uzbekistan highlighted the vision for the country to create resilience in the water sector

in the face of heightened future demand due to climate change and increasing population, through water and energy savings to provide high reliability of supply to water users while achieving environmental improvements through facilitating the implementation of modern and innovative water management solutions to improve the performance of the water sector while enhancing environmental, social and governance outcomes in urban and rural regions of the Republic of Uzbekistan. Activities such as implementing and promoting water and energy-saving technologies, training agricultural and irrigation extension specialists and rural women, focusing on environmental health, systematic monitoring and evaluation of water distribution and sponsoring legal, financial and economic literacy are being endorsed for irrigation development in Uzbekistan. Future investment directions include flood risk management, water resources management, automated water delivery and infrastructure planning tools.

Mr. Bezzel Chitsungo, Director, Department of Irrigation, Zimbabwe informed that the irrigation development in the country is in accordance with development priorities of political administrative boundaries within hydrological boundaries. He informed that the Government has increased funding for water resources, water conveyance, and communal irrigation schemes as per National Development Strategy (NDS) 1 (2021 – 2025) & NDS 2 (2026 –2030). For irrigation development and agricultural and food systems transformation, irrigation modernization is crucial and accordingly, the area under irrigation needs to increase sustainably. During the discussions, the prospective areas for future management emerged as improved institutional coordination, increased international cooperation, innovative water development and management practices, sector leadership, networking, technological innovation, improved technical capacity and alignment of activities to attain the SDGs in line with ICID Vision 2030.



SIDE EVENTS

During the 24th ICID Congress, several Special Events were organized to deliberate upon different aspects of the theme of the Congress. The following are the main outcomes of the discussion during the session:

Side Event 1: Application of Geosynthetics in Irrigation, Drainage and Agriculture (International Geosynthetics Society Program)

Mr. Eric Blond, President, Eric Blond Consultant Inc. opened the session to the program conducted by the International Geosynthetics Society. The International Geosynthetics Society (IGS) is a learned society dedicated to the scientific and engineering development of geotextiles, geomembranes, related products, and associated technologies. The purpose of the IGS is to provide an understanding of and promote the appropriate use of geosynthetics throughout the world. The program focused on different aspects of geosynthetics and was conducted in three different sessions namely, water containment and preservation, seepage control in canals and bank stabilization and erosion control.

During the session on water containment and preservation with geosynthetics, the water-saving characteristic of geosynthetics was discussed, highlighted through presentations such as irrigation leakage control and evaporation control using geosynthetics, a case study demonstrating the transformation of wineries in South Australia as large-scale irrigation projects, enhancing water conservation with polyethylene barrier, use of clay liners as sustainable and resilient barriers for hydraulic engineering applications.

While discussing the use of geosynthetics for seepage control in canals, several relevant presentations were made to discuss its relevance in irrigation management such as the use of geosynthetic materials, construction and performance, introduction to geocell channel protection systems, waterproofing of hydraulic structures with geomembranes, use of bituminous geomembrane (BGM) in water storage reservoirs, and overall use of geosynthetics as a sustainable solution for water management.

During the session on geosynthetics for bank stabilization and erosion control, several presentations were made on different aspects of the use of geosynthetics to control soil erosion as well as provide stability to the banks such as introduction to different geosynthetics products for erosion control in irrigation channels, use of concrete mattresses for lining and sealing of canals, geosynthetic cementitious mats and barriers as a new approach to lining canals and protection of riverine and coastal environments using sand filled containers.

Overall, geosynthetics offer cost-effective and durable solutions for seepage control, drainage, surface erosion control, stabilization of weak subgrades and soil reinforcement. During the session, the use of geosynthetics was demonstrated in the engineering

community specializing in water storage, transport and distribution. Geosynthetics are used in large canals as well as in medium to small canals, and in other water retaining structures: to control seepage, avoid erosion, stabilize banks, or ensure structural integrity. They have been used successfully in thousands of kilometres of canals in all parts of the world: the Americas, Europe, Asia, the Middle East, Africa, and Australia/New Zealand. A group of experts were selected by the Technical Committee on Hydraulics and the Technical Committee on Barriers of the International Geosynthetics Society to present this series of presentations on the use of geosynthetics in canals as a side-event leading up to the ICID conference in Adelaide in October 2022. Attendees were exposed to an overview of the use of geosynthetics for water containment, water transport, erosion control and bank stabilization. Case studies from various parts of the world, and using different geosynthetic materials, were presented. The contribution of geosynthetics to the implementation of durable infrastructure, with a very low carbon footprint, and often reduced costs to traditional lining methods were explored. Furthermore, a discussion panel deliberated on the sustainable contribution of geosynthetics to irrigation projects during the side event.

Side Event 2: A Newly and Spatially Distributed Crop Water Requirement Estimation (Southern Australia)

Ms. Kelly Gill and Mr. Richard Mills - Department for Environment and Water, Government of South Australia (SA) presented a case study on 'A Newly and Spatially Distributed "Crop Water Requirement Estimation.' Considering the present levels of water stress, especially in arid regions, the speakers reiterated the fact that people from water-scarce locations are more likely to support and participate in water conservation behaviours. Providing a brief account of the water management in Southern Australia, the speakers focused their attention on the concept of water licenses and emphasized that the licensees must meter, manage share within annual allocations and report meter readings to ensure correct data for the water accounting of the region within the SA Metering Framework. Explaining the successful model of water licensing in the region, the speakers deliberated on the future plans of the Southern Australian Government for water planning and management. They informed that everything is metered except low-risk low volume takes in the SA region. The speakers also discussed the gaps to improve the performance of the framework through various measures such as untampered meter installations and ensuring accurate approval certificates and validation certificates for the meters.

◆ Building Resilient Irrigation Water Management from Farm to Basin Scale: An Effective Response to Achieving SDGs (IWMI - World Bank)

The session on Building Resilient Irrigation Water Management from Farm to Basin Scale: An Effective Response to Achieving SDGs featured several presentations from esteemed organizations and seasoned experts on various aspects of irrigation and drainage. The first session was conducted by the International Water Management Institute, IWMI on building resilient irrigation water management from farm to basin scale as an effective response to

achieving SDGs. During the session, Dr. Alok Sikka, Country representative (India) IWMI, welcomed everybody and provided a brief introduction. Dr. Mark Smith, Director General IWMI, Mr. Kushvinder Vohra, CWC, India and Prof. Sue Walker, ARC, Pretoria gave their opening remarks as Co-Chairs of the session. Several important discussions related to the theme of the session were carried out such as enhancing water productivity for improved resilience of irrigation systems across the farm-to-basin scale through better water accounting and cross-sectoral management, reducing water use in irrigation schemes in an increasingly water-scarce climate, strengthening WEF nexus approach for managing trade-offs and synergies of irrigation management in transforming agri-food systems and leaving no-one behind when adapting irrigation to climate change: gender and social inclusion approach.

Mr. Ijsbrand H. de Jong, Lead Water Resources Specialist, The World Bank, WB conversed about irrigation service delivery and asset management. During the session, Mr. Jong discussed World Bank's approach to irrigation service delivery, SAMS and remote sensing for benchmarking and asset management for irrigation investment decisions, ADB's approach to improving irrigation services, productivity, resilience and inclusivity and sustainability and geosynthetics. During the session, insights from the perspective of financing partners were shared as well as the experts deliberated on pathways to move towards accountable irrigation management. After the session, there was an interactive panel and audience discussion on irrigation service delivery for improved irrigation service delivery and climate resilience.

◆ **Beneficiary-centred irrigation management through Abolishing obstacles and putting additional measures into Participatory Irrigation Management (FAO - JICA)**

During the session, Beneficiary-centred irrigation management through Abolishing obstacles and putting additional measures into Participatory Irrigation Management conducted by the Food and Agriculture Organization of the United Nations (FAO) and Japan International Cooperation Agency (JICA), Dr. Sasha Koo-oshima, Deputy Director -Head of Water, FAO discussed the need for new generation models. Dr. Tsugihiko Watanabe Professor Emeritus and Specially Appointed Professor at Kyoto University remarked that the re-positioning of beneficiary-centred management on the global development agenda is crucial in the current scenario. Other aspects discussed during the session included deliberating on the global outlook to the ground-level impacts of the status and benefits of participatory irrigation management and the impact of management transfer on poor farmers. Lessons from the irrigation and drainage development in Japan were shared during the session. Another case study presented focused on the estimation of long-term impacts of participatory irrigation management on farmers in South East Asia.

◆ **Integrating Fish into Irrigation (IACID)**

The special event on Integrating Fish into Irrigation organized by the Australian National Committee on Irrigation and Drainage (IACID) and Irrigation Australia discussed practical solutions to integrating fisheries with irrigation such as modern fish screens for better farming and better fishing. The strong, historical traditions which link fish production (capture fisheries and aquaculture) and irrigation systems have been eroded or lost in the era of modern irrigation development, with an over-emphasis on water delivery, at the expense of ecosystem services. Recovering these linkages through the innovative management and strategic modifications of irrigation systems offers significant opportunities for the re-integration of fisheries and aquaculture to generate win-win outcomes for both sectors; increasing the “bankability” and social licence of river development projects. This would significantly benefit agricultural diversity and economics of production and thus improve food security, household incomes and livelihood diversity within irrigated agriculture systems. Co-benefits also include increased system resilience, opportunities for reduced pesticide use and mitigation of impacts on aquatic biodiversity and aquatic ecosystems. Economics and other social aspects of fish passage and screens were also discussed during the session. Several group discussions were carried out concerning technical solutions (readiness and feasibility), policy needs, legislation and compliance, and planning and implementation of fisheries in agriculture. Additionally, gender equality, disability inclusion, and social inclusion policy and cultural considerations were suggested to integrate into planning and decision-making steps for better results. The discussion also addressed the key knowledge gaps on barriers and enablers to facilitate better fisheries and irrigation integration into the future.

◆ **Australian Irrigation and Water Issues (International Commission on Irrigation and Drainage, ICID, and IWRA)**

A special event was organized by the International Commission on Irrigation and Drainage (ICID) and International Water Resources Association (IWRA) to address the Australian Irrigation and Water Issues. During the session, several presentations discussed various aspects of irrigation development and challenges in Australia. An analysis of farm enterprise risks and non-interruptible water supply to understand the relevance of water in individual scenarios was presented. Other case studies such as understanding optimism bias, ignored cultural and environmental values in Northern Australian irrigation business cases, economic modelling of irrigation activity and water markets in the Murray-Darling Basin, effects of anthropogenic drivers on hydrological droughts in the Murray Darling Basin, robust economic evaluation of payment for water ecosystem services scheme, policy challenges in regulating small dams in mixed-use catchments and recovering the cost of securing low flows, farm dam accounting for healthy and safe food producing catchments and managing plantation forest water interception impacts with tradeable water entitlements in SE South Australia were discussed to understand the diverse needs of irrigation management within the Australian context.

◆ **Maximizing the benefits from paddy fields: multi-functional roles of paddy fields and agricultural water management (FAO-JIRCAS-ADBI)**

As paddy is one of the most popular and consumed crops in the world whilst consuming a large amount of water globally, there was a session on 'Maximizing the benefits from paddy fields: multi-functional roles of paddy fields and agricultural water management' organized by the Food and Agriculture Organization (FAO), Japan International Research Centre for Agricultural Sciences (JIRCAS) and Asian Development Bank Institute (ADBI). During the session, several experts discussed their work and provided examples from different regions of the world to inform on the status of multifunctional roles of paddy fields in emerging paddy countries in Africa, Asia, and Europe using conservation techniques such as SRI, direct seeding, alternate wet and dry, aquaculture etc.

◆ **Transforming Small-Scale Irrigation in sub-Saharan Africa (ICID - IWRA)**

The session on 'Transforming Small-Scale Irrigation in sub-Saharan Africa' conducted by the International Commission on Irrigation and Drainage (ICID) and International Water Resources Association (IWRA) focused on finding pathways to improve the irrigation practices and its outcomes in the Sub-Saharan African region. Small-scale irrigation schemes have been identified as a major vehicle to improve the livelihood of smallholder farmers and their communities in sub-Saharan Africa (SSA), including improving food security, education and health. However, for a complex set of reasons and barriers inhibiting the profitability of this sector, it has failed to live up to these expectations of transforming small-scale irrigation schemes from underperforming to sustainable and profitable systems. The Australian Centre for International Agricultural Research (ACIAR) in 2013 funded the project Transforming Small-scale Irrigation in Southern Africa (TISA) and has shown beneficial results. Examples of that were shared during the session such as increasing trends in water productivity at smallholder irrigation schemes in southern Africa, improved water use efficiency at Southern African irrigation schemes, TISA's transformative impact in small-scale irrigation schemes in Mozambique and Tanzania, improved management of smallholder irrigation scheme leading to better climate change adaptation benefits in South Africa, improving the livelihood of youth on small-scale irrigation schemes in Zimbabwe, improving growth and inequality at the micro-scale: an empirical analysis of farm incomes within smallholder irrigation systems in Zimbabwe, Tanzania and Mozambique, implementing the vision for circular food systems as drivers of rural transformation, capacity strengthening, discussion on TISA's Theory of Change and the impact of TISA within the three countries.

◆ **INSPIRE (World Bank)**

During the session on INSPIRE (International Network of Service Providers for Irrigation Excellence) where the discussion was led by the World Bank, several professional associations shared their experiences such as using remote sensing for monitoring irrigation performance, effective design and challenges of asset management in public

irrigation systems and the irrigation operator of the future toolkit - supporting irrigation operators in assessing performance and developing strategic plans. Furthermore, the need for collaboration with the concerned stakeholders and the relevant institutions to establish guidelines for sustainable irrigation development was underlined.



INTERNATIONAL WORKSHOPS

Under its mandate, the Permanent Committee for Technical Activities (PCTA) of ICID hosts various working groups to promote three core areas viz, irrigation, drainage and flood management by addressing their engineering, agronomic, environmental, social, financial and institutional aspects. During the 24th ICID Congress, the following working groups organized seven international workshops to address various issues.

1. Working Group on Managing Water Scarcity under Conflicting Demands (WG-MWSCD)
2. Working Group on Water Food Energy Nexus (WG-WFE-N)
3. Working Group on Use of Non-Conventional Water Resources for Irrigation (WG-NCWRI)
4. Working Group on Modernization and Revitalisation of Irrigation Schemes (WG-M&R)
5. Working Group on Institutional and Organizational Aspects of Irrigation/ Drainage System Management (WG-IOA)
6. Working Group on Sustainable Development of Tidal Areas (WG-SDTA)
7. Working Group on Adaptive Flood Management (WG-AFM)





The international workshop on Managing the Regional, State or Local Level, Water Scarcity Resulting from Conflicting Demands was conducted by the Working Group on Managing Water Scarcity under Conflicting Demands (WG-MWSCD). Across geographical and temporal variations, the rainfall and irrigation water availability fluctuate globally and thus, storage potential acts as a buffer between availability during a short duration and demand for a long time. With this background, the session focused its attention on understanding balancing demands and scarcity of water, integrated water management, and managing conflicts through institutional provisions such as water use permits, inter-basin transfer etc. During the session, several presentations and case studies were discussed, especially from water-scarce regions globally on how different technical or institutional provisions are helping in regulating water scarcity and managing the present water stress faced by them.

The international workshop on the Water-Energy-Food Nexus: Implementation and Example of Application was organized by the Working Group on Water Food Energy Nexus (WG-WFE-N). The session deliberated on the various synergies and trade-offs among the water, food and energy sectors and how this concept is being implemented globally through various case studies. Citing several Australian examples, the session discussed a wide range of topics such as the effects of anthropogenic drivers on hydrological droughts, economic models of water markets, improving farm dam accounting for healthy and safe catchments, optimism bias, ignored cultural and environmental values in irrigation business cases, policy challenges in recovering the cost of securing low flows, to name a few.

The international workshop on non-conventional irrigation in high-value agriculture using the application of modern technologies conducted by the Working Group on Use of Non-Conventional Water Resources for Irrigation (WG-NCWRI) deliberated on the use of reclaimed water in agriculture and its benefits through various case studies and group discussions. Non-conventional water reuse is a long-established practice for irrigation and is beneficial for developing countries as it is cost-free and reduces the burden on freshwater resources along with other environmental benefits. However, the reuse of non-conventional water must be carried out with caution considering the wastewater quality issues in terms of salinity, sodium and infiltration rate, ion toxicity, excessive nutrients, organic matter and hazardous materials and microbial contamination. During the session, several case studies were presented discussing myriad ways in which non-conventional water usage in agriculture has helped in producing high-value crops such as improved wastewater quality, crop selection and timing of irrigation, water, crop, rootzone monitoring, modelling and management and precision irrigation & drainage management.

The working group on Working Group on Modernization and Revitalisation of Irrigation Schemes (WG-M&R) organized the workshop on the modernization and revitalisation of irrigation schemes to improve climate resilience, environmental sustainability and agricultural water productivity in drought-affected regions. Smallholder irrigation schemes contribute to food security and rural economies, they remain of paramount importance in addressing issues of food and nutrition security, poverty alleviation and employment creation.

Through several case studies across continents, the sessions discussed interventions such as modernising a pressurised pipeline supply system for high-value agriculture which have resulted in the adoption of climate-resilient irrigation management services, development of flexible and modernized irrigation systems and efficient on-farm water management practices for the beneficiary farmers.

During the workshop organized by the working group on Institutional and Organizational Aspects of Irrigation/ Drainage System Management (WG-IOA), several presentations were made to demonstrate the functioning and significance of Public-Private Partnerships (PPPs) in irrigation and drainage operation and maintenance toward sustainable irrigated agricultural water management through several case studies in China, Chinese Taipei, India, Indonesia, Iran, Mali, Nepal and Pakistan. PPP projects for the consolidation and resilience of the national economy focus on the rehabilitation, maintenance and strengthening of existing economic infrastructure. The sessions discussed how farmer groups and Water Use Associations (WUA) are the most important factors in irrigation maintenance and sustainability. The success of the PPPs includes streamlining the PPP procurement process through excellent design to increase efficiency and reduce abuses, controlling the quality of equipment and designing and implementing a good maintenance system for infrastructure carried out in PPP mode.

Other workshops were conducted by the Working Group on Sustainable Development of Tidal Areas (WG-SDTA) discussing integrated solutions for irrigation and drainage tails and land subsidence for sustainable development in tidal areas and the Working Group on Adaptive Flood Management (WG-AFM) presenting various case studies on different flood prevention and management techniques.



5

24th ICID Congress Wrap-Up: Innovation and Research in Agriculture Water Management to Achieve Sustainable Development Goals



The Adelaide Statement 2022

The 24th ICID Congress with the main theme “**Innovation and Research in Agricultural Water Management to Achieve Sustainable Development Goals**” was held from 03-10 October 2022 at Adelaide Convention Centre, Adelaide City Australia, organized by the Australian National Committee of ICID (IACID) and Irrigation Australia. The Congress was attended by about 2000 delegates from 64 countries including exhibitors, students and Young Professionals.

Based on the 149 papers presented orally and through posters from more than 40 countries for the Congress and Special Sessions, the participants discussed the two Questions i.e., Question 62 “What Role can Information and Communication Technology Play in Travelling the Last Mile (i.e., The Greater Adoption of Research Outputs)?” and Question 63 “What Role is Played by Multi-Disciplinary Dialogue to Achieve Sustainable Development Goals? “. In addition, various Symposia, Special Sessions, international workshops, various side events and training were organised, including:

- Symposium on ‘Integrated Approaches to Irrigation Management in Future’;
- Special Session on ‘Developing the future tools for managing the uncertainty in irrigation water supply’;
- Two training workshops for Young Professionals;
- International workshops by multiple working groups of ICID; and

11th N.D. Gulhati Memorial lecture for International Cooperation in Irrigation and Drainage, entitled “Putting People at The Heart of What We Do” was delivered by Hon Karlene Maywald, South Australian Water Ambassador and former South Australian Minister for Water Security, and former Chair of the Australian National Water Commission.

As a result of intense deliberations, the following outcome in respect of Congress Questions 62 and Question 63, has emerged:

‘Question 62: What Role can Information and Communication Technology Play in Travelling the Last Mile?’

1. Information and Communication Technologies (ICT) may already provide (and perhaps, underutilised) pathways to support the uptake of research outputs related to irrigation and drainage, but more can be done to expand the use of these tools.
2. Many new technologies and innovative approaches are becoming available to allow users to efficiently and effectively use irrigation water. However, the integration of these new and innovative technologies in both routine irrigation practice and the extension of research output continues to lag behind.
3. Opportunity exists to better understand the interests, motivations and impediments to adoption as exhibited by target beneficiaries, and to design with and for each community, pathways to facilitate the adoption of research. It is not about ‘One Size fits All’, ICT allows for better targeting of information and process.
4. The performance of methodologies and experimentation in a test framework and its success is validated only if issues of uptake and implementation are addressed.
5. Software development in the sector has identified the importance of end-user-based validation in the areas of programming, the functionality of interface and reliability but this identification needs to be carried through to practice.
6. Socioeconomic aspects influencing the utilisation of social media are an important aspect of knowledge dissemination under diverse situations but appear inadequately considered and incorporated in the early phases of R&D or project development. (These tools are not an add-in but a fundamental aspect of the research).
7. The developmental status of a region/ country may affect the use of social media in the adoption of appropriate resources but mobile phones can be found almost everywhere and direct targeting of end-users may be an option to pursue.

8. There is a need to address gender and community issues when integrating new technologies into the irrigation communities
9. Water trading has not been explored fully in a worldwide manner, especially where such trading may be a powerful tool for policy implementation rather than primarily as a mercantile scheme in its own right. The role of ICT in water trading paradigms is lacking widespread recognition.
10. While there are project-specific experiences on the aspects of water trading, systematic adoption of these experiences in dealing with future uncertainty needs further attention.

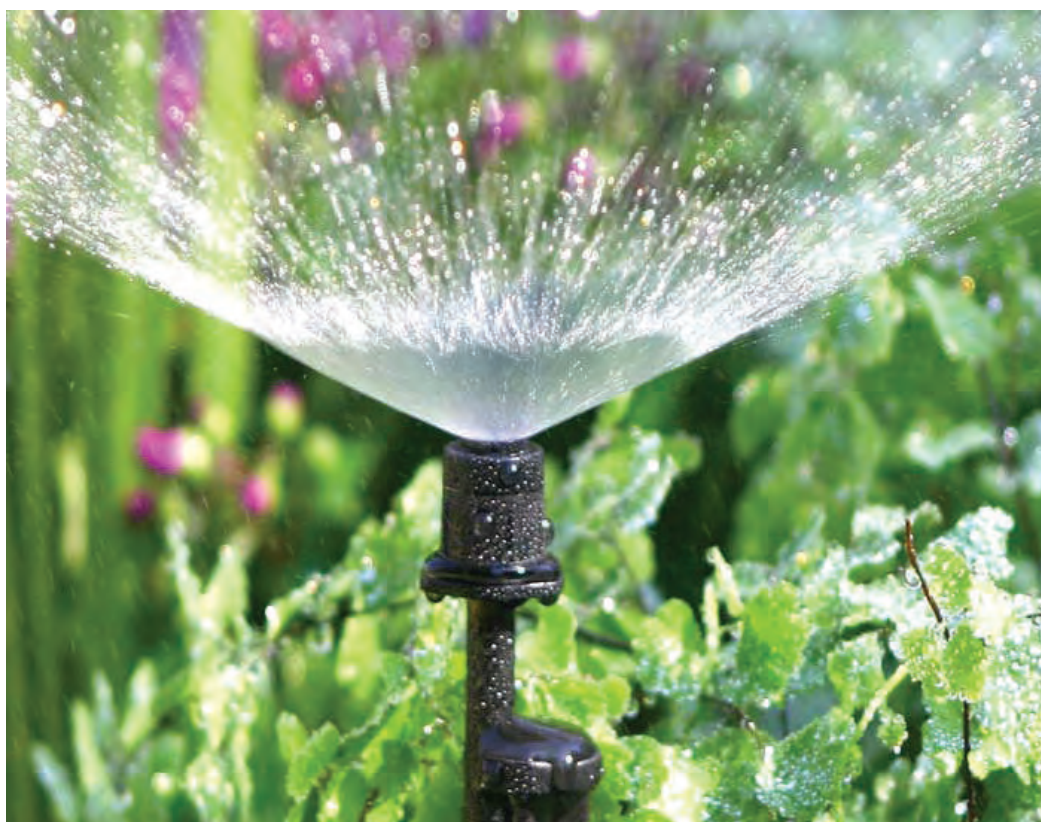
Question 63: ‘What Role Is Played by Multi-Disciplinary Dialogue to Achieve Sustainable Development Goals?’

1. Multidisciplinary approaches, though recognized at theoretical and policy levels, still lack full-scale application. A greater commitment to multi-disciplinary dialogue needs to be enacted by all involved through a change in mindset and remain under-utilized.
2. Irrigated agriculture has the potential and needs to impact across the full spectrum of 17 SDGs.
3. The global population is predicted to increase by 2050 and beyond. Current patterns of production and consumption worldwide can involve significant waste of resources and may damage vital natural ecosystems unless multiple objectives are dealt with simultaneously.
4. The community has played a critical role in driving actions on the ground and stakeholders who were not familiar with SDGs were able to understand and implement concepts with suitable capacity development.
5. The perception of irrigation water as an environmental problem has to be transformed into irrigation water as part of the solution. Otherwise, regulators and political leaders are likely to be influenced by perceptions and therefore impose unwise constraints on irrigated agriculture to the detriment of food production.
6. Consultative processes amongst stakeholders viz. farmers, irrigation RD&E departments, water supply utilities, development agencies and local authorities can result in favourable outcomes for the reallocation of water resources under scarcity conditions.
7. Multi-disciplinary management interventions work better towards obtaining sustainable management of watersheds and river basin health.
8. A range of models spanning from individual on-farm irrigation investments to regional scale mappings is applied for decision support systems.
9. There is a critical need for a continued focus on capacity development among stakeholders in the agricultural and water management sectors. However, the

need to communicate the values and challenges of agricultural water management beyond immediate stakeholders is also acute.

10. The irrigation and drainage professionals must communicate more effectively with broader society to maintain the “social license to operate”. This is relevant for all economies be they developed or developing.
11. Essential roles are: enabling an exchange of understanding about the concerns and objectives of different stakeholder groups, providing a venue for capacity development and providing a basis for a shared vision of the future of the sector in the community involved.

At the end of the ceremony, the Australian National Committee provided a vote of thanks to the ICID and all the participants of the 24th ICID Congress. A welcome reception was hosted by the Malaysian National Committee of ICID (MANCID) to invite the esteemed participants to attend the 4th World Irrigation Forum (WIF4) to be held from 7-13 September 2025, Malaysia.

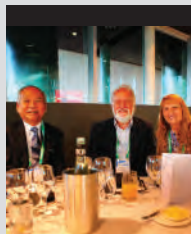


RECEPTIONS

Receptions during the ICID events play a vital role in facilitating networking, knowledge exchange, community building, enhancing the overall event experience, and publicity of the forthcoming events. They contribute to the success and long-term impact of the event by fostering connections, collaboration, and a sense of belonging among participants.

During the 24th ICID Congress & 73rd IEC Meeting, the host Irrigation Australia Limited (IAL)/ Irrigation Australia's Committee on Irrigation and Drainage (IACID) hosted receptions to the ICID Management Board and IAL Board Members on 4 October 2022, and Conference Dinner sponsored by Davey Water Products on 6 October 2022. In addition, IAL coordinated the hosting of the Chinese Reception on 5 October 2022, the Indian Reception on 7 October 2022, and the Malaysian Reception on 8 October 2022 by respective National Committees to promote their forthcoming events.

Reception hosted by CNCID on 5 October 2022



Conference Dinner hosted by Irrigation Australia sponsored by Davey Water Products on 6 October 2022



Reception hosted by INCID on 7 October 2022



Reception hosted by MANCID on 8 October 2022



PRESENTATION OF AWARDS AND PLAQUES

The winners of World Heritage Irrigation Structures, WatSave, Best Paper and Best Performing Workbody are given below:

WHIS AWARDS 2022

Australia

- 1 Dethridge Outlet/Wheel

China

- 1 Chongyi Shangbao Terraces
- 2 Songgu Irrigation Scheme
- 3 Tongjiyan Irrigation Scheme
- 4 Xinghua Duotian Irrigation and Drainage System

India

- 1 Baitarani Irrigation Projects
- 2 Lower Anicut
- 3 Rushikulya Irrigation System
- 4 Sir Arthur Cotton Barrage

Iraq

- 1 Al-Adhem Dam
- 2 White Bridge

Japan

- 1 Kanuki Irrigation Canal
- 2 Teradani Irrigation System (Canal)
- 3 Yukawa Irrigation Canal

South Korea

- 1 Uiseong Small Reservoir Irrigation System

Sri Lanka

- 1 Kala Wewa
- 2 Maduru Oya Ancient Dam and the Sluice
- 3 Padaviya
- 4 Thekkam Anicut



WATSAVE AWARDS 2022

Management: Water Rights Trading of Hetao Irrigation Scheme

China - Li Gendong and Su Xiaofei



Technology: Leveraging Canal Automation Technology to Improve Karnataka's Precious Water Resources

Australia - Sumith Choy, Varun Ravi, N. Srinivas Reddy, and Satya N. Jaddu



Young Professional: Drip Tape Irrigation of Transplanted Rice in Puddled Paddy Soil

Iran - Ramtin Nabipour Shiri



Farmer: Cultivation Model Compatible with Arid and Semi-arid Climate of Iran in order to Increase Water's Economic Productivity

Iran - Nader Zarei

BEST PAPER AWARD 2022

Bacillus amyloliquefaciens application to prevent biofilms in reclaimed water micro-irrigation systems

Jiixin Wen, Yang Xiao, Peng Song, Bo Sun, Tahir Muhammad, Lianghe Ma, An Waier Aosiman, Yunkai Li



BEST PERFORMING WORKBODY AWARD 2022

African Regional Working Group (AFRWG)



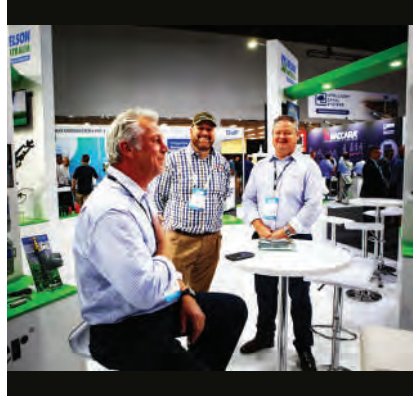
6

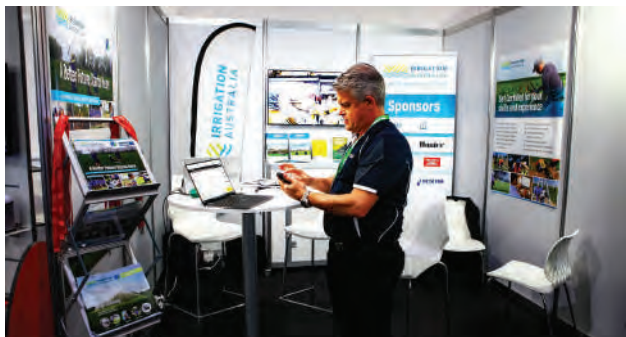
EXHIBITION

More than 110 companies participated in the exhibition. In addition, few National Committees also participated actively. It was well attended and received by all the participants. A list of the exhibitors is given at page 72.









LIST OF EXHIBITORS

1. ABB Australia - <https://new.abb.com/au>
2. AcquaSaver - <https://www.acquasaver.com.au/>
3. Acu-Tech Piping Systems - <http://www.acu-tech.com.au/>
4. Advanced Nutrients - <https://advancednutrients.com.au/>
5. AIP Motion Australia - <https://www.advancedindustrial.com.au/>
6. Amiad Water Systems - <https://au.amiad.com/>
7. ANAFIDE: National Association of Land Improvements, Irrigation, Drainage and Environment - <http://www.anafide.ma/>
8. Antelco - <https://antelco.com/>
9. Aquaduct 2020 LTD - <https://aquaduct2020.com/>
10. Aster S.R.L - <https://www.aster.cc/?lang=en>
11. Australian Centre for International Agricultural Research (ACIAR) - <https://www.aciar.gov.au/>
12. Baccara Geva Australia - <https://www.baccara-geva.com/>
13. Bate Engineering and Construction (Trading as Batescrew Pumps & Valves Australia) - <https://www.batescrew.com/>
14. Bauer Group - https://www.bauer.de/bauer_group/index.html
15. Bermad Water Technologies - <https://www.bermad.com.au/>
16. BMEL – Federal Ministry of Food and Agriculture - https://www.bmel.de/EN/Home/home_node.html
17. Brown Brothers Engineers Australia - <https://brownbros.com.au/>
18. CHT Australia - https://www.cht.com/cht/web.nsf/id/pa_smart-chemistry-en.html
19. Concrete Canvas Ltd - <https://www.concretecanvas.com/>
20. CropX Australia - <https://cropx.com/>
21. Crusader Hose - <https://www.crusaderhose.com.au/>
22. Custom Built Stainless (CBS) - <http://cbstainless.com.au/>
23. Davey Water Products - <https://www.daveywater.com/au>
24. Detection Services Pty Ltd - <https://www.detectionservices.com.au/>
25. DLG Service GmbH – Agritechnica - <https://dlg-service-gmbh.business.site/>
26. DM Plastics and Steel - <http://www.dmplastics.com.au/>
27. Farm In One /HTM Complete - <https://www.htmcomplete.com.au/>
28. Filtersafe Australia - <https://filtersafe.net/>
29. Focus Planting Australia - <https://franklin-electric.com.au/>
30. Franklin Electric Australia - <https://focusplantingaustralia.com.au/>
31. Goldtec Control Systems - <https://goldtecsystems.com.au/>
32. Groundwater Imaging - <http://groundwaterimaging.com.au/main/>
33. Grundfos Pumps - <http://www.grundfos.com.au/>

34. GWF Technologies GmbH - <https://gwf-technologies.de/en/>
35. Hatz Australia - <http://www.hatz.com.au/>
36. Holman Industries - <http://www.holmanindustries.com.au/>
37. HR Products - <https://www.hrproducts.com.au/>
38. Huesker Australia - <http://www.huesker.com.au/>
39. Hunter Industries - <https://www.hunterindustries.com/en-metric>
40. Hydrorock Australia - <https://hydrorock.com.au/>
41. Hydrosmart Australia - <http://www.hydrosmart.com.au/>
42. HyQuest Solutions - <http://www.hyquestsolutions.com/>
43. Ifm Efector - <https://www.ifm.com/au/en>
44. Indian National Committee (INCID) - <http://www.incid.cwc.gov.in/>
45. Industries – Energy Efficiency Solutions Projects - <https://www.dpi.nsw.gov.au/dpi/climate/energy>
46. Inquik Pty Ltd - <https://inquik.com.au/>
47. Intelligent Canal Systems - <https://www.intelligentcanalsystems.com/>
48. International Commission on Irrigation and Drainage (ICID) - <https://icid-ciid.org/home>
49. Iplex Australia - <https://www.iplx.com.au/>
50. Irrigation Australia - www.irrigationaustralia.com.au
51. Irrigation Australia Rainwater Harvesting Committee - <https://www.irrigationaustralia.com.au/>
52. Irrigation Australia Training and Certification - <https://www.irrigationaustralia.com.au/>
53. Irrigation Components Australia - <https://www.irrigationaustralia.com.au/>
54. Irrigation Components Australia - <https://www.irrigationaustralia.com.au/>
55. Irrigation Components International - <https://www.irrigationaustralia.com.au/>
56. Irrigear - <http://www.irrigear.com.au/>
57. Isuzu Australia - <http://www.isuzu.com.au/%20>
58. Kingspan Water and Energy - <http://kingspan.com.au/water>
59. Kleenscreen - <http://kleenscreen.com/%20>
60. Landf/x - <https://www.landfx.com/>
61. Lena Service GmbH - <http://www.lenaservice.de/>
62. Lena Service GmbH - Agritechnica - <http://www.lenaservice.de/>
63. Mace – and In Situ Brand - <https://in-situ.com/en/>
64. Mait Industries - <https://www.mait.com.au/>
65. Manas Microsystems - <https://www.manasmicro.nz/>
66. Maric Flow Control - <https://www.maric.com/>
67. Maxijet Australia - <https://maxijet.com.au/>
68. Mottech Parkland - <https://www.parkland.com.au/>
69. Myriota - <https://myriota.com/>

70. NanDanJain Australia - <https://naandanjain.com/>
71. N-Drip Australia - <https://www.advancedindustrial.com.au/>
72. Nelson Australia - <https://www.naandanjain.com.au/>
73. Nested Venture Australian - <http://www.nestedventures.com/>
74. Netafim Australia - <https://www.netafim.com.au/>
75. Norma Pacific - <http://www.normagroup.com/>
76. NSW Government-Department of Regional NSW, Department of Primary - <https://www.dpi.nsw.gov.au/dpi/climate/energy>
77. Orbit - <https://www.orbitonline.com/>
78. Penske Australia - <https://penske.com.au/>
79. Pentair Australia - <https://www.pentair.com.au/>
80. Pinion Advisory - <https://www.pinionadvisory.com/>
81. Plasson Australia - <http://www.plasson.com.au/>
82. Puretec Group - <https://www.puretec.com.au/>
83. Queensland Irrigation Services (QIS) - <https://www.qldirrig.com.au/>
84. Rain Bird Australia and New Zealand - <http://www.rainbird.com.au/>
85. Rain Harvesting T/As Blue Mountain Co - <https://bluemountainco.com.au/>
86. Reaqua - <http://www.lorentz.com.au/>
87. Reece Irrigation and Pools - <http://www.rainbird.com.au/>
88. Reece Pumps - <https://reece.com.au/>
89. Rivulis - <https://www.rivulis.com/>
90. Rubicon Water - <https://rubiconwater.com/en/>
91. Saisanket Industries - <http://www.saisanket.com/>
92. Senninger Irrigation Inc - <https://www.senninger.com/>
93. Sentek Technologies - <http://www.sentektechnologies.com/>
94. Siemens - <https://www.sigsense.com.au/>
95. Sigsense - <https://www.sigsense.com.au/>
96. Sterling Pumps - <http://www.sterlingpumps.com.au/>
97. Sulzer Australia - <http://www.sulzer.com/>
98. Suntex Import and Export Trading Co Ltd - <http://www.sitg.fluidtech.com/>
99. Swans Systems - <https://www.swansystems.com.au/>
100. The German Pavilion: Ifwexpo Heidelberg Gmbh - <http://www.ifw-expo.de/>
101. Thinkwater - <https://www.thinkwater.com.au/>
102. Triangle Waterquip - <https://www.trianglewaterquip.com.au/>
103. Trident Plastics - <http://www.tridentaustalia.com/>
104. Tyeware - <http://www.tyeware.com/>
105. Valley Irrigation Australia - <http://anz.valleyirrigation.com/>

106. Vinindex Rodney Industries - <https://www.vinindex.com.au/>
107. Water Control Solutions - <https://www.awmawatercontrol.com.au/>
108. Wateraid Australia - <https://wellcross.com.au/>
109. Wateresource - <http://www.wateresource.com.au/>
110. Welling and Crossley - <https://wellcross.com.au/>
111. White International - <http://www.whiteint.com.au/>
112. Wilo Australia - <http://www.wilo.com/au/en/>
113. Yuzuak Makina ITH - <https://www.yuzuak.com/>



Glimpses of the 24th ICID Congress, Adelaide, Australia. 2022







ICID • CIID

For more information, please contact:

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