Report of the 22nd International Congress on Irrigation and Drainage

14-20 September 2014, Gwangju, Korea

Securing Water for Food and Rural Community under Climate Change

INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE

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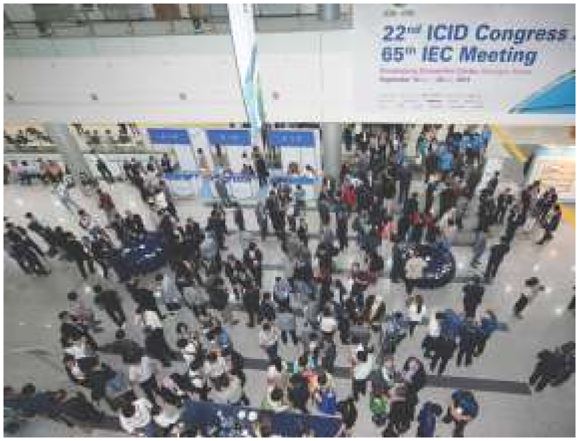

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Report of the
22nd International Congress on
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Gwangju, Republic of Korea, 2014

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International Commission on Irrigation and Drainage (ICID), established in 1950 is the leading scientific, technical and not-for-profit international Non-Governmental Organization (NGO). 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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Er. Avinash C. Tyagi, Secretary General
Dr. Vijay K. Labhsetwar, Director
Mr. Madhu Mohanan, Communication Officer

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Foreword

Dr. Saeed Nairizi

PRESIDENT

Agriculture is one of the major sectors providing livelihood in rural communities around the world, particularly in developing economies. With the increasing challenges being posed by population growth, limiting natural resources, increasing water stress and climate extremes, the very foundation of livelihood for rural communities gets undermined. The climate change has resulted in frequent extreme drought and flood events. With the erratic precipitation the impact of climate change food production will depend more heavily on irrigation and drainage for better water management. Climate change is an added stressor on the increasingly complex and interlinked issues of rural development, food security under demographic changes, and overstretched environmental and natural resources.

Food production and rural community is the largest water user, using as much as 70% of total fresh water supply, and most of the water is used for irrigation. With 40% of food grown from irrigated lands, irrigation is of significant importance to food security, social and economic development and social stability. With social and economic development more and more water is being requisitioned by industry and domestic water supply. As such, irrigation systems are under great pressure to lower water use, to the favour of other sectors or transforming the irrigation infrastructure from single purpose to multiple purposes. The challenge for sustainable development in context of rural communities is therefore two-pronged: the climate change and economic development.

International Commission on Irrigation and Drainage, committed to sustainable agriculture water management through efficient and effective use of irrigation and drainage tools, organizes International Irrigation and Drainage Congress every three years with focus on the most burning topic. The theme of 22nd Congress was therefore chosen as "Securing Water for Food and Rural Community under Climate Change". Specifically, the two questions addressed were:

Question 58: How Irrigation and drainage play an important role in climate change adaptation?

Question 59: How do irrigation and drainage interventions secure food production and livelihood for rural community?

In addition to the technical sessions addressing these two questions, a Special Session on "New Partnership for Rural Development", a Symposium on "Non-point Sources Pollution and Best Management Practices", and a Workshop on "Sustainable Management of Tidal Areas in the Era of Climate Change" were held and were attended by more than 1300 participants from 61 countries. A Roundtable on "Irrigated agriculture and rural development in developing countries", where ministers from a number of developing countries participated, and an Exhibition truly enriched the scope of the Congress.

Earlier, prior to the Congress in August 2014, the pre-Congress proceedings were published with the Abstracts of all the papers in hard copy accompanied by the full length papers in soft version before the Congress. These were instrumental in raising the level of technical deliberations at various sessions discussing the two questions. This publication brings out the outcomes of all the technical sessions and brief summary of other events.

On behalf of the ICID fraternity, I am extremely thankful to Dr. Lee, Sang-Mu, Chairman of NOC for 2014 ICID Congress, Chairman of Korean National Committee on Irrigation and Drainage (KCID), President, Korea Rural Community Corporation, and Mr Park, Jae Soon Co-Chairman of NOC for 2014 ICID Congress for their leadership which made the 22nd Congress as one of the most successful events organized in the recent past. The fact that Dr. Lee Dong-phil Minister of Agriculture, Food and Rural Affairs Gwangju took the responsibility as Chairman of the Congress, and address from Her Excellency, Ms. Park Geun-hye, President of Republic of South Korea to the delegates attending the Congress at the inaugural ceremony, was an ample proof as to the importance that Government of South Korea attaches to Rural Development and recognizes the role played by Irrigation and Drainage.

ICID fraternity had the opportunity to experience the excellent hospitality which Korea is famous for and providing a lively atmosphere for the deliberations on such important issues and 22nd ICID Congress would be remembered by all the participants for its technical richness, efficiency and grandeur.

Preface

Avinash C. Tyagi
SECRETARY GENERAL

As agriculture continues to be the major contributor to the rural employment in many countries, and climate change already setting in, the theme of 22nd ICID Congress was aptly chosen to be "Securing Water for Food and Rural Community under Climate Change". The looming specter of climate change, apart from impacting the overall physical environment for plant growth in terms of increasing temperatures and carbon-di-oxide concentration or changing relative humidity, sunshine hours etc, is also likely to impact the water availability both in time and space. Increase in climate variability is already prominently displayed through increasing frequency and intensity of droughts.

Irrigation, over the centuries has helped in mitigating the impacts of climate variability and achieve reasonably stable food production to meet the growing needs of the population. With a view to explore the way the countries are addressing these issues the theme of the 22nd ICID Congress was articulated in the form of two major questions:

Question 58: How irrigation and drainage play an important role in climate change adaptation?

Question 59: How do irrigation and drainage interventions secure food production and livelihood for rural community?

This post-congress proceeding, in addition, also briefly outlines the outcomes of the Symposium on "Non-point Sources Pollution and Best Management Practices", the International Workshop on "Sustainable Management of Tidal Areas in the Era of Climate Change", a Special Session on "New Partnership for Rural Development", and a number of roundtables. This post-Congress proceedings should be read with the Vol. I and Vol. II brought out before the Congress.

It was a pleasure to see the active involvement of all the National Committees of ICID, experts from international organizations, including the other stakeholders. The participation of over 1300 delegates from 60 countries and ministerial level delegates from eight countries dealing with agricultural water management and representing the government agencies, universities, research institutions, private companies and farmers proves the success of this 22nd ICID Congress. The untiring efforts put in by a team of technical experts who sieved through abstracts and papers received are duly acknowledged. Due to lack of space their names are mentioned under acknowledgements. However, I would like to specifically mention the names of Rapporteurs of the two questions, Prof. Dr. Tsugihiro Watanabe (Japan) and Dr Francois Brelle (France) and their teams of experts for going through all the papers and preparing General Reports on the two Congress Questions and Dr. Anna Tedeschi (Italy) for being General Report for the Symposium.

The daunting task of organizing the 22nd ICID Congress by the Korean National Committee of ICID (KCID) started in the right earnest in February 2014 when a National Workshop was organized by KCID to sensitize all the stakeholders within South Korea of the coming event. Then President Dr Gao Zhany and myself attended the Workshop.

Particularly, the hard work put in by the members of the National Organizing Committee, Co-chaired by Dr. Park, Jaesoon and Dr. Lee, Sang-Mu, Chairman of the KCID, General Rapporteurs, teams coordinating the Seminar, Symposium and International Workshops, has gone a long way in enhancing the richness of the event. Exhibition was the main attraction of the Congress organized very ably by the team headed by Dr. Deasu Eo, Secretary General, NOC. The contribution of colleagues from KCID, KRC and Ministry of Agriculture, Food and Rural Affairs is highly appreciated and acknowledged.

On behalf of all the participants, I express my sincere thanks to the people of Gwangju through Mr. Yoon, Jang-Hyeon, Mayor, Gwangju Metropolitan City; Mr. Lee, Nakyeon, Governor, Jeollanamdo; and H.E. Dr. Lee, Dong-phil, Minister of Agriculture, Food and Rural Affairs, Republic of Korea for providing the serene atmosphere in this centre of agriculture revolution. I am sure, all the participants enjoyed the innovative mix of traditional and modern forms of art as displayed by the famous artists during the Opening and Closing Ceremonies; the tremendous progress ushered in the region exposed through the Saemangeum Project and the Yeongsan River Comprehensive Agricultural Development Project.

Without the active support of the sponsors, it would not have been possible to organize the Forum successfully.

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Wrachien, Daniele De (Italy)

22ND ICID CONGRESS NATIONAL ORGANIZING COMMITTEE (NOC)

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VP Bong Hoon Lee
Dr. Daesu Eo, Secretary General, NOC
Mr. Sunho Kim
Dr. Young D. Kim
Mr. Heo Namjoo
Ms. Merian KJ Kim

Abbreviations

ANADER	National Agency for Support to Rural Development
AR5	Fifth Assessment Report
BMP	Best Management Practices
BPNCA	Best Performing National Committee Award
BPWA	Best Performing Workbody Award
CNCID	Chinese National Committee on Irrigation and Drainage
FAO	Food and Agriculture Organization
GCM	General Circulation Model
GDP	Gross Domestic Product
GFCS	Global Framework for Climate Services
GLUE	Generalized Likelihood Uncertainty Estimation
HIS	Heritage Irrigation Structures
ICID	International Commission on Irrigation and Drainage
IEC	International Executive Council
IPCC	Intergovernmental Panel on Climate Change
IRNCID	Iranian National Committee on Irrigation and Drainage
KAFF	Korean Advanced Farmers Federation
KCID	Korean National Committee on Irrigation and Drainage
KRCC	Korean Rural Community Corporation
MCS	Monte Carlo Simulation
MDGs	Millennium Development Goals
MME	Multi-model Ensemble
NC	National Committee
NGO	Non-governmental Organization
NOC	National Organizing Committee
NPS	Non-Point Source
NRN	National Rural Network
O&M	Operations & Maintenance
ODA	Official Development Assistance
ODA	Overseas Development Assistance
OECD	Organization for Economic Co-operation and Development
PH	President Honoraire
PPP	Public Private Partnership
PPPP	People Public Private Partnership
SDG	Sustainable Development Goals
SMU	Sae Maul Undong
UN	United Nations
VP	Vice President
VPH	Vice President Honoraire
WMO	World Meteorological Organization
WTO	World Trade Organization

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Opening Ceremony

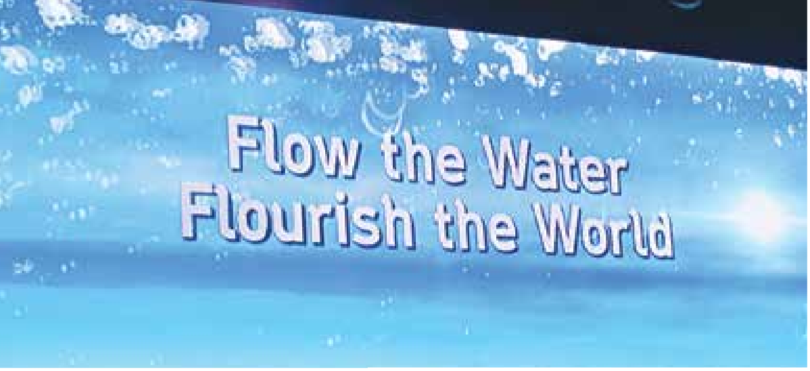
Uniting River Waters

At the opening ceremony water from eight famous rivers: Amazon, Colorado, Rhine, Nile, Euphrates, Ganges, Yellow River and Youngsan River, from five continents, were brought together for 'Uniting River Waters' and the beautiful display of sand art displaying iconic locations of the country from where the water reached. Dr. Park, Jaesoon, Co-chair of National Organizing Committee (NOC) explained the philosophy behind uniting river waters which was symbolic of International Cooperation on Water and highlighted how we can achieve harmony and eradicate poverty by joining hands together.

The multi-purpose Kimdaejung Convention Center, Gwangju Metropolitan City, Republic of Korea was witness to the gala opening ceremony of the 22nd ICID Congress and 65th IEC meeting held on 14 September 2014 with more than 1300 participants, which included around 500 foreign participants. Dr. Lee, Sang-Mu, Chairman of the Korean National Committee on Irrigation and Drainage (KCID), and CEO of Korea Rural Community Corporation welcomed the delegates. President of ICID, Dr. Gao Zhanyi delivered the keynote address. Mr. Yoon, Jang-Hyeon, Mayor, Gwangju Metropolitan City and H.E. Mr. Lee, Nakyeon, Governor, Jeollanamdo also welcomed the participants.

The opening ceremony was graced by the presence of H.E. Dr. Lee, Dong-phil, Minister of Agriculture, Food and Rural Affairs, Republic of Korea; H.E. Mr. Luvsanvandan Bold, Minister of Foreign Affairs from Mongolia; H.E. Zerubabel Nyiira, Minister of Agriculture, Animal Industry and Fisheries from Uganda and H.E. Li Guoying, Vice Minister of Water Resources from People's Republic of China.

Her Excellency Park, Geun-hye President of Republic of Korea, delivered a recorded congratulatory video message from, wherein she emphasized that the time was ripe for the global community to come together and confront the pressing issues of natural disaster, food security and sustainable development of the agricultural sector. President Park, emphasized that the theme of the Congress ''Securing Water for Food and Rural Community under Climate Change" is very timely and meaningful and thanked ICID for choosing Gwangju as the Congress venue. She highlighted the situation arising in the recent years due to severe droughts and flooding in various parts of the world, has drawn the attention of many nations forcing them to put sustainable agricultural water management at the top of their agenda. President Park, Geun-hye mentioned that it is high time that the global community comes together to confront these pressing issues and sustainable development of rural community. She reassured that Korea is committed to share its rich experiences, gained in 1970's from 'Saemaeul Undong' as well as recent developments, with international community in order to fight against hunger and poverty elevation. Live recording of the message can be seen at ICID YouTube channel <http://www.youtube.com/watch?v=2Bnnao51pd0>


Flow the Water
Flourish the World


Community


Community


Community


ICID Congress and 65th IEC


22nd ICID Congress and 65th IEC Meeting

WELCOME ADDRESS

Dr. Lee Sang-Mu
Chairman
Korean National Committee on Irrigation and Drainage (KCID) and National Organizing Committee

A new beginning

Honorable Minister Dr. Lee, Dongpil, Honorable President of ICID, Dr. Gao Zhanyi, Distinguished guests and participants from all over the world! I welcome each and every one of you to the 22nd ICID Congress and 65th IEC Meeting.

Water is the most essential element in life. All life is dependent on water to survive. For this reason, human beings always strived to improve water efficiency in areas of irrigation and drainage. The irrigation technology that greatly advanced the lifestyle of human beings is now considered not just a part of agriculture, but a separate field of science. And, many countries are putting a lot of efforts to conduct research into this field.

However, we are facing lots of problems due to environmental threats, such as natural disasters, caused by climate change, including droughts, floods and storms, which vividly entail the significance of water-control. At this important juncture, 2014 ICID Congress in Gwangju is a great chance to suggest possible solutions for the world's problems.

Korea National Committee on Irrigation and Drainage (KCID) joined ICID in 1969 and actively engaged in international activities and made continuous effort to build overseas networks. As a result, the committee successfully held the 52nd IEC and Asian Regional Conference at Seoul in 2001. After 13 years in Gwangju today, we are hosting the ICID Congress. As the President of KCID, I am grateful and excited to stand here and witness this day.

As the Chairman of the Committee, I am pleased to see the fruits of our efforts, and I want to say thank you to all of the committee staffs and members for their unsparing efforts to make today's meeting possible. Based on these efforts, I am confident that 2014 ICID Congress in Gwangju will be the best Congress ever in history of ICID. The theme of this year's Congress is "Securing water for food and rural community under climate change." The core of this theme is, undoubtedly, water.

The stage of 2014 ICID Congress in Gwangju is open for you now; for the Ministers from many countries to establish policies and directions; for each country's delegates to share practical experiences; and for young professionals to lead the future. Through our cooperation and harmonization, I believe the vision and objective of ICID will spread out. I sincerely hope that over the next 7 days, we can draw valuable results on reassessing the role of irrigation and drainage in the era of climate change, and finding new solutions together. Also, I hope today can be a new beginning of the agriculture in Korea and a turning point in the history of world agriculture.

Once again, I wholeheartedly welcome everyone to 2014 ICID Congress in Gwangju.

Thank you very much.

KEYNOTE ADDRESS

Dr. Gao Zhanyi
President,
International Commission on
Irrigation and Drainage (ICID)

Integrating actions to cope the challenges

Your Excellency Ministers and Vice Ministers. Mayor of Gwangju Metropolitan City, Chairman of KCID, Dear Colleagues and Friends, Ladies and Gentlemen Good afternoon. Welcome to the 22nd ICID Congress in the Golden Season of autumn in Gwangju Metropolitan City, Republic of Korea.

The theme of this Congress is “Securing Water for Food and Rural Community under Climate Change”. We are facing the challenges to increase food production and rural development under the condition of population increase, water competition and scarcity, climate change, and urbanization. With population increase, we need to produce more food,; we need to increase water use efficiency, productivity and equality;. with urbanization, we need to produce and provide more water consumed food and with less labor in rural areas; with climate change, we need to take measures to adapt it.

Climate change has induced frequent extreme drought and flooding. With the impact of the climate change, food production will depend more heavily on irrigation and drainage for better water management. Currently, the area of farmland with irrigation and drainage facility covers only 27% of the total farmland, but it produces 55% of the total food production. To cope with the changes and challenges, we have to increase the resilience of agricultural production, and need a robust irrigation and drainage systems for better water management.

We need to take integrated measures to upgrade or modernize existing structures, construct new facilities, apply efficient irrigation technology and methods, reform institutions. The active involvement of all the stakeholders is essential for achieving the productivity, profitability, equality and sustainability of the irrigation systems.

As agriculture sector is still the major contributor to the GDP and employment in many countries, irrigation is of significant importance to food security, social and economic development and social stability. Therefore, the government should continue to play an important role in promoting irrigation development. In recent years many countries, such as China and India have worked out national irrigation development planning and increased the investment for irrigation sector.

The development and management of irrigation system needs to integrate nature science and technology with social science and institutions. The interactions of Policy, Science and Society are very important for building and operating sustainable water management system for rural areas. In this congress, we will discuss various topics on how to take integrated actions to cope with challenges with the main theme of Securing Water for Food and Rural Community under Climate Change.

Distinguish delegates, Dear colleagues, Ladies and Gentlemen, ICID network covers more than 100 countries with diversified irrigation and drainage systems, we always say ICID is a family, the family with all members who are working for improving water management for food and fiber production and rural community development. With your great support and active involvement, we have achieved a lot to fulfil our mission. On behalf of ICID, I would like to express thanks to all of you for your support and contribution. Taking this opportunity, I also like to express my sincere thanks to all of you for your support for me to serve as the President of ICID during the last three years, My special thanks must go to the Ministry of Water Resources of P.R. of China for the significant support, which helped to fulfill the promises made when I was elected as the President of ICID in 2011. Thank you very much Vice Minister Li Guoying.

Finally, on behalf of ICID and all the participants, I would like to express my thanks to the Korean Government, National Organizing Committee of the 22nd ICID Congress, Korean Rural Community Cooperation, Korean National Committee on Irrigation and Drainage (KCID), and all my colleagues who were involved in the preparation and organization of the 22nd ICID Congress and 65th IEC meeting.

I wish all of you a successful and fruitful conference and pleasant stay in Korea.

Thank you very much.

SPEECH

H.E. Dr. Lee Dong-phil
Minister of Agriculture,
Food and Rural Affairs,
Republic of Korea

Creating Best Environment for the Next Generation....

Honorable Dr. Gao Zhanyi, President of ICID, Mr. Bold Luvsanvandan Minister of Foreign Affairs, Mongolia, Prof. Zerubabel Nyira, Minister of State for Agriculture, Uganda, Mr. Yoon, Jang Hyeon, Mayor of Gwangju Metropolitan City, Dr. Lee, Sang-Mu, Chairman of KCID, Dr. Park, Jae Soon, Chairman of the 22nd ICID Congress National Organizing Committee, and Respected delegates from home and abroad, and ladies and gentlemen.

It is a great pleasure to welcome you to the opening of the 22nd ICID Congress and the 65th IEC Meeting in Gwangju Metropolitan City. On behalf of the Korean government, I extend my warmest welcome to all of you.

Korea's long agricultural history dates back to prehistoric period. Korea developed the world's first rice variety called "Sonori" about 17,000 years ago. As shown by the historical records on the origin of rice farming utilizing irrigation facilities 3,000 years ago, I could say that Korea's ancient history is closely related with agriculture. Also, the city of Gwangju is indeed the hub of the nation's agriculture. In that sense, I take it as a great honor to meet the leading groups of the water and agriculture here in Gwangju.

As you are well aware, food and energy deficiency, climate change and natural disasters are some of the problems that the world is currently facing. Securing water and food, in particular, have the most direct connection with the very survival of the mankind. Even at this moment, more than one billion people live in chronic hunger. Water management is an important element in food production. According to the FAO report, irrigated yields in developing countries are in general, two to three times higher than those of rainfed yields. It is meaningful that ICID Congress takes place in Gwangju, the agricultural capital of Korea.

What drove Korea's development following the devastating Korean War was nothing but the growth of agriculture. Other industries could develop based on the infrastructure laid by agricultural development, which ensured the stable supply of food and accelerate economic development. As a result, Korea has shifted from an aid recipient country to a donor country in less than half a century.

Korea has contributed to secure stable food supply by modernization and mechanization of infrastructure domestically and to develop overseas agriculture projects for food security and rural development in 24 countries like Angola, Tanzania, Indonesia, Bangladesh, etc. since 1972. It is my earnest hope that we concentrate on the collaborative works to address poverty and water shortage by sharing our experiences of rural and agricultural development in more proactive with neighbouring countries.

During this Congress we are going to open a series of roundtable meetings, special sessions at minister level, and various technical sessions on the questions before the Congress. The stage is set and you are the key player on the stage. I believe that your active participation and discussion will enrich the Congress and make it fruitful events.

In this Congress, we would deliberate together the water issues for rural and agricultural development under climate change. I am expecting that we could contribute to creation of a better environment for the next generations as well as this generation. I sincerely hope that this congress presents a priceless opportunity to discover viable alternatives to our common issues. The Korean government is committed to working with ICID for the development of irrigation and drainage in international level.

Before I conclude my speech, Korea is most beautiful in September. You couldn't have come here in a better time than this. Take this chance to find the beauty of Korea and leave with a fond memory.

Thank you.

SPEECH

H.E. Mr. Li Guoying
Vice Minister of Water Resources,
People's Republic of China

Sharing achievements and experiences...

Distinguished President Dr. GAO Zhanyi, Ladies and Gentlemen,

In this golden autumn, we all gather in this beautiful city of Gwangju for the 22nd International Congress of the International Commission on Irrigation and Drainage (ICID) and the 65th International Executive Council Meeting (IEC) of ICID. On behalf of the Ministry of Water Resources of China and the Chinese National Committee on Irrigation and Drainage (CNCID), I would like to extend my warmest congratulation on the grand opening of the event.

This year marks the 65th anniversary of ICID. We greatly appreciate and a dmire ICID for its enormous contribution, in promoting the development of technology and the exchange of experience in the field of irrigation and drainage, which are of high importance in achieving world food security, and stimulating sustainable economic and social development.

This year also celebrates the 35th anniversary of the Chinese National Committee on Irrigation and Drainage (CNCID). Since joining the ICID in 1983, China has attached great importance to cooperation and exchange with ICID, and actively participated in ICID activities with enthusiasm. We have successfully hosted the 42nd IEC Meeting in 1991, and the 19th ICID Congress and the 56th IEC Meeting in 2005. China has also provided full support to ICID training programs, and various initiatives such as the World Irrigation Forum, World Irrigation and Drainage Prize, and the Recognition of "Heritage Irrigation Structures (HIS)", trying to make greater contribution to the international irrigation and drainage community.

The theme of this congress is “Securing Water for Food and Rural Community under Climate Change”. I am delighted to take this opportunity to exchange with you about China’s approaches and experience in farmland irrigation.

The particular Chinese climatic and geographic conditions, as well as its traditional crop planting pattern, have determined that irrigation is necessary for almost all farmlands in China. Since ancient times, China has always been paying high attention to irrigation and drainage. Total area of irrigated farmland in China has reached 62.5 million ha, which equals to 51% of China’s total arable area, and produces 75% of food crop and more than 90% of cash crop. It is with the remarkable development in farmland irrigation that China feeds 20% of world’s population and sustains rapid social and economic development with only 9% of the world’s arable land.

Therefore, it is an inevitable choice for China to stick to the sustainable development strategy for farmland irrigation in the future. There are three basic principles for us to follow. Firstly, water consumption, policy-making and development activities shall be based on the availability of water. Secondly, water saving shall be prioritized and advanced technology will be applied to increase water-use efficiency. Thirdly, water rights will be clearly defined to serve as a basis for quota management and service guarantee. Accordingly, the 2020 development goals are set as following:

Firstly, we will basically complete the follow-up construction, supplementary projects and water-saving renovation for large-scale and key middle-scale irrigation areas. Secondly, we will vigorously promote high efficient water-saving irrigation, so that by 2020 the total effective irrigated area will account for more than 30% of China’s total farmland. Thirdly, we will realize zero increase in national aggregate water consumption for irrigation purpose, and crop yield with unit water use will reach 1.55 kg/m^3.

Ladies and gentlemen, China has entered into a new phase of development for modern irrigation, and we are willing to share our achievements and experience with the international irrigation and drainage community. Let us join hands to promote the great undertaking of irrigation and drainage, and make our due contribution to safeguarding world food security.

Finally, I would like to wish the congress a great success.

Thank you.

CLOSING REMARKS

Dr. Park, Jaesoon
Co-Chairman
National Organizing Committee

Let the Water Flow and Flourish the World

Lee, Dong-pil, the minister of Ministry of Agriculture, Food and Rural Affairs, Dr. Lee, Sang-mu, the Chairman of 2014 ICID Gawngju Congress, President of ICID, Dr Gao Zhanyi

Distinguished Guests, ladies and gentlemen and all the participants who came here Gwangju from all over the world!

Today, we are talking about the importance of water and water management, and how much they affect our lives. And in the next seven days, I expect, and hope, that we will see good results that can make our world change.

Ladies and gentlemen, today, I would like to have a meaningful event with you, carrying our hopes, to commemorate 2014 ICID Gwangju Congress. The slogan of 2014 ICID Gwangju Congress is “Flow the Water, Flourish the World.” It means that through the Water, we can achieve harmony and prosperity of mankind. This slogan is very precious because it was chosen by the people here in a vote. And I hope it carries your passion and enthusiasm for the Water.

Today, with us this afternoon are the representatives from about sixty countries. So, with these representatives from the world, we will have a ceremony of gathering the water flowing in each continent thereby expressing our willingness to bring our effort together for our common goal and better future.

We will powerfully move forward for coexistence by gathering the water from the Yellow River and the Ganges, the symbols of Asia, from the Tigris and Euphrates Rivers of Middle Asia, from the Nile River of Africa, from the Rhine River of Europe, from the Colorado River of North America, from the Amazon River of South America, and lastly from the Youngsan River, which stands for Korea and flows through Gwangju. Through this ceremony, we promise to make efforts so that our world becomes one, and I hope our promise lasts for long time to come.

Lastly, I whole heartily thank the representatives of the seven countries that have taken the trouble to come so far carrying water for their countries for this ceremony.

Thank you.

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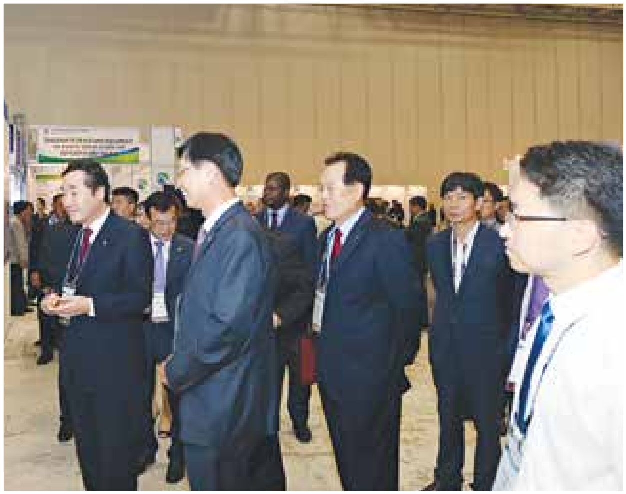
Exhibition

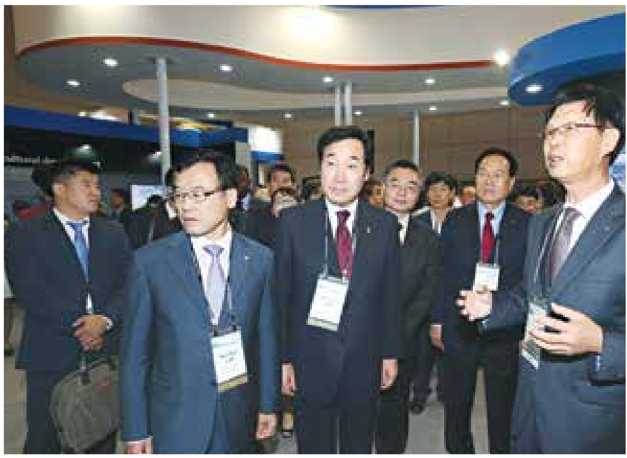
Cutting-edge agricultural water technologies and products

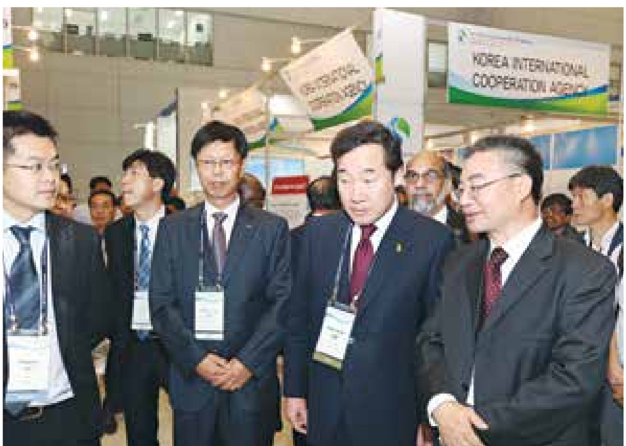
22nd ICID Congress and 65th IEC Meeting provided an attractive platform to companies to show case their own products and services through the Exhibition. This was one of the largest business events related to agriculture, water, and the environment in the region.

The exhibition consisting of 75 booths, showcased products and services provided by around 40 companies. Over 120 distinguished guests including Dr. Lee, Dong-phil, Minister of Agriculture, Food and Rural Affairs, Republic of Korea, Dr, Lee, Sang-Mu, Chairman of the KCID & NOC, Dr. Park, Jaesoon, Co-Chairman of the NOC Mr. Yoon, Jang-Hyeon, Mayor of Gwangju Metropolitan City, President Gao Zhanyi, and Er. Avinash Tyagi, Secretary General attended the ribbon cutting ceremony and visited the stalls.


고 내일
Food Production Complex






KOREA INTERNATIONAL
COOPERATION AGENCY

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9th N.D. Gulhati Memorial Lecture

Climate Variability and Change: Impacts on Water Availability

Mr. Jeremiah R. D. Lengoasa
Deputy Secretary-General,
World Meterological Organization

Mr. Jeremiah R. D. Lengoasa delivered the 9th N.D. Gulhati Memorial lecture for International Cooperation in Irrigation and Drainage on "Climate Variability and Change: Impacts on Water Availability".

Climate change adaptation in the water, as well as the agricultural sector, is not only key to water and food security but also to sustainable development in future. Irrigation, which falls at the intersection of adaptation in water and agriculture domains and serves as a tool to mitigate the adverse impacts of droughts, has contributed to the Green Revolution and continues to stabilize food production against variable weather and water availability. The need for the application of irrigation water depends largely on the timely availability of water in the form of soil moisture for the healthy growth of plants. It is therefore important to understand the variability of weather, which determines the soil-moisture, evaporation and the availability of rain to determine the irrigation requirement. How these weather and, and in the longer term, climate elements will change in future under climate change conditions will determine the long-term sustainability of food production in many areas.

The focus of the lecture therefore was on: (i) the latest scientific understanding on climate change, (ii) the efforts being made by WMO in delivering science based services through its various programmes, (iii) the new initiative that has been taken by the WMO in collaboration with other international agencies to provide climate information and services through the Global Framework for Climate Services (GFCS), and (iv) the need for broader collaboration and cooperation among different development sectors at global as well as regional and national levels.

He pointed out that if we can ensure that the needs of the agricultural sector for targeted and relevant climate services are met through closer cooperation between the institutions within the countries and the respective National Meteorological and Hydrological institutions, we would have moved a long way towards adaptation to climate change. He informed that through the new initiative of GFCS, WMO is spearheading closer collaboration between users and providers of weather and climate information and services. He invited the NCs of exploring the possibility of establishing such collaborations at the national level among the water, agriculture and climate communities of your countries and offer WMO's support to such initiatives.

In his closing remarks, Mr. Lengoasa emphasized the need for closer cooperation between ICID members and WMO to work together in the field of adaptation to climate change in agricultural water management.

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22nd ICID Congress

Securing Water for Food and Rural Community under Climate Change

Climate change is an added stressor on the increasingly complex and interlinked issues of rural development, food security under demographic changes, and overstretched environmental and natural resources. According to IPCC AR5, the major impacts of climate change in rural areas will be felt through impacts on water supply, food security and agricultural incomes. Most studies conclude that climate change impacts will be substantial, especially for developing countries due to geographical locations and because rural population suffer from low adaptive capacities. AR5 observed that climate variability, climate change, and increased incidents of extreme events constitute an additional burden to rural communities already living in poverty.

Better understanding of the effects of climate change, in the context of a framework where climate change, sustainable agriculture, poverty, food security and rural development are interlinked, is called for. Intensification of agricultural support with irrigation and favourable techniques for rainfed agriculture will play the pivotal role. This may require greater attention to ensuring stability and resilience of agricultural production and farm incomes in vulnerable regions.

Realizing that more targeted objectives can help achieve more climate resilience in rural areas, the focus of the Congress, keeping in view the mission of ICID to work towards managing water for sustainable agriculture, is clearly on water security perspective. Accordingly, the main theme for deliberations at the 22nd International Congress on Irrigation and Drainage is chosen as "Securing Water for Food and Rural Community under Climate Change", with focus on questions discussed in the chapter.

Question 58: How irrigation and drainage play an important role in climate change adaptation?

General Reporter Prof. Dr. Tsugihiro Watanabe (Japan)

Panel of Experts Dr. Takao MASUMOTO (Japan); VPH Felix Britz Reinders (South Africa); and Prof. Dr. Kim, Seong-Joon (Korea)

Water is essential for agriculture and rainfall is the source of all waters. Too little rain causes drought and too much rain causes floods and waterlogging and therefore Irrigation and Drainage had always played important roles in ensuring food security by supplementing rainfall and by draining excess water from the cropped lands. Hence, storing rainwater for future uses and agricultural drainage have been common practices the world over. To add to the complexity, the space-time domain of occurrence and distribution of rainfall has become more uncertain and unpredictable under the present and the anticipated future climate change scenarios.

Several farming systems in developing countries are at risk due to increasing water stresses from the impacts of climate change. Intervention to mitigate the impacts of increasing climate variability and consequent extreme climate events, such as floods and drought, have to be integrated in to all decision making processes in the irrigation and drainage activities.

In this context it is believed that improving irrigation and drainage systems and rural development as well as increasing food production will play a key role in achieving the rural water and food security, especially in the developing countries.

Understanding Impacts of Climate Change on Land and Water Use

Climate change has substantial impacts on both water resources demand and availability. It is critical to understand the processes driving these changes, the sequences of the changes and their manifestation at different spatial and temporal levels. The climate change can have both positive and negative effects depending on the location. Rural communities face an increasing risk of crop failures and loss of fertile topsoil owing to greater erosion. Risk of conflict over scarce land and water; and escalating ecosystem degradation, improved and integrated management of water and land resources becomes key to sustainable rural development strategies.

From the supply side, climate change affects the water cycle directly and, through it, the quantity and quality of water resources available to meet the needs of societies and ecosystems. Higher temperatures and changes in extreme weather conditions are projected to affect availability and distribution of rainfall, snowmelt, river flows and groundwater, and further deterioration of water quality. Receding glaciers, melting permafrost and changes in precipitation from snow to rain are likely to affect seasonal flows. Longer dry periods are likely to reduce groundwater recharge, lower minimum flows in rivers and affect water availability, agriculture, drinking water supply, manufacturing and energy production, thermal plant cooling and navigation.

The large contiguous areas of irrigated lands associated with river deltas are at risk from a combination of reduced inflows, change in annual flood cycles, increased salinity and rising sea levels. In irrigation systems that rely on high mountain glaciers for water, high runoff periods will advance earlier in the spring, when irrigation water demand is still low. The impacts in different regions would depend on their location according to climatic zones, topography, geology and the resilience of the community.

Revisiting Design and Operation Criteria for Irrigation and Drainage Facilities

Inherently, current engineering design practices rely on historical time series of observations assuming it to be representative of the future trends with unchanged overall statistical parameters. Design practices lack the tools that factor the changing climate trends, which are not necessarily linear. New design approaches under non-stationarity in hydrologic time series due to changing climate need to be evolved for evaluation of new project and assessed for their practicality and replicability.

As per the UN-Water Policy Brief (2010) on "Pivotal Role of Water in Adaptation", water managers who have been dealing with contemporary climate variability would have to suitably adjust interventions such as building new infrastructure, reviewing operation, re-engineering, modifying processes and demands, major rehabilitation and introducing and popularizing new efficient technologies could ultimately serve as the foundation for adapting to climate change. The emphasis would have to be on those tools and techniques that are dependent on a sound knowledge of flood and drought frequencies-as part of highly uncertain climate change scenarios.

Managing Frequent Floods and Droughts

In its Fifth Assessment Report (AR5), the Intergovernmental Panel on Climate Change (IPCC) has concluded that the frequency of occurrence of more intense rainfall events in many parts of Asia has increased and the trend is likely to be experienced around the globe. Increased intensity in precipitation is likely to cause greater peak runoffs resulting in more frequent and severe flooding. At the same time there is a 90 per cent probability that under the changing climate, the extent of drought- affected areas across climatic zones would increase. Increased water related risks associated with the changes in frequency and intensity of extreme events, such as droughts, floods, storm surges, and landslides, will put additional strain on water resources management. These extreme events have devastating and highly visible consequences for vulnerable rural communities.

Both the short term and long term measures do build resilience against extreme climate events. Some of the possible short to medium term adaptive solutions include, among others: adjusting the timing of farm operations; choosing crops and varieties better adapted to the expected length of the growing season and water availability; improving the effectiveness of pest and disease control; using water more efficiently by reducing water losses, improving irrigation practices, and recycling or storing water; and improving soil management practices by enhanced conservation of soil moisture etc.

Flood risk assessments should incorporate climate change effects on the magnitude of floods and the vulnerability of populations. Similarly, the integrated approaches to Drought Management incorporating the pre-, during- and post- drought actions covering including irrigation provisions for drought prevention, drought monitoring and drought early warning for the large regions of rainfed agriculture form essential components. Engagement of all stakeholders, right from the planning stages and mobilising the communities at large in case of post disaster recovery forms essential elements.

OUTCOME

Considering the impending climate change, intervention to mitigate the climate change impacts and consequent extreme events, such as floods and drought, have to be factored in all decision making processes in the irrigation and drainage activities.

How irrigation and drainage play an important role in climate change adaptation?

While impact assessment was the main focus of most of the papers, the number of paper that simulate the situation with changes of conditions, or project future changes due to climate change is limited, just one-fifth of the total. The papers on observations are one-third of the total, and the papers on evaluation, both with and without numerical model, form the major group. Reflecting the contents explained above, half of the paper is discussing the hydrological regime, including land and water condition and regional environment, while the number of papers discussing institution, including design criteria, regulation, and organization of irrigation and drainage management is not so large.

The topic and method of each paper or poster is quite different with wide variety of location in the whole process of approaching to climate change issues. Then, major findings are identified in exact implementation of research and development in the limited parts of the whole process. At this stage, it is very hard to do integrated impact assessment, which covers the whole agricultural and hydrological process. Therefore, each sub-process is to be evaluated and accumulation of its outcomes is to be promoted.

The changes, however, of precipitation is also projected and it might affect river discharge and available water resources for irrigation. To know actual changes of crop growth, on-farm water sufficiency, and crop production, predicting the future hydrological regime of the basin where the irrigated area is located is needed. To assess the impacts of pest and diseased caused by changed climate, and changes of cropping pattern is also important. Since these integrated approaches are quite difficult to adopt, many papers or authors/researchers are focusing on some limited paths in the whole process or mechanism of the climate change impacts.

To assess the climate change impacts and to establish the adaptation measures, hydrological tools surely play important roles, as many papers presented under Question 58 develop or apply the hydrological model from farm to basin level. There are many excellent and state-of-the art models developed for evaluation and simulation of irrigation and drainage management, conserving local hydrological environment, which should utilize these models for climate change related issues.

Understanding impacts of climate change on land and water use requires an understanding of the role and categories of the relevant models including the development and/or the modification of hydrologic models. These models involve modelling of anthropogenic water use activities, coupling of surface water models with groundwater flow models etc. The importance of analysis of observed data and continuous data acquisition was also emphasized.

Many authors proposed innovative tools and challenging approaches, for example, proposal of step-wise integrated approach for the impact assessment, treatment of water temperature, usage of RCP scenario, integration of climate smart agriculture, and climate trust fund. The necessity of research on extreme events due to climate change, such as heavy rainfalls, floods, droughts, landslides and so on was also emphasized. As much more basic and important base, application of the latest and common scenarios of the RCP for GCM experiments is recommend to be introduced in the climate change impact assessments at this stage.

For integrated approach, it is needed to analyse the relationship between climate and basin hydrology regime with water resources availability, and water management and agricultural production of the basin. These analysis/ diagnoses include various factors, which are often uncertain and inter-dependent. Therefore, integrated assessment is to be developed for better projection and evaluation of climate change impacts as the basis for better adaptation. While the "integrated assessment" is, however, actually very difficult to be developed and implemented, since the behaviour and future statuses of the various factors and players affecting each other are difficult to be projected in detail. Practically, the step-wise approaches are acceptable with scenario based projection. This scenario generation process in these approaches is to be used to assess the vulnerability of the present system.

Although, the case study utilizing the step-wise integrated approach has made the preliminary, but very logical conclusions, predicting future changes of the whole system caused by global climate change is still a difficult undertaking, and predicting future irrigation and agriculture in a specific place and year is to be considered almost "impossible". At the moment, future climate change projections are still uncertain and a challenging topic, while their reliability is surely getting higher.

Approach to adaptive adaptation

If the phenomena or factors associated with climate change and its apparent impacts are difficult to be projected and evaluated, one of the more effective and feasible measures for adapting to the impacts is to take actions incrementally; as in a trial-and-error manner, utilizing the best available current knowledge and past experience; and collecting additional information as needed. In pursuing such an adaptive approach, the step-wise integrated assessment is effective and reliable.

At present, using on-going observation and advanced modelling technologies, future events are to be predicted to some extent within certain bounds of accuracy, while in the past natural events were largely unpredictable and we could only react passively to them. With a combination of advanced prediction and local traditional knowledge, there is the possibility for wise irrigation and drainage management, smart agricultural production, and improvement of regional environments.

To keep function of adaptive adaptation in local areas, it is needed to maintain local resource in systematic manner, including water resource management system. All stakeholders should participate at some level or some extent in the process of monitoring, assessing the baseline and impacts of climate change, making decision for adaptation, and establishing mitigation measures. Although, the well-designed preparedness is quite general to be proposed, it would be most dependable and reliable action. Research and development for establishing better management system should be promoted, not only against the climate change but also for everlasting improvement of the system.

HIGHLIGHTS

i. Climate change is an added stress on the increasingly complex and interlinked issues of rural development. Interventions to mitigate the extreme impacts of climate change such as floods and drought have to be integrated in all decision making processes.

ii. Irrigation and drainage are important adaptation strategies that provide the means to mitigate negative impacts of climate change for food and water security. They generally go a long way in building resilience and promoting rural development.

iii. Negative impacts of climate change on crop yields have become more common than positive impacts. The exact problems are not well-defined in less developed regions with limited water availability, where vulnerability to climate change is higher. Therefore, it is necessary to establish effective counter-measures, assessing the past and present conditions, with innovation in methodology and state-of-the art technologies.

iv. While impacts of climate change in the atmospheric and hydrologic systems on food production are being projected, the impacts on crops, even on the major cereals, are still under initial assessment, there is a need for evaluation of the impacts of climate change on agricultural and hydrological processes, including soil-water profile, groundwater dynamics, river flow, water requirement, crop growth, drainage discharge, water quality, cropping pattern and farming system, etc. need to be evaluated and implementation of results need to be promoted.

v. Since the phenomena or factors associated with climate change and its apparent impacts are difficult to be projected with certainty, one of the more effective and feasible measures for adapting to the impacts is to take actions incrementally, as in an adaptive/trial-and-error manner, utilizing the best available past experiences and current knowledge, while collecting additional information as needed. In pursuing such an adaptive approach, a step-wise integrated assessment is effective and reliable.

Question 59: How do Irrigation and Drainage Interventions secure food production and livelihood for rural community?

General Reporter VP François BRELLE (France)

Panel of Experts VPH Dr. Ragab Ragab (UK); VP Laurie Tollefson (Canada); and Prof. Kyung Sook Choi (Korea)

Although share of agriculture in GDP in many countries around the world, including those in developing countries is low, the share of agriculture in providing livelihoods remains high in several countries. In most developing countries, increased productivity through optimal utilization of these resources vis a vis their availability has a crucial role in poverty alleviation in rural communities.

Primary concern of a farmer is the timely water availability in adequate quantity to facilitate healthy growth of crop and good crop yields. Under rainfed agriculture, the production is poor due to uncertain water availability in time and in quantity. Increased variability of precipitation especially in rainfed agriculture systems tends to increase the risk to agriculture production as compared to when there is assured availability of water through irrigation. Irrigation facilities ensure stability and resilience of agricultural production and farm incomes in vulnerable regions.

Similarly, when the rainfall is heavy, land topography unfavourable and soils have poor water transmission characteristics, natural drainage may not be enough to clear the land of excess water. in such circumstances Artificial drainage becomes necessary to maintain the crop productivity equal to its potential, lest the crops are damaged due to excess water. Irrigation and drainage interventions are, therefore, key factors in enhancing food production, maintaining its sustainability and ensuring uninterrupted livelihood of the rural community.

Securing Water and Livelihood of Rural Community

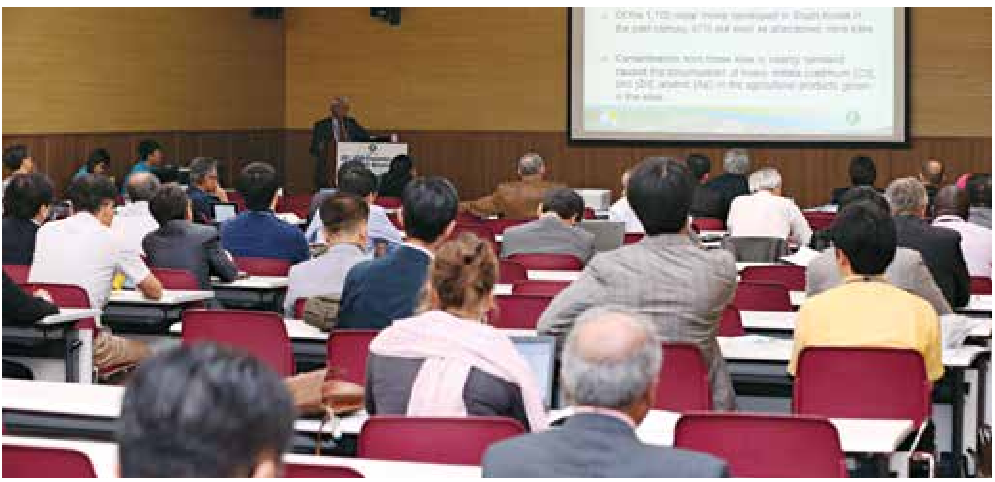
Climate change is likely to compromise water security, as the vast majority of its impacts will be on the water cycle, resulting in higher climatic and hydrological variability, with important consequences for societies. In the semi-arid zones in low latitudes, it is likely to result in more frequent and severe droughts and floods which will hurt subsistence agriculture. This has the potential to worsen the living conditions of rural populations who are heavily dependent on agriculture for their livelihood.

Water supplied by an irrigation system serves multiple roles in the rural context. More often it provides the sole source of water for drinking purposes for the humans as well as the livestock and for various other household chores that contribute to the health and nutritional well-being of the rural population. And by ensuring dependable food production, it ensures both food and water security. The papers invited to deliberate over this sub-question are expected to address improvement of livelihood of rural community with irrigation and the assessment of irrigation and drainage system impacts on natural ecology and rural community.

Improving Irrigation Efficiency

Agriculture uses 70 per cent of all water used by human beings. Due to demographic and other global changes, there is demand for greater share of water from sectors other than agriculture, particularly, energy, industry and domestic water supply. Limited water resources in water stressed regions, impacted adversely by climate change, would have to be used more efficiently while increasing food production.

In broad terms, agriculture has two options to increase the efficiency in the use of water: reduce water losses and increase water productivity. In addition, the need for providing due share for meeting ecological needs, calls for reducing absolute losses through evapotranspiration while realizing that the water lost to groundwater through irrigation conveyance systems and flood irrigation, can be used but at a cost in terms of energy required to materialize such a use. And so does conjunctive use of



surface and ground water on one end and artificial recharge of ground water through harvesting and conservation.

The papers tried to answer this question by exploring water saving techniques, automated and rotational irrigation scheduling systems, current trends and new technologies in micro-irrigation, design of micro-irrigation system and their impact on agricultural productivity, measurement of water delivery and application, rehabilitation and modernization of irrigation and drainage facilities, and new technologies to improve irrigation efficiency, water productivity and efficiency in greenhouse farming.

Water Sharing and Water Transfer in Water Stressed Areas

Water and climate do not respect borders, and many adaptation measures will have effects on neighbouring countries. This fact calls for cooperative solutions that help prevent the negative effects of unilaterally taken adaptation measures and identify more comprehensive solutions. Integrated Water Resources Management employs a variety of tools based on multidisciplinary inputs, public participation, and regulatory, financial and political incentives. Well-functioning institutions are therefore needed to effectively administer this array of fairly complex management measures.

Transboundary cooperation in developing adaptation strategies can bring mutual benefits for all riparian parties – for example, it reduces uncertainty through exchange of data and information. This cooperation can also widen the knowledge and information base, increasing the set of options available for prevention, preparedness and recovery, and thereby helping to find better and more cost-effective solutions.

The sub-question will therefore attempt at the benefits of inter-basin cooperation for productive use of limited water resources, effective use of series of cascade dams, water transfer within the domestic watersheds and in the international rivers and means of conflict resolutions. The approaches has to be based on clearly defined framework of water use rights and mechanism for water conflict resolution.

OUTCOME

After having not been considered a priority during last two decades of 20th century, compared for instance to access to water and sanitation, food security and good nutrition are now considered among major goals, along with ending poverty and achieving universal access to water and sanitation. Question 59 of the 22nd ICID Congress by addressing both issues of ensuring food security and securing livelihood in rural areas is particularly relevant within the Sustainable Development Goals (SDG) process led by United Nations <http://www.icid.org/22cong_gr_q59.pdf>.

Along with increasing the yields of rainfed agriculture, developing and improving irrigation are major ways to achieve this goal : By allowing farmers to master how and when to give water to the plants, irrigation is the best tool for securing the production against hazards of climate, and as such for ensuring food production, as regards quantity and quality as well.

The renewed interest in stable agriculture production that can be secured by irrigation, also contribute to public health and economic development and serves as a tool for social and political stability, must be accompanied by development of technical, social and economic models adopted for the development of irrigation. Such models have to take into account the experiences from the past duly incorporating the impacts and influence of recent developments, especially with regard to technological advances, new socio-economical approaches and climate changes.

Securing water and livelihood of rural community

Securing irrigation may be the major way to maintain economic activity in rural areas. It therefore, contributes to livelihood and prevent the rural populations from poverty, and thus from migrating towards cities, along with well-known increase of poverty, unemployment and criminality.

Improving irrigation infrastructures often appears as contributing to the increase of farmland area, agricultural productivity, farm income and regional development. Many cases studies have identified various ways in which the livelihoods of farmers could be improved; for instance revival of traditional practices, adequate use of so called "poor quality water", as well as changes in farm and natural ecology due to irrigation and drainage. Several authors have presented case studies and experiments relating how to better assessing the actually available water, or highlighting how identifying indigenous coping strategies adopted by farmers may help to ensure better resilience to future droughts.

Many authors have highlighted the role on which rural community can play in governance of water resource and hydraulic systems, provided that relevant capacity building is carried out. Participatory irrigation management and management by institutions may complement each other, and focus has been made on farmers' coordination, which is often achieved successfully. Last but not least, considering multiple uses of water may contribute to sustainability of irrigation systems and thus achieve rural development.

Improving irrigation efficiency

Water needs for food production are increasing. But other uses must be considered as well: water needs for environment have to be better satisfied; water for drinking and for hygiene must be made more available for more people, especially in rural areas. On the other hand, climate changes will result in lower or more irregular rainfalls in many regions, making availability of the water resource scarcer. It is therefore crucial to improve irrigation efficiency so that water can be diverted to economically and environmentally beneficial uses.

Irrigation will be compulsorily thriftier, and thus developing water saving methods, tools and techniques is essential. Works presented were related to techniques assessing the actual needs for irrigation, automated irrigation scheduling systems and water delivery measurement. Many papers have reported on how new information and communication technologies improve irrigation efficiency. Sensor networks, web information services and use of satellite data, precision irrigation are among innovative systems presented as able to make substantial water savings. Success stories of farmers' participation in governance, water management and rural development were presented. Such experiences have resulted in significant water savings and farmers becoming confident, investing for instance in water harvesting structures and drip irrigation systems.

Water sharing and water transfer in water stressed areas

Water availability is highly variable not only in time but also in space. Inter-basin cooperation, either within a country or transboundary, is often the solution to cope with spatial variability of water resources or to solve water conflicts. Systems of water use rights differ from country to country, but are often among the oldest country regulations and must be carefully taken into consideration.

In a few papers, the issue of virtual water trade was also addressed, for instance by evaluating the water dependency, i.e. the level to which a nation relies on foreign water resources, the trade intensity, and analysing the imbalance of global virtual water trade.

Overview

A key element in irrigated agriculture development is the concept that long-term sustainability which can be achieved only if, (i) water resource is properly conserved, (ii) active participation of the major stakeholders, i.e. the farmers, and (iii) by way of recovering O&M and water management costs. These conditions rely on a secured water resource and the livelihood of farmers / water users. Both are closely dependent on the performance of the irrigation, from water resource management to distribution, which thus appears as a key factor for improving farmers' revenue and rural population livelihood.

HIGHLIGHTS

i. Securing irrigation water makes food production safe and is one of the ways to maintain – or re-settle – people in rural areas, by giving them an economic activity. It therefore contributes to securing livelihood and protects the rural population from poverty, and thus from migrating towards big cities, increasing poverty and unemployment.

ii. Multiple use of water in irrigation systems and adequate use of poor quality water as well as changes in farm and natural ecology due to irrigation and drainage are important development factors in rural areas. Attention must be paid to the role which the rural community can play in the governance of water resource and hydraulic systems, provided that relevant capacity building is carried out.

iii. Water needs are increasing for food production yet water needs for the environment have to be better satisfied; water for drinking and for hygiene must be made more available for more people. On the other hand, climate changes will result in many regions, in lower or more irregular rainfall, often making water resource scarcer. It is therefore crucial to improve irrigation efficiency. As irrigation will be compulsorily thriftier, developing water saving methods and techniques is essential.

iv. Ways for improving irrigation efficiency are through automated and rotational irrigation scheduling systems and measurement of water delivery and application. Modernization of irrigation and drainage facilities are of course a means towards water savings and therefore a better productivity of irrigation water, which can be achieved not only by implementing new technologies, but also through integrated irrigation and drainage management systems.

v. Inter-basin cooperation, either within a country or transboundary, is often the solution to cope with limited water resources or to solve water conflicts. Water use rights differ from country to country, but are often among the oldest country regulations and must be carefully taken into consideration.

5

Special Session, Symposium and Workshop

SPECIAL SESSION

New Partnership for Rural Development

General Reporter Dr. Nam Ho Lee (Korea)

High population growth and consequent high demand for food and nutrition, competing demands for natural resources (land and water) by various sectors, sustainability issue and climate change have turned agriculture from a localized vocation into a country level and international concern to improve crop, water and land productivity to efficiently support life on the earth without degrading the resource bases (environment). Promoting climate friendly and resilient agriculture and improving processes to preserve the environment, requires clear understanding of the multi-dimensional cause and effect mechanisms. As such, climate change adaptation is a research field which is constantly evolving. New technical options for adapting to these climate change impacts are being devised. Farmers, authorities and experts should be able to exchange and constantly integrate new information, such as climate information into their adaptation strategies across sectors at all levels.

Recognising the importance of overall rural development, during the Congress papers were invited on evaluation and new trends in the international cooperation for rural development; implementation strategy for the activation of rural development project in Overseas Development Assistance (ODA); role of UN agencies, donor countries and institutions for holistic implementation of ODA and the role and contributions of ICID member countries and other NGOs to the successful advancement of MDG’s goal.

OUTCOME

Recognizing the importance of overall rural development, the Special Session on 'New Partnerships for Rural Development' deliberated on the related aspects. Developing countries currently have limited access to effective funding mechanisms to support adaptation to climate change. More funding must be made available for adaptation strategies to become sustainable. Increased support is needed for adaptation actions through targeted financing and improved aid effectiveness. All countries should have access to funds to improve their adaptation strategies in a holistic way through partnership. Sound land and water management practices that provide mitigation and adaptation benefits should be eligible for such funding. There is a need to set up a National Rural Network (NRN), bringing together all stakeholders involved in rural development in order to facilitate the pooling and exchange of expertise and know-how and to identify transferable practices. The session came out with following recommendations:

Rural development needs to be managed by the locals in partnership with external players and support. Micro-financing is a possibility and sometimes communities may not require government/external support for rural development.

There is need to bring a feeling of community ownership and voluntary participation, an important ingredients for successful rural development, through capacity development, government support to the decisions made by the community and partial government financing.

Development of Agro/Eco-park is crucial for rural development, where all stakeholders are organized through a network, resources are equitably distribured, wastes are decreased, innovative technologies used and quality products are exported.

Increasing food production is invariably the focus of agricultural development, but value chain development (adding value to market products) is missing.

There is need to move from PPP to PPPP (the 4th P is for producers), leading to participatory approach in the community including woman in the rural development model.

SYMPOSIUM

Non-point Sources Pollution (NPS) and Best Management Practices (BMPs)

General Reporter Dr. Anna Tedeschi (Italy)

Agriculture, due to its large-scale use of chemicals, is the most conspicuous activity domain causing non-point source (NPS) pollution of the farm lands, the surface water and the groundwater. Added to this is the pollution due to particulate matter such as sediment and sewage disposal, both of which have physical and chemical ramifications. The land, the surface water and the groundwater are used for purposes other than agriculture, thereby posing a greater ecological danger of a much larger dimension than what is generally thought. Topic of NPS was consciously included this topic as the Symposium to get a world view of the problem and its probable remedies.

Environmental issues such as climate change, ozone depletion, biodiversity, erosion, deforestation, desertification, and NPS pollution are global concerns. These challenges are exacerbated by the rising trend of the world population and consumption. The most important global issue is satisfying the ever-growing need for natural resources to meet food and living-standard demands, while minimizing adverse impacts on the environment that already show signal of degradation, acknowledging that agriculture is currently the single greatest contributor of NPS pollutants to soil and subsurface water resources. The NPS pollution is of greater environmental concern than point source pollutants because they are ubiquitous and the task of clean-up is costly and nearly impossible to accomplish. NPS cannot be traced to a point location or source in contrast to the point source pollutants which are identifiable and more easily controlled than NPS. Non-point sources pollutants are largely a consequence of agricultural activities, industrial and urban runoff, mining and forest harvesting activities, path salt runoff, atmospheric deposition, and hydrological modification i.e., diversion, dam, over pumping of groundwater etc.

The evaluation of the effect of agricultural management practices on NPS pollution on local, regional, and global scale has become a key component of strategies for achieving sustainable agriculture and mitigating harmful environmental impacts. This is a challenging requirement as the assessment of NPS pollutants is a complex, multidisciplinary environmental problem that encompasses coupled physical and chemical processes that occur across disparate spatial and temporal scales.

The detrimental environmental health effects of NPS pollutants, even at low concentrations, are chronic rather than acute. Less expensive pollution prevention strategies are preferred that advantageously anticipate and prevent NPS pollution before it occurs and avoid the future need for costly remediation efforts. Therefore, Best Management Practices (BMP) – policies and strategies, are needed to help reducing NPS pollution and thereby ensuring sustainability in food production.

The target of sustainable agriculture is predicted to be on a delicate balance of maximizing crop productivity and maintaining economic stability while minimizing the utilization of finite natural resources and detrimental environmental impacts associated with NPS pollutants. This is a dilemma because on one hand there is the growing pressure of meeting the food demands of a constantly growing population, but in doing so the likelihood of detrimentally impacting the environment with NPS pollutants seems inevitable.

OUTCOME

For all the reasons above described, the International Commission of Irrigation and Drainage considered it important to encourage the scientific community to give attention to the NPS issue and to bring to the fore the environmental problems involved in the different countries and the BMP.

Most of the responses to the themes (all together 59 contributions) were from Korea and China. Only one European country submitted full papers and it was Italy (2 papers). Outside Europe, Iran and Japan as well submitted a full paper. The weak response from various National Committees is not a sign of the absence of NPS problem in these countries, but it is more linked to the current world economic moment in which, as well as other sectors, the scientific community is fighting to get funds for conducting large-scale and meaningful research.

The related assessment studies are often undertaken on sites of limited extension (from a few hundred square meters to few thousands of square meters) and in the laboratory. It is, therefore, unclear whether these studies do really represent the behaviour of NPS, rather than point source pollution. A particularly relevant issue is whether these studies address the spatial and temporal variability of the sites. In this scenario, a true assessment of the proposed Best Management Practise (BMP), or rather the indirect deduction of a BMP that can be inferred is not yet possible to draw because it should be confirmed in the long-term evaluation.

Further, it is observed that NPS pollution load is sensitive to climate change parameters thus there is need to develop adaptation measures for reducing the impacts of climate change on NPS pollution based on various climate change scenarios presented by downscaled GCM models. As a general conclusion, there are a number of potential areas of interest that could be put on table for discussion and to elaborate recommendations for future work necessary to cope with the topics.

Sustainable Management of Tidal Area in the Era of Climate Change

General Reporter Dr. Ruey-Chy Kao (Chinese Taipei)

Well-managed paddy fields, irrigation canals and freshwater reservoirs have excellent functions as wetland to provide habitats for birds, fishes and worms throughout the year. There still remain problems to cope with the disaster caused by the Typhoon and Tsunami near the tidal areas. Tidal lowland development will continue to meet the needs of the ever expanding population. It is estimated that 10% of the increase in food production required in 2050 will have to come from newly reclaimed lands. In tidal areas, fresh water is needed to reclaim saline land for agriculture, to irrigate new agricultural land, to create and maintain fresh water lakes, etc. Development of tidal areas will also be affected by systemic changes such as population growth and those arising from climate change, e.g. the predicted sea level rise and increase in the intensities of storms.

Seven full papers from Korea, Indonesia and Taiwan were discussed addressing some of the aspects related to the sustainable development of tidal areas under changing climate. Yang et al. presented a coupled prediction of inundation and land subsidence using the one-dimensional land subsidence (LSUB1) model in Yunlin County in Taiwan. The conclusion was that the study results could be applied to map out the potential inundation and establish flood-mitigation measures by the flood control authority through a decision support system.

Herawati et al. from Indonesia analysed the river flow regime changes related to water availability on Kapuas River as the likely result of climate change. The result shows the changes in the hydrological

aspects of the study area that have altered the river flow regime of Kapuas River within the last 30 years and has influenced the river water availability. The paper by Mawandha et al. show how mini polders can be used as an alternative of flood management in the lower Bengawan Solo River in Indonesia.

Dal-Lim et al., focussed on the reclamation activity of the Saemangeum intertidal area in the south-western part of Korean Peninsula. Based on the monitoring of growth rates of the salinity tolerant saplings, the suitable plant species and the nursery bed dimensions were recommended. Lee et al. discussed the beach morphological changes and beach nourishment effects on the Byunsan Beach, West Coast, South Korea..

Ham and Hong performed uncertainty analysis to investigate the effects of various types of uncertainties on water quality predictions using generalized likelihood uncertainty estimation (GLUE) for model parameter uncertainty and Monte Carlo simulation (MCS) for climate data and predicted PS load uncertainties.

OUTCOME

The era of climate change, the anticipated sea level rise in the future, highlights the need of sustainable management of tidal areas. Evolving strategies, as above, to address the impacts will thus be essential. The Chairman, therefore, believed that this international workshop contributed to an improved understanding of and brought out new information relevant to the sustainable management of tidal areas in the era of climate change.

6 Ministerial Meeting

Ministerial level representatives from eight countries, which included Ministers from Russia, Mongolia, Myanmar, Vietnam, Kazakhstan, Thailand, Philippine and Uganda, participated in the meeting. These countries have close business relations with KRC (Korea Rural Community Corporation). The session was chaired by KRC President Dr. Lee, Sang-Mu. During the meeting they shared their experiences on “New trends in international cooperation for rural development in the 21st Century”, “Public Private Partnership (PPP) for rural development” and “Bilateral and multilateral cooperation for rural development” and other related issues. The meeting was successful in strengthening relations among invited countries and provided a forum for sharing knowledge and experiences of rural development and discussion of issues at the level of ministers dealing with agriculture and rural development, food security and poverty eradication.

Dr. Lee Sang-Mu emphasized the need for future cooperation between the countries. He stressed on the mutual benefits of the collaborative efforts that are implemented based on actual needs, practicality, efficient and cost effectiveness, and most important, in a transparent and accountable manner. Need for a regional block like Asian Union similar to European Union (EU) was also discussed. It was generally agreed that, cooperation between nations is the way to improve the quality of life of people living in rural area especially in developing countries. A technical tour of Yeongsang River Basin Agricultural Development Project was arranged for participants.

7

Roundtable Meetings

The purpose of the round table meeting was to provide developing countries with opportunities to discuss food security and to share their own experiences to overcome the challenges. In addition, it provided a chance to share knowledge and experiences on better agricultural practices and technologies with close cooperation and networking at international level. The roundtables were centred around theme ' Irrigated agriculture and rural development in developing countries' with following topics: Governance on rural development in developing country; Agricultural water development and its effects on food production and rural development; and Process of comprehensive agricultural development project and cases of well-developed model on rural development.

Roundtable 1

In the Roundtable on "Agricultural water development and its effects on food production and rural development", participants from Argentina, Ghana, India, Tanzania, Angola, DR Congo, Ethiopia, Ivory Coast, and Madagascar took part in the meeting.

Participants discussed the Korean experience on irrigation and rural development focusing on policy transition and international cooperation with the objective to explore the replicability of Local Community Movement (Saemaul Undong), a very successful movement in Korea in agriculture and rural development. Prof Tai Cheol Kim, Chairing the session explained as to how Korea struggling like a poor least developed country in 1950s moved on to became an advanced country in less than one generation. He.described and stressed the importance of policy transition from the modernity to post-modernity. This economic growth was brought in by focussing on food security to begin with, he emphasised. Sae Maul Undong (SMU), the movement served as a mental revolution used to break people's pessimism and activate rural community, served as a framework.

In the 1980s, "export oriented industry" with the barter trade system had been set up under the staple food security and stable society. In the 1990s Korea became a member of OECD and joined WTO. Restructuring of irrigation schemes such as large plots and automation formed an important part of the rural development policy. However, the priority of irrigation project among the rural development was determined by the residents and farmers through a "bottom-up" approach. In the 2000s, the concept of sustainable development was recommended and reflected into the budget allocation. In the 2010s, Korea began reciprocating the ODA favours which were once received from advanced countries in the 1950s.

Mr Thierry Facon (FAO) in his background paper introduced the new challenges and questions for irrigation in Asia. Mr. Ryu Jeon Yong (Korea) highlighted the agricultural water infrastructure development policies in Korea in the past decades that were responsible for transforming South Korea in to a developed nation. It was emphasized that the directions of irrigation and rural development largely depends on the level of the economic growth.

Roundtable 2

The Roundtable – 2 focused on "Agricultural water development and its effects on food production and rural development" which was chaired by Dr Sylvester Mpandeli (South Africa). It was opined that the agricultural water development was one of the key approaches in increasing food production and rural development particularly in developing countries. It can be achieved through constructing new irrigation infrastructure and increasing efficiency in utilising water resources for irrigation.

Mr. James K Akatse (Ghana) informed of the development of National Irrigation Development Master Plan to guide the development of irrigation and water management in Ghana. Dr Suresh Kulkarni (India) sought the support from members to implement modernisation of irrigation water delivery systems including their operation and on-farm management so as to use the available water efficiently and productively. Mr. Aloyce L Masanja (Tanzania) strongly supported the use of water-saving

technologies for food production and livelihoods. He said that the System of Rice Intensification has enhanced water use efficiency and increased rice productivity in Tanzania from 2 tons per hectare to as much as 8 tons per hectare recently.

Mr. Joaquim D Gomes (Angola) informed that Angola is a well-endowed country with water resources but the 30-year-old civil war kept much of the productive processes underperforming. However the national government has developed a comprehensive irrigation development plan (PLANIRRIGA) to improve water management in general and development programmes aiming at facilitating agricultural development and rural development in particular. Mr. MAMANGA ma MBNZA Joachim (DR Congo) informed of the successful launch of Tshuenge integrated rural water development pilot project. He emphasised the need for creation of specialised institutes and universities to focus on irrigation water management in agriculture.

Mr. Brahima Kone (Ivory Coast) talked about the National Agency for Support to Rural Development (ANADER) which played an important role in the dynamics of National irrigation development. However ANADER will need to strengthen its own capacity for irrigation and management of irrigation schemes. Mr. Rakotonirina Luc Marcel (Madagascar) questioned the target of increasing the productivity of water for rain fed agriculture and irrigation by 30% between 2000 and 2015 and increases the irrigated area by 50% during the same period and suggested the proper implementation of water code and regulations.

Roundtable 3

The Roundtable - 3 addressed the "Process of comprehensive agricultural development project and cases of well-developed model on rural development" which was chaired by Prof Jang Tae-il (Korea). Numerous food security and rural development programs have been implemented in previous decades and information of successes and limitations of these programs need to be shared globally for development of better program. The roundtable was attended by 9 countries - Bangladesh, Cambodia, Philippines, Thailand, Bolivia, Indonesia, Lao DPR, Myanmar and Vietnam.

Dr Kamrul Ahsan (Bangladesh) presented the "Comilla Approach to Rural Development in Bangladesh" which is a well-known rural development model through which physical, institutional and administrative development infrastructures of rural areas took place. Dr. Pheak Sothea (Cambodia) presented the "Integrated Rural Development Model" which contributed to improve the rural economics of the poor which encouraged the rural community participation in the rural development programmes.

Dr. Somkiat Prajamwong (Thailand) discussed the "Mae Yom Operation and Maintenance Project" as an example of an initiative to mitigate drought in Thailand by easeing water conflicts in Thai society. Mr. Soe Myint Tun (Myanmar) presented the case study for implementation of comprehensive agricultural development project by land consolidation model farm in central dry-zone of the country. This, they hope, will establish the foundation for commercial agriculture in Myanmar. Prof Nguyen Tuan Anh (Vietnam) demonstrated the use of water-saving technologies in increasing the productivity of Grape and Dragon fruit.

Mr. Herman Z. Ongkiko (Philippines) presented the comprehensive agricultural development project

cases of a well-developed rural development model which led to 15% increase in crop yields and 12% increase in household income resulting in long lasting peace and development in the rural communities. Mr. Oscar M Silva (Bolivia) presented the case of irrigation Project La Angostura which focused on capacity building of farmers in integrated best practices for intensive production at the family level, seems adequate for promoting true development of the farmer population in the Valley regions of Bolivia.

Conclusions

After the Roundtable Meetings, a panel discussion was moderated by Prof. Chun Gyeong Yoon (Korea) and Dr. Thierry Facon (FAO). During the session, key issues such as Irrigation, agriculture, food security and rural development were discussed.

The Roundtable meetings provided an important platform to share experiences, problems, case studies and innovative ideas for solving the problems of addressing rural development issues with focus on the role of irrigation development in the member countries. It was recommended that similar Roundtable meeting should be held regularly during ICID events as they provide an important platform to share experiences, problems, case studies and innovative ideas for solving the problems among member countries.

8

The Gwangju Statement

The 22nd International Congress on Irrigation and Drainage with the main theme "Securing Water for Food and Rural Community under Climate Change" was held during 14-16 September 2014 at Kimdaejung Convention Centre in Gwangju Metropolitan City, Republic of Korea, organized and hosted by Korean National Committee of ICID (KCID). The Congress was attended by more than 1100 delegates from 61 countries.

Based on 228 papers and posters from 42 countries submitted, the participants discussed the two Questions i.e. Q. 58: "How Irrigation and Drainage play an important role in Climate Change Adaptation?" and Q.59: "How do Irrigation and Drainage Interventions secure food production and livelihood for the rural community". During the Congress, in addition to addressing these two questions, a Round Table meeting on 'Irrigated Agriculture and Development in Developing Countries', a Symposium on "Non-point Pollution – Best Management Practices", special sessions on "New Partnership for the Rural Development", and a number of side events were also organized.

Question 58: How Irrigation and Drainage play important role in Climate Change Adaptation?

i. Climate change is an added stress on the increasingly complex and interlinked issues of rural development. Interventions to mitigate the extreme impacts of climate change such as floods and drought have to be integrated in all decision making processes.

ii. Irrigation and drainage are important adaptation strategies that provide the means to mitigate negative impacts of climate change for food and water security. They generally go a long way in building resilience and promoting rural development.

iii. To mitigate climate change on agricultural water use, installation of water measurement equipment in irrigation projects, modernization of current irrigation systems, encouragement of people as well as relevant stakeholders (irrigation cooperatives, NGOs, etc.), leading to sustainable irrigation water use.

iv. There should be more efforts to addressing flood and drought risks in agriculture at the policy level with adequate integration into agricultural development policies, plans and programmes. A community-centred bottom-up approach and model-based analysis are good ways forward that address the risks of current and advanced adaptation and resilience for the future.

v Negative impacts of climate change on crop yields have become more common than positive impacts. The exact problems are not well-defined in less developed regions with limited water availability, where vulnerability to climate change is higher. Therefore, it is necessary to establish effective counter-measures, assessing the past and present conditions, with innovation in methodology and state-of-the art technologies.

vi. While impacts of climate change in the atmospheric and hydrologic systems on food production are being projected, the impacts on crops, even on the major cereals, are still under initial assessment, there is a need for evaluation of the impacts of climate change on agricultural and hydrological processes, including soil-water profile, groundwater dynamics, river flow, water requirement, crop growth, drainage discharge, water quality, cropping pattern and farming system, etc. need to be evaluated and implementation of results need to be promoted.

vii. Since the phenomena or factors associated with climate change and its apparent impacts are difficult to be projected with certainty, one of the more effective and feasible measures for adapting to the impacts is to take actions incrementally, as in an adaptive/trial-and-error manner, utilizing the best available past experiences and current knowledge, while collecting additional information as needed. In pursuing such an adaptive approach, a step-wise integrated assessment is effective and reliable.

Question 59: How do Irrigation and Drainage Interventions secure food production and livelihood for rural community?

i. Securing irrigation water makes food production safe and is one of the ways to maintain – or re-settle – people in rural areas, by giving them an economic activity. It therefore contributes to securing livelihood and protects the rural population from poverty, and thus from migrating towards big cities, increasing poverty and unemployment.

ii. Multiple use of water in irrigation systems and adequate use of poor quality water as well as changes in farm and natural ecology due to irrigation and drainage are important development factors in rural areas. Attention must be paid to the role which the rural community can play in the governance of water resource and hydraulic systems, provided that relevant capacity building is carried out.

iii. Water needs are increasing for food production yet water needs for the environment have to be better satisfied; water for drinking and for hygiene must be made more available for more people. On the other hand, climate changes will result in many regions, in lower or more irregular rainfall, often making water resource scarcer. It is therefore crucial to improve irrigation efficiency. As irrigation will be compulsorily thriftier, developing water saving methods and techniques is essential.

iv. A common definition of how we define water use across sector is required for a common understanding of the concept of "Irrigation efficiency". We need to define what, when, where and why? Improving irrigation efficiency requires an integrated approach which includes: agronomic, engineering, management, institutional, policy and social parameters. Focusing on a single approach will fail.

v. Water sharing often accompany with conflicts among different water users. Agreements need to be made not only among countries but also within domestic activity sectors. Considering complex nature of water sharing, decision must be made when and where to distribute water resources with adequate quantity and quality to meet water demands.

vi. Ways for improving irrigation efficiency are through automated and rotational irrigation scheduling systems and measurement of water delivery and application. Modernization of irrigation and drainage facilities are of course a means towards water savings and therefore a better productivity of irrigation water, which can be achieved not only by implementing new technologies, but also through integrated irrigation and drainage management systems.

vii. Inter-basin cooperation, either within a country or transboundary, is often the solution to cope with limited water resources or to solve water conflicts. Water use rights differ from country to country, but are often among the oldest country regulations and must be carefully taken into consideration.

New Partnerships for Rural Development

High population growth with changing dietary habits results into high demand for food and nutrition from the limited natural resources (land and water). Improving processes to preserve the natural resources require clear understanding of the multi-dimensional cause-and-effect mechanisms in the sphere of agriculture and rural development. Developing countries currently have limited access to effective funding for developing such mechanisms and preserve land and water degradation. Recognizing the importance of overall rural development, the Special Session on 'New Partnerships for Rural Development' deliberated on the related aspects and came out with following recommendations:

- There is need to bring a feeling of community ownership and voluntary participation, an important ingredients for successful rural development, through elections in each community, capacity development, government support to the decisions made by the community and partial government financing.
- Increasing food production is invariably the focus of agricultural development, but value chain development (adding value to market products) is missing.
- There is need to move from PPP to PPPP (the 4th P is for producers), leading to participatory approach in the community including woman in the rural development model.
- Development of Agro-park/Eco-park is crucial for rural development, where all stakeholders are organized into a network, resources are circulated, wastes are decreased, innovative technologies used and quality products are exported.
- Rural development needs to be managed by the locals in partnership with external players and support. Micro-financing is a possibility and sometimes communities may not require government/external support for rural development.

Working towards a cooperative network

ICID has encouraged developing countries to participate in its activity, because water for food is the most important issue that determines their food security. Developing countries learn lessons from the developed countries who have transitioned recently, particularly countries like Korea which has taken long strides in economic growth in the past thirty years. A Round Table Meeting (RTM) was organized by the Korea Rural Community Corporation to build up a cooperative network with global partners. Experts from 17 countries and 5 international organizations presented 23 papers. The invited experts shared their experiences and discussed various issues connected with on food security and rural development and the means to overcome these challenges.

Recognizing that the irrigation projects in each developing country have their own characteristics depending on their local needs and stage of economic transition, the RTM called for institutional innovation of the irrigation agencies and associations to provide the practical services to farmers. In the process it is necessary to involve the farmers in the operation and maintenance of irrigation facilities, provide them required technical training and enhance the effectiveness of implementation of rural development programs through monitoring and evaluation of existing rural development projects for more promising outcome from upcoming projects. The Round Table called for establishing the feasibility of an organization like International Rural Development Cooperation Center with the objective to facilitate sustainable solutions for improving living condition of residents in rural area.

Management of non-point sources of pollution

Non-point source pollutants are mainly a consequence of agriculture activities which are currently recognized as the single greatest contributor of NPS pollutant to the soil and water sources. Assessment of NPS, which is the first step in dealing with the issue itself is a complex issue requiring interdisciplinary inputs. The Symposium on "Non-point Sources Pollution and Best Management Practices" was the main theme. Developing less expensive Best Management Practices (BMPs) is important to prevent NPS pollution before it occurs and enters the water bodies in order to ensure quality water resources and consequent sustainable agricultural food production. While the symposium fell short of identifying 'best management practice', it raised some major concerns and observations that need to be addressed in dealing with NPS and suggested that the following points may be kept in view while assessing best management practices.

- As the present state of methodology of assessment of the NPS of pollutants are lacking there is need to consider the long-term evaluation studies in various conditions in order to draw clear and robust guidelines for structural and non-structural BMPs.
- Process-based models, which are able to consider the fate and behavior of agrochemicals, need to be used for assessing the effects of BMPs on agricultural water resources in advance and should take into account the weather variables (ex. rainfall) in the impact assessment.
- Impact of climate change in agricultural NPS pollution cannot be ignored and uncertainties of climate change scenarios should be considered through multi-model ensemble (MME) and appropriate downscaling methods.
- Assessment of proposed BMPs should consider their economic feasibility.

Study Tours

Technical Tours were an added feature to the Congress to showcase the success stories of comprehensive agricultural development in Korea.

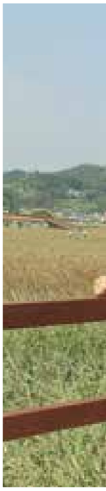
Technical Tour – 1 took the participants to Yeongsan River to look at comprehensive agricultural development project and climate change mitigation measures. This tour gave a chance to experience agricultural project with regional development, cultural shows at temple and dynamic experiences at F1 circuit, a unique racecourse for F1 grand prix in Korea.

Technical Tour – 2 took participants to Saemangeum project, which is one of the biggest comprehensive agricultural development projects to develop land resources and freshwater lake with 33 km sea dike, the longest in the world.

Technical Tour – 3 took the participants to short YeongsanA River Project. The itinerary Aincluded Jangsung dam, Baekyang Temple and Gwangju Binnale, the choicest tourist attractions.

Accompanying Persons Tours

The accompanying persons tours were (1) Cradle of Namdo culture and art in Gwangju – Gwangju Binnale – Gwangju National Museum – Gwangju Folk Museum – Mt mudeung were the attractions (2) The Centre of Joseon dynasty in Jeonju – Jeonju Pungnam Gate - Jeondong Catholic church – Gyeonggijeon – Jeonju Village where the attractions.

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Social Events

Several social events were organized by various national committees to promote harmony, brotherhood and strengthen relationships among ICID memberships:

- 14 September 2014: Welcome Diner by the host National Committee – KCID
- 16 September 2014: French Reception for 2015 by the French National Commmitee – AFEID
- 17 September 2014: Thai Invited Dinner for 2016 by Thai National Committee (THAICID)
- 18 September 2014 Reception for Korea – China – Japan
- 18 September 2014: Iranian Invited Dinner by Iranian National Committee (IRNCID)
- 19 September 2014: Farewell Dinner by the host National Committee – KCID



Korea Rural Community










Congress Wrapup Session

OPENING REMARKS

Dr. Gao Zhayni
President
International Commission on
Irrigation and Drainage

President Dr. Gao Zhanyi welcomed the participants to the Wrap-up Session of the 22nd ICID Congress. The session started with keynote speeches by H.E. Mr. Shavkat Khamraev, Minister of Agriculture and Welfare, Uzbekistan on the topic “Improvement of the condition of irrigated land and efficiency of water use in a guarantee of sustainable development”; H.E. Sattar Mohmoudi, Senior Vice Minister of Energy, Iran on the topic “Water, energy and food nexus”; and Mr. Jae-Beom Son, Secretary General, Korean Advanced Farmers Federation (KAFF) as representative of Korean Agriculture.

Prof. Dr. Tsugihiro Watanabe (Japan) presented the outcome of the Question 58: How irrigation and drainage play an important role in climate change adaptation?

Vice President François BRELLE (France) presented the outcome of the Question 59: How do irrigation and drainage interventions secure food production and livelihood for rural community?

Vice President Prof. Kim, Tai-Cheol (Korea) delivered the closing remarks.

President Dr. Gao Zhanyi presented plaques to the retiring Vice Presidents and Chairs of workbodies.

At the end Secretary General Avinash C. Tyagi gave Vote of Thanks speech and thanked all the participants for their active participation in enriching the value of ICID Congress.

KEYNOTE SPEECH

H.E. Mr. Khamraev Sh.R.
Deputy Minister of Agriculture and
Water Resources,
Republic of Uzbekistan

Improvement of the Condition of Irrigated Land and Efficiency of Water Use is a Guarantee of Sustainable Development

Dear Ladies and Gentlemen,

Let me greet all the participants of the Congress!

Irrigation and drainage plays an important role in the life of Uzbekistan by ensuring national food security. The issues related to the improvement of the condition of irrigated land, rational and efficient use of water resources and enhancement of irrigated soil fertility are among priority directions in the national development policy. Since independence, owing to recognition of the social value of irrigation in the water sector, Uzbekistan has managed to preserve its irrigation fund and modernize and improve irrigation systems.

At present, under conditions of growing water deficit, Uzbekistan is playing a leading role in application of advanced technologies and promotion of efficient water use in irrigated areas. The Republic has pioneered the development and implementation of integrated water resources management (IWRM) using the example of the Fergana Valley. This allowed aggregating all modern methods in irrigation water management, improving institutional structure and technical facilities, with consequent saving of 200 Mm3/year on an area of more than 130,000 ha.

During the period from 2008 to 2014, optimal groundwater bedding was achieved on an area of 1,500,000 ha to ensure good growth and development of crops. Moreover, the irrigated areas with groundwater table of less than 2 m have decreased by 117,600 ha, and 113,000 ha of strongly and medium saline land were brought to the condition of slightly saline and non-saline land.

For further improvement of irrigated land conditions, development and enhancement of irrigation and drainage structures, effective use of water resources, and increase of irrigated land productivity, the

2013 Decree of the President of Uzbekistan identified integrated measures and targets for reclamation of irrigated land over 2013-2017, for construction, reconstruction and rehabilitation of irrigation systems, and for application of drip irrigation. More than US$1.2 billion were allocated for these purposes.

More than 80% of water used in Uzbekistan flows from neighboring countries. Dry years are becoming more frequent in the Aral Sea basin. Before 2000 dry years occurred every 6-8 years, whereas recently they repeat every 2-3 years. Under such conditions, the rational and efficient use of water resources and improvement of irrigated soil fertility are among the development priorities.

According to the Uzbek Government's Decree, agricultural producers, who adopted drip irrigation or other water-saving technologies, have a right to use saved water for growing crops on the areas made available from cereals, and agricultural entities applying drip irrigation also exempted from the land tax for 5 years.

This work on adoption of advanced technologies is accompanied by a widespread capacity building company. More than ten thousand persons among the personnel of water management organizations and staff of WUAs, especially, farmers get trained every year.

The Republic pays particular attention to agricultural diversification. Water intensive crops, such as rice, cotton, and alfalfa are replaced by less water consuming crops, such as cereals, cucurbits, orchards, vines, etc. While at the beginning of the 1980s cotton occupied more than 2 Mha out of 4.3 Mha of the total irrigated area (about 50%), nowadays the cotton area is slightly more than 1,250,000 ha or 30%, i.e. almost twice less. The area under rice was reduced from 180,000 ha to 40,000 ha or 4 times.

As a consequence of the above-mentioned measures, the total water diversion decreased from 64 to 51 billion m3 a year (21%) as compared to the 1990s in the Republic. The unit water diversion for irrigation of one hectare decreased from 18,000 m3/ha to 10,500 m3/ha. However, despite the undertaken water-conservation measures, irrigated land in Uzbekistan suffers from water shortage.

An important impetus to solution of water problems was given by the Interstate Commission for Water Coordination, which was established in 1992. This is a unique interstate organization that, along with planning of water allocation among the five countries, undertakes management, monitoring and coordination of activities related to water management and improvement of this process. Another important cooperation institute - International fund for Saving the Aral Sea - was formed in 1993.

Dear participants of the Conference!

We realize very well that the objectives set for food and water security are difficult to achieve without fruitful cooperation and active interactions with international organizations, among which ICID takes a special place. We are appealing to ICID, which has a colossal experience and great reputation, for continuation of activity aimed to ensure stable and guaranteed access to water and food for all in need, especially in the arid zones.

Thank you for attention

KEYNOTE SPEECH

H.E. Mr. Sattar Mahmoudi
Senior Vice Minister of Energy
I. R. Iran

Water, Energy and Food Nexus

Excellencies,

Dear Guests,

I have the pleasure to thank all of the organizers of this great event held in the beautiful city of Gwangju in South Korea. My special thanks goes to Dr. Gao, President, ICID, Er. Tyagi, Secretary General, ICID, Dr. Lee Sang Mu, Chairman KCID and his wonderful team.

Ladies and Gentlemen,

Water security, energy security and food security are all linked together and actions in one area often have impacts in one or both of the others. A reliable supply of water, energy and food is one of the most challenging issues at present and in future.

Food production is the largest consumer of global fresh water supplies, so far. Agriculture is responsible for an average of 70% of fresh water consumption by humans. In some countries this figure jumps up to a range of around 80%-90% or even higher. Agriculture is therefore also responsible for much of fresh water over-exploitation. Food production further impacts the water sector through land degradation, changes in runoff, disruption of groundwater discharge, water quality and availability of water and land for other purposes such as natural habitat.

The increased yields that have resulted from mechanization and other modern measures have come at a high energy price, as the full food and supply chain claims approximately 30% of total global energy demand. The links between food and energy have become quite apparent in recent years as increases in the price of oil lead very quickly to increases in the price of food.

Improved water, energy and food security on a global level can be achieved through a nexus approach. A nexus approach can support the transition to a Green Economy, which aims, among other things, at resource use efficiency and greater policy coherence.

A deep understanding of the nexus will provide the informed and transparent framework that is required to meet increasing global demands without putting sustainability into risk.

The nexus approach will also allow decision-makers to develop appropriate policies, strategies and investments, to explore and exploit synergies, and to identify and mitigate trade-offs among the development goals related to water, energy and food security. Active participation by and among government agencies, the private sector and civil society is critical to avoid unwanted adverse impacts. A true nexus approach can only be achieved through close collaboration of all actors from all sectors.

Worth noting that, the Iranian National Committee on Irrigation and Drainage (IRNCID) has so far published several publications in the field of water, energy and food security and several events have been also organized from the irrigation and drainage perspective.

Last but not least, I would like to announce that the Islamic Republic of Iran is quite prepared to collaborate with ICID in concern with, knowledge and experience exchange in relevant water issues including irrigation, drainage and flood control.

Thank you for your attention.

PRESENTATION

Mr. Jae-Beom Son
Secretary General, Korean Advanced Farmers Federation

Water and Sustainable Agriculture in Korea

Some of the points highlighted in the presentation are -

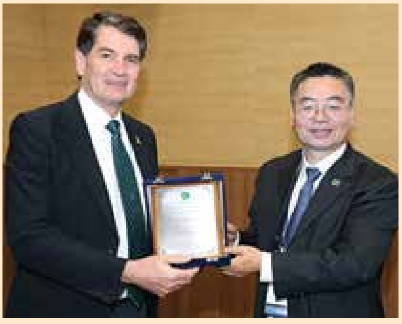
- WATER is essential element for sustainable agriculture.
- The opportunity should be enhanced for farmers, as users of water, to voluntarily participate in using the water and managing the facilities.
- Expansion of budget, and development of both water management system and technology should be done together with positive attitude of government for efficient and stable water storage.
- To be sustainable agricultural and water industry in the future, the agricultural water facility would be developed as the place where city and farming community are coexistent.

Presentation of Awards, Plaques and Recognitions

Best Performing National Committee Award (BPNCA)

Korean National Committee on Irrigation and Drainage (KCID) has won the 5th BPNC Award. The award was received by KCID representative from President Dr. Gao Zhanyi and President Hon. Peter S. Lee on the occasion of the 65th IEC and 22nd ICID Congress held at Gwangju, Republic of Korea, September 2014.

Best Performing Workbody Award (BPWA)

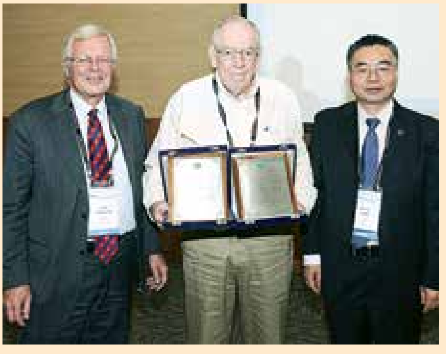


The 4th BPWA was presented to the Working Group on On-Farm Irrigation Systems (WG-ON-FARM) by the President Dr. Gao Zhanyi on the occasion of the 65th IEC and 22nd ICID Congress held at Gwangju, Republic of Korea, September 2014. The performance of a workbody is adjudged based upon a set of criteria and its contribution towards the mandate and mission of ICID.

The Award was presented to Vice President Hon. Felix B. Reinders (South Africa), Chairman, WG-ON-FARM.

Best Paper Award

The Wiley-Blackwell 2014 Best Paper Award was awarded to Marylou M. Smith and Stephen W. Smith (USA) for their paper titled "Agricultural/Urban/ Environmental Water Sharing in the Western United States. Can Engineers Engage Social Science for Successful Solutions?, published in issue 62.3 of Irrigation and Drainage – the Journal of ICID. The award was given during 65th IEC meeting on 20 September 2014 at Gwangju, Republic of Korea and was received by Vice President Hon. Larry D. Stephens,U.S. National Committee on Irrigation and Drainage (USCID) on behalf of the authors.



Winners of WatSave Awards 2014

ICID presents every year the Annual WatSave Awards in recognizition of the outstanding contribution to water conservation or water saving and thereby creating the culture of

water savings for the benefit of all water-users. WatSave Awards are made in respect of actual realised savings and not for promising research results, plans and/ or good ideas/ intentions to save water. The WatSave Awards 2014 winners are -

Technology Award

Jeff Shaw and Todd Kotey (USA)

The International Panel of Judges of WatSave Awards has adjudged Mr. Jeff Shaw (USA) for conferring the WatSave Technology Award 2014' to him for his work on Benefits of the South San Joaquin Irrigation District's Pilot Pressure Irrigation Project

Mr. Jeff Shaw (USA) selected for Technology Award for his work on "Computerized and automated pressurized irrigation and water supply delivery system for the South San Joaquin Irrigation District"

Innovative Water Management Award

Dr. Yosri Ibrahim Mohamed Atta (Egypt)

The International Panel of Judges of WatSave Awards has adjudged. Dr. Yosri Ibrahim Mohamed Atta (Egypt) for conferring the WatSave Innovative Water Management Award 2014, for his work on "Improving growth, yield and water productivity of some maize cultivars by new planting method".

Dr. Yosri I. Atta (Egypt) selected for Management Award for his work on "Furrow design and maize crop planting technique"

Presentation of Plaques to retiring ICID Office Bearers

At concluding session, plaques were presented to the ICID Office Bearers who were to retire after the 22nd ICID Congress and 65th IEC in Gwangju, Republic of Korea. They were:

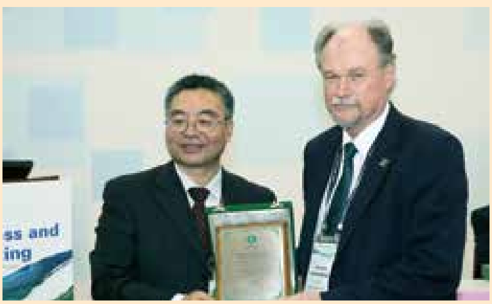
President — (2011-2014)

Dr. Gao Zhanyi (China)

Vice Presidents — (2011-2014)

Prof. Kim, Tai-Cheol (Republic of Korea)

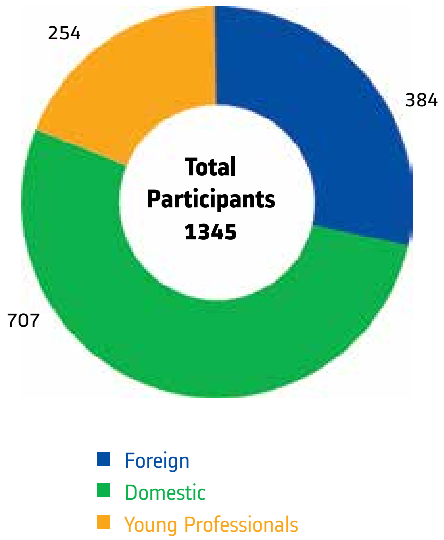
Mr. Adama SANGARE (Mali)



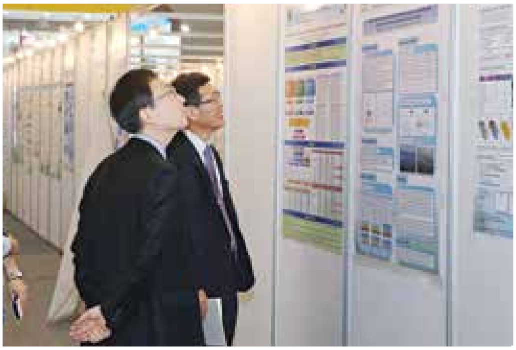
Dr. Gerhard R. Backeberg (South Africa)

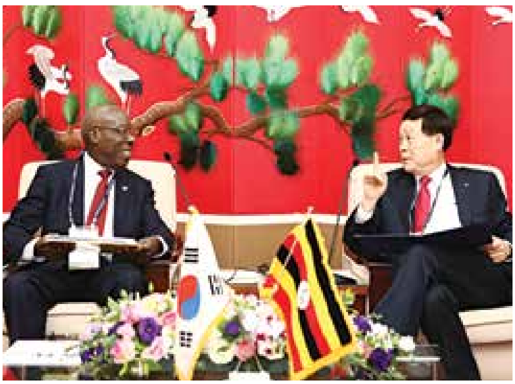
Participants from various Countries

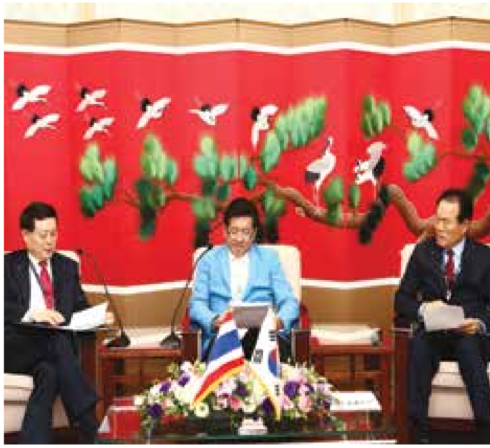
Country	No. of Participants	Country	No. of Participants
Afghanistan	1	Kyrgyzstan	1
Angola	1	Lao People's Democratic republic	2
Argentina	1	Madagascar	1
Australia	2	Malawi	1
Austria	1	Malaysia	21
Bangladesh	3	Mali	1
Bolivia	1	Mexico	6
Burkina Faso	5	Mongolia	3
Cambodia	1	Myanmar	6
Canada	2	Nepal	9
China	42	Netherlands	2
Chinese Taipei	18	Niger	1
Congo, Dem. Rep	1	Nigeria	11
Egypt	11	Norway	2
Eritrea	1	Philippines	1
Ethiopia	1	Republic of Cote d' Ivoire	1
Finland	1	Republic of Korea	923
France	8	Russian Federation	11
Germany	2	Saudi Arabia	4
Ghana	1	Senegal	1
Hungary	2	South Africa	6
India	17	Sri Lanka	2
Indonesia	72	Switzerland	2
Iran	28	Tadjikistan	3
Iraq	4	Thailand	26
Italy	6	Turkey	7
Japan	29	Uganda	3
Kazakhstan	2	Ukraine	1
United Kingdom	4	Uzbekistan	5
United Republic of Tazania	1	Vietnam	4
United States of America	8	Zimbabwe	1
Total Participants 1345			

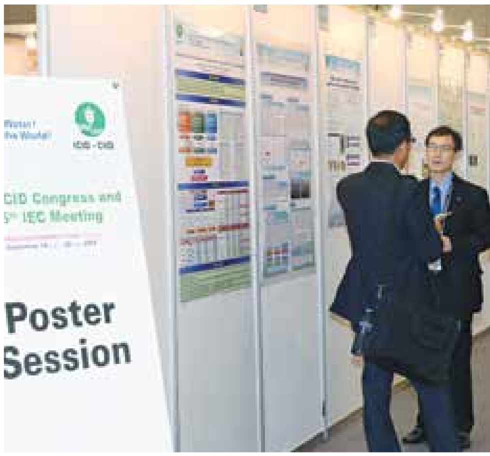


Glimpses of 22nd ICID Congress








ICID · CIID
Poster
Session


ICID · CIID
22nd ICID Congress and


MoU Signing Ceremony
Iran Water Resources Management Company
and Korea Rural Community Corporation
September 19, 2014


22nd ICID Congress
22nd ICID Congress

For more information, please contact:

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