2013 | FOURTH QUARTER

ICID NEWS

Managing Water for Sustainable Agriculture

MESSAGE FROM THE PRESIDENT

Dear members and friends of ICID,

You are reading this message at the verge of the current year. During the year 2013, ICID could successfully implement its new initiatives with your strong support and active contributions. I would like to express my sincere thanks to you all for the encouragement and active participations in all ICID events.

For the first time, ICID organized the 1st World Irrigation Forum (WIF1) with participation of over 700 delegates from 62 countries and 13 UN/ International organizations dealing with agricultural water management. There were special workshops, round tables, panel discussions, side events and technical exhibition. The annual meetings of various workbodies and 64th International Executive Council meeting were also held succeeding the WIF1.

Another landmark initiative was of presentation of the 1st World Irrigation and Drainage (WID) Prize to recognize the work of dedicated professionals and institutions who have actively contributed to the development of 'Irrigation and Drainage' ensuring increased agricultural production at national, regional and international level. The First WID Prize was presented to Prof. Victor A. Dukhovny, Uzbekistan in recognition of his outstanding contributions to the development of agriculture water management made over 57 years. The Annual WatSave Awards and ICID Journal Best paper Award were also presented on the occasion.

The 'knowledge / information platform' was much appreciated by our National Committees, international organizations, institutions and individuals. This was evidenced from the many emails which I have received from our colleagues and friends expressing their satisfaction and admiration to ICID for organizing such a great event to enhance cooperation among stakeholders towards advancement of irrigation and drainage.

The 1st World Irrigation Forum was deliberated on three sub-themes, namely, Policy, science and society, Challenges and developments in financing irrigation and drainage, and Integrated water management approaches for sustainable food production. Many new thoughts and ideas on how to achieve sustainable irrigation and drainage development and management emanated during the deliberations.

(From left): Engr. Avinash Tyagi, Secretary General; Mr. Akif OZKALDI, Director General, DSI; Dr. Gao Zhanyi, President; Prof. Dr. Veysel Eroğlu, Minister of Forestry and Water Affairs, Turkey; Mr. Abdel Waheb (Egypt), & Ms. Zahida Detho (Pakistan) representing IFAD; Mr. İrfan Aker, Dolsar Engineering; Mr. Jeremy Bird, Director General, IWMI; and Dr. Bruce Stewart, WMO at the First World Irrigation Forum, Plenary Session

ICID•CIID
www.icid.org

Inside

Useful suggestions were received as how ICID can provide better services to our stakeholders, especially farmers and irrigation system managers. We need to enthuse Ministers/ policy makers to attend our conferences and discuss the policy issues for promoting irrigation and drainage. We need to have more farmers, youths and irrigation managers to join us to bridge the knowledge gap and promote adoption of improved technologies.

There are gaps as regards existing and required infrastructure and technology for achieving improved irrigation and drainage among the countries under different development stages. ICID is poised to bridge the knowledge gap and I encourage all National Committees and members to fully explore the ICID platform to collect and share knowledge, information and technology. We have done a lot in this aspect, but there is still a need and room to improve this capacity. We need to strive together to showcase ICID as a unique platform for international cooperation on agricultural water management. During the year we have made significant contributions to various international fora like - the Year of International Water Cooperation, Stockholm World Water Week, etc. I am contented with our achievements and express my sincere gratitude to all our National Committees, members and partnering International Organizations.

In 2013, as the President of ICID, I visited many National Committees and International organizations and received a warm welcome from all. I have learnt a lot during these visits and appreciate your valuable contribution and friendship. It was my honor to meet our President Honoraire Dr. M.E. Jensen in Fort Collins, Colorado in August 2013. In our conversation, he recalled his career in agricultural water management and as the President of ICID from 1984 to 1987. Despite his old age (90 years), he remains connected with Commission through periodicals and other publications. PH Jensen has conveyed his regards to all members and friends of ICID. The achievement and progress of ICID during the last 64 years was made possible due to enormous efforts and contributions through generations of professionalism. I am grateful to all our senior members and friends of ICID and wish them good health and a happy life.

During the 64th IEC meeting, three new Vice Presidents were elected, viz., Dr. Ir. Basuki Hadimoeljono, Director General, Spatial Planning and Development Ministry of Public Works, Indonesia; Mr. Kadhim Mohsin Ahmed, Deputy of General Director, Center of the Restoration of the Iraqi Marshes & Wetland, Ministry of Water Resources, Iraq; and Er. A.B. Pandya, Chairman, Central Water Commission, Ministry of Water Resources, Govt. of India. I congratulate the new Vice Presidents and encourage them to work towards furthering the mission of ICID.

While I once again thank you all for the support extended during the current year, we have a very exciting year ahead too. From 14 to 20 September 2014, the 22nd Congress and 65th IEC meeting of ICID will be hosted by our Korean National Committee in Gwangju Metropolitan City of Republic of Korea. The theme of the Congress is Securing Water for Food and Rural Community under Climate Change. Our Korean colleagues are working hard to prepare for the Congress and IEC meeting. I invite you to support the event by contributing technical papers. We will further explore the Congress questions and try to find solutions for the sustainable agricultural water management for achieving global food security under changing climate.

Season's greetings and best wishes for a happy and fruitful New Year 2014!

Yours truly

Dr. Gao Zhanyi
President, ICID

Revitalizing Irrigation Sector through Policy, Science and Society Interaction

Agriculture Water Management (AWM) encompasses a range of options from rainfed farming to full irrigation. The approaches of various actors involved in AWM are changing, at a reasonable pace in some areas but slowly in others. Globally, there have been changes in knowledge, attitudes and policies regarding AWM and the environment. In order to address these issues and fulfilling ICID's mission and objectives of contributing to food security, ICID is bringing together representatives of all stakeholders involved in irrigation of all types and at all scales under the umbrella of World Irrigation Forum (WIF). With this objective in view, over 700 participants from 62 countries across the world were gathered at the First World Irrigation Forum (WIF1) held at Mardin, Turkey from 29 September to 5 October 2013.

The theme of the Forum was 'Irrigation and Drainage in a Changing World: Challenges and Opportunities for the Global Food Security' and was convened under three sub-themes, roundtables, panel discussions and side events. The three sub-themes were - (I) Policy, science and society interactions, (II) Challenges and developments in financing irrigation and drainage sector, and (III) Integrated water management approaches for sustainable food production. The Forum also highlighted irrigation management as a tool to mitigate climate variability impacts.

ICID News will provide a summary of key outcomes of each of the three sub-themes to our readers. This edition presents the outcomes of the sub-theme on 'Policy, Science and Society Interaction' which inter alia considered innovative irrigation and drainage services and interactions among stakeholders,

Introduction

Irrigated agriculture is undergoing rapid change and is facing issues related to climate change, population growth, consumption patterns, competition for resources and cost of development. The challenge is whether water availability for irrigation along with rainfed production will be sufficient to meet the growing food demand and improve global food security.

After the 1960s and 1970s, the "golden era" of irrigation development, the 1980s and 1990s saw a significant slowing down in the rate of irrigation expansion in much of the world, and the beginning of a shift in attention towards the management of irrigation to improve the performance of irrigated agriculture and the returns on irrigation investment. This slowing down of global expansion in irrigated area is likely to continue, with a concentration of new irrigation investments in areas where water and land are available and other conditions are particularly conducive.

In the next few decades irrigated agriculture in many parts of the world will be affected, at least to some extent by four global forces: the increasing pressure on irrigation to serve a more demanding and productive agriculture, to reduce water use, to ensure water security and meet other human and

environmental needs; the increased tendency for irrigation investments to be driven by markets and financial incentives; the reality of climate variability and change and the irrigated agriculture will increasingly be viewed as part of a larger water, food and energy system.

The changing landscape of irrigated agriculture will undoubtedly express itself differently in different parts of the world but four major areas can be singled out as a springboard for discussion: ensuring sustainability of groundwater resources in regions where groundwater irrigation is extensive and where groundwater resources are in danger of being overdrawn; managing water storage for irrigated agriculture; sorting out the tension between environmental and agricultural uses of water; and providing incentives for the adoption of water-efficient irrigation technologies and practices.

Critical for irrigation and drainage management to enable adoption of farm level innovation is the adoption of service oriented management, together with incentives for innovation and performance for irrigation and drainage staff. In many countries irrigation and drainage agencies and agricultural support systems have been slow to adapt to the utilization of technology and the transformation of farming systems. To a large extent, the information technology revolution has not yet fully reached the irrigation and drainage sector. This is however, changing rapidly.

The innovation-extension-irrigation and drainage services nexus is also essential in allowing the sector to achieve economic, social and environmental sustainability along with food security. This encompasses the whole range of agricultural water management practices including genetics and agronomy, technological, institutional and policy innovation along with innovation in knowledge, management and diffusion systems.

Agricultural water management related policies, strategies and investment programs must include incentives and support for dynamic innovation and knowledge management systems. Policy developed must be sensitive to local conditions, adaptive to user needs, have a flexible institution structure and allow for institutional learning and change. Stakeholders must be supported to provide their perspective of problems, solutions, interests and preferences during participative decision making.

In the light of these pressures, there have been increased calls for "re-inventing" irrigation. Developing the technological, social, institutional and policy innovations needed to address the increasing complexities of irrigated agriculture will require the best of science, and from a diverse set of disciplines and perspectives including agricultural science and water resources/irrigation engineering, natural resource economics, political science, rural sociology and anthropology, public health, water law, business administration, and information science, to name just a few.

Outcomes

As a result of the discussions based on the keynote addresses, technical papers and short communications, following recommendations were made.

- It is essential to take lessons from previous mistakes (gaps in the delivery of plans, performance of schemes, scaling up and sustainability) and introduce better techniques.
- Irrigation and drainage sector should take full advantage of the very rapid technological advances that have taken place during the past few years in some areas like information and communication technology, satellite imagery, and development of new adaptable, flexible irrigation systems.
- Irrigation and drainage must change, innovate and open to other sectors and actors to effectively contribute to ensuring food security, reducing poverty and sustaining growth while sustainably managing natural resources in a rapidly changing context.
- This will require the best of science, a focus on practice, dialogues and partnerships among stakeholders and disciplines, empowering farmers and the private sector, improved governance adapted to local contexts, effective policies and institutions, service-oriented management and enhanced participation. Farmers should be involved from the planning stage of projects.
- There is a need to turn irrigation and drainage into an exciting career that attracts the younger generations.
- Change processes should respect the conservation of essential human, cultural and natural values important to rural communities.
- Market-based approaches can be effective in bringing affordable and adapted innovation to the poor but public investment will be needed to respond to the needs of poor and small farmers.
- Role of farmers as innovators and adaptors of technologies and major investors in irrigation should be recognized to take irrigation forward.
- Innovation is not just about technology. Equally important is innovation in operation and management (O&M) of institutions, management systems, water accounting systems and in business models that local entrepreneurs use.
- Research and knowledge financed by public funds should be a public good and not intellectual property protected, which would hinder its dissemination and uptake by private industry

Jiamakou Irrigation Scheme - An Example of the Best Management Practices

Jiamakou Irrigation Scheme (JIS) is the first large high-lift irrigation scheme constructed on Yellow River in Shanxi Province of China in 1960. After nearly 40 years of operation, there were problems like aging of pumping station, incomplete infrastructures, overstaffing, organizational overlapping and outdated management practices; which resulted in poor performance of the scheme. Mr. Zhang Xuehui, presently Director General, took the responsibility of planning and implementing of rehabilitation of the pumping station and other infrastructure in 1998. He formulated a comprehensive and scientific irrigation management of the scheme. The traditional irrigation management was replaced by the modern system of enterprise operation and management. The implementation of innovated technologies and reform of irrigation management in JIS has contributed in promoting local agricultural development, enhanced farmer's income and improved rural environment. Recognizing Mr. Zhang Xuehui's exemplary contribution and leadership, he was honored with ICID WatSave Innovative Water Management Award at the 64th IEC meeting held at Mardin, Turkey in October 2013. The following is a brief summary of the innovative work

The Jiamakou Yellow River Diversion Irrigation Project was constructed on Yellow River near Yuncheng city of Shanxi Province during 1958 -1960. The scheme is located in semi arid region with rainfall ranging between 490 to 450 mm and the groundwater is 160-200 m deep. The total area irrigated under the scheme is 60,600 ha. The scheme comprises six main canals with a total length of 125 km, 49 Branch canals with a total length of 342 km, 1316 tertiary canals with a total length of 1282 km, and 4940 hydraulic structures. The main pumping station has 26 pumps with a design capacity of 67.8 m^3/sec. The scheme mainly serves the purpose of agricultural irrigation covering 60,600 ha and benefiting about 450,000 people living in nineteen townships.

Floating pumping station on Yellow River

After nearly 40 years of operation, there were problems like aging of pumping station, incomplete infrastructures, overstaffing and organizational overlapping and outdated management practices, which resulted in poor performances and low efficiency. After the shift to a market-based economy in China, farmers diversified and intensified their agriculture production. Those within the irrigated areas were required to improve irrigation services to maximize their productive capacity. Consequently, a comprehensive rehabilitation programme with the funding support of 133 million RMB Yuan (US$ 21.8 million) from the Chinese Government for Jiamakou Irrigation Scheme (JIS) was taken up in 1998. Rehabilitation of 48 km main canal, 78 km branch canal, and 729 hydraulic structures was carried out. In 2002, Mr. Zhang designed and constructed a floating pumping station which could accommodate the fluctuating water level of the Yellow River and with this a major water shortage problem was solved. With the innovations of the special lubrication system and impeller, the pump set can operate 2,630 hours and the annual maintenance cost was lowered by 10% and the service life of the impeller enhanced from 1000 to 4000 hours.

The entire scheme operation and management is divided into four major divisions, namely; administrative management division, integrated affairs management division, logistic service division, and water business entities. During the period 2002 - 2012, various technical standards, guidelines, rules and regulations were revised ensuring better quality and effectiveness of works. Accurate and scientific measurement and allocation of irrigation water ensured fair and transparent deliveries

A section of main canal before and after renovation

among users. There are 166 Water User Associations (WUAs) in the scheme area and a network of about 400 km of tertiary canals was lined with their voluntary support leading to significant improvement in the water delivery services to farmers. As a result water use efficiency, productivity and benefits of irrigation system have been enhanced greatly. Farmers have shifted from wheat, cotton and other cereal crops to more remunerative crops like fruit trees. The Figure shows the area irrigated and water volume applied since the commencement of irrigation in 1961 to 2012. Rapid increase in the irrigated area can be seen from 2000 onwards.

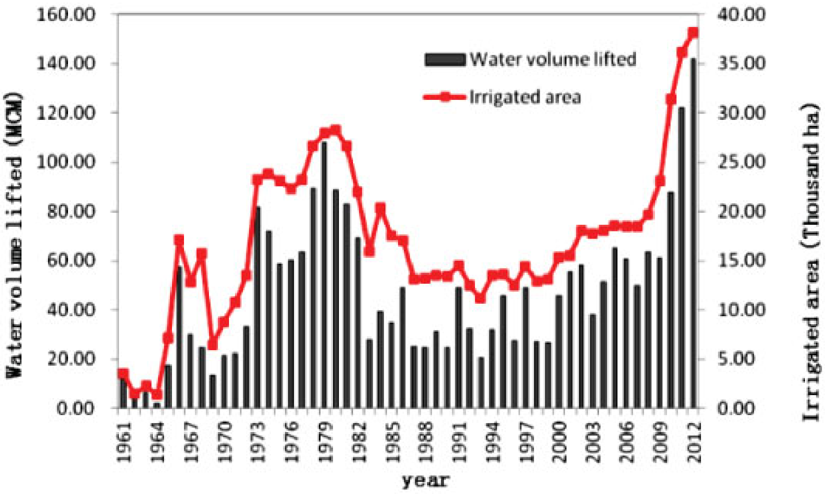

Figure. Annual area irrigated and water volume pumped (1961-2012)

With the adoption of innovative practices, there was remarkable improvement in the reliability, flexibility, equality, efficiency of water supply and irrigation. Thus there has been increase in economic and social benefits to farmers. The key benefits as realized are summarized below:

1. Increased efficiency: Conveyance efficiency at the main and branch canals have increased from 68% in 1996 to 83% in 2012. As a result more than 18 million m^3 of water is saved every year, and totally about 120 million m^3 of water was saved from 2000 to 2012.

2. Reduction in power consumption: The power consumptiondecreased from 0.265 kwh/ m^3 in 2002 to 0.247 kwh/ m^3 in 2012. The unit cost of lifting water decreased from 3.77 RMB/ m^3 in 2002 to 2.87 RMB/ m^3 in 2012.

3. Increased revenue: The statistic data from 2002 to 2012 indicated that the annual added value of irrigation water was increased from 570 million RMB Yuan (US$ 93.4 million) to 1730 million RMB Yuan (US$ 283.6 million) and added value of per cubic meter of irrigation water increased from 10.62 RMB Yuan (US$ 1.74) to 22.34 RMB Yuan (US$ 3.66). During the same period, the annual net income per farmer increased from 5,040 RMB Yuan (US$ 826) to 14,100 RMB Yuan (US$ 2311).

4. Increased irrigated area: The irrigated area has been increased from 12,333 ha in 1998 to 33,530 ha in 2007. With the implementation of the north extension project in 2008, the irrigated area was increased to 60,600 ha in 2012.

5. Increased employees income: The annual average income of an employee was increased from 3,300 RMB Yuan (US$ 540) in 1998 to 35,263 RMB Yuan (US$ 5780) in 2012.

A Rapid Appraisal study conducted by FAO in 2006 observed that "the overall irrigation benefits, water use efficiency and irrigation water productivity are all higher compared with other irrigated areas with the same conditions and lead the way in China and the Asia-Pacific region".A training center has been established and more than 20 training programs have been conducted for extending the innovations and reforms achieved in JIS to other places. So far, the innovative management practices have been extended to other 15 large irrigation schemes in China covering an area of 645,000 ha.

Mr. Zhang Xuehui, Director General can be contacted at Email: ziyun5021@sina.com

Farmer Managed Modern Yaylak Pressurized Irrigation Scheme of Eastern Anatolia

(A report from the field)

The Southeastern Anatolian Project (GAP) located in Eastern Anatolia region of Turkey between the Euphrates and Tigris rivers is the largest integratedwater developmentproject presently under implementation. The project comprises the development of 1.8 million ha of irrigation and the construction of 22 large dams and 16 power plants with a total capacity of 7300 MW. Presently, about 377,000 ha are under irrigation and construction of 16 dams has been completed.

Yaylak Plain Pressurized Irrigation scheme is one of the schemes of GAP project. Water is diverted) from the Ataturk reservoir through Yaslica tunnel (about 1.49 Km length and 4.0 meter diameter) to the main pumping station. The main pumping station has17 submersible pumps with a cumulative discharge of 21 m3 / sec and pumps water to the Yaylak Main Channel serving 9 pumping stations installed along the canal. The Yaylak Main Channel is 83 Km concrete lined channel having design discharge of 17.08 m^3/s and the bed slope as 0.0002. The scheme is designed to irrigate 18,322ha benefitting 6000 farmers from 36 villages. The main canal is equipped with the bivalent downstream irrigation canal gates which are controlled through a fully automated SCADA system.To prevent flooding in case of closure of the check structure, the side banks of the channel have been raised, appropriately. The system minimizes water losses during the operation. The water level in the canal can fluctuate between two limits defined by canal safety and by the depth needed for operation of the pumps. There are no field operators and the staff in the control room is on standby only.

The irrigation water is distributed through 641 km long high pressure pipe network. Water is supplied on demand to farmers through the hydrants having 7 LPS flow rate to irrigate 4.665 hectares. The hydrants are equipped with a pressure gauge and a flow meter. The farmers can irrigate their fields by connecting their sprinkler/ drip system to the hydrant. The major irrigation systems used by the farmers comprises the sprinkler (90%) and the drip (10%).

Water distribution is carried out by the Water Union Organization (WUO). There about 58 staff working under WUO. The DSI is responsible for managing the financial aspects of the WUOs. The water charging is based on the area irrigated. Significant saving in water use has been achieved due to the automation and involvement of WUOs in the system operation. Although, the Government is providing financial support to the farmers in procuring inputs like the fuel and fertilizers, the high energy price remains the main concern of farmers.

On an average annually about 110 million cubic meter of water is used for irrigation purpose. Farmers pay a nominal fee per hectare and per crop ranging from 55 TL (US $27.5) for vegetables, cotton, sugar beet to 25 TL (US $12.5) for cereals, which is highly subsidized

(Inputs received from Ms. Remziye YILDIZ GÜLAĞACI, GAP 15. Region Directorate (ŞANLIURFA DSI), The General Directorate of State Hydraulic Works (DSI) are appreciated. Ms. Remziye may be contacted at remziyey@ dsi.gov)

A view of the control room

Spread of the Sprinkler and Micro irrigation Technology around the World

'Water Scarcity' has become a common phrase among water professionals, policy makers, farmers and corporate houses in most countries worldwide. Irrigated agriculture is still the dominant user of world's fresh water accounting 70% of the total water use. However, owing to rapid increase in water demand from industries, energy production, drinking and sanitation from rural and urban areas, and recreational purposes, pressure on reducing water use in agriculture has been rising. Given the crucial role of the irrigated agriculture in assured and higher food production as needed by the world's increasing population, and also the slow rate of expansion of irrigated land, use of water saving measures and technologies have become indispensable. Micro and sprinkler irrigation technology has been recognized as an effective water saving and demand management measure to cope with the increasing water scarcity in agriculture. Today, about 18% of the world irrigated area is equipped with the sprinkler and micro irrigation systems. ICID since 1981 has been compiling the data on sprinkler and micro irrigated areas in its member countries. The following brief presents a global scenario.

Worldwide, the use of drip/ trickle or micro irrigation methods has been steadily increasing in order to cope with declining water withdrawals to irrigation, shortage of farm labour, better use of other farm inputs like seed, fertilizers and chemicals, energy besides increasing crop yields. Of the total world irrigated area of about 300 million ha, currently, about 43 million ha are under sprinkler irrigation and some 11 million ha are under micro-irrigation.

Micro irrigation

Water application through drip (also called trickle or localized irrigation), micro-sprinklers (spinners and rotators), micro-jets (static and vibrating), micro-sprayers, bubblers, and drip tapes (both surface and subsurface) is collectively referred to as micro irrigation.

Micro irrigation provides many unique agronomic and water and energy conservation benefits that address some of the challenges facing irrigated agriculture. Drip irrigation was first used about 40 years ago but its wide-scale adoption commenced in 1970s when it was used on 56,000 ha. Since then the use of micro irrigation has progressively increased around the world. As per the data compiled by ICID, the micro irrigated area in 1981 was 0.44 million ha and it became 1.03 million ha in 1986, 1.83 million ha in 1991, 3.20 million ha in 2000, 6.00 million ha in 2006, 9.40 million ha in 2010, and 10.8 million ha in 2012. The regional distribution of micro irrigation and the top ten micro irrigated countries are shown in Figures 1 and 2, respectively.

Sprinkler irrigation

Although sprinkler irrigation was introduced to the world more than 80 years ago, its wide scale use for field crops commenced in 1950s due to the availability of better sprinklers, aluminum pipes and more efficient pumps. Today, a variety of sprinkler systems ranging from simple hand move to large self-propelled (Centre pivot, Linear move, Traveler, etc.) machines are in use worldwide. The sprinkler irrigated area has doubled from 21.6 million ha in 1990 to about 43.3 million ha in 2012. Thus sprinkler irrigation continues to dominate the irrigation scenario.

Centre pivot, linear move, traveler systems have made remarkable impact on sprinkler irrigation technology. Now centre pivots are available in size ranging from one tower to irrigate 2.5 to 5 ha to multi-tower machines capable of irrigating over 200 ha. The centre pivot machines up to 60 ha are towable and thus can be used to irrigate multiple fields. Earlier pivots were operated using high pressure 2.5 to 4 kg/cm^2; however now spray nozzles operating at as low as 0.6 to 1.0 kg/cm^2 are available. In Low Energy Precision Application (LEPA) system, the water is applied through drop nozzles which operate at about 0.5 kg/cm^2 and the nozzles can be extended near the crop canopy which reduces evaporation and wind draft losses.

The regional distribution of sprinkler irrigation and the top ten sprinkler irrigated countries are shown in Figure 3 and 4, respectively.

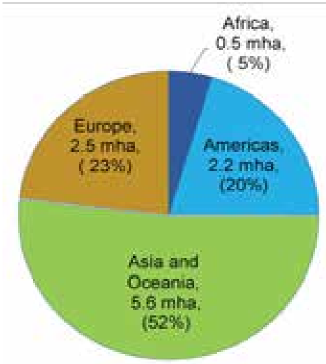

Fig 1. Region-wise micro irrigation

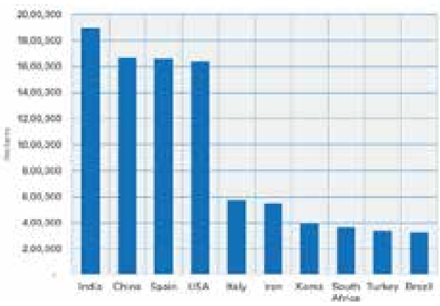

Fig 2. Top 10 countries - micro irrigated area

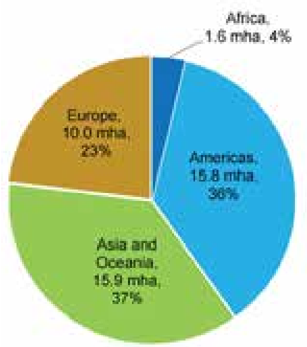

Fig 3. Region-wise sprinkler irrigation

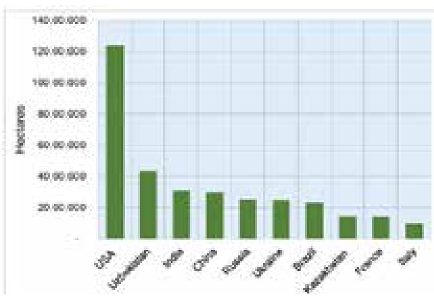

Fig 4. Top 10 countries - sprinkler irrigated area

For the country- wise latest data of sprinkler and micro irrigated areas, please access http://www.icid.org/sprin_micro_11.pdf

ICID•CIID

International Commission on Irrigation and Drainage (ICID) was established in 1950 as a scientific, technical and voluntary not-for-profit non-governmental international organization. The ICID News is published quarterly by ICID Central Office, New Delhi, India.

EDITOR

Dr. Suresh A. Kulkarni
Executive Secretary
ICID, 48 Nyaya Marg
Chanakyapuri, New Delhi, India
Tel: +91-11-2611 6837/5679
E-mail: icid@icid.org