2016 | Second Quarter

ICID NEWS

MANAGING WATER FOR SUSTAINABLE AGRICULTURE

MESSAGE FROM THE PRESIDENT

Dear Colleagues,

Today, across Africa, through the untiring efforts of organizations like Alliance for Green Revolution in Africa, the African Union, African Development Bank and many other development partners, small family farms are entering a renaissance period in Africa's agriculture where they are powered by more options in the seeds they plant, fertilizers they use, and markets available to purchase their produce. However, the progress on providing the most important input, water, has been a bit muted. In this inspiring new future farmers resilience against the increasingly frequent drought situations has to be enhanced by providing water security through irrigation services. Or else, the agriculture becomes a gamble.

ICID community has to self-appropriate its role in African Green Revolution. Accordingly, ICID at the 4th African Regional Conference on Irrigation and Drainage (ARCID4) held in Aswan, Egypt from 26-28 April 2016, decided to prepare a Position Paper on African Green Revolution and how the ICID community could play its designated role through its National Committees (NCs). At the Conference, a questionnaire was shared among NCs. Based on the response to the questionnaire, a Position Paper would be prepared by the African Regional Working Group (AFRWG) for discussion at Chiang Mai in November 2016 before presenting it to the 67th IEC. Interest of NCs would be best served by providing timely response to this questionnaire.

I had the occasion to be part of the Golden Jubilee celebration of the Land Reclamation and Development in Russia, which has significantly contributed to the global fight against hunger. The celebrations were organized from 2-3 June 2016 at Moscow. While sharing the ICID Vision 2030, I impressed upon the ICID community in Russia to share their vast experience in this field to fight against hunger. I firmly believe that Russia continues to be characterized by a massive move towards knowledge based and more modernized land reclamation and development practices. I invited RUCID to make use of the platforms such as International Research Program and Irrigation and Drainage (IRPID), and Technical Support Unit (TSU) for dissemination of the knowledge. On behalf of ICID, I offered to facilitate any such initiative from the Russian government.

As you all are aware IRPID's mission is to enhance research activities on science, technology, and management aspects of irrigation and drainage within the member countries. Two regional nodes, one in Iran and another in China have been established. A stakeholder's workshop of the Iran Centre of IRPID is proposed to be organized later in August 2016. I encourage NCs to organize themselves and support this program by conducting collaborative research organized by these regional nodes.

In order to turn our vision of a 'Water secure world free of hunger and poverty' into a reality, we need to keep infusing the experience and wisdom of our experts with enthusiasm and entrepreneurship of Young Professionals in the irrigation and drainage sector. Over the years ICID has been making efforts in a small way and has been partially successful in getting young brigade on board. It was heartening to see the enthusiasm of the Young Professionals from Africa participating in the training program organized preceding ARCID4.

However, much more needs to be done in this direction. Taking a technological turn, ICID has now established an ICID Young Professionals e-Forum (IYPeF) as a Linked in group. The e-Forum will have e-discussions on three important topics in the context of irrigation and drainage: Adopting Geospatial technologies; Education and training; and Role of Women. These topics will be discussed on e-Forum during the next three months. The voice of Youth from this e-Forum would serve as input to the deliberations at WIF2. The Young Professionals actively and effectively participating in and putting across their view would get chance to personally represent IYPeF at the 2nd World Irrigation Forum (WIF2), Chiang Mai, in November 2016. I urge all the NCs to encourage their young professionals to join this e-Forum and participate actively in the discussions.

I encourage all NCs to take advantage of various initiatives, we have undertaken together and make use of the network of partners'. I also encourage you all to take advantage of the Early Bird Registration for the 2nd World Irrigation Forum, which is open till 31 July 2016.

With regards,

Dr. Saeed Nairizi
President, ICID

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Inside

Water Saving and Profitable Rice Cultivation

Prof. Li Xinjian*

The WatSave Technology Award 2015 was awarded to Prof. Li for his research work on "Water Saving, Pollution Prevention and Emission Reduction of Paddy Rice". This article provides the glimpses of his research work in developing and extending water saving technology for paddy rice.

The controlled irrigation technique for paddy rice includes optimal combination of irrigation timing, irrigation frequency, irrigation water applied, control of water level in the field and amount of fertilizer applications. The controlled irrigation technique for paddy rice has been applied in larger areas in South China. From 1990 to 2013, the technique has been promoted on a total area of 15.3 million ha in the region resulting in 28.7 billion cubic meters of water savings during the period.

Located in the subtropical monsoon climate zone with abundant precipitation, South China is the planting base for rice, sugarcane, mango, tea and citrus fruits. In fact, 80% of the area planting these crops in China is concentrated in this region. Precipitation in the region is distributed unevenly in time and space, with more than 80% of the annual rainfall concentrated in the period between May and September, which tends to cause seasonal drought. In South China, paddy fields are traditionally watered through flood and plot-to-plot irrigationwith the help of gravity, and the fields are inundated for long periods of time. Such irrigation method is flawed on two fronts. First, inundation of field over a long period of time results in high level of moisture and humidity which leads to plant diseases and pests, unproductive tiller, weak stem, and lodging, resulting in yield decline. Second, with annual water consumption reaching 12000-15000 m^3/ha, it results in wastage of water and results in disputes among farmers over water sharing in dry seasons. In order to boost outputs, famers have been applying fertilizers, pesticides and herbicides in large quantities, leading to contamination of surface water and shallow groundwater. Sixty percent of China's sugarcane, mango and citrus production are also concentrated in the Guangxi Zhuang Autonomous Region, and most of these cash crops are planted on dry slopes, a landscape for which research of irrigation methods and techniques is lacking. As a result, famers had no access to viable methods and techniques to improve yield.

Table 1. Major irrigation methods for reference during various growth stages of paddy

Paddy growth stage	Definition of paddy growth stage	Irrigation methods and water depths during various growth stages	Fertilization methods
The stage when transplanted seedlings turn green	From transplanting to one day before tillers appear. The seedlings should be observed in the days after the transplant. If the color of the leaves turns green, new roots grow, and true leaves appear, then it can be called the stage when transplanted seedlings turn green.	During transplanting, water depth should be kept between 15 to 20 mm During the stage when transplanted seedlings turn green, water depth should be kept between 20 to 30 mm	Base manure should be applied before planting: phosphate fertilizer 300 kg/ha, urea 30 kg/ ha. Ten days after planting: urea 187.5kg/ha.
Early tillering stage	The stage begins when the number of tillers reaches 10% of the seedlings and ends one day before tillering slows down	Keep the soil saturated by watering it once every three to five days, and water depth after irrigation should be kept below 10 mm	Thirty days after transplanting using: urea 75 kg/ha and compound fertilizer 150 kg/ha
Late tillering stage	The stage begins when tillering starts to slow down and ends one day before young ears form.	No water exists on the land surface so that slight dryness can push the roots to grow downwards, increasing the permeability of oxygen and limiting non-productive tillering	After the dried land is re-watered: add compound fertilizer 112.5 kg/ha and potash fertilizer 300 kg/ha
Jointing and booting stage	Dissect the main stem and remove the blades and sheath so that growing web is exposed. If the early form of young ears at the vegetative cone reaches 1 mm and is visible and covered, then this stage begins. And it ends one day before heading.	Backwater irrigation with the water depth being kept at 10-20 mm and cyclical irrigation should be applied two to three days after the water naturally dries up	–
Heading and flowering stage	This stage begins when more than 10% of the sheath is exposed and ends one day before the period of milky ripeness.	Thin water irrigation with water depth being kept at 5-15 mm, and cyclical irrigation should be applied 3-5 days after the water naturally dries up	–
The stage of milky ripeness	The stage begins when 10% of the grains at the middle part of the ears are filled and ends one day before the gold ripeness period.	Wetting irrigation every three to five days with the water depth being kept below 10 mm	–
The stage of gold ripeness	The stage begins when 80% of the grains at the middle part of ears turn gold and ends on the harvesting day.	Let the water dry up naturally	–

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To address these problems, Prof. Li Xinjian and his team at Guilin Irrigation Experimental Station began their research on water application using different irrigation methods and techniques for paddy and cash crops. After more than three decades of experimentation and studies, the team introduced a controlled irrigation methodology, described in Tables 1 and 2, to be used for rice paddy and sugarcane respectively that saves both water and fertilizer and boosts production. This technique has been widely recognized by the international community.

Combining this techniques with on-farm water-saving methods, agronomic measures, and management of canal water distribution system, this technique results in water saving, pollution prevention and reduction in emission of greenhouse gases. This technique innovatively addresses al the indicators of paddy field irrigation from the perspectives of water resources, water environment, and canal system management: time of irrigation and fertilization, frequency of irrigation and fertilization, the volume of water and fertilizer needed, and the volume control and water sharing management in the canal system management process. In addition, this technology is easy to implement and practice.

Table 2. Irrigation method for high-yield and high-sugar sugarcane

Time of irrigation	Method of irrigation	Volume of water used for irrigation m³/ha	Frequency of irrigation	Depth of moist layer after irrigation (cm)
Seedling stage	Keep soil moisture content at 60-70% of field moisture capacity	45-75	Once (one additional round of irrigation, if weather conditions require?)	20-25
Tillering stage	Keep soil moisture content at 70-80% of field moisture capacity	60-90	Once (one additional round of irrigation, if weather conditions require?)	30-35
Elongation stage	Keep soil moisture content at 80-85% of field moisture capacity	90-120	Once (two-four additional rounds of irrigation, if weather conditions require?)	35-40
Ripeness stage	Keep soil moisture content at 55-65% of field moisture capacity	30-60	One or two rounds of irrigation according to soil moisture status	25-30
Method of fertilization see Table 3				

Table 3. Sugarcane fertilization plan under drip irrigation condition

Stage	Urea (kg)	Mono-ammonium phosphate (kg)	Potassium chloride (kg)	Magnesium sulfate (kg)	Trace elements (kg)
Three true leaves	30	0	0	0	1.5
Five true leaves	30	15	30	15	0
Early tillering stage	45	15	45	15	1.5
Intermediary tillering stage	45	15	45	15	0
Late tillering stage	60	15	60	15	1.5
Early jointing stage	60	15	60	15	1.5
Intermediary jointing stage	60	15	75	30	1.5
Early elongation stage	60	15	60	15	0
Intermediary elongation stage	60	15	75	30	0
Total	450	120	450	150	7.5

Under drip irrigation condition, to save water and fertilizer and boost yield, the following fertilization method should be applied for sugarcane: the principle to follow—test the soil content first and then decide the fertilizer doze; apply smaller doze of fertilizer each time and more rounds of fertilization; maintain the balance among nutrients. See Table 3 for fertilizing plan for every hectare of land.

As a result of these techniques, saving of irrigation water in 667,000 ha under paddy is added every year; saving irrigation water by 1872 m³/ha adding up to 1.25 billion m³ cumulatively; crop yield is increased by 300 kg/ha and 200,000 tons cumulatively; and farmer income increased by 900 yuan/ha (US$ 137) and 600 million yuan cumulatively. From 1990 to 2013, the cumulative water-saving in Guangxi Autonomous Region amounted to 28.704 billion m³; total crop yield growth added up to 4.6 million tons; and the income growth totaled to 276 billion Yuan (1 US$ = 6.6 Yuan), while the consumptions of fertilizer fell by 2.3 million tons, and nitrogen and phosphorus elements washed away dropped by 30%, and the emission of non-point source pollution was reduced by 26 billion m³.

Full text of this article can be accessed from: http://www.icid.org/ws_technology_2015.pdf and a live video can be seen on ICID Facebook link: https://www.facebook.com/icidat/videos/vb.224035987686391/1078003728956275/?type=2&theater

Key Issues of Irrigation and Drainage in Balancing Water, Food, Energy and Ecology

This article is an extract of the background paper prepared by a team* under the leadership of Prof. Dr. Reza Ardakanian (UNU-FLORES) for the Sub-theme 1 of the Second World Irrigation Forum (WIF2) to be held at Chaing Mai, Thailand, from 6-8 November 2016. The full length paper on the Sub-themes would be made available on the ICID website. The brief background paper on the other two Sub-themes will be published in the ICID News 2016 (Third Quarter).

One of the greatest challenges of the coming decades will be to increase food production with fewer resources – water, soil, energy and biodiversity. The effective and sustainable use of resources for agriculture requires urgent and immediate solutions in view of the intensifying competition. In order to foster sustainable development, it is essential to maintain the balance between water, energy, food and ecosystem services. The irrigation and drainage sector is facing a number of issues. Some of them are ensuring resource availability, safeguarding the resources and their quality when designing new systems; operation and maintenance of existing systems and in turn their impact on the existing resources and the environment; and stakeholder interaction and participation that lead to better governance of the systems and their underlying resources.

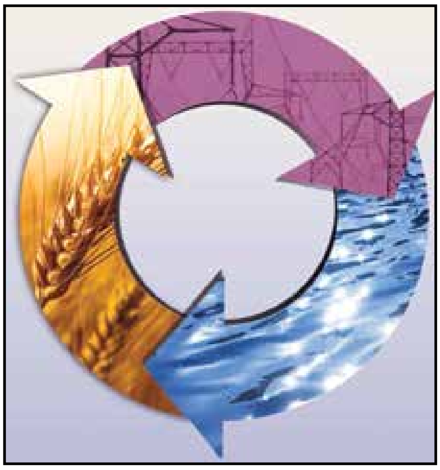
Overcoming unforeseen challenges requires unconventional thinking and solutions. Augmenting water supply to meet the future demand requires an effective and efficient utilization of water resources, use of non-conventional water resources, and water harvesting. Ambitious plans for large irrigation infrastructures exist, yet they are fraught with uncertainty and risks due to climate change, declining groundwater resources, and salinization. At the same time, although resource development and financial mobilization remain crucial and feasible in certain cases, opportunities for further massive development seem unlikely in many countries, owing to competitive demands of development. As a consequence, supply-driven approaches must definitely give way to demand management, efficiency of resource optimization, optimal allocation of resources, capacity development and sound governance.

One of the key approaches to augment water supply is to increase the extent of irrigated areas. Expansion of irrigated areas in future will stem from factors such as the development of supplemental irrigation methods in humid and rain-deprived areas; better utilization of water resources and their associated irrigation systems; use of non-conventional water sources such as the reuse of municipal, industrial and agricultural wastewaters; and integrating different disciplines to model new irrigation schemes that can applied at various spatio-temporal scales.

Irrigation systems and related infrastructure closely interact with the three environmental compartments namely water, soil, and air. Such interactions refer to direct environmental impacts, e.g., emissions, non-point pollutions and salinization. They also interact with riparian ecosystem and regional areas, e.g., hosting or threatening diverse biome and species, mitigating or amplifying floods, recycling nutrients etc. The irrigation systems also offer a number of services such as micro climatic regulation, biomass production, and specific products to the local community and societies at large.

Thinking within the overall water-energy-ecosystem-food nexus framework with existing water resources is essential. Balancing irrigation needs against environmental needs can be challenging. We need to adopt an integrated holistic approach to understand and sustainably manage resources with the aim to produce more from less with the "more crop per drop per kilowatt" method without hampering natural ecosystem services. It is only possible to achieve sustainability with this water chain approach along with the complete involvement of the stakeholder from beginning till end, extending from the farmer to the minister.

Irrigation and drainage systems have long provided a number of ecosystem services that serve societies at large. These services are:



- supporting services - hosting wildlife (birds, fish, biodiversity), and recycling nutrients;
- provisioning services - including food production (crops, fish, livestock), water supply to communities; provision of fodder, fuel wood, and medicinal resources;
- regulatory services - moderating local climate, mitigating floods, and helping purify water; and
- socio-cultural services - irrigation landscapes that offer socio-cultural and recreational values.

In order to manage poorly managed schemes and battle their negative impact, it is imperative to evaluate the aforementioned services and factor these services in the financial analyses. The paradigm shift towards the multi-functionality of irrigation systems will help in overcoming the negative impacts of the poorly managed schemes as well. Approaches that view irrigation and drainage structures as suppliers of ecosystem services and require payment for them can be embedded in the water-energy-food nexus, thus opening discussion about other natural resources in addition to water.. At the same time, strategies to avoid negative impacts such as over-abstraction of fresh water or salinization of soils need to be stepped up, and mechanisms for discontinuing existing mal-functioning systems should be implemented.

Stakeholder involvement and capacity development should be the central focus

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of resource management more than our description of the role of the stakeholders in water management systems, it is important to learn and find out what the stakeholder consider their role to be and how they can contribute in maintaining effective water management systems. All stakeholders from farmers to system operators to top level regional and national government staff need to have a clear understanding of the potential benefits of being involved. It is equally important to assure them of the sustainability of the benefits.

Capacity development is an important aspect of stakeholder engagement but is only one element in a much more complex process of stakeholder engagement. Considerable attention has been paid to describing who, what, where and how of stakeholder engagement. It is important to address the upstreams and downstreams of the water management systems in relation to the broadened scope of the water-energy-food nexus. It is not just the environmental impact but also the integration of ecology, and consideration of the ecological water needs, both in terms of quantity and quality, in the resource management chain.

The irrigation and drainage community has come a long way from designing large infrastructure projects all the way to valuing schemes that integrate into the landscape, provide eco-system services and are considered part of the cultural heritage of civilization. Nonetheless, many questions about the integration of different resource needs and balancing the trade-offs remain open. Under this sub-theme, we expect to obtain some answers to the questions such as:

- How can the use of smart infrastructure help in minimizing the harmful and negative impacts on the environment and the affected population while maximizing the yields?
- What management and governance strategies need to be established to support this?
- How can the negative impacts be assessed objectively and what measures can be taken to mitigate or avoid these impacts? What systems are needed for this?

For full version of the background paper can be accessed at http://www.icid.org/wif2_bg_pap_st1.pdf

Product Lineup

Soil Moisture

Peter White*

The author has over 20 years of experience in irrigation monitoring and scheduling, Soil Moisture Sense Ltd., lead the way in cost effective irrigation scheduling and irrigation management.

Plants require a good supply of water and nutrients in order to thrive. Water is essential in the plant for a number of reasons - water pressure within the plant cell walls provides physical support; it is the medium in which all chemical processes of plant metabolism occur; it acts as a solvent and medium for minerals and sugars to be transported around the plant; and Inter-cellular water evaporation can also act as a cooling mechanism to maintain plant at a temperature favourable for metabolic processes.

Plants draw water from the tiny pores (holes) present in soils and just like a sponge these pores (and the surface of the particles that make up the pores) can hold water. This water can be extracted by plant roots as they grow through the soil. When a soil is holding lots of water the plant can easily draw out the water, as less and less water is present it becomes increasingly difficult for the plant to draw water. When plants are starved of water it results in reduction in the rate of plant growth and restricts the yield of the crop being produced. Eventually, if the soil becomes too dry the crop will no longer be able to sustain itself and will die.

Most growers understand the benefits of irrigation. However, the decision when to irrigate are generally based on observation or through "kicking the soil" or inaccurate water balance methods. By deploying accurate, in-field sensors to monitor the changing soil moisture conditions one can determine when, and how much irrigation a crop needs to keep it growing to reach its full economic potential.

The prudent approach is to irrigate only when the crop needs water and to apply the correct amount to re-fill the soil pores. Once you decide to irrigate you need to ensure your application does not exceed the absorption capabilities of the soil. One needs to be careful as quite a few soils have water logging problems. While applying irrigation water the amount and timing of irrigation is important. If you water potato ridges too rapidly the ridges will shed much of the irrigation and the crop roots will remain parched.

A variety of soil moisture probes are available in the market. Soil moisture can be measured or estimated in a variety of ways ranging from the simple, low cost feel method to more accurate, expensive neutron probe units. For most irrigation water management applications, one of the several resistance-block types or tensiometers is sufficient. When monitoring drip irrigation the team often put in two probes, one beside the dripper and one some distance away where would like the

water to spread to, thus wetting a bigger root volume and allowing us to put on more water without leaching. The team then carried experiments (as all soils are different) to show how to get the best water spread without waste.

By collecting continuous, in field, multi-depth soil moisture data can you really know what is happening in your soil profile and make informed irrigation decisions. However, accurate regional soil moisture

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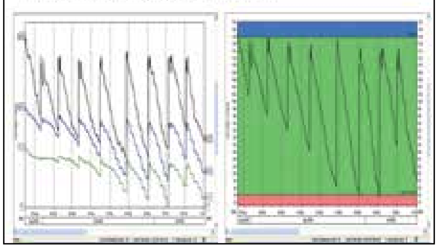
Perfect watering with drip irrigation and an EnviroSCAN – no stress, increasing deficits between irrigation, easy prediction of harvest deficits and simple management.



knowledge is elusive, due to an inability to economically monitor the spatial variation in soil moisture from traditional point measurement techniques. Microwave remote sensing provides the capability for measuring the spatial distribution of soil moisture content for regions with low to moderate levels of vegetation cover, but is limited to the top few centimetres of soil. To overcome the limits on soil moisture estimation accuracy, point measurement spatial coverage limits, and microwave remote sensing spatial-temporal sampling limits, uncertainties can be reduced through a combination of these approaches.

The author used Sentek EnviroSCAN range for over 20 years. The equipment is scientifically accredited, properly calibrated and has accurate installation techniques and wonderful software for viewing and interpreting the data. The concern is that growers who have this equipment assume that it is giving them useful information and think they are doing a good job when they are not. The author used benchmarking to compare the best growers with the rest so that they realise they are not so good. For example, if you are a potato grower and you are growing variety A and producing 50 tons/ha you may think you are doing well but if there are others who are producing 70t/ha - you need to know what you are doing wrong – often it is irrigation – you need to know you are doing it correctly and when you have problems be able to look back at all the inputs including irrigation to see what went wrong.

Example 1

Some years ago our team was asked to help a customer who imported peppers from Europe as the quality was often poor. Our team suggested that the problems were being caused by bad irrigation so EnviroSCAN were installed in the plastic greenhouse in Spain. By installing this technology 47% of the water saving was achieved from what they would normally have used and as they fertigated and did not change the mix, 47% of their fertiliser. An area where water is short and leaching of fertilisers is a problem, a simple probe in one place achieved the above across 9.5 ha. The yields and quality were excellent and both customer and grower were happy.

The main problem with the peppers was blossom end rot and the team suspected it was mainly caused by poor calcium uptake caused by excessive irrigation. Excessive irrigation would have resulted in a small root system that was unable to take up enough calcium. By irrigating less often and being able to see the rooting depth increase the team could schedule infrequent larger irrigations. This big strong root system solved the problems while saving a lot of time and money.

Example 2

The team was asked to install a monitoring system again in Europe where the quality of strawberries was not good enough. The crop was Spring ever bearer crop and was being picked when they arrived to install the probes. While trying to install the equipment the team found the soil was so wet it dripped off the auger. The team spoke to the grower and asked how often and how much they were applying – 4 hours per day. Nearby we had a grower with the same crop applying 20 minutes every two days! That is about 10% - no wonder the local rivers were bright blue with fertiliser. But the real problem for the grower assuming he had ample water and a big enough bank balance to keep buying fertiliser was that the quality of his berries was poor and the customers did not want to buy them and certainly would not pay top price as the taste and shelf life were poor.

The author can be contacted on info@soilmoisturesense.com and available examples can be seen at http://www.soilmoisturesense.com (login using 'demo' as both username and password, then click My Account, then choose between soil Moisture or Weather).

Second Green Revolution: Articulating an Agriculture Water Management Perspective

Avinash C. Tyagi*

The seeds for the first Green Revolution (GR 1.0) were sown by Dr. Norman Borlaug in 1950s, which spread and brought very good results in different parts of the world over a spread of two decades. The success was also the result of a sequence of scientific breakthroughs and development activities that successfully fought hunger around the world by increasing food production.

Basic ingredients of GR 1.0 were: High Yield Verities (HYV) of seeds with superior genetics; use of chemicals - pesticides and fertilizers; and multiple cropping system supported by the use of modern farm machinery and proper irrigation system. During the period there was also expansion of farming areas. GR 1.0 resulted in increase in agricultural production and changed the thinking of farmers. It had a marked impact on the rural employment, resulted in increase in trade and the surplus and rural income that helped to mobilize wealth to be deployed in the industries. Self-sufficiency in food grains was one of the major goals that gave a boost to the national self-confidence of the then emerging economies.

However, given the projected demand for food and nutrition for a burgeoning population, it is imperative that the food production and productivity is further enhanced in many parts of the world. There is a need for a Second Green Revolution (GR 2.0). World leaders such as Former UN Secretary General Mr. Kofi Annan, as many as two Prime Ministers, two Finance Ministers of India and other world leaders have called for such a revolution.

While GR 2.0 has to cover the regions that got a miss in the first edition, for example the African Continent was unable to reap the benefits of GR 1.0, it has to be distinctly different from GR 1.0. Similarly, within countries in Asia, for example India, East and North East States were not privileged enough to benefit from GR 1.0. Second, in a world that faces new challenges and is more sensitive to the sustainability concerns, it is important

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that GR 2.0 should align itself with the sustainable development principles. Further, the emphasis should be on small and marginal farmers. Attempt should be made not only to increase the production but also to sustain the productivity within the limits of the natural resources. GR 2.0 should envisage integrated programs taking care of all aspects of agriculture from soil characteristics, matching seeds, grains, conversion to food and its marketing after value addition. Due to the shadows of G 1.0, there are a number of misgivings about GR 2.0 which need to be set straight.

Irrigation and drainage sector, which played a crucial role in GR 1.0, will be expected to do more with little as it is expected to face a stiff competition for water from other sectors like domestic, industries, environment etc. Under finite land and water resources, increased agricultural production will have to come from the limited net sown area by increasing productivity with an optimal use of available water resources with improved irrigation management and agronomical practices for achieving this target. Further, the uncertainty due to increasing variability of climate is making the occupation risky, leading to increasing financial losses to farmers, particularly the small and marginal farmers.

> **The world urgently needs a green revolution in Africa and the African continent has the potential to deliver**
>
> — Lennart Bage, Former President, IFAD

With reference to agriculture water management GR 1.0 faced a number of criticism such as diminishing water availability, deteriorating water quality, point and non-point pollution of water bodies, over exploitation of ground water, land degradation due to waterlogging and salinity, deteriorating irrigation and drainage infrastructure due to poor maintenance, poor water governance and service delivery, climate variability and impacts of climate change etc.

There is no doubt that GR 1.0 gave a definite push to the rural development. However, in a number of countries of Asia and particularly in India the thrust given by GR 1.0 was supplemented by the blue revolution in fisheries, and white revolution through milk production, etc. Supply of water by multi-use irrigation systems played a significant role in the success of these revolutions.

Many of these shortcomings were due to the amorphous and un-coordinate nature of the development process through which GR 1.0 went through. The whole process was driven through the pioneering work on HYV and supporting sectors and services like irrigation and drainage were made to follow and fulfil the expected demands.

It is important that a framework for GR 2.0 is clearly articulated which is fully comprehended by all the stakeholders to enable them to contribute towards the desired objectives in a synergetic collaboration. The framework will differ from region to region based on the objectives, means and socio-economic situation. It would be appropriate that the objectives and means of GR 2.0 are clearly articulated so that all the stakeholders, service providers and the beneficiaries clearly see the goal and prepare and plan themselves to make a meaningful and sustainable contribution. ICID believes that through the efforts of the National Committees and support from other partner organizations it will be able to facilitate GR 2.0.

The Alliance for Green Revolution in Africa (AGRA) www.agra.org has been working on various important aspects over the years. It is important that ICID community supports these efforts. As a network of AWM professionals, we have the duty to make contribution towards sustainable rural development in Africa that ICID has envisioned in its new vision. Let us articulate how irrigation and drainage can make GR 2.0 a realty.

In ICID, we need to ask ourselves: "What and how can ICID as a network and as National Committees contribute to the Global initiative to bring Green Revolution in Africa?" In order to articulate this at the global level, NCs from Africa should deliberate on the following questions:

1. What were the achievements of the First Green Revolution (~1960-1990) in the country?
2. Why did the country miss out, if so, on the First Green Revolution?

3. What should be the mission and objectives of the African Green Revolution in your country?
4. What are the main challenges that may inhibit the African Green Revolution?
5. What should be the three most important components of the African Green Revolution?
6. What tools would be most relevant for the African Green Revolution?
7. Is your country equipped with the required AWM tools for the African Green Revolution?
8. If not, what in your opinion are the capacity gaps that need to be addressed for supporting the African Green Revolution?

African National Committees would make a great contribution by deliberating on the role that irrigation and drainage sector can play in making agriculture more resilient, productive and above all profitable in their respective countries. May I invite all NCs from Africa to send their inputs on the above questions, as agreed at the 4th African Regional Conference on Irrigation and Drainage (ARCID4), Aswan, April 2016. This will also form part of their input to the ICID Action Plan 2030.

For more information please visit our website page on Second Green Revolution at http://www.icid.org/second_g_revolution.html.

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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

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