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ICID NEWS

MANAGING WATER FOR SUSTAINABLE AGRICULTURE

MESSAGE FROM THE PRESIDENT

Dear Colleagues,

The world is in a constant evolving state with socio-economic developments considered the core issue for long term sustainability. In spite of the fact that we are living on a blue planet with water abundancy, yet non-availability of fresh water in many parts of the world hampers development and even poses challenges for existence of life. Globally, agricultural sector which extracts 70 percent of freshwater, which can be as high as 90 percent in some developing countries, contributes less than 5% to the global GDP. In a narrow sense, it presents a case for diverting scarce water resources from agricultural sector to the industry and municipal use to provide a higher GDP at national and global levels and meet the growing needs of urbanisation respectively.

Food security, poverty alleviation, employment, health issues and by all means urbanisation, are the growing sectors competing for larger share in the scarce water resources. Low productive agricultural practices should be drastically improved to cost effective sustainable agricultural production oriented activities to continue to provide rural livelihood. Appropriate water productivity models should be developed and advocated for better water management practices at farm levels.

ICID as a knowledge based professional NGO with a prestigious history of developing technical and scientific practices for improved management of water for food is now facing with a tough challenge of meeting its objectives. It is the responsibility of ICID to facilitate incorporation of optimal use solutions for the complex development situation within the national development strategies among its member countries.

ICID has successfully evolved a mechanism that stand on three pillars: National Committees, Working Groups and Office Bearers. The knowledge and experience acquired by ICID through its National Committees (NC) over the years have been objectively focused on dealing with practical local and global issues, which have been appreciated by many stakeholders involved in agriculture water sector and water communities worldwide. Very often these NCs play a crucial role in policy formulation. They need to bring together various stakeholders within the countries and discuss various development perspectives. In the absence of such an interactions certain policy issues might impact agriculture water management adversely. NCs can learn from each other in this respect.

The real strength of the National Committees as a very powerful international network for technical and knowledge exchange has not been fully utilized to its potential. Issues related to low productivity, mismanagement of irrigation schemes, inefficient irrigation operation, and above all inappropriate design concepts and implementation, inter alia, continue to hamper optimal use of resources in many irrigation projects within developing countries. NCs should share experiences in dealing with such cases for the attention of the related technical bodies and discussion during IEC and seek technical inputs for mutual benefit. Obviously, ICID Work Bodies and NCs should be prepared for such interaction to make this initiative a success.

The outcomes of the 22nd ICID Congress have been disseminated through various channels with the final report in the printed version coming out very soon. NCs are requested to utilize their national and local capacities and networks to further disseminate the messages emanating from the 22nd ICID Congress and the First World Irrigation Forum (WIF1). I request Office Bearers of the respective NCs to make a road map for enhancement of NCs performance and involvement in decision making processes within their respective countries.

Best regards,

Dr. S. Nairizi
President, ICID

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Inside

How do Irrigation and Drainage Interventions Secure Food Production and Livelihood for Rural Community?

François Brelle*

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 lack of interest for irrigated agriculture by funding institutions from 1960s to 2000s may be mainly explained by the statement of failure of many projects between 1950 and 1980. They often appeared as insufficiently robust to changes, organizations and management instruments revealing their inability to ensure the sustainability of the infrastructures and of the water services provided by them.

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.

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Overview

A key element in irrigated agriculture development is the concept that long-term sustainability which can be achieved only (i) if water resource is properly conserved, (ii) with the 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.

Product Lineup

Maintaining Sub-surface Drainage Systems

Drainage for Sustainability

Increased competition in food producing countries demands maximum effort to achieve high yield against low costs. One of the pre-requisites to achieve this is by well-maintained irrigation and subsurface drainage methods: on the land or in the greenhouse. Reliable water levels in the field can help plants grow even under difficult circumstances.

Drainage problems are serious on about 100-110 million hectares of irrigated land located in the world's semi-arid and arid zones. At present, about 20-30 million hectares of irrigated land are seriously damaged by the build-up of salts and 0.25-0.5 million hectares are estimated to be lost from production every year as a result of salt build-up.

Drainage, by virtue of man-made surface or sub-surface conduits, attempts to create well drained arable lands, preventing salinization of the soils, lowering of groundwater table and removal of accumulated salts or toxic elements.

Regular maintenance keeps your soil healthy

The high investments in equipment demands provision for adequate maintenance. The sub-surface conduits have a tendency to clog for a variety of reasons such as design of the system, materials used for construction, and installation procedures. A predominant phenomenon in clogging of agricultural drainage systems is formation of iron deposits.

For the past 35 years HOMBURG in Holland is the world leading manufacturer for the maintenance of sub-surface drainage systems. The extremely rigid HPE hose is pushed into the drain (up to 500 metres), in combination with the unique low-pressure system (only 10 to 12 bar) making it possible for the specially developed nozzle to clean the drain and remove the dirt. HOMBURG drain cleaners are economical to use, reliable and extremely robust. Their simple operation guarantees a safe and efficient working environment. The patented system cleans without affecting the structure of the soil or the drain.

For more information or free CD-ROM? Check **http://www.drainjetter.com** or send an email to **info@homburg-holland.com**

Pressure Irrigation Project for Water Saving

The case of the South San Joaquin Irrigation District (SSJID), USA

Jeff Shaw[1] and Todd Kotey[2]

For over a hundred years, water was delivered to South San Joaquin Irrigation District (SJJID) Division-9 customers through miles of gravity based canals and pipelines which was inefficient, ecologically wasteful, and ultimately insufficient, as farmers changed crops and increasingly moved from flood to pressurized irrigation. The SSJID and M/s Stantec partnered to develop a pilot program that is a model for future water delivery, with a network of pressurized pipelines that radically increases efficiency and improves service. The project has won international recognition, by winning the ICID WatSave Technology Award 2014 for applying the best technology for water saving for having virtually eliminated water waste and provides growers with individualized, automated irrigation access built on an easy to use mobile based technology that revolutionized irrigation in the Central Valley.

Innovative application of new techniques

Since 1909, farmers received water through a distribution system designed to provide water on a rotational schedule for flood irrigation of field crops. Though highly inefficient, originally the system generally met users' needs. Over the past few decades there has been a significant and accelerating increase in pressurized on-farm irrigation systems, which are more economically beneficial. Compared to flood systems, pressurized systems typically require smaller, more precise, and steadier flow rates at more frequent intervals, and for longer durations. The existing gravity system could not reliably meet these demands, so many growers converted to groundwater to meet their needs. This has created new problems, as elevated salinity levels in groundwater forced many farmers to return to their old system and settle for less than ideal delivery.

The new, completed pressurized irrigation system is one of the most water-efficient irrigation delivery systems in the agricultural industry, and provides growers with individualized, automated irrigation access. The project consists of a 19-mile network of pipelines with flexible pressurization and delivery rates, a 56-acre-foot water storage basin, a 1,225 HP pumping station containing seven variable frequency drive vertical turbine pumps capable of pumping a total of 23,500 gal/min, and a total of 55 solar-powered Remote Telemetry Units (RTU's) controlling 78 customer connections. The solar-powered RTUs consist of a PV panel, a flow control valve and a meter, farm moisture sensors, pressure transmitter, and a radio based Supervisory Control that Communicates with Data Acquisition (SCADA) system in the pumping control room.

One of the project's most striking innovations is the integrated online platform for ordering and delivery. The simple-to-use interface provides farmers with all the tools they need to manage the irrigation deliveries, including detailed weather information, historical water delivery data, and real-time field moisture sensor information, which indicate the optimal time to irrigate. This simple platform requires only three steps to order, and can be done from any Internet-connected device, including a tablet or smart mobile phone. From an online calendar, which resembles a familiar airline ticketing calendar, the farmer selects the date and duration of the water delivery. The site immediately queries the SSJID's system to confirm that it has sufficient capacity, sends the order to the SSJID's SCADA

Farm-Level Benefits

The project improves:

- Crop quality and marketable yield;
- Delivery measurement and water management information;
- Ability to comply with new water quality regulations;
- Irrigation scheduling flexibility; and
- Air quality by eliminating diesel powered pumps.

The project reduces:

- Production inputs, including water, fertilizer, pump energy (by 38%) and maintenance;
- Farm management costs;
- Farm labor costs;
- On-farm pumping (completely eliminated); and
- Irrigation costs by 50%.

District-Level and Societal Benefits

The project improves:

- Water administration through automated billing and account management;
- Beneficial use of SSJIDs water rights;
- Ability to fully comply with State volumetric billing requirements;
- District enrollment and number of active surface water users; and
- Opportunities to transfer conserved water and increases revenues.

The project reduces:

- Seepage, spillage and evaporation losses enhanced;
- Overall energy use through highly efficient centralized, larger pumps;
- Operations labor, fleet mileage and air emissions;
- Maintenance costs; and
- Capital costs of repairing and replacing aging infrastructure.

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server, and finally routes the order to the local turnout's RTU using the SSJID's private radio network. Farmers receive text and email alerts prior to irrigation, and a delivery summary upon completion; full account management is always available on the farmer's personalized web section.

Future value to the engineering profession and perception by the public

This project provides a model for the future of specialized, efficient irrigation systems; the need for these systems is becoming increasingly apparent in California, where the state's $43 billion agricultural industry is suffering through the worst drought in decades. It proves that automated pressurized irrigation is not just theoretically possible, it is both achievable and cost-effective.

This project has already been a tremendous public success, featured positively in a wide range of local media outlets. The General Manager called it "the most advanced irrigation delivery system in the country", and the project has been lauded by the Bureau of Reclamation and the US Department of Agriculture, which awarded the pilot project a grant of $1 million dollars. It has received national recognition from the United States Committee on Irrigation and Drainage (USCID).

Social, economic and sustainable design considerations

Solar energy powers all aspects of the customer connection, reducing overall energy use and completely eliminating the need for District staff to travel to manually open and close values and record delivery measurements. The pumping station further conserves energy by eliminating on-farm diesel pumps and replacing them with a centralized, highly efficient solar pumping station. In addition, it drastically improving air quality, and new efficiencies like this has reduced irrigation costs to farmer by 50%.

The old gravity-based pipelines were doubly wasteful: the pipelines frequently leaked, and the water was used for flood watering, a very inefficient irrigation method. The new system reduces spills by 1,000 acre feet and overall conserves 12,800 acre-feet of water per year (the equivalent of 76,800 people's water use), by utilizing a closed, pressurized distribution system, a tail water recovery system, intelligent irrigation scheduling, and soil moisture monitoring. It maximizes the "crop per drop," with a demonstrated 30% reduction in on-farm water use per irrigated acre and a 30% increase in crop yields.

The project has relieved 500 acres of farmland from groundwater pumping, and protecting an over drafted groundwater aquifer. Nitrate contamination of groundwater aquifers – a result of the deep percolation of farm irrigation fertilizers – is a severe health concern for the Central Valley. This project reduces fertilizer inputs by directly injecting nutrients into the crop's root zone through drip and micro emitters. Irrigation application efficiency increased from 65% to 90%, significantly reducing farm leaching. The problem of farm runoff has been eliminated by using a pressurized, on-demand system with targeted deliveries. The regulating reservoir includes an integrated tail water recovery system, which allows the reuse of irrigation tail water. The system has reduced erosion and has provided the customers with a greater ability to resist pests and disease, while reducing chemical weed control applications, by the targeted use of irrigation water where the water is needed most.

Complexity

The Division 9 system sets a world standard for "intelligent" irrigation infrastructure, employing the latest technology to provide an integrated, automated irrigation management and delivery system. Though incredibly complex, the design made sure that all parts of the system work together simply and seamlessly.

The system was programmed to read solar-powered soil moisture sensors based on soil tensiometer readings to give real-time feedback to farmers on their custom website. The farmer website and SSJID operator dashboard website were programmed with the best suite of software, including Microsoft SQL, PHP, PHP Mailer, AJAX, JAVA, JSON, HTML 5, JQUERY, and High Charts. This website is an incredibly powerful tool, but could only be a success, if the farmers themselves found it useful, so a major design challenge was to develop a site that was userfriendly, so that farmers of all ages would use it. At the end, the website has been an astounding success, with almost 100% of Division 9 pressure customers ordering online. In addition to the obvious benefit to the farmer, this has allowed the SSJID to re-allocate their staff to more profitable tasks.

Programming the pump station, so that the right size and number of pumps operated at the optimal speed and pressure required a control strategy and pump selection set that could accommodate every system scenario. Similarly, challenging was the communications system, which links the web server, a Supervisory Control, and Data Acquisition (SCADA) server, the microwave and radio frequency based systems that provide instantaneous communication between the SSJIDs main office, the un-manned Division 9 Control Room, and the remote customer connections. The website, pump station, conveyance and communications system have worked flawlessly, providing guaranteed on-demand service through the first two years, in the face of numerous operational scenarios encountered.

Successful fulfillment of client/owner needs

The Division 9 project has been incredibly successful, proving to both the client and the farmers that an automated pressurized irrigation is not only technically possible, it is a major improvement over the old system. The district estimated that 30-40% of farmers would eventually adopt to the new system. Instead, nearly every farmer is now using the new delivery system. Not only has it solved the problem of on-time pressurized water delivery, far exceeding grower expectations, it eliminated the need to continually maintain the inefficient and costly gravity delivery system, freeing up SSJID staff and capital funds.

Conceived as a pilot project on 3,000 acres, the astounding success of the project has prompted the SSJID to work with M/s Stantec to evaluate the feasibility of extending pressurized service to its remaining 55,000 acres of service area.

In the end, this system may help ensure the future of farming in the Central Valley. The new system, which seamlessly integrates Internet-based technologies, is incredibly popular with the children of the farmers, as the first generation is nearing retirement age. Without an engaged, enthusiastic generation to take over family farms, the

state could see a major loss of agriculture production, but projects like this help ensure that California will be producing for years to come.

Full version can be downloaded from <http://www.icid.org/ws_tech_pap2014.pdf>

Learning from our Irrigation Heritage

Avinash C. Tyagi*

Heritage is that which has been handed down to us from the past through our forebears. Today, the water managers are dealing with multiple complex challenges due to complicated natural resources and development scenarios. This is in stark contrast to the situation some hundreds of years back when irrigation infrastructure was built in the atmosphere of abundance but under severe technical constraints. Some of these structures have survived for centuries and continue to serve their original objectives. The sustainability of such structures is our Irrigation Heritage. Like other tangible and intangible heritage such as traditions, culture and values irrigation experts can also learn from their philosophy of design and tradition followed in their management.

At the 63rd meeting of International Executive Council (IEC) held at Adelaide, Australia, June 2012, a process for recognition of the historical irrigation structures on the lines of World Heritage Sites as recognized by UNESCO was initiated. Accordingly, a Task Team was set up to work out objectives, guidelines and procedures to select the structures.

The main objectives of recognition of historical irrigation and/or drainage structure fulfilling certain criterion, recognized as "Heritage Irrigation Structure" (HIS) are:

(i) Tracing the history and understanding the evolution of irrigation in the civilizations across the world;

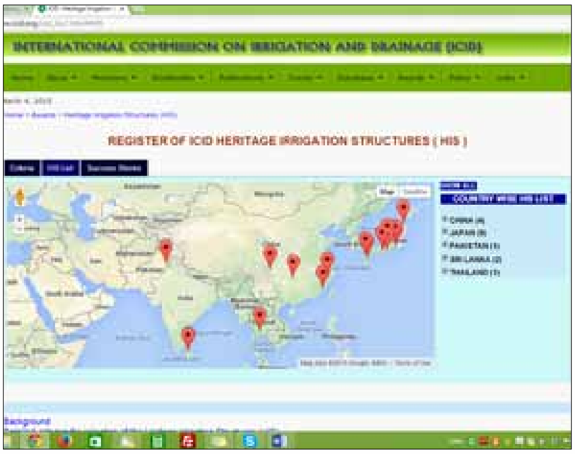
(ii) To select and collect information on heritage irrigation structures from around the world, understand their significant achievements and gather knowledge about the unique features that have sustained the project for such a long period;

(iii) To learn the philosophy and wisdom on sustainable irrigation from these structures; and

(iv) To protect/preserve these heritage irrigation structures.

The Heritage Irrigation Structures which have served for more than 100 years such as Dams (operational largely for irrigation purpose); water storage structures such as tanks; barrages and other water diversion structures; canal systems; old waterwheels; and old shadouf, etc.

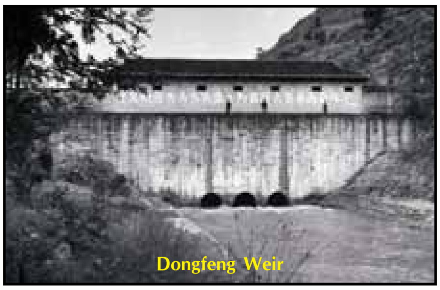
How are the structures recognized?



An irrigation and drainage structure fulfilling the criterion, based on the recommendation of the International Jury constituted for the purpose, is recognized as Heritage Irrigation Structure (HIS) by including it in the "ICID Register of Heritage Irrigation Structures" and presenting a "Heritage Irrigation Structure" Plaque and Certificate citing the salient features of the structure. The Register is maintained online on ICID website <http://www.icid.org/icid_his1.html>

At the 65th IEC meeting at Gwangju, Korea, 2014, Council approved the inclusion of first batch of 17 heritage irrigation and drainage structures for inclusion in the ICID Register of "Heritage Irrigation Structures". The approved list is shown in the table.

Registered Heritage Irriation Structures	
China	Dongfeng Weir
	Mulanbei Water Conservation Project
	Tongjiyan Irrigation Structure
	Ziquejie Terraces
Japan	Fukarayousui Irrigation Canal Inaoigawa Irrigation Canal Ogawazeki Irrigation Canal Sayamaike Reservoir Shichikayousui Irrigation System Tachibaiyousui Irrigation Canal Tanzansosui Irrigation System Tsujunyousui Irrigation System Yamadazeki Barrage System
Pakistan	Balloki Barrage
Sri Lanka	Abhaya Wewa Reservoir
	Nachchaduwa Wewa Reservoir
Thailand	Sareadphong Dam



Dongfeng Weir

Tachibaiyousui Irrigation Canal

Nachchaduwa Wewa Reservoir

Open Nominations

Nomination for heritage irrigation structures are open and can be submitted throughout the year. A milestone from administrative perspective has been earmarked as 15 July every year specifically to enable the Jury to process them before the next IEC meeting held generally between September – November for inclusion in the "ICID Register of Heritage Irrigation Structures". National Committee can nominate more than one structure, using separate nomination form for each structure. Associated Members and non-member countries can nominate their structures through the neighboring active national committees or by submitting directly to Central Office. For information related nomination form and more details, visit <http://www.icid.org/icid_his1.html>

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Channel Weed Control

Irrigation Australia Limited Plays a Facilitator

Anne Currey*

IAL is Australia's the leading national organization representing all Australian stakeholders of irrigation industry, from water users, consultants, designers and installers through educational institutions, government, manufacturers and retailers. IAL has been active in the areas of education and certification, being a major advocate for recognizing and building on the skills of those working in the irrigation industry. It also has a major voice at Federal policy level, working closely with the Australian Government, the Australia Water Association, Water Services Association of Australia and other stakeholder groups. Australia joined ICID in 1952 and IAL is the Australian representative body/ national committee (www.irrigationaustralia.com.au)

A big issue for many water supply companies in Australia is controlling aquatic weeds in the channels. Until recently, many companies across Australia relied on an herbicide called acrolein to control submerged aquatic weeds such as floating pondweed, elodea, milfoil and ribbon weed in irrigation channels. Growth of submerged weeds like these reduces channel capacity and increase siltation, which slows the delivery of irrigation water to the farms.

When the manufacturer gave notice in 2011, informing that acrolein may no longer be available due to difficulties in obtaining supply, the Irrigation Water Suppliers Special Interest Group developed a research project under the auspices of IAL to test the efficacy of a herbicide called Endothal a potential alternative for acrolein.

The aims of this project were to test the effectiveness of Endothal in controlling aquatic weeds and to assemble the data necessary to obtain a permit for use in irrigation channels in Australia.

This project was funded by Murrumbidgee Irrigation, Victorian Department of Environment and Primary Industries and Goulburn Murray Water.

Herbicide effective: permit holder needed

When Endothal research confirmed the herbicide's efficacy in controlling the most significant aquatic weeds the next step was to secure a permit to allow its supply and use in irrigation channels. According to Mr. Mark Finlay from Goulburn-Murray Water, the information assembled in the project satisfied the requirements of the APVMA (Australian Pesticides and Veterinary Medicines Authority). The main issue was finding a permit holder who could supply the chemical to enable the product to be used in Victoria, NSW, Qld and Western Australia.

The photograpghs compare occurrence of Sagitarria in treated and untreated sections of a channel in Victoria. The section of channel in the top photo was untreated while the bottom was treated with Endothal at 5 ppm during winter, which substantially reduced biomass for 19 weeks.

Normally, a permit holder would be a company, but this would restrict the use to a single state jurisdiction. Because IAL incorporates irrigation water companies across Australia, it was considered to be the perfect owner for the permit, so that the product could be used across Australia.

A conversation with IAL resulted in a solution, which was that IAL would apply to be the permit holder of the pesticide,

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Endothal efficacy – The short story

The Research conducted from 2012 to 2014 in Victoria and NSW and funded by Murrumbidgee Irrigation, Goulburn-Murray Water and Victoria's Department of Environment and Primary Industries assessed the effectiveness of herbicides such as Endothal in controlling aquatic weeds.

Determining the efficacy of the herbicide Endothal on Sagitarria (arrowhead) used a desktop search, and shade house and channel trials to assess whether or not Endothal could be considered a viable option for controlling Sagittaria. The research tested both formulations of Endothal (monamine salt, or E-MAS, and dipotassium salt, or E-PDS).

The trials confirmed the efficacy of Endothal in controlling a number of significant aquatic weeds, including Sagittaria. A literature review found it was effective against other weeds such as floating pondweed, ribbon weed, elodea, cabomba and egeria.

The research also showed that water temperature and a combination of chemical concentration and how long plants are exposed to the chemical are important considerations in determining dose rates and when to apply to it for optimum control.

Water temperature. The action of microbes causes Endothal to decay. Because the activity of microbes is affected by temperature, the rate at which Endothal decays and, as a result, the length of time plants are exposed to the chemical will similarly be influenced by temperature. Thus, in cool water, plants will be exposed to the herbicide for longer than in warm water because the activity of microbes is slower. In contrast, herbicide activity is more rapid when plants are actively growing in warm water.

Concentration and exposure time. How well aquatic weeds are controlled is influenced by combination of the concentration of Endothal in the water and how long plants are exposed to the herbicide. This is known as the CET relationship and is different for each combination of target species and herbicide.

Formulations. After testing E-MAS and E-PDS, singly and in various combinations, it was found that E-MAS used at any rate reduced leaf area quicker and for longer than E-PDS used alone. In the various combinations of the two formulations the effect of E-MAS was proportional to its fraction in the herbicide mixture. The difference in the ability of the two formulations to decrease leaf area reduced over time but the conclusion was that E-MAS used either alone or in any combination with E-PDS is more effective.

The bottom line

The research results show that Endothal, particularly E-MAS used either alone or in combination with E-PDS, significantly reduced the leaf area of Sagittaria over a long period. A literature review found similar results for other aquatic weeds such as floating pondweed, and ribbon weed.

It was also established that chemical concentration needs to be varied based on temperature (season) concentration and exposure time. For sagittaria control the best time to dose irrigation channels is during the winter which is irrigation off season. This is because the cooler temperatures mean the chemical decays more slowly than in warmer temperatures, exposing weeds to its effects over a longer time period.

which is produced by United Phosphorus Limited. The licensing role has enabled IAL to engage with the relevant government departments about the trial and with licensing requirements, while supporting industry researchers and irrigation professionals to provide a safe, readily available, and cost-effective alternative for channel weed control.

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I am pleased by the important role played by IAL in the Endothal trial and its licensing.

As the national association for the irrigation industry, a key part of IAL's charter is to engage with industry to improve the efficiency and sustainability of irrigation in Australia. Taking on the role of the Australian Licence holder for Endothal was a logical step for IAL and is consistent with the aims of our charter.

Managing weed growth in irrigation channels enables more efficient movement of water to end users, saves water from being taken from the system by these plants, extends the service life of the channel, and removes a potential source of contaminants from irrigation water.

This is a great example of IAL working with the irrigation industry to provide practical outcomes that have applications across a broad geographic area.

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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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