LIFETIME ACHIEVER — WARREN MUIRHEAD

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QUICK TAKE

- Warren Muirhead, long-time irrigation and agricultural scientist with CSIRO at Griffith, received an IREC Lifetime Achievement Award in August 2014.
- The award recognised his outstanding lifetime contribution to research, extension and training of young scientists in the irrigation industry of the Murrumbidgee Valley.
- Warren earnt respect across the farming and scientific communities, for the careful and practical science he conducted to address issues affecting crop production and irrigaton in the region.
- This article is a very slightly edited version of the tribute speech for Warren Muirhead made by Liz Humphreys at the award dinner held in Griffith.

Thanks both to Warren Muirhead and IREC for providing an excuse for this fantastic reunion — bringing together people from many eras and from many walks of life with one thing in common, that their work and/or lives were touched in some way by Warren.

As I started to jot down a few things about Warren, I quickly realised that this award was a no-brainer! What an outstanding contribution Warren has made in so many ways, and none could be more deserving for this prestigious award. I thank IREC for giving me the honour of making this formal tribute to Warren.

Warren spent his childhood in a horticultural farming family near Maitland, where his father mainly grew potatoes, cabbages and cauliflowers. In his teens, he received a Soil Conservation Service traineeship, which enabled him to do a degree in Agricultural Science at the University of Sydney.

Soil conservation

After graduating in 1954 Warren was posted to the NSW Soil Conservation Service at Condobolin for 12 months to gain some experience before taking over the Hay office. The Condobolin office had an attractive, spirited young secretary called Gwen, who loved dancing and sport. Warren didn't like dancing and wasn't interested in sport, but something must have clicked, because here they are tonight [at the award dinner], together with three daughters and five grandchildren.

Warren and Gwen shifted to Hay where Warren worked on reclamation of scalds — bare patches of degraded land that had lost the topsoil as a result of over-grazing and wind erosion. In the 1950s, the Soil Conservation Service constructed several enclosures in the western Riverina in an attempt to reclaim the land by excluding stock together with various practices such as furrowing, water ponding, seeding with salt bush and natural regeneration. One of Warren's jobs was to study the response to the reclamation measures and evapotranspiration from salt bush. I think you can still see one of the enclosures where Warren used to work just south of Hay on the road to Deniliquin.

Irrigation research

In the late 1950s, Arthur West's father Eric retired as Chief of CSIRO Division of Irrigation Research at Griffith. With the arrival of the new Chief, Eric Hoare, several new positions were created. Warren commenced with CSIRO in 1960 as an Experimental Officer. His first job was to evaluate the potential for crops and pastures planted between rice crops, to help manage the problems of watertables and soil salinisation. He did much of this work on Jim Wilkinson's farm at Murrami, and this was the topic of his Masters Degree, awarded from the University of Adelaide in 1967. The research showed that if the rice straw was retained in the field, the low light levels beneath the straw inhibited crop establishment. However, with a good stubble burn, establishment was satisfactory and led to lowering of the watertable by the crop. More than 40 years later, John Blackwell and his Indian collaborators developed the Happy Seeder technology to the degree that it is now possible to get good establishment of wheat in standing rice residues in the conditions of north west India.

The current version of the Happy Seeder leaves the seed row uncovered, and John asked me to acknowledge both Warren and Evan Christen's encouragement in this work. John has found that the concept is suitable for conditions in the Riverina, but is still working out how to manufacture a machine of suitable quality.

Over the next 36 years with CSIRO, Warren worked on a wide range of problems and opportunities for irrigation farmers, in both broadacre crops and horticulture.

Solving soil problems

In the mid-1960s, Alistair Low appeared on the scene and introduced short-duration cotton varieties and cotton production took off in a small way. However, a major limitation was the poor physical properties of the clay soils, and Warren and colleagues set about investigating soil amelioration options such as gypsum and deep tillage. A lot of this work was done on John Woodside's property at Benerembah, and in 1976 Warren was awarded his PhD with Macquarie University on this topic.

At this stage, farmers were increasingly diversifying to other crops in the rice rotation such as maize and sunflowers, and the problem of "rice stubble disorder" emerged rather spectacularly, with big lush plants on the former contour lines where the rice banks had been, and stunted growth in the former rice bays. This was a very nice example of the use of science to determine the cause of a problem and come up with management practices that went a long way to reducing the problem.

The problem was largely caused by changes in the soil properties as a result of growing flooded rice, which caused phosphorus tie up when the soil was not flooded. The solution was to band the phosphorus fertiliser below the seed instead of broadcasting. Warren and his team were over a decade ahead of the Americans, who "rediscovered" this problem in the 1980s. I understand the problem is again being rediscovered in this region, with funding being sought for further research, probably reflecting the lack of investment in agricultural RD&E and loss of corporate memory in the irrigation areas over the past 20 years.

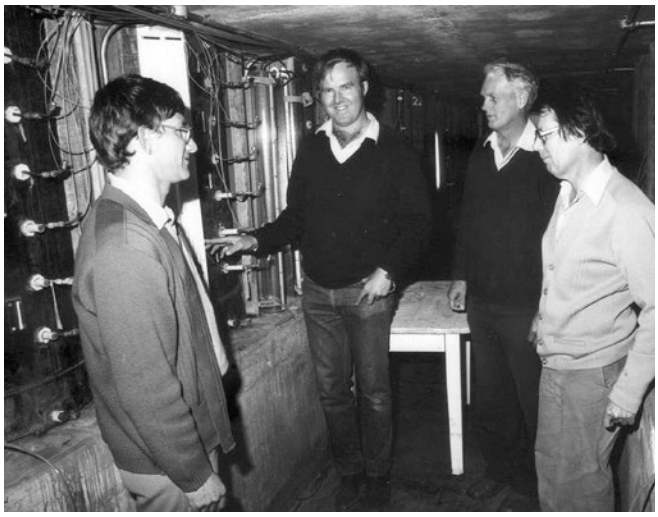
Nitrogen fertiliser efficiency

Around the time I started at CSIRO Griffith, in the early 1980s, Warren was in the midst of a program on improving the efficiency of nitrogen fertilisers applied to row crops, especially maize and sunflowers. At the same time, Barry Steer was doing plant physiological studies on sunflowers. It was around this time that farmers were experimenting with anhydrous ammonia applied in the irrigation water, and Warren, Bob White and John Lockhart did some good science which showed that water run urea was indeed a most efficient and robust method of applying nitrogen fertiliser. They did a lot of this work on Alan Irvin's farm at Benerembah. As a result of this work Warren received a Certificate of Appreciation from the Maize Association of Australia.

Also at Irvin's, Warren and his collaborators from Canberra and Griffith showed that there were huge losses of nitrogen fertiliser applied to rice if it was topdressed into the floodwater before the plant canopy was well developed, and also if it was applied prior to combine sowing rice followed by flush irrigations.

Warren Muirhead commenced his distinguished career with the NSW Soil Conservation Service, working at Condobolin and then Hay.

Warren joined CSIRO in 1960, where he earnt his reputation as the farmer's scientist, finding practical solutions to enhance the productivity of the region's soils.



In the lysimeter at CSIRO Griffith, are, from left, Wayne Meyer, Peter Cull, Warren and Henry Barr

A 1980s field trial where gaseous loss of nitrogen fertiliser was measured. The results have influenced rice nitrogen management since.

From left, Bruce and Marie Smith, and Jean and Graeme Menzies

Irrigation & drainage management

In the 1980s the CSIRO Griffith lab became part of CSIRO Division of Water Resources, and there was a compulsory shift away from an agronomic and production focus to a water management and environmental focus. With a lot of help from Warren and team, John Blackwell managed to get some funds for a lateral move sprinkler irrigator and evaluated it for rice on the Whitton common. The sprinkler irrigated rice performed poorly from early on, and was also hit very hard by cold damage — 1983–84 was a very bad year for cold damage.

In those days, much of the wheat was still grown in rice layouts in which the water came in at the top of the field and flowed from bay to bay to the bottom end, meaning that the upper bays were waterlogged for a long time. Warren initiated some nice research which showed that yield declined as the duration of ponding increased, and the importance of getting the water on and off as quickly as possible.

Warren also initiated CSIRO research on puddling for rice to reduce drainage losses, which brought me back to Griffith again, after a stint in Canberra. Most of this work was done at Coleambally, on the farms of Noel Sutton, Brian Mannes, Keith Burge and Peter Shepheard. We also snuck in a bit of work on nitrogen management for puddled soils, which Lucy Kealey did for her Masters Degree. It was during this era that Brad Fawcett and John Townsend also joined the team. The work on puddling was rather controversial for a couple of reasons. Firstly, it highlighted the problem of large accessions to the watertable from rice culture, which didn't exactly endear us to the rice growing community. Also, we received some pretty harsh criticism from our fellow soil scientists because they were concerned about soil degradation. We didn't find any impacts of puddling on the performance of crops grown in rotation with rice, but we didn't conduct our research for long enough for the usual reasons (short-term funding).

These days there is a big move in parts of Asia to shift from puddling and transplanting of rice to dry seeding with intermittent irrigation and conservation agriculture — especially in the rice-wheat systems of south Asia, where we find that after 2–3 years of puddling rice there are deleterious effects on wheat.

Around the same time, Warren initiated research on irrigation and drainage management in horticulture. This included collaboration with a couple of drainage gurus from Silsoe in England, which resulted in Evan Christen coming to CSIRO to conduct his PhD research, initially on mole drainage. A lot of this work was done on Jim Geltch's farm at Whitton, where he was also showing big benefits of raised beds for reducing waterlogging on heavy clay soils. It was at this time that Warren recruited Jim Moll and somehow turned him into an agricultural economist, now his lifetime career.

Busy retirement

Warren retired from CSIRO a little prematurely in 1996, so that he could look after Gwen following a couple of health hiccups. In fact, for the first 10 or more years after he retired, I think that

Gwen saw less of Warren than she had when he was working for CSIRO. Retirement was when his real career began.

In no time, he became leader of the Coleambally Land and Water Management Plan Education Program, and shortly after that he became a director on the board of Coleambally Irrigation, a role which he continued for seven years to 2004. During that period he had a lot of interaction with Arun Tiwari, Environment Manager at CICL.

At the same time, he stayed on as an honorary fellow with CSIRO in an advisory role to various people, and worked with Tony Parle on his vegetable and cucumber crops.

Warren was a passionate advocate for irrigated agriculture, but equally strong on the need for radical changes in on-farm and industry practices if irrigated agriculture was to remain a viable and vibrant industry in the region. He carefully studied many proposals and plans such as the Living Murray, the Murray–Darling Basin plans, and whatever else came along. He wrote strongly-argued submissions on draft plans and to inquiries, not just in relation to water, but also other matters. For example, while I was googling Warren on the internet, I came across a submission to the Productivity Commission's Citrus Industry Inquiry in 2000. In his submission, Warren put the case for value adding, concluding with the following remarks:

> *"The future for irrigated agriculture is likely to depend more on strategies of value adding, niche markets, "new age" cooperatives and sound financial planning, than simply producing a commodity. The Griffith community may well have a new vibrant industry if citrus growers encourage their representatives to spend more time talking to people knowledgeable in agribusiness, food technology and product innovation than to politicians."*

Thoroughly deserved

This brief outline of Warren's career is very incomplete and empty without emphasising several very important characteristics which really highlight why he is so deserving of this Lifetime Achievement Award.

Practical solutions

Warren has always been driven by a very strong desire to find practical solutions to help farmers to improve their production, economic viability and sustainability — in both environmental and political terms.

Being a member of IREC subcommittees was a valuable opportunity for Warren to interact with farmers, agribusiness, consultants and other researchers to identify important barriers to crop production and to assist with the adoption of possible solutions by irrigators.

He was much more driven by practical solutions than by producing scientific publications, at times to his detriment in CSIRO. None the less, he has a healthy publication record in scientific journals, but this is far outweighed by his publications in farmer magazines such as the IREC *Farmers' Newsletter*, the Onion Grower and so on.

Gwen and Warren Muirhead with Jim Geltch, a farmer cooperator with Warren for drainage research in broadacre vegetable crops

From left, Peter Ryrie, Lance Parker, Sue Chittick-Dalton and Adrienne Steer

From left, Evan Christian, Roy Zandona, Warren and Jim Moll

Liz Humphreys congratulates Gwen and Warren on Warren's IREC Lifetime Achievement Award

Devloping and evaluating new technology

As I have already outlined, Warren made a significant contribution to the development and/or evaluation of many technologies to increase yield and efficiency of input use. He did not do this in isolation — he was always talking to farmers, attending farmer meetings and field days, listening, and coming up with ideas that he would try out with farmers on their farms.

In the late 1970s, a new Chief of the CSIRO Division of Irrigation Research banned Warren from going onto farms and attending farmer meetings. He was also evicted from his office in the main CSIRO building to a small building at the other end of the CSIRO site to try and prevent him from spending too much time talking to others — because Warren had many visitors who wanted to sound out ideas, and seek information and suggestions.

So Warren and his team were exiled to Siberia, the building that was eventually taken over by IREC until CSIRO sold out to Murrumbidgee Irrigation over seven years ago. Maybe the idea of his chief at that time was to try and get more scientific papers from Warren, or maybe there were other motives. Anyway, that didn't stop Warren. Whenever he wanted to go on a farm or to farmer meetings he took leave. Fortunately, the new chief didn't last long but that was the beginning of the gradual downgrading of the CSIRO Griffith laboratory and CSIRO's many efforts to close the laboratory since then.

Excellent experimentalist

Warren was a very good field experimentalist — he used thorough and rigourous methods in soil and crop monitoring and processing, and in data analysis and interpretation. He was always alert to the arrival of new monitoring technologies and keen to test and adapt them as they became available. This didn't just apply to scientific monitoring, it also applied to communications technologies of all sorts and continues to this day.

Identifying opportunity

Warren has a great gift for gaining new insights and identifying new opportunities — I often saw this in terms of unexpected findings in field experimentation, organisational changes that were thrust upon us, and in the policy arena. He was quick to move on and grasp the new opportunities, rather than whinge about the changes and losses. It was through Warren that the concept of "out of adversity grows opportunity" first crystallised for me.

Teacher & mentor

Warren has been a great teacher and mentor for many people in this room, and for countless other students and young scientists, all of whom thought he was wonderful. None of them ever had a bad word to say against Warren. Students came from various parts of Australia and from other parts of the world, especially Holland. Sigrid Tijs was one of those students, luckily for Roy Zandona. In my early days at CSIRO I remember a young Brian Freeman dropping in frequently for D&Ms with Warren in his office in Siberia. Brian went on to become head of the school of wine science and viticulture at Charles Sturt University, and Director of the Cooperative Research Centre.

For me personally, Warren's greatest legacies have been the solid foundation that he gave me in the conduct of rigorous field research, data analysis and interpretation, being open to unexpected findings, and willing to question. Equally important was his kindly and helpful approach to the mentoring of young scientists. I remember making a strong mental note very early on — if Warren makes a gentle suggestion, consider it as a bloody good idea to be followed up on immediately! His approach was always about respect and concern for the whole person, active listening and never being dismissive.

Congratulations Warren on your Lifetime Achievement Award, you truly deserve it.