A Passion for Irrigation and Computer Models

Louis Ehlers wanted to be a scientist since his school years in the small town of Bloemhof just across the Free State border in North West. The town lies right next to the Bloemhof Dam, that forms the centre of an irrigation farming community.

Louis did not grow up on one of these farms. Landing in soil science during his first year of study at the Free State University was the result of a farmer friend's advice.

His consequent growing interest in the more specialised field of irrigation had much to do with pioneer soil scientist Professor Alan Bennie. "Die Oubaas" – which is how Louis calls his biggest source of academic inspiration – is now mostly retired from his lecturing post at the same university. He is a full-time irrigation farmer in Bainsvlei outside Bloemfontein, actively applying the results he obtained over a lengthy research career.

Many will tell you that Prof Bennie will one day be remembered for, among other things, the relevancy of his research. Louis appears to be following this lead – pursuing those results that promise to make a noticeable impact in practice.

His research on the contribution of water tables to irrigation farming is applicable on at least 20% or 260 000 hectares of all irrigated land in South Africa. This is the estimated surface under which shallow water tables - in or just below the potential rooting depth of annual crops – can be found.

Louis Ehlers between wheat plantings on his latest research project's trial plot outside Bloemfontein. Louis and two fellow soil scientists from the Free State University are investigating the effect of deteriorating irrigation water quality on crop growth.

The models compiled with the research results can help ensure reductions of between 30% and 65% in the irrigation requirements of these farmers' crops – with corresponding irrigation water savings. Wheat farmers in particular can save as much as 60%.

This represents considerable relief to an industry whose profits seem destined to suffer due to rising water costs and decreasing availability of water.

It brings even further relief to the many farmers whose soils are constantly under threat of waterlogging and salinisation due to a history of over-irrigation. The adapted models are a welcome alternative to the expensive pipe draining systems they have been using since the eighties to combat these problems.

"Irrigation worldwide leads to increases in groundwater recharge, which in turn results in rising water tables. South Africa is no exception," Louis explains.

"Proper use of shallow water tables, through capillary rise in the root zone, can contribute significantly to crop growth. However, when utilised improperly, these shallow water tables can cause severe crop and soil losses due to salinisation of the upper part of the root zone."

Louis, Prof Bennie and Prof Chris du Preez, also from the Free State

University, recently completed an investigation into the contribution of root accessible water tables towards the irrigation requirements of crops. The three-year-project was funded by the Water Research Commission.

As part of the project they adapted two existing computer models for irrigation farmers: Annandale's Soil Water Balance model (SWB) and Bennie's Soil Water Management Program (SWAMP).

Both models were used to simulate plant roots' water uptake from shallow water tables. The estimated values were found to be of acceptable accuracy compared to measured values. Any of the two models can now be used to predict the contribution of water tables to plant growth for a variety of crops, soils and water table depths.

The research was done on wheat, maize, potatoes, groundnuts and peas, and the adapted models are a first for South Africa.

In effect, farmers can now do far more accurate seasonal planning by predicting a certain yield thanks to a particular water table.

The adapted models are also of use to dryland farmers in areas with natural water tables, such as at Viljoenskroon in the northern Free State. The models can guide them to properly manage the water tables that often cause considerable yield losses during wet seasons. The models further assist these farmers to more accurately determine the required density of plant populations for optimum yield.

Louis' research on the subject did not stop with the adapted models. Earlier this year he started running a follow-up WRC project, with Marnus Strydom and Prof Bennie and Prof Chris du Preez, on the effect of deteriorating irrigation water quality on crop growth. It is specifically aimed at finding solutions to the salinisation problem associated with irrigation.

"Any water table is to some degree saline. When the table is utilised by withdrawing water, its salinity increases. Irrigation schedules must accordingly be adapted to keep these salts out of the root zone," Louis explains.

How this should be done is what he wants to determine in the latest project, with which he hopes to obtain a doctorate.

In the mean time, some fallow land near Die Oubaas' farm is calling for Louis to test in practice what he has learned through academic studies. He recently bought a smallholding outside the city, where he plans to establish an irrigation farming enterprise as a hobby.

Louis Ehlers records research data in a tunnel underneath trial wheat plantings outside Bloemfontein. The project is aimed at finding solutions to the salinisation problem associated with irrigation.