Adoption of irrigation scheduling methods in South Africa

by

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DECLARATION

I declare that the thesis, which I hereby submit for the degree Philosophy Doctor at the University of Pretoria is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

SIGNATURE                               DATE
ABSTRACT

ADOPTION OF IRRIGATION SCHEDULING METHODS IN SOUTH AFRICA

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Degree: Philosophy Doctor

Irrigation scheduling is accepted as the process to decide when to irrigate crops and how much to apply and is assumed to play an important role in the general improvement of water efficiency on the farm. However, the idea that there is a single key to the adoption of irrigation scheduling on the farm is simplistic. It implies that science has all the answers, and “we need just to convince the farmers”.

The objectives of this study were to investigate the adoption process in South Africa with the further purpose to identify the possible human and socio-economic factors that may influence it. In order to appreciate the spectrum of soil-plant-atmosphere irrigation scheduling models and techniques that are available to potential users, it was necessary to quantitatively describe and classify the scheduling methods. The adoption of irrigation scheduling methods among commercial and small-scale farmers was investigated on a scheme (macro) level as well as on-farm (micro) level through a quantitative assessment of scheduling methods on a national basis, semi-structured interviews with irrigation professionals, survey among a stratified sample of commercial farmers and case studies of small scale irrigation farmers.
It was hypothesized that the adoption behaviour of irrigation farmers is determined by socio-economic (independent) and intervening factors. It was also hypothesized that ground level support and effective dialogue between scientist and farmers are conducive for the implementation of irrigation scheduling.

The study indicates that only 18% of irrigation farmers in South Africa make use of objective irrigation scheduling method, while the rest make use of subjective scheduling methods based on intuition, observation, local knowledge and experience. Differential perceptions occur between farmers as well as between farmers and scientists with regard to the concept of “irrigation scheduling” commonly being used. These differences contributed to the communication gap between science and the practice of irrigation scheduling resulting in the unsuccessful communication between farmers and scientists and the ultimate low adoption rate.

The implementation of irrigation scheduling models are predominantly advisor-driven and not farmer-driven, as they are perceived by farmers to be complex and not easy to implement on the farm. Younger farmers are more willing to use irrigation models because of their higher computer literacy levels and positive attitude towards the use of computers in general. The technology level of a farm, size of farming operation and the value of the crop being produced determine the selection of irrigation scheduling methods. The general problems experienced by some farmers with regard to bulk water delivery hampers the implementation of more precise irrigation scheduling.

Farmers’ awareness, flexibility and willingness to change, innovate and step outside of accustomed ways of implementing irrigation, are strongly influenced by their social, economic, cultural and institutional settings, and not merely by irrigation scheduling technology. Perceived indicators of efficient use of irrigation on the farm include increased production levels, decreasing electricity costs, improvement of crop quality and efficiency of fertiliser use. Farmers identified accuracy, reliability, ease of implementing and affordability as important technological characteristics of scheduling methods and devices.
The case studies of small-scale irrigation farming revealed that weak institutional arrangements and handling of farmers’ affairs on the level of several small-scale irrigation schemes hampers sustainable agricultural development. Small-scale irrigators have reported that the lack of competent extension support prevents them from implementing irrigation scheduling. Also, the scientific framework used by scientists and advisors to convey information to irrigators often follows the linear transfer of technology approach instead of following the “learning based approach”.

A significant relationship exists between the number of information sources used and the implementation of the type of scheduling methods. The majority of irrigation farmers are more interested in the use of irrigation scheduling to identify “troubles or problems” experienced with irrigation, and inevitably farmers will differ in their selection of the most appropriate scheduling method and technique.
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- Prof. Allan Bennie: University of Free State
- Prof Gavin Fraser: University of Fort Hare
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<td>AC</td>
<td>Alternating Current</td>
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<tr>
<td>AE</td>
<td>Application Efficiency</td>
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<td>AED</td>
<td>Atmospheric Evaporative Demand</td>
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<td>Agri SA</td>
<td>Agriculture South Africa</td>
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<td>ARC</td>
<td>Agricultural Research Council</td>
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<td>ARC-ILI</td>
<td>Agricultural Research Council - Instituut vir Landbou Ingenieurswese</td>
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<td>E</td>
<td>Soil water evaporation</td>
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<td>Maximum total evaporation from specific crop surface in given growth stage</td>
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