

TRAINING GUIDELINES FOR IMPLEMENTATION OF ON-FARM AND ON-SCHEME WATER MEASUREMENT AND METERING

Report to the
WATER RESEARCH COMMISSION

by

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NB SYSTEMS

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1. INTRODUCTION

This report presents the analysis of results from the project activities as set out in the terms of reference and reported on in the project entitled “Training guidelines for implementation of on-farm and on-scheme water measurement and metering”. Although the original aim of the project was to determine the training needs, the data collected during the project and the compilation of a WRC technology transfer project which started in April 2007 (WRC Project 1778//4), has lead to a broader outcome (than only training needs) being assessed in the course of the project.

1.1. Project background

The fact that South Africa has a new National Water Act (NWA) (Act 36 of 1998) that promotes good water management and conservation practices does not ensure effective water measuring. Water measuring is considered a best management practice according to the Water Conservation and Demand strategy (DWAF,2000), which now forms part of the National Water Resources Strategy (NWRS) (DWAF, 2004) but there are no clear guidelines from the Department on how it should be implemented. The NWA and the NWRS need to be followed up and supported by sound measuring regulations and procedures to speed up the process of implementation.

A previous WRC project titled “Guidelines for Irrigation Water Measurement in Practice” (TT 248/05) has lead to the gathering of a large volume of information on different measuring devices and their applications. It was recommended that this information should be made available to the WUAs and their members as widely as possible. This consultation project prepared the way for transferring the technology to the relevant stakeholders by determining the technology transfer needs of the target groups.

The irrigation water meter Knowledge Base System (KBS) had also been developed as part of the TT 248/05 project. The KBS was distributed on a CD with the WRC report but for the KBS to stay relevant, it will have to be maintained and updated regularly. A possible solution to this problem through funding from irrigation water meter manufacturers and other possible stakeholders to ensure the long term sustainability of the KBS CD and the development of a future KBS website, was investigated.

1.2. Project aims

The aims of the consultation project were therefore:

- a. To introduce guidelines for irrigation water measurement in practice to stakeholders in the irrigation industry.
- b. To collaborate with water meter manufacturers to ensure better informed suppliers and consumers in the irrigation industry.

- c. To determine the training needs for implementation of on farm and on scheme water measurement in South Africa.
- d. To update the KBS CD and identify possible maintenance options through interaction with the water meter manufacturers and water users.

1.3. Project methodology

In order to meet the project aims, the activities were executed over the period June 2006 to February 2007:

1. Identify relevant manufacturers and suppliers from the water measurement industry and collaborate with them to obtain inputs on the following:
 - Clear definitions of real irrigation water measuring problems and possible solutions.
 - Their contribution and participation in the needs assessment workshops.
 - Population of the KBS database.
 - Possible maintenance options to update and distribute the KBS database on a long term basis.
2. Organize six workshops in selected areas throughout South Africa to introduce the guidelines for irrigation water measurement in practice to stakeholders in the irrigation industry.

The venues for the workshops are listed below and displayed in Figure 1.

- Western Cape: Stellenbosch
- Northern Cape/Free State: Jacobsdal
- Eastern Cape: Sunland
- KZN: Pietermaritzburg
- Mpumalanga / Limpopo: Nelspruit
- North West / Gauteng: Pretoria

3. Use the feedback from the workshops and write a report in preparation for a technology transfer project for implementation of on farm and on scheme water measurement in South Africa.
4. Update the existing KBS CD, and compile a report on the final product and suggested maintenance plan for future updates.

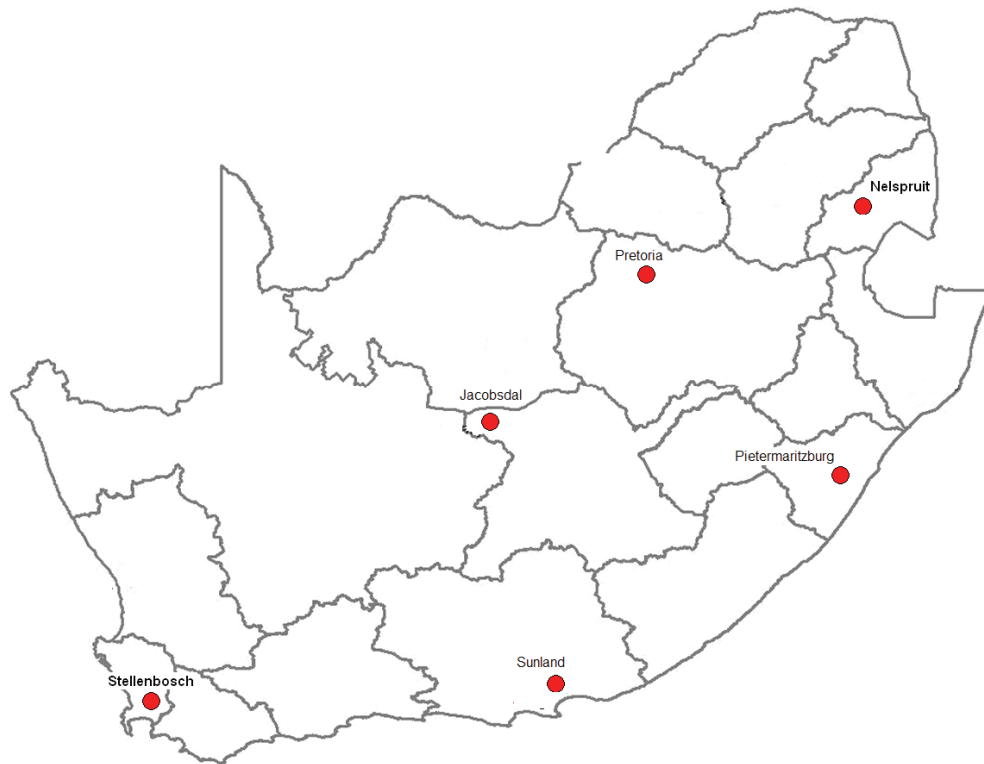


Figure 1 Workshop venues

2. PROJECT ACTIVITIES

2.1. Introduction

This chapter presents an overview of the activities undertaken during the project period.

2.2. Stakeholder address database

The first step in the project was to identify stakeholders that could be approached for inputs to the project. The groups of stakeholders that were identified included:

- Department of Water Affairs and Forestry
- Department of Agriculture
- Irrigation Boards (IBs)
- Government Water Schemes (GWSs)
- Water User Associations (WUAs)
- Water meter manufacturers / suppliers
- Researchers and other interested parties

The government departments were approached through their various directorates (at head / national office) and regional / provincial offices. An address list of IBs, GWSs and WUAs were obtained from DWAF to contact the water users. Many of the contact details on the list were outdated or incorrect, and a lot of effort was put into the process of obtaining correct information.

2.3. Stakeholder workshops

Six workshops were organized in selected areas throughout South Africa. The venues and dates where the workshops were held are listed in Table 1 and displayed in Figure 1. The list of Water User Associations / Irrigation Boards from DWAF as described under 2.1 were used as a database of addresses to send out invitations. The journal of the South African Irrigation Institute (SABI), SA Irrigation, also published a notice on the workshops in the magazine's diary.

Table 1 Details of proposed workshops

	Province(s)	Town	Venue	Date
1	Western Cape	Stellenbosch	Eisenburg	30 Aug 2006
2	Eastern Cape	Sunland	LSRWUA	31 Aug 2006
3	Mpumalanga	Nelspruit	Lowveld college	20 Sep 2006
4	Northwest/Gauteng	Pretoria	ARC	21 Sep 2006
5	KwaZulu-Natal	Pietermaritzburg	Cedara	12 Oct 2006
6	Northern Cape/Free State	Jacobsdal	ORWUA	18 Oct 2006

The workshops took place from 08:30 until approximately 12:30. The final program is attached in Appendix A. At each workshop, a local representative of DWAF was invited to give a 20 minute overview of the department's view on the current situation and expectations of irrigation water measurement. In two of the provinces (Eastern Cape and Mpumalanga), the DWAF officials received the instructions from their superiors too late to prepare presentations. In these cases the project team presented an introductory presentation on the legislative issues regarding water measurement and the officials responded to comments and questions.

The DWAF perspective was followed by an overview of the outcomes of WRC Project K5/1265, as documented in WRC Report TT 248/05. The focus was on the guidelines for irrigation water measurement implementation and the Knowledge Base System (KBS). After a break for tea, the terms of reference of the envisaged WRC project on irrigation water measurement due to start in 2007 was presented to the attendees. After each presentation, questions were handled and at the end of the workshop an hour long discussion took place. The attendance lists and copies of the presentations are attached in Appendices B and C respectively.

The interaction with stakeholders at the workshops showed that there are more basic issues around irrigation water measurement that will have to be sorted out before the role players will be ready to receive training. Some of these issues include the establishment of water management institutions as required by the National Water Act, the issuing of water use licenses and the implementation of water allocation reform.

If one considers the past actions of water users and water management organisations (such as irrigation boards), it can be seen that decisions regarding water management had most often been taken with the thought of saving money uppermost, rather than saving water. The National Water Act and increased pressure on resources calls for a shift in focus, towards water conservation and demand management through good measuring practices and integrated management approaches.

Shortly after the workshops were undertaken, the project team was informed that DWAF, specifically the Directorate Water Use Efficiency has made the decision that measurement of water abstracted from resources must become a priority. This new approach will play an important role in the planning and execution of the WRC TT project that will take place from 2007 to 2011.

2.4. KBS database

2.4.1 Introduction

The following paragraphs present the updated Knowledge Base System (KBS), the response from meter manufactures to advertise on the KBS CD and the proposed maintenance plan to make the KBS CD self sustainable.

During a previous WRC project titled “Guidelines for Irrigation Water Measurement in Practice” (TT 248/05) a Knowledge Base System (KBS) was developed. The KBS is a database which contains information on irrigation water meters and meter manufacturers. The main purpose of the KBS was to capture the large volume of information on measuring devices and suppliers that was generated during the above mentioned project and to make it available to all stakeholders.

The KBS was distributed on a CD with the WRC report but for the KBS to stay relevant, it will have to be maintained and updated regularly. This is one of the objectives of this consultation project. The main objective of this project regarding the KBS CD was to update the KBS CD and identify possible maintenance options through interaction with the water meter manufacturers and water users.

2.4.2 KBS Workshops feedback

The KBS was very well received at all the workshops and the overall feeling was that we should proceed with our efforts to make it self sustainable. Some of the suppliers suggested that more fields (as listed below) should be added to the database.

The question was also raised why the KBS is not implemented on the internet. The main reason is that not many farmers, Irrigation boards and WUAs have broad band internet access which will be necessary to access images of different water metering equipment. It is also very difficult to have the same functionality on a website compared to a stand alone database application running on a PC.

- Stakeholders support is essential for successful KBS.
- The brand and supplier fields must be separated in KBS.
- A field to show whether a meter is imported or locally manufactured must be added.

2.4.3 KBS Modifications

The following modifications and improvements were made to the KBS:

- The interface was simplified and updated with better looking icons on all speed buttons.
- A supplier field was added which now makes it possible to set a filter on the brand and/or the supplier.
- A manufactured field was added which is used to show whether a meter is imported or locally manufactured.
- The image viewer was improved to fit the full image properly when the full view option is selected.
- All lookups were updated and unused information was removed.

- Field widths were adjusted where necessary to fit the captured information.
- The information on the About form was updated.
- A bug was fixed which enables/disables the Web site speed button depending on the existence of a web site address.
- Data and images supplied by meter manufactures were captured.

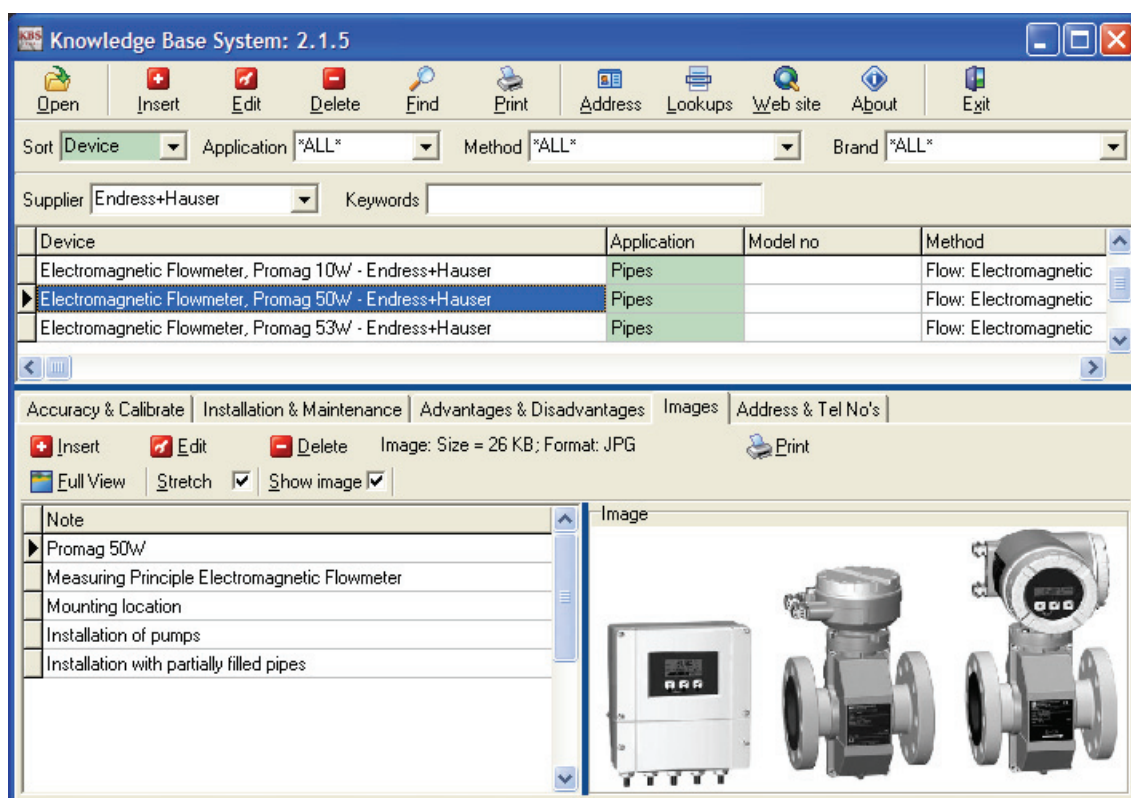


Figure 2 Knowledge Base System main screen

Figure 1 show the KBS main screen which is used as the main interface to the KBS database. The interface includes the following filters:

- Application: The Application filter has two options which are Open channel and Pipes.
- Method: The Method filter is used to filter according to the method of measurement e.g. Electromagnetic, area-velocity, mechanical etc.
- Brand: Filters on the Brand name.
- Supplier: Filters on the name of the Supplier.
- Keywords: Filter the set of records according to the specified keyword.

A filter can be used on its own or in conjunction with other filters.

2.4.4 List of meter manufacturers

The KBS CD populated during a previous WRC project contained a list of irrigation water meter manufacturers which was used to compile the list in the table below. The

contact information on the list was verified and updated doing searches on the Internet. Searches on the Internet were also done to find other South African based meter manufacturers that were not on the KBS list.

This list, as shown in Table 1, was used to promote the workshops and the advertising opportunity on the KBS CD to the meter manufacturers.

Table 2 Meter manufacturers address list

	COMPANY	NAME	POSTAL ADDRESS	TEL.NO	CELLPHONE	FAX	WEB ADDRESS	E-MAIL ADDRESS
1	Actaris Metering	Kubwalo;Max	PO Box 4059;Tyger Valley;7536	021 914 3640		021 914 3630	www.actaris.com	
2	Austratech	Huyzers;Harry	PO Box 97;Bredasdorp;7280		082 898 9789	028 425 1185	http://zapages.com/austratech	
3	Barlofco	Jackman;Ian	PO Box 300 Umbogintwini;Amansimtoti;4120	031 3044 775	082 5573803	031 304 5249	www.brabys.com	ian@barlofco.co.za
4	Bep Bestobell	Burger;Barry	PO Box 8035;Elandsfontein;1406	011 397 3377		011 379 3100	www.bestobell.com	bepsa@besa.co.za
5	Campbell Scientific Africa	Visagie;Johan	PO Box 2450;Somerset West;7129	021 880 1252		021 880 0240	www.csafrica.co.za	jvisagie@mbv.co.za
6	Electroflo	Du Plessis;Francis	PO Box 3011;Matliland;7602		083 6264605		fdpmbb@iafrica.com	
7	Elster Kent Metering	Cresswell;Raymond	PO Box 201;Auckland Park;2006	011 474 8697	082 443 1521	011 474 3232	www.elstermetering.com	raymond.cresswell@elster.com
8	Endress + Hauser	Van Wyk;Gert	PO Box 783996;Sandton;2146	011 262 8000		011 262 8062	www.endress.com	gert.vanwyk@za.endress.com
9	Flowmetrix SA	Ruthnum;clinton	PO Box 17143;Congella; 4013	031 206 0630	083 661 5944	031 206 0635	www.flometrix.co.za	clinton.ruthnum@flometrix.co.za
10	Honeywell Southern Africa	Meiring;Michelle	PO Box 6674;Midrand;1685	011 695 8000	082 851 2904	011 805 1504	www.honeywell.co.za	flometrix@mwweb.co.za
11	Israel Irrigation Coordinators	Tidhar;Ramy	PO Box 9750;Edenglen;1613	011 452 0679		011 452 0683		
12	Macsteel	Cowan;Tom	PO Box 7729;Johannesburg;2000	011 871 4600	082 557 2497	011 824 5892	www.macsteel.co.za	info@macsteel.co.za
13	Mecosa	Spronger;Henning	PO Box 651240;Benmore;2010	011 257 100	083 675 0328	011 257 6123	www.mecosa.edx.co.za	measure@mecosa.co.za
14	N&Z Instrumentation Contractors	Glatt;M	Private Bag X18;Rosettenville;2130	011 435 1080	083 452 6666	011 435 1306		enquiries@nz.co.za
15	Ott Southern Africa	Havenga;Wouter	PO Box 1099;Brakpan;1540	011 421 4484	082 455 0216	011 421 4485	www.otf-hydrimetry.de	havenga@atglobal.net
16	Peter Jones Electronic Equipment	Beastall;Allan	PO Box 2263;Pinegowrie;2123	011 605 2213		011 605 2203		pielec@mwweb.co.za
17	Prodesign		PO Box 50541;Randjesfontein;1683	011 314 2510		011 314 2501	www.prodesign.co.za	
18	Same	Van der Made;Manuelle	PO Box 198;Alberton;1450	011 902 4900	082 4545 168	011 902 8854		tenvdm@same.co.za
19	Sensus Metering	Bold;Basil	PO Box 3493;Rivonia;2128	011 466 1680	083 4444 411	011 466 1695	www.sensus.com	basil.bold@sensus.com
20	SSE	Bezuidenhout;Gert	PO Box 7170;Centurion;0046	012 663 4331		012 663 4335	www.sse.co.za	info@sse.co.za
21	Alltron Instruments		PO Box 6527;Halfwayhouse;1685	011 314 6228		011 314 6195	www.alltron.co.za	sales@alltron.co.za

A total of 21 meter manufacturers were invited to the workshops and asked to advertise on the KBS CD. Only 6 meter manufacturers attended some of the workshops which included:

- Endress + Hauser
- Flowmetrix SA
- Electroflo
- Macsteel
- N&Z Instrumentation
- C-PAC (Pumps & Valves)

Only 5 meter manufacturers agreed to pay for advertising space on the KBS CD which included:

Table 3 Meter manufacturers that advertised on the KBS CD

Meter manufacturer	No of records	Price (Incl VAT)
Endress + Hauser	4	R2,850.00
Flowmetrix SA	3	R2,850.00
Electroflow	1	R1,710.00
Campbell Scientific Africa	1	R1,710.00
N&Z Instrumentation	4	R2,850.00
Totals	13	R11,970.00

2.4.5 Workshops

Six workshops were organized in selected areas throughout South Africa. The venues and dates where the workshops were held are listed in Table 1.

Table 4 Details of workshops

	Province	Town	Venue	Date
1	Western Cape	Stellenbosch	Elsenburg	30 Aug 2006
2	Eastern Cape	Sunland	LSRWUA	31 Aug 2006
3	Mpumalanga	Nelspruit	Lowveld college	20 Sep 2006
4	Northwest/Gauteng	Pretoria	ARC	21 Sep 2006
5	KwaZulu-Natal	Pietermaritzburg	Cedara	12 Oct 2006
6	Northern Cape/Free State	Jacobsdal	ORWUA	18 Oct 2006

The workshops took place from 08:30 until approximately 12:30. At least two meter manufactures attended each workshop. The meter manufacturers were given the opportunity to introduce themselves and display their products at each workshop. The meter manufacturers also had the opportunity to have discussions with some of the stakeholders and take part in the KBS discussions at the end of each KBS presentation.

2.4.6 Conclusion and recommendations

The initial reaction from the meter manufacturers were very positive and those that replied also indicated that they wanted exhibition space at the workshops and that they would like to be included in the KBS CD. In reality only 6 meter manufacturers attended the workshops and only 5 actually agreed to advertise on the KBS CD.

The feedback and discussions at the workshops were positive and suggestions were made for additional information that they would like to be added to the KBS database. The end result was however disappointing given the facts that the total amount that can be invoiced is R 11 970.00 and that it costs R 4 845.00 to reproduce 500 CDs alone. The cost of the distribution of the 500 CDs is estimated at R 5000.00 which leaves a difference of R 2 125.00 excluding any labour costs.

Table 5 KBS Budget

KBS Budget	
Income from advertising	R11,970.00
Reproduce 500 CDs	-R4,845.00
Distribute 500 CDs	-R5,000.00
Labour costs	-R22,800.00
	-R20,675.00

Gathering information from meter manufactures is very time consuming which increases the labour costs. The labour on this project exceeded the total income from advertising alone. Many more meter manufacturers will have to commit themselves to advertise on the KBS CD to make it self sustainable in the future. Given the response from this project it is highly unlikely that it will be the case. The project team is therefore of the opinion that the self sustainability of the KBS is not a viable option.

2.5. Technology transfer project proposal

The data that was collected through the workshops and other stakeholder interactions were analysed and the results are presented in chapter 3 of this report. The outcomes were used to refine and update the terms of reference for the proposed follow-up project "Awareness creation, implementation plans and guidelines for management of sustainable on-farm and on-scheme water measurement".

3. PROJECT RESULTS

3.1. Introduction

The results of the project were analysed according to the proposed structure of the follow-up technology transfer project. The analysis firstly explains some of the requirements that have to be met by the water use regulator, the Department of Water Affairs and Forestry (and the Catchment Management Agencies, in future).

Secondly, the perceived needs of the water users as aired during the stakeholder interaction are discussed. This is followed by a section on the constraints faced by irrigation water users when implementing measurement, as well as potential incentives that can be used to encourage measuring devices to be used successfully.

Finally, the chapter presents some of the ideas that came from the stakeholders on the implementation part of the proposed project.

3.2. The requirements of the regulator

The Department of Water Affairs and Forestry are responsible for managing the country's water resources in an integrated manner, from a number of perspectives, all which require water measurement output. The activities are performed by a number of different directorates that function at national or local level.

Firstly, DWAF is responsible for water resource management, both for planning purposes and monitoring. In order to plan infrastructure needed to ensure reliable future water supplies, current use and availability of water need to be monitored. This consists mostly of bulk water measurements such as river flows, especially low flows, dam levels and major abstractions from the available sources. Climatic information such as rainfall, evaporation, and groundwater levels are all needed to manage the resource. These data inputs are needed by the directorate responsible for information systems but the instrumentation is installed and operated by the directorate for hydrometry.

As far as water use is concerned, water users are supposed to firstly ensure their water use is registered with DWAF and secondly submit regular reports of consumption to the department. The directorate for water use is responsible for issuing of licenses, and the validation and verification processes. Once licenses have been issued, the water user must keep record of his/her water use and this requires water measurement. All IBs', GWSs and WUAs should submit monthly disposal reports to state how much water was used and distributed within their control areas. At this stage it is estimated that approximately 11% of these reports are submitted. The directorate water use efficiency is busy with a project to improve the disposal report submissions. It is also responsible for implementing the water conservation and water demand management (WCDM) strategies in all the water use

sectors. WCDM calls for greater efficiency when using water and water measurement is the first best management practice listed in the agricultural WCDM strategy guidelines.

Furthermore, from an environmental perspective water quality has to be monitored on a continuous basis across the country. WUAs and GWSs regularly collect water samples that are sent to the directorate responsible for water quality monitoring, where long term records are kept. In parts of the Eastern Cape, water releases from storage dams are managed in such a way as to ensure acceptable water quality rather than quantity to the downstream users, as salt leached from the soils have a negative effect on water quality in the rivers. In order to manage these releases, water measurement is required.

Lastly, in order to facilitate transfers and water trading, accurate measuring records are needed. This is best done by the regional offices who are involved with the day to management of water in the different provinces.

One of the supporting strategies mentioned in the National Water Resources Strategy (NWRS) published by DWAF in 2004, is capacity building amongst water management staff and water users. DWAF has a mandate to ensure training of staff and other stakeholder take place.

Although the regulator seems to have all the necessary directorates in place, there seems to be poor communication between them. The officials in the regional offices seem to feel alienated from the staff in head office, often not understanding new policies or how they should be implemented. It is hoped that the proposed TT project can promote communication between the relevant directorates at DWAF head office and the regions, at least on the topic of water measurement implementation.

3.3. The users' needs

The water users are faced with two distinct yet different reasons for irrigation water measurement. On the one hand, measuring is required by the regulator, sometimes as a license requirement, or as part of the WCDM strategy implementation, or other legal reasons. The message from DWAF was clear during the workshops: if no water use records are kept, the users will be billed for what DWAF calculates their usage to be. If accurate water use records are kept, it is up to DWAF to prove them wrong.

On the other hand, if the irrigation farmer wants to optimise his / her irrigation scheduling and on-farm water management, it cannot be done without at least fairly accurate water measurement. Compared to the cost of an irrigation system, a water meter costs very little yet the benefits are numerous.

For both these reasons, water users need reliable, affordable and practical water measuring devices. These devices are available commercially, as have been shown in WRC Report TT 248/05, provided the devices are selected, installed and managed correctly. Despite this, farmers are still reluctant to install meters and the reasons behind their behaviour will be investigated further in the proposed follow-up TT project.

One of the reasons could be that only a small number of licenses have been issued, and that the importance of measurement will only be realised once these licenses have to be renewed. During discussions at the workshops, there was greater urgency for water licenses than for water meters.

Another need that was raised, was training on the requirements set by the different DWAF strategies. There are a number of policies that are being implemented but few users at ground level seem to be aware of it. For example, WUAs are required by law to compile business plans and water management plans yet this has only been done at three pilot studies funded by DWAF.

Concerns were also raised about illegal water use and what is being done to prevent it. Legitimate water users feel that they can't be expected to comply with the law when unlawful abstractions are being allowed. This links closely with the fact that the necessary water management institutions are not in place and cannot monitor unlawful use. Some stakeholders mentioned that they are paying a catchment management levy, yet no CMA has been formed in their area.

In summary, most of the needs expressed by the water users at the workshops concerned the implementation of the National Water Act in general, such as licenses and institutional arrangements, and not water measurement specifically. Most stakeholders agreed that measurement have to take place and their biggest concern was about the cost of implementation. At almost every workshop there was a call to DWAF for a subsidy for water meters. However, one should keep in mind that the installation of the meter alone does not ensure better management – data collection and regular maintenance is necessary to ensure sustainability.

3.4. Constraints to successful implementation

The following constraints were raised at the workshops and the project team will attempt to address them during the follow-up TT project:

- Regarding the environment within which measurements must take place:
 - Water management institutions (WUAs and CMAs) are not established and functioning as intended. This may affect measurement implementation, operation and maintenance.

- Water users are still billed according to irrigated areas and not volume of water used, and therefore the installation of a meter serves no purpose.
 - Water users are scared that their water rights will be reduced if the measurements show they use less than their allocations.
 - In the case of small-scale farmers, they already face so many other constraints, water measurement seems of little importance.
- Regarding the measuring devices (hardware):
 - Poor state of existing infrastructure makes it difficult to install accurate devices and manage water efficiently.
 - Cost of devices, especially for small-scale farmers
 - Reliability of the devices
 - Cost and responsibility of maintenance
- Other constraints:
 - Inconsistency in government policies: water measuring devices are seldom specified in government tenders.
 - Return flows cannot be measured accurately.
 - Infrastructure and operational policies do not allow for water banking, so there is no incentive to use less than the allocation.

3.5. Incentives to support implementation

During the stakeholder interactions, a number of possible incentives to encourage water measurement were made. The incentives were mostly concerning external and internal mechanisms that put pressure on water users to measure, and also concerning the state of the resource.

It was felt that the strongest motivation for measurement implementation comes from external mechanisms. This confirms on of the conclusion in the previous WRC project (TT 248/05) – there has to be a reason (trigger) for measurement. These external mechanisms include the following:

- Eurepgap: A strict set of conditions that have to be met before a farmer can export his produce to Europe. Some of the stakeholders said that if measurement was made a compulsory requirement by Eurepgap, farmers would install water meters despite their complaints about the cost.
- IPPC: The IPPC (International Plant Protection Convention) specifies that from Oct 2007 water needs to be measured in order to produce crops. It is not clear how this will be enforced and the project team need to obtain a better understanding of this requirement.
- ESKOM DSM: ESKOM has already successfully funded a number of infrastructure upgrade projects aimed at shifting the electricity load during critical periods. Most of these projects include changes to pump stations and in most cases new water meters were installed as part of the upgrade.

Some internal mechanisms that could be used by the WUA or CMA to encourage water measurement include the following:

- Water pricing: By introducing volumetric billing and sliding scales for water prices, the water authority may get more users to accept the concept of water measurement.
- Water trading: The National Water Act makes provision for water trading to take place, and in some WUAs this is necessary to make sure enough income is generated to keep the WUA in operation. Water trading cannot take place without some form of measurement.
- Dispute resolution: The installation of a measuring device can be made a condition for dispute resolution, provided all parties have faith in the measurement results.
- Benchmarking: One of the components of the agricultural WCDM strategy, benchmarking of irrigation water requirements encourage better on-farm water management. Although based on irrigated areas, unlike billing per area, it can lead to water savings.

There were also a number of incentives mentioned that were purely aimed at conserving the resource, including the following:

- Stressed catchments: Where water is over-allocated, or close to it, every water user has the responsibility of keeping to his / her allocation. This can only be done through careful monitoring of actual water use.

3.6. Considerations for implementation phase in the TT project

In the proposed follow-up TT project, it is required from the project team “to practically demonstrate how to undertake effective water measurement in the implementation phase, including:

- a) To select suitable sites (WUAs/Irrigation Boards/individual farmers at different levels of management capabilities, including emerging farmers) to co-operate with as part of pilot studies.
- b) To undertake a process to obtain buy-in of role players in the selected pilot study areas/sites for the implementation plan.
- c) To adapt the general implementation plan into specific implementation plans for the selected pilot studies.
- d) To implement, test, and adjust the guidelines for water measurement, considering at least the following aspects:
 - A reason for measuring (“trigger”).
 - Acceptance and support by the water users.
 - Assessment of the current situation and planning the system.
 - Choosing appropriate systems.
 - Correct installation by skilled technicians.
 - Sound operation and maintenance policies.
 - A system for data retrieval and management.

- Comprehensive financial planning, and
 - Procedures for handling disputes and tampering.
- e) To measure effectiveness of the guidelines for water measurements against set targets.”

During the stakeholder workshops, the proposed methodology was presented and the stakeholders offered some useful inputs on the implementation phase of the proposed project.

As far as site selection is concerned, the stakeholders recommended that the regional DWAF offices should be consulted so that suitable schemes can be found. Some stakeholder felt that it may be simpler to attempt implementation at a small scheme with fewer water users than at a big scheme where the situation is complex and implementation will be very expensive. In most cases, the big schemes have already made some progress to improve their water management (because they have the resources to do so) while a smaller scheme may benefit more from the WRC’s involvement. The improvement may also be more evident at a small scheme.

It was considered very important to get DWAF’s support for the WRC project. The project should enhance the initiatives and strategies being implemented by DWAF, and could benefit both researchers and government department. The work done by the researchers should be practical and compliment specifically the drive by DWAF to improve the submission of disposal reports and the development of water management plans by the WUAs.

It was reiterated that bulk water measurement should be addressed first before each individual abstraction is fitted with a measuring device. The TT project team’s first major challenge will be to develop a water measurement implementation plan in conjunction with DWAF for bulk water measurement. Either way, different situations should be assessed and solutions investigated so that as many case studies (preferably success stories) as possible can be written up by the end of the project to use as training material in future.

4. CONCLUSION

Measurement of irrigation water is becoming more important as progress is made with the implementation of the National Water Act. There is greater awareness amongst both DWAF officials and water users of the benefits of accurate measurement, yet implementation is slow.

This knowledge dissemination project presented a unique opportunity in the way it enabled the researchers to obtain an overview of the situation regarding water measurement at grass roots level. There is a lot of confusion about government policies and poor communication seems to be the main reason.

Where the previous project on water measurement was focused on the technical performance of measuring devices, the challenge now faced is that of implementation. Most stakeholders see the cost of measurement as the biggest constraint and this is certainly one of the aspects that will have to be addressed, together with training requirements.

The timing of the proposed follow-up project fits in very well with the current situation on the ground: water use licenses are being issued, water allocation reform is being implemented and water management is being decentralized through the formation of CMAs and WUAs. It is quite certain that the project could make an important contribution to the way water measurement is implemented in South Africa and contribute to capacity building amongst scheme and farm level water managers.

Appendix A: Workshop programme

**TRAINING GUIDELINES FOR IMPLEMENTATION OF ON FARM AND ON
SCHEME WATER MEASUREMENT AND METERING**

Stakeholder workshop

DATE: Thursday, 12 October 2006

VENUE: CEDARA, Pietermaritzburg

Program

Chairperson: I van der Stoep

08:30 Registration & Coffee/Tea

09:00 Welcome - *I van der Stoep*

09:10 The importance of water measurement in South Africa – Norman Ward
(DWAF)

09:30 Questions / Discussion

09:40 Introducing the “Guidelines for Irrigation Water Measurement in Practice”
(WRC Report TT 248) – *I van der Stoep*

10:00 Questions / Discussion

10:10 Introducing the KBS database of measuring devices – *N Benadé*

10:30 Questions / Discussion

10:40 Coffee/Tea

11:00 Introducing the envisaged WRC project on “Awareness creation,
implementation plans and guidelines for management of sustainable on-farm
and on-scheme water measurement” – *I van der Stoep*

11:20 Discussion

12:15 Workshop summary – *I van der Stoep*

12:30 Closure & Lunch

Appendix B: Workshop attendance registers

**TRAINING GUIDELINES FOR IMPLEMENTATION OF ON FARM AND
ON SCHEME WATER MEASUREMENT AND METERING**

STAKE HOLDER WORKSHOP - ELSENBURG

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**TRAINING GUIDELINES FOR IMPLEMENTATION OF ON FARM AND
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**TRAINING GUIDELINES FOR IMPLEMENTATION OF ON FARM AND
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**TRAINING GUIDELINES FOR IMPLEMENTATION OF ON FARM AND
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**TRAINING GUIDELINES FOR IMPLEMENTATION OF ON FARM AND
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Appendix C: Summary of important issues

The important issues that were raised during the workshops are categorised in the following paragraphs.

C1 KBS

The KBS was very well received at all the workshops and the overall feeling was that we should proceed with our efforts to make it self sustainable. Some of the suppliers suggested that more fields (as listed below) should be added to the database.

The question was also raised why the KBS is not implemented on the internet. The main reason is that not many farmers, Irrigation boards and WUAs have broad band internet access which will be necessary to access images of different water metering equipment. It is also very difficult to have the same functionality on a website compared to a stand alone database application running on a PC.

- Stakeholders support is essential for successful KBS.
- KBS – The brand and supplier fields must be separated.

C2 Incentives and reasons for measuring

Incentives and reasons for measuring were discussed extensively at all workshops. The following paragraph summarise the points that were raised during the workshops. What came out strongly from the workshops is that there must be a reason to measure and that the measuring equipment must be reliable and affordable. A number of people also felt that water meters should be subsidised by DWAF.

- Incentives are necessary for farmers to buy into measuring.
- People will only buy into metering if there are incentives.
- The user who installed meter must get something back.
- In new project different options for incentives should be identified.
- Financial support is necessary for WUAs to implement measurement.
- DWAF is requested to subsidise the cost of the meters (50/50).
- Eskom may contribute as well.
- People will not buy into WCDM just because it is the right thing to do.
- Water pricing is the (only?) mechanism to create awareness.
- The cost of water is important (agriculture vs. others).
- An effort must be made to find a good reason for measuring. Water trading is a good reason.
- The WUAs realise that they will have to start to measure, but it is difficult to motivate it to the members.
- It depends how scarce the resource is; if sufficient water the question can be asked why to measure.
- The cost of meters is important.
- In certain schemes there are over-allocations of 50% and these farmers realise that they have to measure. They have started with canal farmers, but not yet with farmers pumping out of rivers.
- Without meters there are disputes between farmers.
- DWAF can stop water use if there is a dispute.
- If Euro gap will specify that water must be measured, farmers will probably agree to measure.
- There is a mind shift taking place with farmers that they will have to measure in order to survive.
- Users will have to start to measure; if they can't proof their use they will be billed according to hectares and quota.
- If you have to measure because you have a problem, you will measure. However, if you have to measure because you are told to do so, you will be reluctant to measure.
- Farmers have apparently no problem to install a water meter for their own management application.

- Institutional structures (CMAs, WUAs) need to be in place, and catchment level measurement need to be effective before farm level measurement will be justified.
- Metering is necessary to determine how much water is used.
- The new minister said that water must be saved in order to make it available to new users.
- The IPPC (International Plant Protection Convention) specifies that from Oct 2007 water needs to be measured in order to produce.
- In developing farmer projects farmers have so much other problems, and water measurement will just add to these. In the Eastern Cape, however, a group of farmers realised that metering will help them to share their electricity bill.
- Stressed catchment areas are more interested in measurement.

C3 Reasons why people don't measure

The reasons why people don't measure were also discussed during the workshops. A number of reasons came out of the workshops which are listed below. Water users fear that their water rights will be reduced once they start measuring and that DWAF will use the results against them.

- There is also a fear among users that, once they start to measure they will realise that there is not sufficient water for the reserve, in which case their water rights will be reduced.
- Implementation of legislation – concern about cost and reliability of meters.
- The new act determines that water is charged against the land, whether the farmer uses the water or not.
- Infrastructure in bad state (waited to long with maintenance), and the WUA cannot afford to get it back to standard. The WUA has no money to buy meters.
- Nowhere in the tenders for irrigation systems for communities are water meters specified.

C4 Other issues

- Evaporation from storage dams.
- Measurement on farms with more than one water source can be problematic.
- Water stressed areas are the most critical to start measuring.
- Water use efficiency / Demand management are important issues.
- Verification and licensing should be priority.
- Awareness creation of farmers is very important. TRAINING!! All agricultural issues that affect water use must be addresses (electricity, fertilizer).
- Selecting of stakeholders will be important (individual and scheme farmers, emerging farmers, DWAF, DoA).
- Other water use sectors must also improve efficiencies.
- There are deadlines for WMPs.
- The 4 year term of the project is too long.
- Metering will be important during licensing; it will be useful if new project outcome will be available in this process. Four years seems to be a long time.
- The name "project" should preferably be referred to as "program".
- Use benchmarking instead of e.g. "80% of quota" principle.
- Implementation: (The Project?) show a clear benefit in results of the implementation – it can be used as case studies during training.
- People siphon illegally water from the canals in townships.
- There is a build-up of algae in the canals.
- Losses in the canals are high (15% of inflow is estimated).

- High evaporation due to length of canals.
- There are no long weirs in canals.
- There are some return-flows from the canals. These are not measured.
- The inflow into the canals are measured fairly accurate.
- It will be expensive to measure for small scale farmers, it should be considered to measure sections of canals and not necessarily individual farmers.
- De Kaap Irrigation Board is busy installing meters in 6 river systems. This is a Eskom Demand Shift Management project
- It is accepted that piped systems must be measured in order to manage the scheme.
- Measurement of flows into dams should preferably be measured.
- The affect of less return flow in future may become a problem (increased irrigation efficiency -> less return flow -> less water.
- Eskom's program may change abstraction patterns in future.
- Primary water usage needs not be measured individually. At present it is often enlisted as agricultural water. This may have to be rescheduled in future.
- Even if water usage in towns / cities doubles, it will not affect agricultural significantly (the use of Nelspruit is 500 ha, compared to 15000 ha agriculture).
- Fractional water allocation – Some areas do not allow water banking (“use it or loose it”).
- Late registration of boreholes is possible.
- One license per water resource will be issued. The WUA will receive a license for the scheme enlistment.
- There is also a bigger interest in measurement on schemes where the government is involved.
- The meter manufacturers experience no significant shift towards metering during the last number of years.
- People are not prepared to sell their water rights; it seems like a psychological behaviour.
- Leasing of water rights is (widely) taking place.
- DWAF does not want to force water metering everywhere; the cost will be enormous.
- Will WUAs be prepared to become involved with the new WRC project?
 - Yes they will be keen to participate, provided that nothing will be taken away from the farmers. They need this assurance from DWAF.
 - Yes, but it will depend on the cost to partake.
- The project can compliment the implementation of WMPs (in order to establish that WMPs are achievable.
- The project should try to get involved WUAs who do not measure at all. The (positive) outcome will be best illustrated with these schemes (Stella – groundwater).
- Outcome of project must be communicated with DWAF. There is a lack of communication between the (3) directorates in DWAF and this are a big problem. They will have to buy into the project.
- The project is looking for ‘case studies’ from which the outcomes can be communicated through the country, illustrating positive spin-offs due to metering.
- There are so many uncertainties regarding the info required on the disposal reports that WUAs are also not serious about it.
- Officials higher up in the ranks of DWAF needs to give their backing to the importance of disposal reports to give weight to the importance of these reports. DWAF regional contact with head office is a problem.
- The project can help with communication in the department, especially with what happens with measured information.
- Advises that “waterbestuursbeampes” are consulted to identify appropriate schemes for inclusion in project, regional offices of DWAF will also assist.
- Go for schemes which are not too complicated (Stella, Petrusburg), complicated schemes will be difficult to handle.
- Do not ignore O/Riet scheme in the project.

- Water banking – system capacity not always allows for this. Act probably does not allow rolling over from one year to the next.
- Water trading among farmers is allowed, they agree between themselves about cost for water. If farmer's supply is closed the WUA will trade the water in order to generate income.
- As long as low flow measuring structures are not in place, bulk measuring will remain a problem.
- Why must WUAs pay a Catchment Management Fee if DWAF does not deliver these services?
- WMPs rest on three levels of measurement: Bulk, WUAs, and users. Each level has its own requirement; the first step is to start with bulk measurements.
- A well designed and –managed sluice is adequately accurate – 8%.
- Eskom's SM scheme is working well in the O/Riet scheme, currently mainly at bulk supply level, but next year they will expand to apply on farm level.

Appendix D: List of Addresses

LIST OF ADDRESSES OF IRRIGATION BOARDS

NORTH WEST PROVINCE	P. 2
GAUTENG	P. 6
NORTHERN PROVINCE	P. 8
MPUMALANGA	P. 11
KWAZULU-NATAL	P. 17
WESTERN CAPE	P. 23
NORTHERN CAPE	P. 41
FREE STATE	P. 45
EASTERN CAPE	P. 46

D1 NORTH WEST PROVINCE

SECRETARY

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