

Irrigation water measurement – from voluntary management tool to pending regulations

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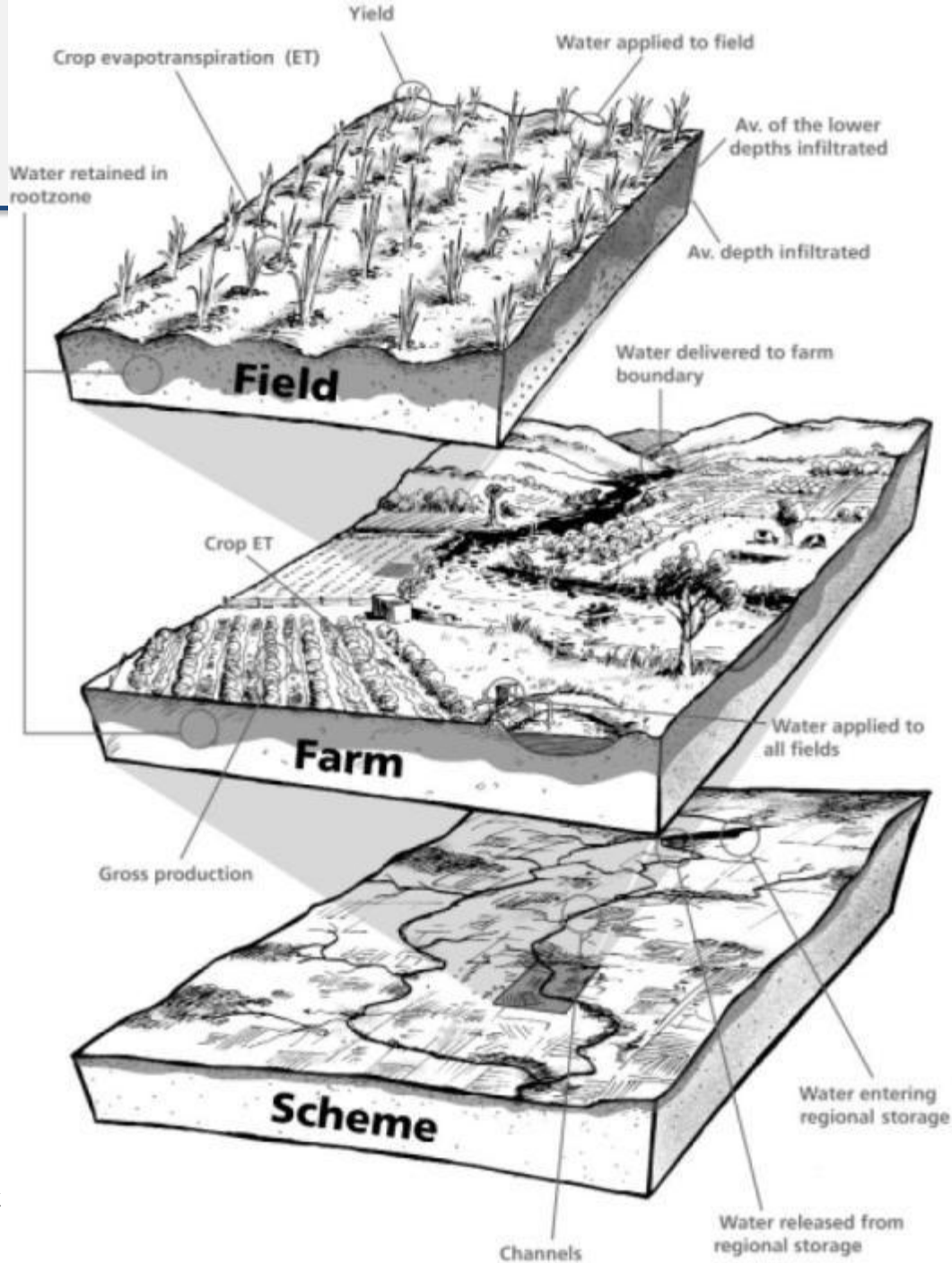
1 September 2011



Introduction

- 💧 Water cannot be managed without being measured
- 💧 WRC study (2009):
 - 💧 Only 30% of irrigation water use is being measured
- 💧 To manage water, it can be measured:
 - 💧 at the point of abstraction from the shared resource
 - 💧 at various points on-farm
 - 💧 at various points on-scheme





Uniformity and
accuracy



Energy and
economics



Water quantity
and quality



Scope of irrigation systems in SA

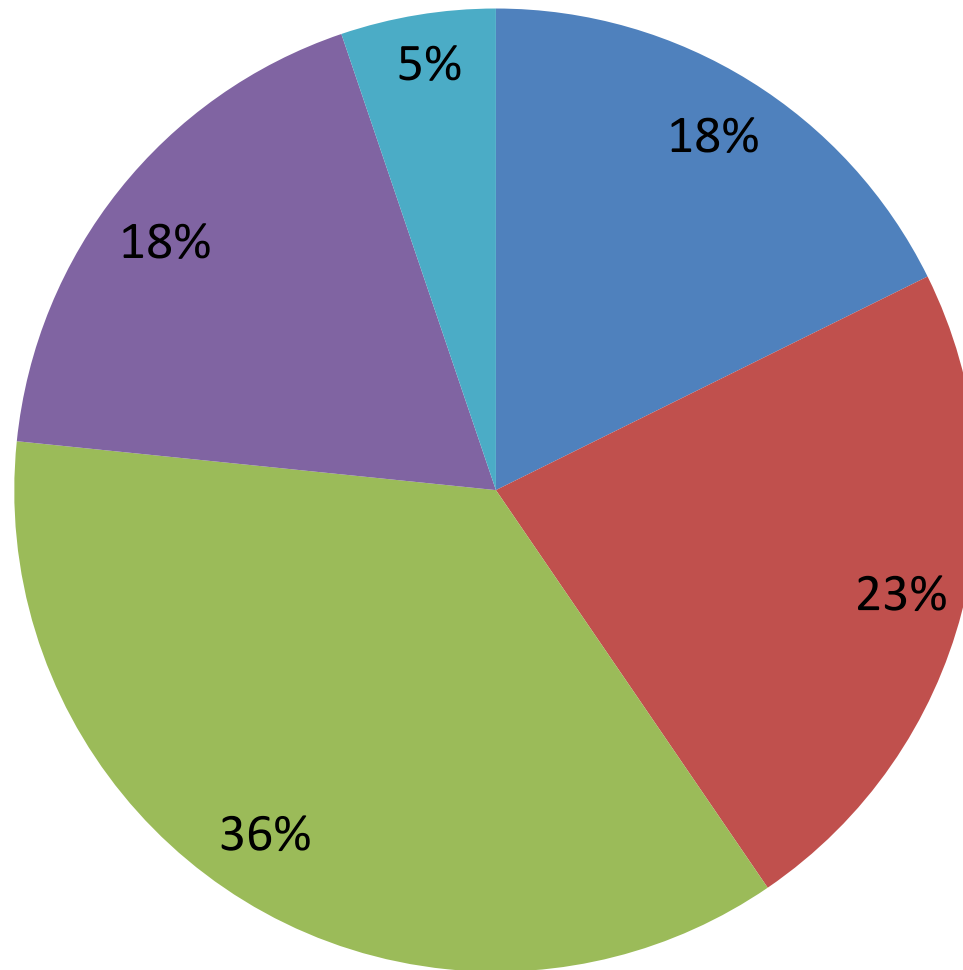
Selected data – July 2008:

- 💧 1 675 822 ha of registered irrigation area
- 💧 1 399 221 ha of annually irrigated area
- 💧 38 243 unique registered water users
- 💧 56 811 registered irrigation systems
 - 💧 46 431 pressurised irrigation systems
 - 💧 10 380 flood irrigation systems

(WARMS, DWA)



Types of irrigation systems



- Moving systems
- Micro irrigation
- Sprinkler Irrigation
- Flood irrigation
- None specified



Types of measurements

Open channels

- 💧 Permanent (structures, ultrasonic)
- 💧 Portable (mechanical, ultrasonic)



Pipes

- 💧 Permanent (mechanical, electromagnetic, ultrasonic, power)
- 💧 Portable (ultrasonic)

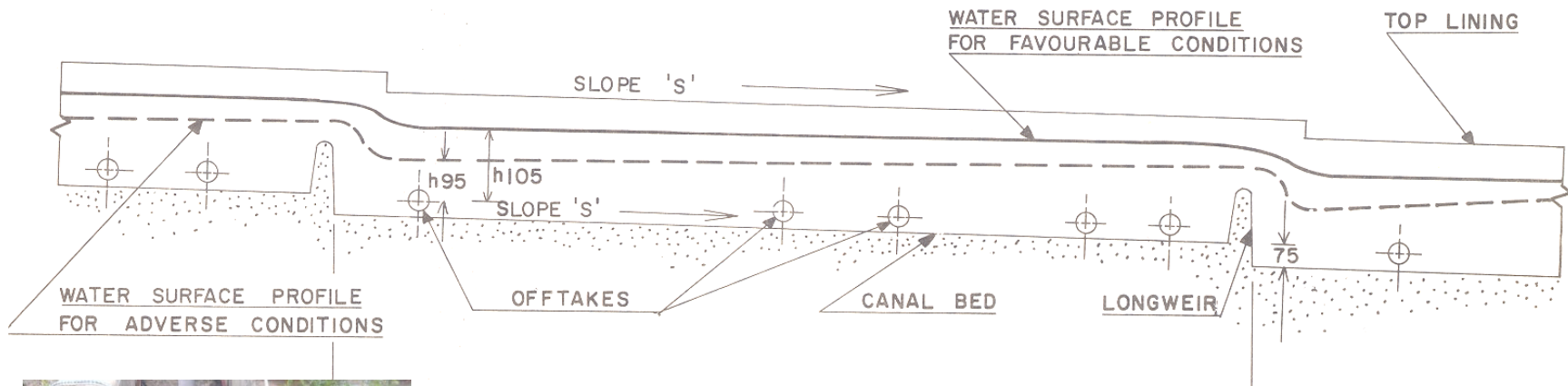


Water levels

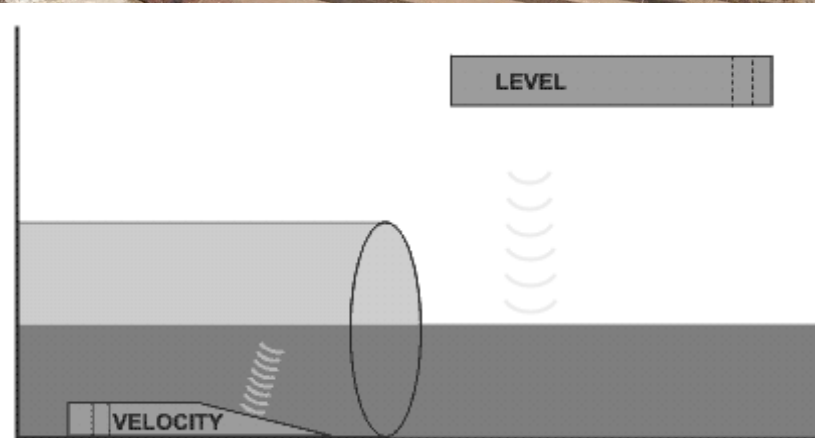
- 💧 Dams, Canals, Aquifers



Open channels - Permanent



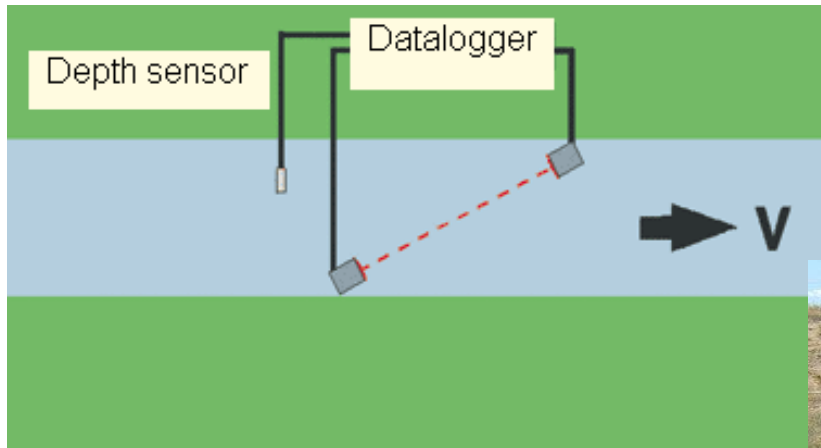
Open channels - Permanent



(Greyline instruments, 2005)

Another project sponsored by www.wrc.org.za

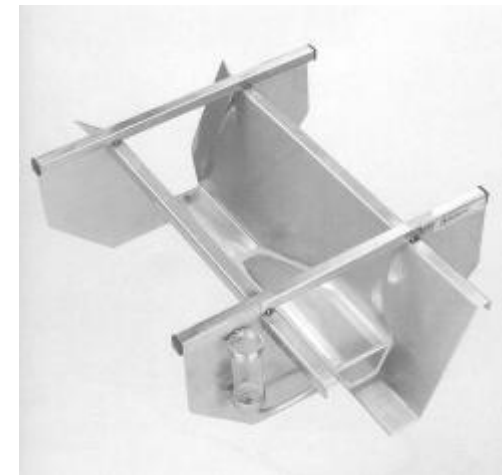
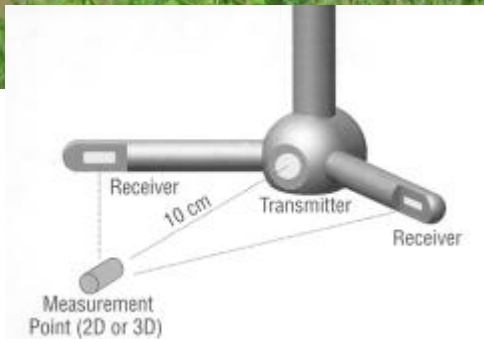
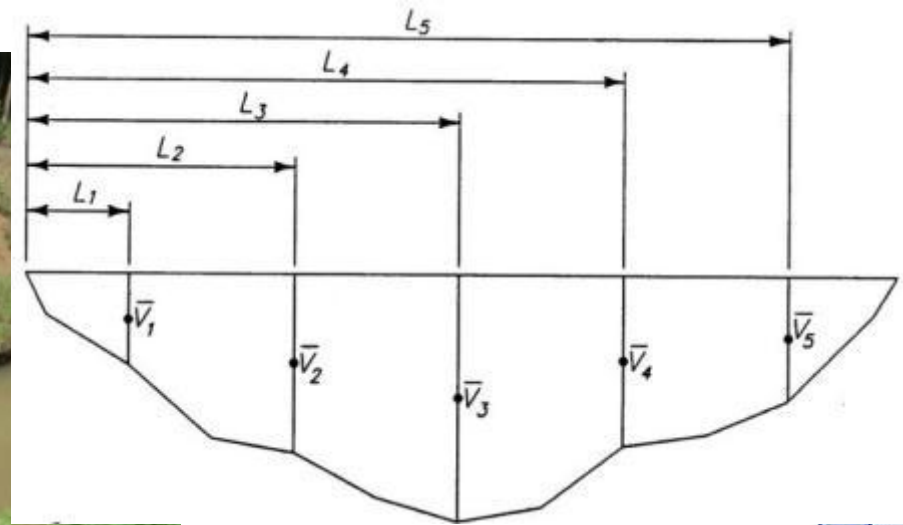
Open channels - Permanent



**Ultrasonic transit time single path
arrangement
(OTT Hydrometry, 2005)**



Open channels - Portable



Pipes - Permanent



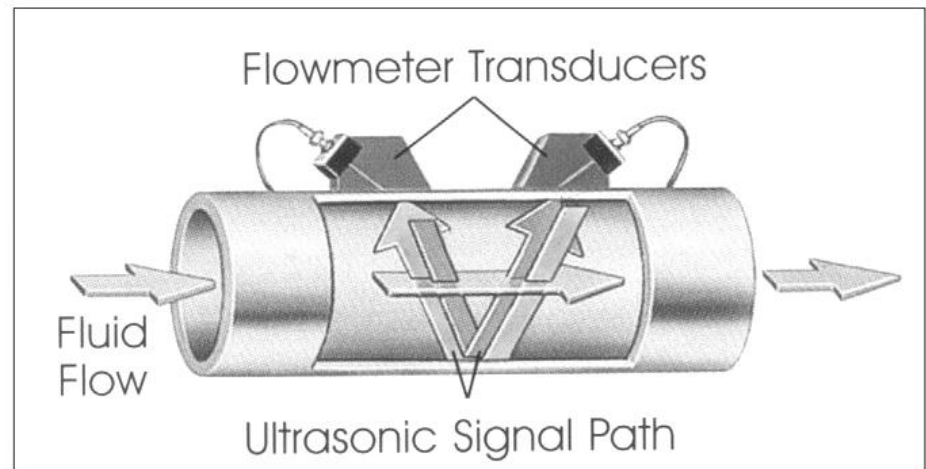
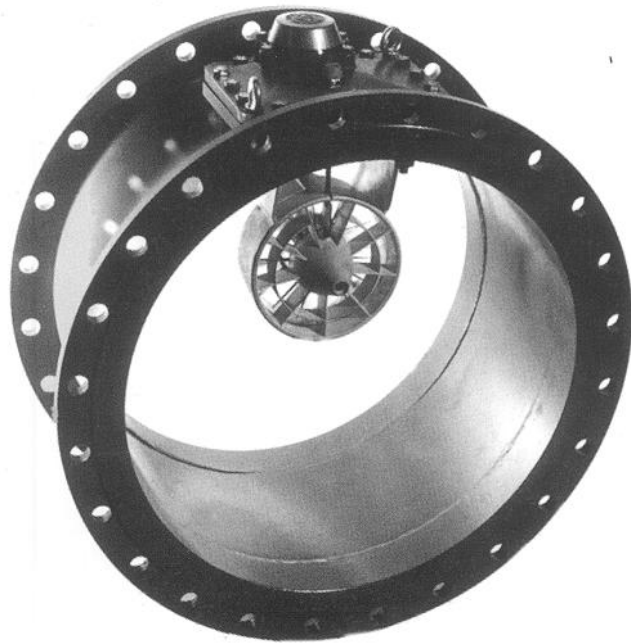
Pipes



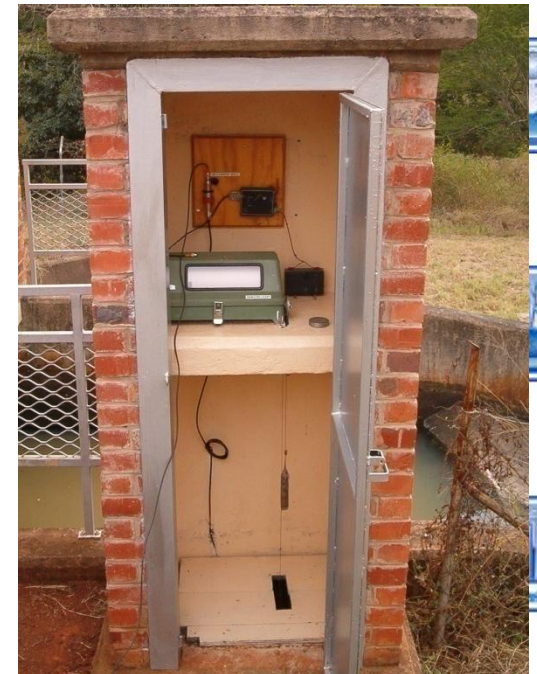
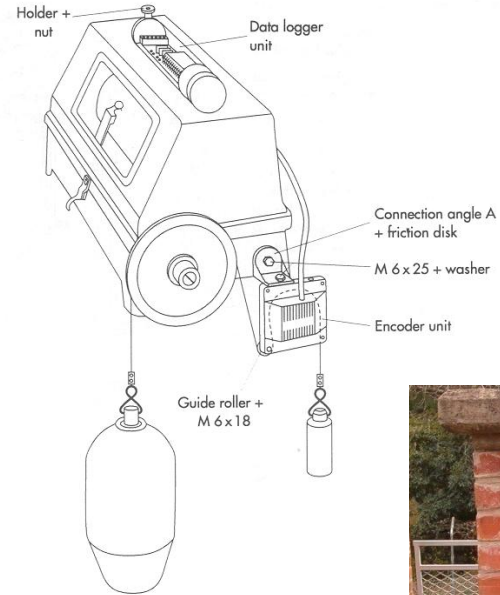
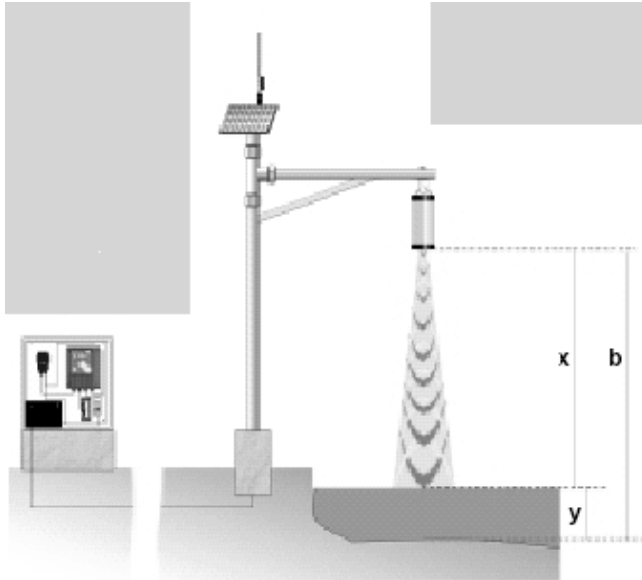
Meter installation



Large diameter pipes



Water levels



Data collection and management

Data tools:

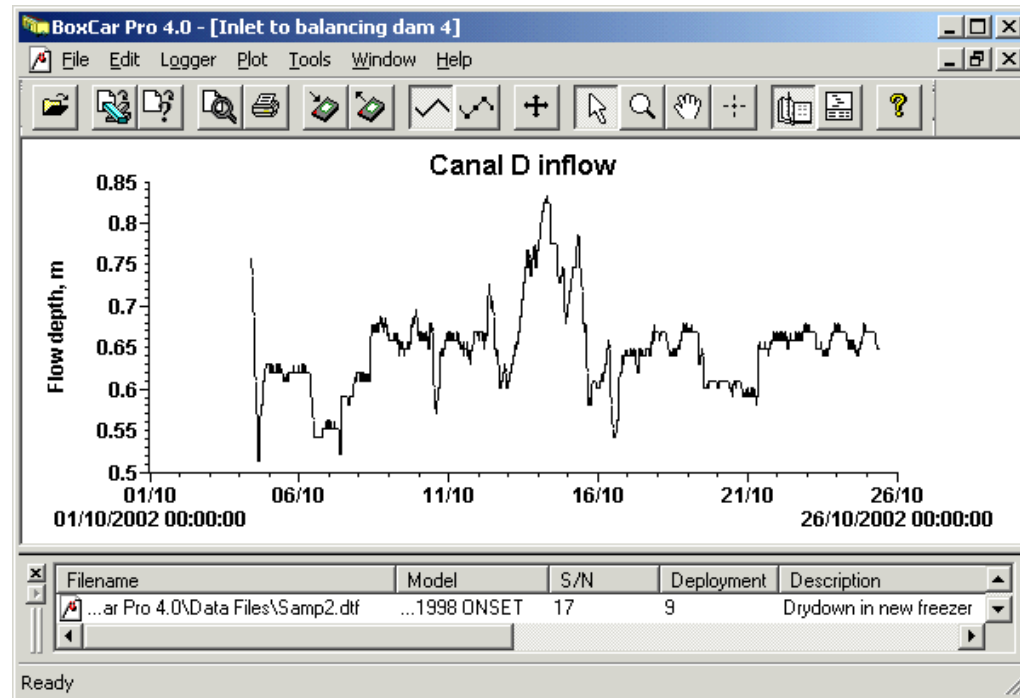
💧 Collection

- 💧 Manual
- 💧 Drive-by
- 💧 Telemetry
- 💧 SCADA

💧 Processing

💧 Presenting

💧 Storing



Considerations when selecting measuring devices:

- 💧 Volumetric reading output
- 💧 Flow rate reading output
- 💧 Sensitivity to installation conditions
- 💧 Power requirement (electricity)
- 💧 Sensitivity to dirty water
- 💧 Accuracy
- 💧 Additional head loss in the system
- 💧 Data format and collection method
- 💧 Security
- 💧 Cost



Measurement linkages

Expand water measurement implementation



Improve water accounting



Improve irrigation efficiency



Implement Water Conservation and Water Demand Management regulations



Water accounting

- Effective management of water require accurate recordkeeping and useful analyses
- Water Use Efficiency Accounting Reports being implemented by DWA
 - scheme, WMA, regional and national levels



Irrigation efficiency

Better water management can help water users to :

- 💧 optimise water productivity,
- 💧 reduce production costs, especially electricity,
- 💧 make better use of fertiliser,
- 💧 conserve soil and water

WRC study (2010):

- 💧 Water balance approach to irrigation system analysis recommended (ICID approved)



Pending Regulations

- 💧 Regulations Requiring the Taking of Water for Irrigation be Limited, Monitored, Measured and Recorded, proposing that
 - 💧 the flow rate at which water can be abstracted should be limited according to quaternary drainage regions,
 - 💧 the responsible authority may direct a water user to install a water measuring device, and
 - 💧 that the responsible authority can install a temporary measuring device.
- 💧 **Awaiting signature before being made available for public comment**



Measurement implementation

56 811 registered irrigation systems

- 46 431 pressurised irrigation systems

- 10 380 flood irrigation systems

70% of irrigation systems not measured

Cost of measurement implementation (2008):

- Piped (pressurised) systems: R17 643 per system

- Open channel (flood) systems: R23 410 per system

Cost of managing measurement systems:

R19,21/ha

(WRC, 2008)



Average water tariffs charged by different irrigation organisations

Irrigation organisation water distribution system type	Average annual water tariff (R/ha, 2008)
Canal distribution	R569.92
River distribution with dam/weir	R397.69
Pipeline distribution	R397.52
Undeveloped river distribution (no dam/weir)	R248.12
Groundwater area	R86.40



Measurement implementation – the bottom line

- 💧 National rollout of metering for the remaining 70% of unmeasured systems, will require capital expenditure of approximately R835.4 million (2008 costs adjusted for inflation)
- 💧 Operating measuring systems on all 1.399 m ha will cost the water users approximately R30.1 million per year in addition to current water tariffs
- 💧 How do we go about this?



To get your fair share - measure

💧 Fair distribution of water requires reliable data of actual flows and abstractions, which in turn will require –



- 💧 Strong conceptualisation of measuring solutions,
- 💧 Standardised measurements and measuring devices,
- 💧 Realistic targets (allowable errors and losses),
- 💧 Practical models (for prediction and analysis),
- 💧 Effective implementation plans (for financial viability),
- 💧 Skilled persons (for effective operation), and
- 💧 Continuous innovation



Conclusion

- 💧 Irrigation water can be measured successfully
- 💧 Investment in physical and social infrastructure for agricultural water management required to ensure social stability, economic development and poverty reduction



Acknowledgements

WRC Projects:

- 💧 TT 248/05
- 💧 K5/1778//4 (in progress)

