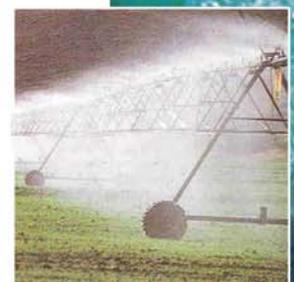
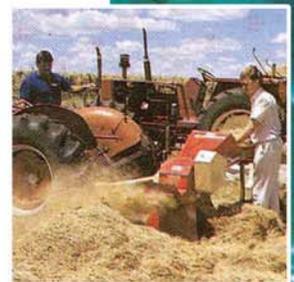




Department: Water Affairs
and Forestry

Water Conservation and Water Demand Management Strategy for the Agriculture Sector



August 2004

Foreword

In South Africa, water is key to winning the battle against poverty and its scarcity could be a limiting factor to growth. No socio- economic development can take place without water.

South Africa's water resources are indeed limited and scarce. The situation is worsened by the occurrence of droughts and the increasing demand associated with population growth and a developing economy. As a country, we are approaching the full utilisation of our available water resources. Further water augmentation schemes will be costly and are likely to be detrimental to our environment. We therefore require a strategic change in the use and conservation of our water resources. Our water is a precious resource that has to be used as efficiently as possible before we consider any new water resources development.

There are opportunities to increase water use efficiency in all water use sectors. Most of the sectors are expected to experience growth and use more water as our country develops. The Agriculture sector is no exception to this.

The Water Conservation and Water Demand Management Strategy is a fundamental step in promoting water use efficiency and is consistent with the National Water Act (Act 36 of 1998) which emphasises effective management of our water resources. Water Conservation and Water Demand Management should not be seen as punitive or restrictive but as a responsible approach that will contribute to our prosperity.

All consumers and water institutions have therefore a duty towards our country, our environment and themselves to implement adequate measures that contribute to water use efficiency through Water Conservation and Water Demand Management. The Agriculture sector has its role to play in this regard and as outline in this document.

Let us work together towards the prosperity of our nation and for the benefit of future generations by using our water efficiently and by protecting our environment.

Buyelwa Sonjica
Minister of Water Affairs and Forestry
August 2004



Executive Summary

In South Africa, the management of water resources and the provision of water to different sectors, including Agriculture, call for a new approach in which Water Conservation and Water Demand Management (WC/WDM) is expected to play a crucial role to ensure social equity, economic development and environmental sustainability.

The National Water Act (Act 36 of 1998) and the Water Services Act (Act 108 of 1997) have provided an enabling environment for WC/WDM. Newly-established institutions with roles and responsibilities are expected to integrate WC/WDM into their activities.

This document, focusing on WC/WDM for the Agriculture sector, is part of four documents which together constitute the Water Conservation and Water Demand Management Strategy. It should be read in conjunction with the first of the four documents, the National Water Conservation and Demand Management Strategy (NWC/WDMS). This document outlines the applicable principles and definitions and spells out the eight generic objectives of the overall strategy. The remaining two sectoral strategy documents deal with:

- Water Services;
- Industry, Mining and Power Generation

The strategy document for each sector provides a detailed background of the sector with regard to WC/WDM, and outlines the expected strategic outputs which are each linked to at least one of the objectives of the overall strategy. For each output, it prioritises the approach that the sector is expected to take and the activities it should carry out to give effect to WC/WDM. The three sectoral strategy documents are complementary to the NWC/WDMS. They provide detailed information on each sector, its strategic outputs, prioritised activities and responsibilities of key role-players. Where relevant, they also refer to guidelines or tools that were developed to support each strategy.

The agriculture sector is the largest water user in South Africa, with a demand of more than 60% of total water use. Efficient use of water by the sector has the potential to play a significant role towards making more water available for use not only within the agriculture sector but also for the other sectors.

The strategy promotes the equitable and efficient use of water to increase productivity and to reduce past inequities in the sector, especially with regard to new entrants. It also endeavours to provide a supportive and enabling framework to improve irrigation efficiency.



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Glossary

Consumptive use:

"Consumptive use" of water refers to the water that is utilised by businesses in closed processes that do not generate wastewater and that effectively remove that water from the water cycle. A bottling plant is an example of a business that has closed processes in which large volumes of consumptive use occur.

Demand-side management:

Any measure or initiative that will result in the reduction of the expected water usage or water demand.

Departmental:

Refers to the Department of Water Affairs and Forestry of South Africa.

Distribution management:

Any function relating to the management, maintenance and operation of any system of structures, pipes, valves, pumps, meters or other associated equipment, including all mains, connection pipes and water installations that are used or intended to be used in connection with the supply of water.

Inefficient use of water:

Water used for a specific purpose over and above the accepted and available best practices and benchmarks or water used for a purpose where very little benefit is derived from it.

Integrated Water Resource Management:

This process determines the optimal way of providing water services by analysing the change in water demand and operation of water institutions and evaluating a variety of supply-side and demand-side management measures.

Non-consumptive use:

A term used to describe the water that is utilised by businesses in open processes that generate

wastewater and which can be recycled or discharged back into the water cycle for use by other users. It should be noted that many open processes are not efficient and that they often contain an element of consumptive use. Cooling is an example of an open process that can consume significant quantities of water, but which also discharges water.

Reserve:

The Reserve consists of two parts: the basic human needs reserve and the ecological reserve. The basic human need reserve provides for the essential needs of individuals served by the water resource in question and includes water for drinking, food preparation and personal hygiene. The ecological reserve relates to the water required to protect aquatic ecosystems of the water resource. The Reserve refers to the quantity and quality of the water in the resource, and will vary depending on the class of that resource.

Retro-fitting:

The modification, adaptation or replacement of an existing device, fitting or appliance.

Supply-side management:

Any measure or initiative that will increase the capacity of a water resource or water supply system to supply water.

Unaccounted-for water:

The difference between the measured volume of water put into the supply and distribution system and the total volume of water measured to authorised consumers whose fixed property address appears on the official list of water services authorities.

Water Institutions:

Water institutions include both Water Management Institutions and Water Services

Acronyms

Institutions as defined in the National Water Act and the Water Services Act respectively.

Water Wastage:

Water lost through leaks or water usage that does not result in any direct benefit to a consumer or user.

Water Conservation:

The minimisation of loss or waste, the care and protection of water resources and the efficient and effective use of water.

Wastewater discharge:

In this document, the term "wastewater discharge" is used very loosely and refers to both the quality and the quantity of water discharged. It refers to the discharge to sewer systems as well as to open river systems. Furthermore, the term also covers the diffuse discharge of polluted water into open river systems.

Water Demand Management:

The adaptation and implementation of a strategy by a water institution or consumer to influence the water demand and use of water in order to meet any of the following objectives: economic efficiency, social development, social equity, environmental protection, sustainability of water supply and services and political acceptability.

Water utilisation:

Used to describe both the consumptive and the non-consumptive uses of water by businesses, whether it is raw or potable water.

ARC	Agricultural Research Council
BMP	Best Management Practice
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
DSE	Diverse Sideline Enterprise
DWAF	Department of Water Affairs and Forestry
IRP	Integrated Resource Planning
IP	Integrated Planning
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
FAO	Food and Agriculture Organisation
NDA	National Department of Agriculture
NWA	National Water Act (Act 36 of 1998)
NWC/WDMS	National Water Conservation and Water Demand Management Strategy
NWCSF	National Water Conservation Strategy Framework
NWRS	National Water Resource Strategy
PDA	Provincial Department of Agriculture
SAII	South African Irrigation Institute
WC/WDM	Water Conservation and Water Demand Management
WMP	Water Management Plan
WRC	Water Research Commission
WUA	Water User Association



1. Introduction

1.1 Agriculture Sector and Water Conservation and Demand Management

The agriculture sector represents about 62% of the total water used in South Africa (NWRS, 2003). Efficient water use by the sector has the potential to release sufficient water for extended use in the sector, especially by new entrants, and also by other sectors. It has the potential to assist South Africa to achieve greater food security not only at national level, but also at household level, especially for the rural poor.

The Agriculture Sector strategy is one of the three components of the National Water Conservation / Water Demand Management Strategy (NWC/WDMS). The other two components are the Water Services Sector strategy and the Industry, Mining and Power Generation strategy. The NWC/WDMS is itself a contribution to the National Water Resources Strategy (NWRS), being a component of Section 3 of Chapter 3 of that document. The NWRS is the overarching Departmental strategy document.

The development of the NWRS is itself a requirement of the National Water Act (Act 36 of 1998). It sets out ways in which South Africa aims to achieve Integrated Water Resource Management (IWRM). It describes policies, strategies, plans and procedures by which this will be achieved. It includes contributions received from a wide range of stakeholders across the country, within and outside the Department. It is a living and interactive document that will continue to grow and change as the needs, capacity and understanding of South Africa's people change and grow.

1.2 Linkage with the National Water Conservation / Water Demand Management Strategy document

This document should be read as an expanded version of the section on the agriculture sector

in the NWC/WDMS. The reader is advised to obtain generic background information from the NWC/WDMS document, in which:

- The introduction provides the background, context and legislative development;
- Chapter 2 explains the need for a WC/WDM strategy; and
- Chapter 3 provides the applicable definitions and principles.

This background information is equally applicable to the two other sectoral strategies.

1.3 Structure of the Agriculture sector strategy document

The Agriculture sector strategy document is structured as follows:

- A background to the Agriculture sector in South Africa (Chapter 2);
- A description of the process followed to develop the strategy, as well as the overall generic objectives of the NWC/WDMS to which the Agriculture sector strategy is a contribution (Chapter 3);
- A situation analysis and the opportunities for WC/WDM in the Agriculture sector (Chapter 4);
- A description of the institutional roles (Chapter 5);
- Detailed outputs, their linkages to the generic objectives, activities associated to each and the responsible institution (Chapter 6);
- A description of guidelines and tools to support the implementation of the Agriculture sector strategy (Chapter 7)

2. Background

2.1 The Agriculture sector in South Africa

The Agriculture sector accounts for about 62% of water utilisation in South Africa. It supports a significant portion of the South African economy and contributes to rural development. In addition to supplying the local market with staple foods, such as wheat, maize, potato, vegetables and various fruits, much agricultural produce is exported. South Africa is mainly self-sufficient, but has to supplement its production with imports of rice, wheat and meat.

Besides assuring food security for the country, the Agriculture sector contributes to employment and job creation throughout the food production chain. Some raw products are directly supplied to both local and export markets while others are further processed, thereby adding value. The latter category includes canned and dried products such as fruits, juices and wine. It also includes spices, maize flour, wheat flour and other cereals. Secondary industries such as transport, preservation and packaging are also supported by the Agriculture sector. The social value of the Agriculture sector should thus be emphasised because of its major contribution to food security and job creation.

The economic value of water used for agriculture is often lower than that for other water use sectors such as mining. However, the social value of agriculture warrants special consideration when deciding on the competitive allocation of water among sectors. Food security and job creation greatly enhance human dignity and contribute to the reduction of social ills such as crime and poverty.

Non-commercial small-scale agriculture at household level will play an increasingly key role in sustaining livelihoods through food security in rural and peri-urban areas. To this end, the basic human need component of the Reserve and the Schedule One allocation, as defined in

the National Water Act (Act 36 of 1998), make provision for water use by households for their vegetable gardens.

Agriculture is closely linked to land ownership. As the land reform process makes progress in South Africa, new entrants are expected to play a greater role in agriculture. This enabling framework will contribute towards greater equity, especially since restituted land will be owned and managed by organised communities. This is likely to result in increased demand for water for productive use.

2.2 Water Conservation and Water Demand Management in the Agriculture sector

Water losses through current irrigation practices range between 30 and 40%. This level of inefficiency is itself indicative of the significant potential for water conservation and water demand management in the Agriculture sector. Not all of the water abstracted for use through conventional irrigation methods reaches the root systems of plants. An unaccounted proportion of irrigation water returns to the river systems by overland flow and return seepage. This return water can be nutrient enriched and polluted with herbicides, pesticides and other pollutants that can detrimentally affect the water quality of the receiving river systems, including possible salinisation downstream. Conveyance losses due to the age of schemes and leaking canals add to the losses. Irrigation methods, irrigation scheduling, soil type, soil preparation and crop selection all have a significant impact on the efficient use of water in agriculture.

Thus, one of the aims of the strategy promoting the equitable and efficient use of water is to provide a regulatory support and incentive framework to improve irrigation efficiency and to increase productivity. The strategy also seeks to promote the optimal use of water in order to release water for use by previously marginalised



farmers and by other water use sectors. This will be achieved through water allocation and compulsory licensing processes. The opportunity also exists for new entrants to trade their water allocation with established farmers. While established irrigators should implement water conservation measures, new entrants should develop appropriate and efficient irrigation infrastructure and practices before claiming their water allocations.

Market forces should also motivate South African farmers to reduce the cost of water as an input in order to compete with other producers in global markets. With the envisaged greater economic integration within the SADC region, the future lifting of trade barriers is likely to flood the South African market with agricultural products from other SADC countries. These are likely to be produced at reduced irrigation cost and might therefore be cheaper than South African products. Efficient use of water can help South Africa to survive this competition.

Water conservation and water demand management for small-scale farmers, including households, has the potential to assist them in achieving greater production. Opportunities for empowering small-scale farmers and households should therefore be pursued actively to assure their greater financial freedom and food security.

Finally, the Agriculture sector has the potential to make use of partially treated effluent water from urban areas. This re-use of water is a contribution to water conservation that should be fully encouraged. The opportunities for water conservation and water demand management by those industrial activities concerned with the processing of agricultural products is discussed in the strategy document for the Industry, Mining and Power Generation sector.



3. Process and objectives

3.1 Process

This Strategy is the result of a process that began with a workshop in July 1999 and has included:

- Distribution of the draft Strategy document to all workshop participants for comment;
- Subsequent workshops and review of all comments received by the steering committee;
- Distribution of edited versions to a wider scope of key role players and interested parties for comment;
- Consolidation and final review based on all comments received by the steering committee;

- Submission of the Strategy to departmental management structures for review, under the guidance of an editorial panel; and
- In parallel with the above, supporting guidelines and tools were developed and tested in pilot and demonstration studies.

3.2 Objectives of the National Water Conservation and Water Demand Management Strategy

The strategic outputs of the Agriculture sector strategy, as further detailed in Chapter 5, are each linked to at least one of the generic objectives of the NWC/WDMS in order to demonstrate their contribution to the overall WC/WDM strategy. The generic objectives of the NWC/WDMS are given in [Table 1](#).

Table 1: National Water Conservation / Water Demand Management Strategy Framework Objectives

Objective	Description of Objective
Objective 1	To facilitate and ensure the role of WC/WDM in achieving sustainable, efficient and affordable management of water resources and water services
Objective 2	To contribute to the protection of the environment, ecology and water resources
Objective 3	To create a culture of WC/WDM within all water management and water services institutions
Objective 4	To create a culture of WC/WDM for all consumers and users
Objective 5	To support water management and water services institutions to implement WC/WDM
Objective 6	To promote the allocation of adequate capacity and resources by water institutions for WC/WDM
Objective 7	To enable water management and water services institutions to adopt integrated planning
Objective 8	To promote international co-operation and participate with other Southern African countries, particularly basin-sharing countries, in developing joint WC/WDM strategies



4. Situation analysis: constraints and opportunities

This chapter analyses the context of the agriculture sector in South Africa, outlining the constraints and opportunities for WC/WDM.

4.1 Constraints

Some of the general features characteristic of the Agriculture sector in South Africa, are described in this section. In developing their own WC/WDM programmes, the various Water User Associations (WUA) and irrigation farmers will need to assess the constraints and opportunities for their own specific circumstances.

Some of the common constraints preventing or restricting the implementation of WC/WDM in the Agriculture sector include:

- *Financial constraints:* Implementing WC/WDM requires investment in new irrigation systems which are not readily available to farmers;
- *Planning constraints:* Current water resources planning practices in the agriculture sector are often focused on supply-side management and only consider infrastructure development as an option;
- *Institutional constraints:* There is sometimes a lack of co-ordination among the various role-players in the water supply chain during the planning process (including the Department, bulk water suppliers and local authorities). There has been inadequate clarity on institutional arrangements, roles and responsibilities. In addition, most WUAs are in a transition phase, transforming from the former Irrigation Boards, while newly established WUAs are learning the challenge of operating schemes;
- *Capacity constraints:* There is often limited capacity available to plan, implement and

maintain WC/WDM measures, especially in the Agriculture sector;

- *Technical constraints:* There is a lack of appropriate WC/WDM planning tools and guidelines available and no adequate standards and enforcement for irrigation techniques. Where available, they are neither supported nor utilised and there is no incentive to do so; and
- *Social constraints:* WC/WDM is not perceived as a priority as it is only enforced during drought periods. There is also a lack of understanding of the value of water in general and that of WC/WDM in particular.

Other constraints include:

- WUAs generally tend to focus on other challenges, and WC/WDM is not perceived as a priority. Not all irrigators are organised into WUAs, which implies the need for interaction at a farm level; and
- Many WUAs do not have the appropriate means for measuring and metering water use. They lack information and adequate information management systems that would facilitate implementing WC/WDM measures.

4.2 Opportunities

The largest potential impact of WC/WDM in the Agricultural sector can be achieved by addressing wastage due to conveyance losses and the inefficient use of water. Water wastage is defined as water intended to perform a specific task, but not used for that purpose because of losses in transit. Wastage occurs because of various inefficient practices including:

- Seepage from irrigation canals which causes water-logging of adjacent land;
- Percolation;

- Evaporation from land surfaces; and
- Degradation in quality of return flows.

Similar wastage is also evident in stock-watering systems. However, stock watering accounts for less than 1,5% of all water use in the country, and more emphasis is thus placed on preventing irrigation water wastage.

In South Africa, large volumes of water must be transported over long distances from the water-rich eastern areas to the water-poor western areas. Water is of high value and the prevention of losses and optimal application of water is a high priority. Water losses occur in shared rivers, communal irrigation canals, on-farm furrows and in irrigation fields.

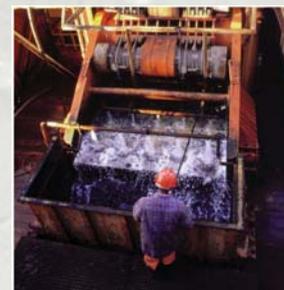
Irrigation losses are often fairly significant and it is estimated that less than 60% of water abstracted from water resources is correctly placed in the root systems of plants. Approximately 35% of irrigation system losses return to the river systems by overland flow and return seepage. This return water can be nutrient enriched and polluted with herbicides, pesticides and other pollutants that could affect the downstream water quality of rivers and streams.

Irrigation methods, irrigation scheduling, soil type, soil preparation, crop selection and evaporation all have an impact on the efficient use of water for irrigation. They should therefore all be taken into account in the quest to achieve maximum water use efficiency.

The role of WC/WDM in ensuring security of supply can be grouped into short-term functions during droughts and sustainable long-term functions. During droughts, emergency water conservation measures such as water restrictions and punitive rates may need to be adopted.

The Agriculture sector strategy for the longer term should promote the equitable and efficient use of water to increase productivity and to reduce income inequalities among people supported by the Agriculture sector. The development of a regulatory support and incentive framework will improve irrigation efficiency. This strategy will therefore aim to:

- Influence optimal use of water within the commercial sector where opportunities for water savings abound and release some of the water saved for use by aspirant and emerging farmers; and
- Provide for the user-management of irrigation schemes.



5. Institutional roles

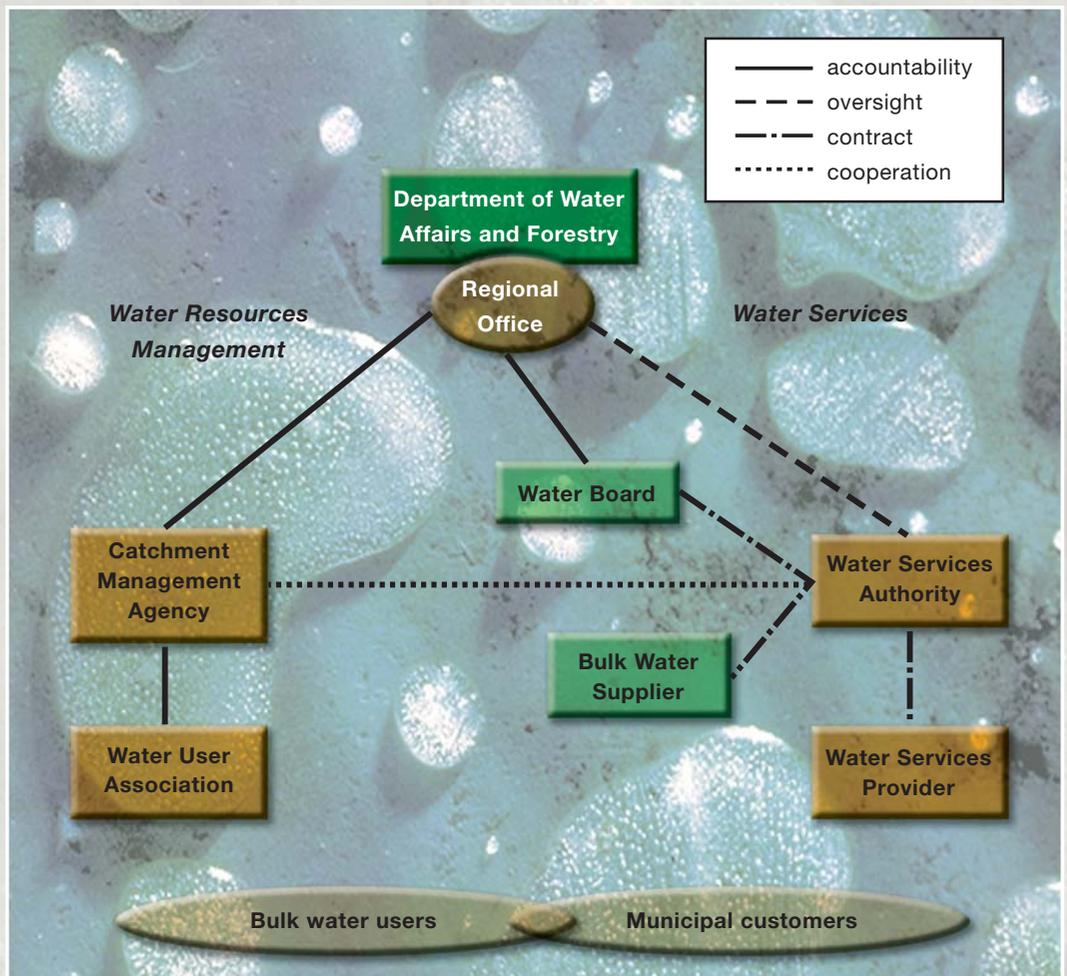
The roles and relationships of the various water sector institutions in respect to WC/WDM are reflected in **Figure 1**. Supporting comments provide a consolidated overview of the different WC/WDM roles and functions of the various water institutions.

It is important to note the different operational boundaries for water resources management and water services. Water resources management is undertaken on a catchment basis, whereas water services are provided according to municipal demarcation. This introduces complexity into the management of relationships between the

Catchment Management Agency (CMA) and the Water Services Institutions (WSI).

CMA's are responsible for Water Resources Management (WRM) planning and implementation at a Water Management Area (WMA) level. This includes the entire scope of WC/WDM. However, it is envisaged that a WSI will have a greater focus on demand management for domestic and industrial use within its area of jurisdiction. Each CMA will co-ordinate the activities of those WSIs falling within the WMA, possibly one or more bulk water suppliers and a number of WUAs.

Figure 1: Roles of water sector institutions for WC/WDM



5.1 The role of the Department of Water Affairs and Forestry

The role of the Department with respect to WC/WDM is a generic role and is applicable to all water use sectors. It includes:

- a) Co-ordinate national functions;
- b) Develop policies and regulations and support implementation;
- c) Perform general regulatory functions;
- d) Develop generic tools and guidelines;
- e) Co-ordinate measures to create an education and water conservation awareness culture throughout South Africa;
- f) Promote WC/WDM to all Water Management and Water Services Institutions, including WUAs; and
- g) Monitor the implementation of WC/WDM by WSIs, including WUAs.

5.2 The role of a Catchment Management Agency

The role of a CMA with respect to WC/WDM is:

- a) Include WC/WDM as part of its Catchment Management Strategy consistent with the NWRS;
- b) Set conditions for water use authorisations;
- c) Ensure the implementation of NWA regulations;
- d) Develop an implementation plan for the WC/WDM component of its Catchment Management Strategy (CMS);
- e) Ensure and monitor the implementation of WC/WDM by WUAs within its jurisdiction; and
- f) Co-ordinate and support the functions of its WUAs and irrigation water users.

5.3 The role of a Water User Association

A WUA's role in WC/WDM will largely depend on the functional role that the WUA plays in the provision of water services to its water users. In cases where a WUA acts as a water service provider, the role will be both administrative and managerial, but only administrative where the irrigation water is supplied directly to the water user. As an institution that represents water user interests, a WUA's role may include some or all of the following:

- Control of raw water storage and conveyance infrastructures at the local level with the aim of limiting water losses. Many irrigation schemes are reaching the stage where major reconstruction and redevelopment is required to maintain operational functionality and efficiency. Neglected schemes may face serious economic and physical consequences. It is important therefore that due attention be given to correct preventative maintenance programmes in order to postpone the necessity for major reconstruction;
- WUAs should ensure that all water used or conveyed to water users is measured accurately and reliably so that losses may be quantified and remedied. Water measurement at all service levels presents a major challenge to WC/WDM efforts. In order to determine accurate water balances, accurate and reliable measuring devices should be installed to quantify the losses in the water conveyance systems and to ascertain the volume of water delivered to end-users. Without measurement of delivered water, it will be difficult for water suppliers to quantify the losses experienced along the distribution system. Where the option is available, end-users should be charged on a volumetric basis, so that WUAs or CMAs can measure their water use and invoice them effectively;



- The NWA stipulates that the use of water for irrigation or commercial purposes is linked to the acquisition of a valid water use licence. Monitoring and control of water use, including prevention of illegal water withdrawal from rivers, ground water and other surface sources, must be actioned;
- A positive approach towards WC/WDM by end-users is pivotal to the successful implementation of the principles of WC/WDM in the agriculture sector. Irrigation water users may require encouragement to participate in WC/WDM efforts. This encouragement should be by means of incentive schemes offered to water users;
- Unlawful water pollution or degradation of water quality must be monitored and prevented, taking account of the potential impacts of land salinisation;
- WC/WDM contributions to Water Management Plans must be developed and implemented;
- Timeous delivery of irrigation water to fields and reliability of irrigation supplies must be ensured. Water delivery scheduling must be arranged for long canals where water takes a considerable time to travel the length of the canal. Special attention must be given to the operation of the canal in order to avoid water spillage and limit illegal abstraction. The most challenging situation, however, is the release of water into a major river to supply irrigation activities downstream;
- Farmers must be supported by providing advice on the latest water efficient irrigation technologies, as well as linking them to the extension services of the Provincial Departments of Agriculture (PDA);
- Scheme management information required by farmers and WUAs is currently not readily available. There is also a serious shortage of information on irrigation and irrigation

farming in South Africa, on the crops that are grown, where they are grown, how much water each crop requires in various localities and the quality of water they need. This information gap should be addressed by the WUAs in collaboration with CMAs, the Department and National Department of Agriculture (NDA).

6. Detailed outputs, activities and role-players

6.1 Approach

The outputs of the WC/WDM strategy for the agriculture sector are linked to at least one of the objectives of the NWC/WDMS. These strategic outputs are summarised in **Table 2** and the list of activities for each output is detailed in **Tables 3 to 10**.

Table 2: Strategic Outputs for the Agriculture Sector and links to the NWC/WDMS framework of objectives

Output	Description of Output	Link to Objectives
1	To ensure that appropriate measures to influence the reduction in water wastage are implemented	2, 3 and 4
2	To ensure that the WUA and end users understand and appreciate the need to modernise their water conveyance systems and irrigation equipment progressively	2 and 3
3	To ensure that water allocations promote equitable and optimal utilisation of water	1
4	To ensure that preventative maintenance programmes are put in place	3 and 4
5	To ensure that sufficient irrigation information is generated and is accessible to all stakeholders	3 and 4
6	To ensure that the concepts of environmental awareness and protection are promoted and accepted by all stakeholders	3 and 4
7	To ensure that accurate water management and service providers implement audits from the water source to end users and beyond	3 and 5
8	To encourage water management and services institutions to use the latest technologies in water release and distribution systems	3 and 6

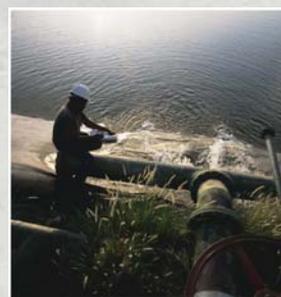


Table 3: Description of activities for Output 1: To ensure that appropriate measures to influence the reduction in water wastage are implemented

Priority No	Activity	Responsible institutions
1	Conduct and support ongoing research necessary for the refinement of the pricing strategy to facilitate the implementation of stepped water tariffs and facilitate the link of the Water Conservation component to the Water Resource Management charge	DWAF, WRC
2	Install suitable measuring devices in all irrigation schemes to facilitate volumetric water charges to the end-user. Implement progressive stepped water tariffs to reduce water demand and to encourage water users to relate water use to cost	DWAF, CMA, WUA
3	Promote the use of more water-efficient irrigation equipment in order to conserve water. Discourage the use of flood irrigation, especially when laser levelling is not continually undertaken to increase application efficiency	CMA, WUA

Table 4: Description of activities for Output 4: To ensure that preventative maintenance programmes are put in place

Priority No	Activity	Responsible institutions
1	Conduct regular preventative maintenance programmes of the raw water distribution and conveyance systems to detect and fix leaks	DWAF, CMA, WUA
2	Provide appropriate support services, where these are needed, in the planning and development of new irrigation schemes and rehabilitation of existing schemes	DWAF, CMA, NDA
3	Implement appropriate preventative maintenance programmes on canals and other raw water infrastructures	CMA, WUA
4	Implement appropriate preventative maintenance programmes on irrigation equipment	Farmer

Table 5: Description of activities for Output 2: To ensure that the WUA and end users understand and appreciate the need to modernise their water conveyance systems and irrigation equipment progressively

Priority No	Activity	Responsible institutions
1	Support ongoing research and development of new crop varieties that are water-efficient, high yielding and high valued to enable farmers to be competitive in the global marketplace	DWAF, NDA, PDA, WRC, CMA, WUA
2	Conduct research to develop, validate and evaluate irrigation technology	DWAF, NDA, PDA, WRC, CMA, WUA
3	Use the latest water conveyance and irrigation technology that prevents unnecessary water wastage and minimises water losses	CMA, WUA, and Farmer
4	Develop models to assist in water management, crop water requirements, equipment selection and design	DWAF, NDA, PDA, WRC, CMA, WUA
5	Practice irrigation scheduling based on crop water requirements to avoid under- and over-irrigation and the associated problems of salinisation and destruction of irrigable land	Farmer
6	Select the irrigation system to suit the crops that are grown, as well as the scheme, water supply regime and farming practices	WUA, Farmer
7	Minimise seepage losses in irrigation canals and irrigation ditches	WUA, Farmer
8	Ensure that the pesticides, herbicides and fertilizers are applied optimally and only when needed, to produce high quality food and to avoid contamination of surface and groundwater resources. Ensure that the quality of the return flows from the irrigation area do not adversely affect the irrigators and other consumers downstream.	WUA, Farmer

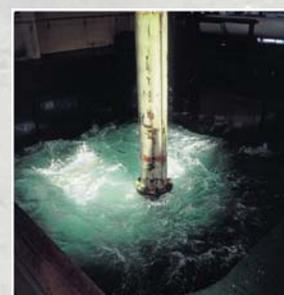


Table 6: Description of activities for Output 3: To ensure that water allocations promote equitable and optimal utilisation of water

Priority No	Activity	Responsible institutions
1	Use the water allocation process to promote WC/WDM principles	DWAF, CMA
2	WUA must submit a water management plan in accordance with the "Implementation Guidelines for WC/WDM in Agriculture: Development of Water Management Plans" as part of its application for water licences	CMA, WUA

Table 7: Description of activities for Output 5: To ensure that sufficient irrigation information is generated and is accessible to all stakeholders

Priority No	Activities	Responsible institutions
1	Develop irrigation databases and make this information widely available	DWAF, CMA, WUA, NDA
2	Encourage the use of the printed and electronic media to disseminate information to all stakeholders	DWAF, CMA
3	Contribute regular articles to local irrigation journals and agricultural publications to promote the concepts of WC/WDM	DWAF, CMA, NDA, PDA, WUA, ARC, SAIL.

Table 8: Description of activities for Output 7: To ensure that accurate water management and service providers implement audits from the water source to end-users and beyond

Priority No	Activity	Responsible institutions
1	Install accurate and reliable measuring devices to determine water balances	CMA, WUA, NDA
2	Prevent unlawful withdrawal of surface and groundwater	CMA, WUA

Table 9: Description of activities for Output 6: To ensure that the concepts of environmental awareness and protection are promoted and accepted by all stakeholders

Priority No	Activity	Responsible institutions
1	Minimise return flows from irrigated fields. Minimise the pollution and degradation of surface and groundwater by the optimal application of pesticides, herbicides and fertilizers	Farmers, NDA, PDA
2	Monitor and measure water quality upstream and downstream of the irrigation areas to protect the aquatic ecosystem and the downstream users. Apply the "polluter pays principle" to encourage compliance with the regulations / rules	CMA, WUA
3	Initiate awareness campaigns through workshops, discussion forums and newsletters	DWAF, CMA, WUA, NDA

Table 10: Description of activities for Output 8: To encourage water management and services institutions to use the latest technologies in water release and distribution systems

Priority No	Activity	Responsible institutions
1	Train relevant people involved in water releases	DWAF
2	Encourage the implementation and use of computerised operational systems in schemes and train WUA bailiffs in the use thereof	DWAF

The proposed policies to facilitate achievement of the activities described in **Tables 3 to 10** include:

- Those water users who do not belong to a WUA and who apply for a licence to use water will be required to develop and submit to the responsible authority a Water Management Plan that complies with the "Implementation Guidelines for Water Conservation and Demand Management in Agriculture: Development of Water Management Plans"; and
- Water users who are members of a WUA and who apply for a licence to use water will be required to adopt and implement the Water Management Plan developed by their WUA.



7. Supporting guidelines and tools

The following guidelines were developed to support the implementation of the WC/WDMS for the agriculture sector:

'DWAF, July 2000. Implementation guidelines for Water Demand Management for the Agricultural Sector regarding the development of Irrigation Water Development Plans for the Agricultural Sector for South Africa.'

These guidelines are aimed at WUAs to assist them in developing their Water Development Plans. However, Water User Associations that originated from Government Water Schemes were already equipped to do this.

8. Conclusion

8.1 Contribution of the Water Conservation / Water Demand Management Strategy of the Agriculture sector to the National Water Conservation and Water Demand Management Strategy and to the National Water Resources Strategy

This document constitutes part of the section on agriculture in the NWC/WDMS that is the basis of Section 3 of Chapter 3 of the NWRS. The documents are consistent and each provides sufficient detail at its own level.

Being the largest water user in South Africa, a successful WC/WDM drive in the Agriculture sector is likely to make available significant quantities of water that could be used both within and outside the sector.

8.2 Future reviews of the National Water Resources Strategy

As the NWRS will be reviewed every five years, the NWC/WDMS will also be reviewed at similar

intervals so that appropriate contributions to the NWRS can be made. As WC/WDM is implemented, some of the eight objectives might become redundant. The local and regional water market might also dictate other substantial reviews of the NWC/WDMS. The Agriculture sector strategy contains specific pointers in this regard. The lessons to be learnt during the implementation of the strategy for the Agriculture sector will contribute to these reviews.

8.3 Challenges

In an endeavour to cover all the possible opportunities for WC/WDM in the Agriculture sector, this strategy has highlighted opportunities for achieving efficient use in this sector. The challenge is to translate the strategy into concrete actions so that future generations can enjoy the benefits that the Department wishes to preserve for them.

This requires commitment of resources and a systematic implementation of the actions outlined in the strategy. The Agriculture sector in particular may require important capital outlays in order to achieve WC/WDM. Adopting irrigation efficient methods will require a change of mindset. Market dynamics induced by a new water pricing strategy and possible competition from outside South Africa are, however, likely to force the sector to consider WC/WDM as an opportunity for sustainability. Redressing past imbalances in the sector will also depend on effective implementation of the WC/WDMS.

REFERENCES

- DWAF, 2003. *Draft National Water Resources Strategy*
- Government Gazette, 1998. *National Water Act (Act 36 of 1998)*
- Government Gazette, 1997. *Water Services Act (Act 108 of 1997)*