



DROUGHT MANAGEMENT IN SOUTH AFRICA*

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1. INTRODUCTION

Droughts of varying extent are a regular occurrence in South Africa. The climate is semi-arid with an average rainfall of nearly 500 mm, which is highly variable. Rainfall declines from above 800 mm/a in the east to below 200 mm/a in the west. Although variations occur between years, clear cycles of approximately 9-10 years below average rain followed by above average rain, have been observed in summer rainfall areas (Tyson, 1987).

Rainfall makes the main contribution to surface run-off and surface water is the main source of water for irrigation. The water requirements for irrigation are estimated at 10 740 million m³/a (Department of Water Affairs and Forestry (DWAF), 1997) and this water is applied on an area of 1,3 to 1,5 million ha (Water Research Commission (WRC), 1996). Irrigated agriculture contributes 25 to 30 % of total national production while an estimated 1 million subsistence farmers and 10 000 commercial farmers are dependent on irrigation farming as the main source of agricultural income.

Although irrigation has a stabilizing effect on seasonal droughts, extended drought periods have wide ranging impacts on irrigation and agriculture in general. During the last dry cycle between 1982 and 1995, annual economic growth has *e.g.* been reduced by between 0,5 and 1,2 % in the four years of 1982, 1983, 1992 and 1995 (Finance Week, 2002). Droughts therefore have an impact on the natural resource base, on people as well as on the viability of farming and regional economies. With this background it is advisable to consider what the appropriate response by management should be, both in the public and private sectors.

2. CONCEPTUAL FRAMEWORK

Based on the literature review by Viljoen *et.al.* (2001a) it was found that a variety of factors must be taken into account when developing effective drought management

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policies and strategies for a local community or region. These factors include aspects such as:

- socio-economic development level of the country
- available institutions (degree of institutional capacity)
- indigenous traditions, culture and beliefs
- sectors and people at risk
- relative importance of irrigation
- frequency of severe droughts
- causes and impacts of droughts
- country specific circumstances
- available resources
- knowledge level
- level of political stability

It follows from the above examples that social, institutional, cultural, religious, economic, environmental, hydrologic, geographic, educational and political factors are all important.

2.1 Theoretical framework for drought management

From a theoretical perspective the procedure to determine effective strategies to manage droughts for a country or region can be summarized as follows (deduced from Viljoen & Smith, 1982 and Van Zyl & Viljoen, 1988):

- Determine the probabilities of droughts of different dimensions to occur in a country or region.
- Determine the extent and nature of the impacts (social, environmental, political; direct and indirect; short and long term; positive and negative; etc.) for droughts of different dimensions and probabilities.
- Determine the cost and effectiveness of different measures and application levels of measures as well as for different combinations of measures and strategies to reduce the negative impacts of droughts of different dimensions and probabilities.
- Integrate the above information within a cost-benefit or multi-criteria decision analysis framework to determine the most effective combination and level of measures and strategy to manage the impacts of droughts optimally.

From this brief synopsis it should be noted that information about the impacts of droughts and the effectiveness of different measures to reduce the negative impacts of droughts are crucial for determining an effective drought management strategy.

2.2 Classification and probabilities of drought

Classifying droughts and attaching probabilities of occurrence to different drought events is necessary basic information for a scientific approach to effective drought management. This is because the extent and nature of impacts as well as the nature and effectiveness of measures to manage droughts are related to dimensions (characteristics) and probabilities of different drought events.

From the literature, different ways to define and classify droughts exist.

Conceptual definitions are mostly dictionary type definitions that define boundaries of the drought concept and are generic in their description of the phenomenon.

Operational definitions identify the precise characteristics and thresholds that define the onset, continuation and termination of drought episodes, as well as their severity. Defining drought in region-specific situations is important in understanding drought and its impacts. This will assist policy makers in taking the appropriate actions or policy decisions.

To be able to evaluate economic impacts and assist policy makers to plan for an “irrigation drought”, a simple definition for such an occurrence is needed. Special references are made of the following general drought definitions to assist in defining irrigation droughts: meteorological, hydrological, agriculture and socio-economic droughts (Wilhite, 1999: 1-2).

- **Meteorological drought** is the first indicator of drought. It is usually a region-specific expression of precipitation's departure from normal over some period of time.
- **Hydrological drought** refers to deficiencies in surface and subsurface water supplies. When reduced precipitation endures over an extended period of time, a decline of surface and sub-surface water will be detected.
- **Agricultural drought** occurs after meteorological drought but before the hydrological drought. In respect of an irrigation drought, this definition is

instrumental for drought planning because agriculture is usually the first economic sector to be affected by drought. It refers to a situation when the amount of water in the soil no longer meets the needs of a particular crop. The three above-mentioned definitions measure drought as a physical phenomenon.

- **Socio-economic drought** deals with drought in terms of supply and demand for goods and services. The physical water shortage starts to affect people and the ripple effect can therefore be traced through economic systems.

Agricultural droughts link various drought characteristics to agricultural impacts. The focus is mainly on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, etc. The elapsed time between when precipitation deficiencies are actually detected in other components of the hydrological system (*e.g.*, storage dams, groundwater levels, etc.) causes impacts of drought to be out of phase with other impacts in the economic sector. This then explains why drought impacts should not just be studied when they happen during a period of water scarcity, but also while they linger when drought conditions no longer exist.

With this information an irrigation drought can then be defined as a drought that is reflected by a disturbance in the normal irrigation practices due to a water scarcity in the water sources allocated to irrigation.

2.3 Private and public responsibility and accountability

The most important requirement for management of a sustainable farming enterprise, is the ability to adapt to changes in the natural and marketing environment. One indicator of these adaptations is the combination of crop and livestock activities and the scale of farming. With reference to irrigation, there are two broad categories of irrigation schemes in South Africa:

- (1) Irrigation schemes with variable water supply or high risk of operating dams:
Farming typically consists of extensive crop production (*e.g.* field or forage crops with low double cropping); larger farming areas; low capital investments; and mixed farming operations.
- (2) Irrigation schemes with assured water supply or low risk of operating dams:
Farming is typically intensive crop production (*e.g.* fruit and vegetables with high

double cropping); smaller farming areas; high capital investment; and specialised farming operations.

Over the long-term many changes influence farm management. These include dry and wet rainfall cycles, variable river flow, dam levels and available water; fluctuating product prices and available technologies; changes in commercial, social and public services. If farmers successfully adapt to all these changes, local communities in rural areas will be progressive; if not, communities will stagnate or decline. The implication is that in a market economy driven by private enterprise, the responsibility for incorrect investment, financing, marketing and production decisions should be carried by farmers themselves (Backeberg, 1996).

Again over the long-term many deviations can occur from the adapted growth path. These can be typified by too high stocking rates in livestock farming; ploughing marginal lands in dryland farming; sub-dividing farms and intensifying crop production on irrigation schemes with high risk or variable water supply. These people induced deviations come to the forefront during or after a drought as a physical phenomenon, which then becomes a socio-economic drought (as described above). Clearly some farmers will be worse affected than others, but usually interest group activity will lead to political pressure for implementation of public support programmes.

In the debate on the merits of government aid, the question is first and foremost whether the problem of economic survival is caused by drought, or whether drought is merely a symptom. Very often problems such as overgrazing, low calving or lambing percentages, variable and low crop yields per ha, fluctuating or negative cash flow and high debt levels are only accentuated by drought. Thereafter, government intervention due to drought must consider at least the following:

- (a) definition of a drought and at what stage assistance should be provided
- (b) on what basis and level should assistance be calculated
- (c) who should receive assistance and for how long.

Since government aid involves the use of public funds for which there are many alternative applications, it should always be subject to a social benefit – cost analysis

or multi-criterion decision analysis. However, it must be accepted that any form of subsidization distorts environmental signals and delays change. A major finding of the Economic Research Service, USDA on climate change is precisely that government support programmes have hindered agricultural adaptation.

3. DISASTER MANAGEMENT

Major shifts in policy have taken place in South Africa since 1994. These can be highlighted by quoting relevant extracts in key policy documents.

3.1 Public policy on disaster management

In the White Paper on Agriculture (National Department of Agriculture (NDA), 1995:7) the following two statements were made:

“Drought will be recognised as a normal phenomenon in the agricultural sector and it will be accommodated as such in farming and agricultural financing systems” and “In the case of natural disasters the Government will be responsible for giving assistance to counter unacceptable consequences as far as possible”.

A later discussion document on a food security policy for South Africa places the emphasis on disaster mitigation by reducing the vulnerability to droughts and other disasters (NDA, 1997:20):

“Strategies to reduce vulnerability should be based on a sound understanding of rural livelihoods and coping strategies, since the impact of a disaster is determined by the underlying vulnerability to such threats. Rural households depend for a large portion of their consumption on income and transfers. However, the most vulnerable people in rural areas are those who rely most heavily on agriculture for their livelihood, by producing for themselves and working for others. These livelihood strategies fail when there are frequent natural disasters, leading to heightened vulnerability. In drought prone areas, consideration could be given to research and extension on the production, processing and storage of drought resilient grains such as grain sorghum and millet”.

The discussion document on Agricultural Policy in South Africa (NDA, 1998:33) acknowledges that *“... agriculture in South Africa is inherently more risky than in many other countries because of low average rainfall, and the wide variability in rainfall both between and within seasons in most parts of the country. In addition to*

the risks associated with drought, farmers are also confronted by a range of other hazards, including hail, fire, pests and diseases.”

The future role of government is explained as follows (NDA, 1998: 33):

“The Government will no longer provide drought relief as in the past. Instead, it will promote other options for reducing risk. All risk-reducing measures entail costs, which can be borne either by farmers or by the Government. Whereas in the past there has been a strong reliance on the state, the role of the Government will now be to reinforce farmers’ ability to deal with risk in a sustainable manner. This will reduce dependency and environmentally damaging cropping and other land-use practices.

Thus the overall change in the orientation of policy will put the responsibility of coping with drought back into the normal production system. This will cause farmers to exercise greater prudence and make themselves less vulnerable to the effects of drought.

The role of the Government is to assist farmers’ own efforts to cope with various risks and, where possible, to take steps to reduce the likelihood of risk. This involves four separate tasks:

- *promoting, through research and extension, technologies and practices which serve to reduce risk to farm incomes*
- *providing timely information on climate and market trends which could assist farmers in avoiding risk*
- *taking preventative action regarding major epidemics and hazards which fall outside the scope of individual farmers*
- *providing information and, where appropriate, facilitation to ensure that farmers are able to take advantage of taxation measures and insurance services which are available to cope with severe income shortfalls”.*

According to the White Paper on Disaster Management (Department of Constitutional Development (DCD), 1998: Section 1 and 2) the primary responsibility for disaster management in South Africa rests with the government. In terms of section 41(1)(b) of the Constitution of the Republic of South Africa (1996) all spheres of government

are required to “*secure the well-being of the people of the Republic*”. The scope and purpose of government policy is *inter alia* the following:

“The proposed disaster management policy pursues the above-mentioned constitutional obligations. It also aims to give effect to various rights contained in the Bill of Rights of the Constitution. This includes the right to life, equality, human dignity, environment, property, health care, food, water and social security.

A further fundamental purpose of the policy is to advocate an approach to disaster management that focuses on reducing risks – the risk of loss of life, economic loss, and damage to property, especially to those sections of the population who are most vulnerable due to poverty and a general lack of resources. It also aims to protect the environment.

This approach involves a shift away from a perception that disasters are rare occurrences managed by emergency rescue and support services. A shared awareness and responsibility need to be created to reduce risk in our homes, communities, places of work and in society generally.

This requires a significantly improved capacity to track, monitor and disseminate information on phenomena and activities that trigger disaster events. It needs the support of institutional emergency preparedness and response capacity at local, provincial and national levels. It also implies an increased commitment to strategies to prevent disasters and mitigate their severity.

The policy also seeks to integrate this risk reduction strategy into existing and future policies, plans and projects of national, provincial and local government, as well as policies and practices of the private sector.

In short, the policy aims to:

- *Provide an enabling environment for disaster management.*
- *Promote proactive disaster management through risk reduction programmes.*
- *Improve South Africa’s ability to manage emergencies or disasters and their consequences in a coordinated, efficient and effective manner.*

- *Promote integrated and coordinated disaster management through partnerships between different stakeholders and through cooperative relations between all spheres of government.*
- *Ensure that adequate financial arrangements are in place.*
- *Promote disaster management training and community awareness.*

There are seven key policy proposals set out in the White Paper:

- *The urgent integration of risk reduction strategies into development initiatives.*
- *The development of a strategy to reduce the vulnerability of South Africans – especially poor and disadvantaged communities – to disasters.*
- *The establishment of a National Disaster Management Centre to:*
 - *Ensure that an effective disaster management strategy is established and implemented.*
 - *Coordinate disaster management at various levels of government.*
 - *Promote and assist the implementation of disaster management activities in all sectors of society.*
- *The introduction of a new disaster management funding system which:*
 - *Ensures that risk reduction measures are taken.*
 - *Builds sufficient capacity to respond to disasters.*
 - *Provides for adequate post-disaster recovery.*
- *The introduction and implementation of a new Disaster Management Act which:*
 - *Brings about a uniform approach to disaster management.*
 - *Seeks to eliminate the confusion created by current legislation regarding declarations of disasters.*
 - *Addresses legislative shortcomings by implementing key policy objectives outlined in this White Paper.*
- *The establishment of a framework to enable communities to be informed, alert and self-reliant and capable to supporting and cooperating with government in disaster prevention and mitigation.*
- *The establishment of a framework for coordinating and strengthening the current fragmented training and community awareness initiatives.”*

Based on this policy, the Disaster Management Act has been promulgated (Republic of South Africa, 2002). It focuses mainly on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery.

The current situation in South Africa is briefly that ...

“at the national level, severe drought has affected macro-economic growth, as well as the livelihoods of especially the poorer sections of the population living in rural areas. It is difficult, however, to exactly measure the human, economic and environmental costs caused by disasters. Some examples of the high costs of disasters are illustrated in the table below.

Table 1: The cost of some recent disasters in South Africa

Place	Disaster	Cost
<i>Ladysmith</i>	<i>Floods, 1994</i>	<ul style="list-style-type: none"> •400 families evacuated •R50 million damages
<i>Merriespruit</i>	<i>Slimes dam, 1994</i>	<ul style="list-style-type: none"> •17 lives lost •R45 million damages
<i>Pietermaritzburg</i>	<i>Floods, 1995</i>	<ul style="list-style-type: none"> •173 lives lost •Emergency shelter needed for 5 500
<i>Ladysmith</i>	<i>Floods, 1996</i>	<i>Damages to infrastructure: R25 million</i>
<i>South Africa</i>	<i>Drought, 1991-92</i>	<ul style="list-style-type: none"> •49 000 agricultural jobs lost •20 000 non-agricultural jobs lost •Associated with 27% decline in agricultural gross domestic product
<i>Limpopo</i>	<i>Floods, 1996</i>	<i>R105 million damages</i>
<i>Mpumalanga</i>	<i>Floods, 1996</i>	<i>R500 million damages</i>

Source: DCD, 1998

While drought, floods, veld fires and mining disasters continue to be areas of concern, disasters that are predicted in the future relate to current trends of rapid urbanisation. Disasters may well result from environmental, technological and natural risk associated with unplanned or poorly planned urbanisation.”

3.2 Integrating disaster management into development planning

The integration of disaster management into development planning and programming can only be effective and realistic if governments and disaster managers are committed to see it through. The following needs to be considered in this regard:

- There must be a political will and commitment to implement the programme. The higher the level of the political authority the better the potential for success.
- If governments are serious about the implementation of such programmes then resources have to be available to ensure effective implementation.
- Disaster management is of a multi-sectoral nature. Thus, the ability to co-ordinate effectively is a major requirement as is the clarity with which the responsibilities and tasks of the sectors are laid down. This is practical integration – an acceptance by the sectors that disaster management is an integrated part of their programmes, to be implemented by them by staff whose job descriptions also carry the disaster management commitment.
- Implementing of such programmes must be cost effective. This involves looking for ways in which disaster management can be implemented without the programme becoming a huge extra cost to government. Existing resources and programmes must be used, rather to create new ones.
- Effective developmental disaster management programmes will only be effective if true ownership of the programme is accepted. True ownership must rest with those who are targeted under the programme. These are the vulnerable and, by implication, the poor – the people who do not have options or choices (Westgate, 1999). To assure this, there must be first the political will to ensure success in disaster management.
- Disaster management must be sustainable. This means keeping the issues alive. Westgate (1999) indicates two useful approaches to keep the issues in the public mind, namely training and public awareness. Training cannot only take place when money is available or once every five years. Therefore, the training process must be integrated and ensure that people are being trained on a regular basis so that people can know what their responsibilities are in the implementation of disaster management programmes. In the same way public awareness can contribute to sustainability. “Ongoing public awareness, with the momentum shifting to community representatives, can lay the foundation of this ownership”. Public awareness must be a two way process which establishes dialogue, rather to

focus too much on officials passing on to communities what they feel communities should know (Westgate, 1999).

Finally, mitigation actions and development are not synonymous and therefore not too much emphasis must be placed on mitigation. Mitigation actions aim to reduce the impact from future disasters, while development aims to build community capacity and to promote self-reliance in relation to social and economic parameters. According to Westgate (1999) the precursor to any effective risk and vulnerability reduction is not purely the implementation of a comprehensive disaster management programme; it is the implementation of a sound development programme (Viljoen, *et.al.*, 2001b: 69-70).

4. RISK MANAGEMENT STRATEGIES

It is important to consider both on-farm and national risk management strategies.

4.1 On-farm risk management strategies

Risk can be defined as the possibility of loss and risk management involves choosing among alternatives to reduce the effects of risk. Among the most important production and market risks there is yield risk, which refers to the impact of uncontrollable events that are often related to the weather (including drought, extreme temperatures, floods and hail) which have an impact on the potential crop yield. The combination of yield (production) and price (market) risk results in income instability and cash-flow variability. These risks can be countered by on-farm strategies (e.g. maintaining cash reserves, improved production efficiency or diversification) and risk-sharing strategies (e.g. vertical integration, production contracts, marketing contracts or futures contracts).

Insurance is another way to reduce the impact of risk. Yield insurance is one type of insurance in agriculture. Crop yields are normally insured for known perils such as hail. This allows the calculation of a probability distribution of a loss occurring, based on historic data. One important requirement that must be met for a risk to be insurable is that the implications of systematic risks must be overcome. Systematic risks are dependent risks, *i.e.* damages that occur at a national scale have the effect that premiums paid into a pool may not be sufficient to cover the loss in the case of *e.g.*

drought or flood. Under these circumstances, government intervention is required (Louw, 2002: 9-19).

As mentioned above government policy has changed, moving away from provision of financial aid to compensate for losses caused by droughts. Instead, these costs will be for the account of farmers, including those of insurance. Attempts have been made in the past to establish a subsidized, drought inclusive insurance scheme, but this has not been successful (NDA, 1998: 35).

Consequently an agricultural insurance bill is currently being prepared “*to provide for a system of agricultural insurance in order to improve the economic stability of agriculture; to enhance the income of farmers and producers against losses of agricultural crops and livestock due to natural and other disasters; to provide for financial assistance in establishing the agricultural insurance system; to provide for the control of certain activities of agricultural insurers and intermediaries; and to provide for other matters related thereto*” (NDA, 2003a).

4.2 National risk management strategies

In the Strategic Plan for South African Agriculture (NDA, 2001: 14-15) it is stated that ... “*an effective risk management strategy is critical to the promotion of risk management tools such as crop insurance products, asset protection and the agricultural futures market. Another component of a comprehensive risk management strategy is an early-warning system that includes adequate access to and utilisation of timely, accurate, relevant and free information about the weather. While this is currently not being done adequately, such information will now be made available through rural information centres through the Agricultural Geographic Information System. Government will promote the wider use of this information system by other information suppliers*”.

Within the context of the above-mentioned early warning system and providing timely, accurate information on the weather, a comprehensive draft drought management strategy has been formulated (NDA, 2003b: 4-36).

“The strategic objectives will begin with a process of reducing risk to drought and the management of drought through:

- *Utilising the existing legislation and organisational structures to manage risk and more specifically the management of drought reducing measures;*
- *Setting up a comprehensive drought plan in a system of information management, monitoring and evaluation that may assist in determining various vulnerability to drought (both biophysical and social) and thereby minimising the impact of droughts;*
- *Compiling drought indicator “maps” as to provide an overview (weekly or bi-weekly) of the drought situation in South Africa, as to where it is emerging, subsiding and forecasted;*
- *Improving and implementing early warning systems; and*
- *Establishing and implementing priority programmes for risk reduction.*

The strategy represents a marked departure from the existing approach to drought management. Risk management and therefore risk reduction, is the core principle of the strategy and is aimed at reducing the vulnerability of the farming communities, especially the poor and disadvantaged. Furthermore it will follow an approach where farmers must learn to live with disasters, especially drought in a sustained, ongoing daily activity.

The strategy signifies a shift away from the disproportionate emphasis given to rare major disasters and the Government’s intension to move away from direct financial intervention and rather improve South Africa’s ability to manage emergencies or disasters and their consequences in a co-ordinated, efficient and effective manner. The strategy recognises the fact that Government should only provide relief where sustainable agricultural management is employed over the long-term, which presents the question of reciprocation by way of a partnership between the Government and the farming community”.

5. CONCLUSION

Various combinations of meteorological, hydrological and agricultural droughts are regularly experienced in South Africa. Particularly in the periods 1925 to 1933, 1962 to 1971 and 1982 to 1995, droughts had wide-ranging negative socio-economic impacts. During the last mentioned drought period, financial assistance in the form of

livestock reduction in extensive grazing areas, pasture conversion on low potential arable land, debt consolidation or debt write-off in mainly rainfed maize production areas and water quota subsidy schemes on government irrigation schemes, were provided by the Department of Agriculture. Although it prevented financial ruin of many farmers and stabilised rural economies, it also highlighted the disparities between conservation and exploitation farming as well as the distortions that are introduced with subsidisation of agricultural enterprises.

It can justifiably be argued that, if seasonal or periodic droughts are a normal phenomenon, then planning and operation of farming activities must adapt to these circumstances. Agricultural policy regarding drought management in South Africa has therefore changed away from intervention with subsidies towards assistance with providing better information. This shift in public policy has taken place within a broader new approach to disaster management, where drought is recognised as one potential natural disaster.

The challenge is now to ensure that research and extension provides the necessary information and knowledge, which will enable farmers to follow sustainable management practices within a farming systems approach. In addition, reliable early warning systems must be implemented, which will also enable farmers to correctly and timely adapt to expected changes in the climate and weather. Unfortunately, however, insufficient research and extension capacity is currently available to address these challenges. The first corrective step has now been taken with formulation of the draft Drought Management Strategy by the National Department of Agriculture (2003b). If past cyclical rainfall patterns will continue, indications are that the next drought period in South Africa is imminent. A sense of urgency must therefore be created to ensure that both farmers and public servants are prepared for the next drought event. The real test of the success of the new drought management policy in South Africa therefore still lies ahead.

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