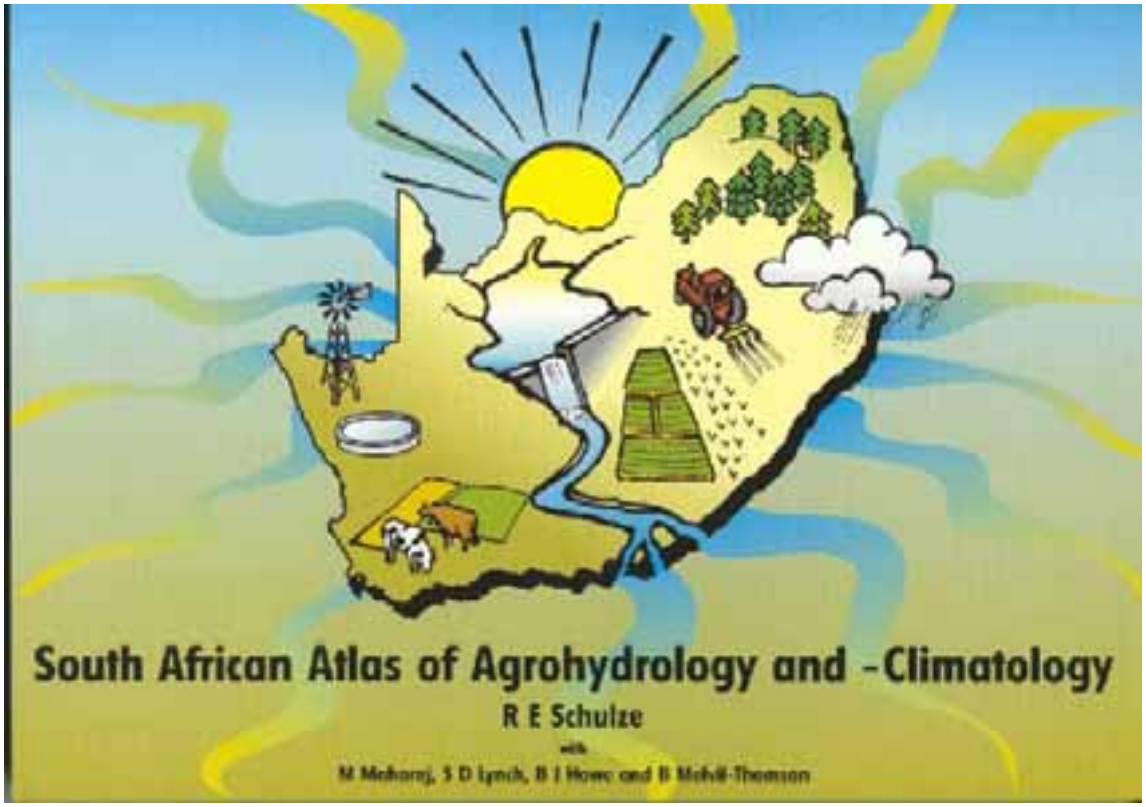


PREFACE

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Background to the Development of this Atlas

In the early 1980s the Agrohydrology and - Climatology of Natal (Schulze, 1983) was published as an atlas by the Water Research Commission (WRC). It proved a widely accepted and popular reference work as well as text at several tertiary institutions , and was used by water resources and agricultural planner, consultant and farmer alike. This present South African Atlas of Agrohydrology and -Climatology is an extension and considerable refinement of its 1983 predecessor. As the Department of Agricultural Engineering's sphere of agrohydrological research expanded from small catchments to provincial scale and then to the region referred to in this Atlas as southern (rather than only South) Africa, defined here as the contiguous geographical entity comprising the nine provinces of the Republic of South Africa plus Lesotho and Swaziland, so the need for detailed spatial and temporal climatic information increased. Consequently databases on precipitation, temperature and potential evaporation were developed, initially to serve the Department's in-house research needs on spatial agrohydrological modelling and impact studies, but later to also form important information bases for WRC projects at other institutions. As a result the research on the contents of this Atlas became a component of a broader WRC funded project in the Department entitled Modelling Impacts of the Agricultural Environment on Water Resources.

Objectives of this Atlas

The objectives if this Atlas are to map, at regional level, climatic parameters which are important in agrohydrology and agroclimatology, and to then apply this information to resource planning, primarily in the fields of water and agriculture. The Atlas is intended as a functional user document to provide the "big picture" in southern Africa, but in sufficient detail to be useful in regional decision making. In adopting a regionalised approach, one of the methodologies used has been to relate climate parameters which are measured at relatively few irregular point locations in the study area (e.g. temperature, potential evaporation), to known physiographically related variables such as altitude, latitude, longitude, distance from the ocean or topographic exposure, and then to apply these relationships to mapping at points where no measurements are made. However, the Atlas presents more than maps only; also included is text on concepts and background regarding the parameters mapped, plus statistical analyses and also scientifically related information on methods used or verifications attained.

What the Atlas should Not be Used for

This Atlas should not be used to obtain what may be perceived to be "exact" parameter values at very specific locations of interest or at farm level. The reason why one should guard against this is that, while sometimes considerable spatial detail may be presented on a map, the values at a specific point were initially derived either by regression analysis or by other simulation models (some simple, others more complex), and this has resulted in a smoothing of local effects and dampening of outlier values. Values at a specific point should thus be viewed in relative rather than absolute terms.

Layout of the Atlas

This Atlas comprises 18 sections of varying lengths and at varying levels of detail, viz.

1 Background Information

2 Physical Environment

3 Solar Radiation

4 Precipitation

5 Temperature

6 Heat Units

7 Frost

8 Positive Chill Units

9 Relative Humidity

10 Potential Evaporation

11 Soils

12 Agricultural Production Potential

13 Pasture Yields

14 Agricultural and Horticultural Crop Yields

15 Timber Production

16 Natural Hazards

17 Irrigation Requirements

18 Water Resources

Some Symbols, Abbreviations, Terms and Notations

Symbols

> : greater than : greater than or equal to

< : less than : less than or equal to

Commonly Used Abbreviations

MAP : Mean annual precipitation (mm)

MAT : Mean annual temperature (°C)

RH : Relative humidity (%)

Tmax, Tmin : Monthly means of daily maximum and minimum temperatures (°C)

N, S, E, W : North, South, East, West (and directional combinations, e.g. NE, SW).

Interchangeable Terms

Rainfall and Precipitation are used interchangeably, but imply the rainfall component of precipitation (excluding snow, fog, dew or hail).

Runoff and Streamflow have been used interchangeably although the latter, strictly speaking , consists of runoff produced from the catchment in question plus all runoff generated from upstream catchments. In the context of this Atlas runoff implies stormflows and baseflows emanating from a specific catchment only, with no cognisance taken of upstream contributions.

Notation of Rates. e.g.

tons per hectare per season : t.ha-1.season-1 megajoules per square metre : MJ.m-2

Spatial/ Temporal Terms

inter : between, e.g. inter-annual variability denotes variability between one year and the next
intra : within, e.g. intra-seasonal differences are differences within a season, i.e. from one month to the next.

## Support Services

Support services are available to users of this Atlas with specialised requests (e.g. separate maps, enlargements or more detailed statistics). A time based levy will be charged to service requests. Special requests should be addressed to

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Fax : 0331-2605818 (Int : +27-331-2605818)

email : schulze@aqua.ccwr.ac.za

Our research group also wishes to collaborate in applying our information bases to develop specialised algorithms for scientists from other disciplines. Once the more scientific papers emanating from this project have been published, some of the secondary datasets (i.e. temperature, potential evaporation) will become public domain through the Computing Centre for Water Research and the Internet. Primary data (e.g. altitude) are already in the public domain, as are gridded values of precipitation.

## The Future

The production of this Atlas, through funding from the WRC, has essentially been a user driven initiative. Following feedback from users it is therefore envisaged that updates and additions/ deletions will be made. Suggestions could come from a variety of fields of activity including food security studies, climate change impacts evaluations, State and provincial needs, the developing and commercial agriculture sectors, regional "what-if" scenario assessments, biodiversity or desertification research. Comments for possible future editions should be sent to the above address.

## Acknowledgements

This Atlas could only be produced with the able assistance of a highly dedicated team. In the first instance I should like to acknowledge very gratefully Mrs Manju Maharaj for her loyal commitment to and perseverance in this project. To Steve Lynch for his innovative applications and mastery with ARC-INFO, to an ever helpful and competent Brad Howe for his input to the GIS aspects of this Atlas, and likewise to Bruce Melvill-Thomson - your inputs were highly appreciated. A special thanks goes to the Computing Centre for Water Research, without whose facilities the production of maps for this Atlas would not have been possible. Finally I should like to express my gratitude to the Water Research Commission for

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Roland Schulze

March 1997

Terminology

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