A prerequisite to achieve the aforementioned is access to accurate, reliable and relevant geo-referenced information. “Good policy decisions need to be based on timely, consistent and accurate information” [1]. Spatial information systems allow for the integration of various sets of data, assisting users in the reaching of conclusions on a specific matter.

The Agricultural Geo-referenced Information System (AGIS) (www.agis.agric.za) has been developed with the aim of assisting decision makers in the agricultural sector to achieve the above. It provides the opportunity for government, organised agriculture, researchers and farmers to gain access to spatial and non-spatial information, via the internet. AGIS consists of a large number of datasets, especially information on natural resources. Through the metadata interface, accessible from the AGIS home page, the opportunity is also provided for the downloading of spatial information, free of charge.

AGIS has been in operation since 1998 and was launched as the official information system for the agricultural sector during the 2002 World Summit on Sustainable Development (WSSD). It is a collaborative initiative between the national Department of Agriculture, the nine provincial departments dealing with agriculture and the Agricultural Research Council (ARC) as the main role-players.

The technology used by AGIS, as described by Lindemann and Weir-Smith (2006), utilises inter alia the ESRI Spatial Database Engine (SDE) and the Internet Map Server (ArcIMS). During the last few years a number of individual systems, web pages and atlases have been developed within AGIS, all with a strong spatial component, supported by non-spatial agricultural information, such as agricultural commodity fact sheets, climate advisories and the Umlundi newsletter. Recent developments within AGIS have been done within the ArcGIS Server environment.

This paper will briefly discuss some of the developments within AGIS.

**AGIS Comprehensive Atlas**

The AGIS Comprehensive Atlas comprises a large number of spatial data layers depicted in an atlas format. Data layers are grouped according to themes that include inter alia groups on natural resources, agricultural potential, land use/land cover, agricultural production, risks and hazards, infrastructure, administrative and cadastral boundaries, demographic information and maps and images. Each of the groups is comprised of supporting and relevant data layers. Recently added datasets include the 10 m pixel resolution 2006 and 2007 SPOT satellite images, crop field boundaries and a spatial representation of land demarcated as agricultural land under Act 70 of 1970.

Functionality that are imbedded within the atlas include a zoom in and out option, zoom-to-scale, panning and an identify option within a selected data layer or group. Queries are constrained to a single, active layer and include an advance search per selected data layer, query per location and the saving of a bookmark.

Other atlases available in AGIS include the Orientation Atlas, Natural Resources Atlas, Food Insecurity and Vulnerability Atlas as well as the Agro-climate Atlas.

**Fig. 1** illustrates the layout of the AGIS Comprehensive Atlas.

**Veld survey database**

A tremendous amount of vegetation surveys have been conducted by various researchers, government and private sector and institutions in the past. This
data has not been captured at a central point for future reference purposes. In order to address this concern, a veld survey system has been developed within AGIS. It consists of the registering of a vegetation survey, through the capturing of metadata pertaining to the locality of the survey, details of the person that conducted the survey, purpose of the survey and the methodology followed. Currently under construction is the development of the database that will consist of the data recorded during the survey, such as the plant species found, its frequency and other data relevant to a vegetation survey.

The system will make use of a comprehensive database, populated by all plants species found in South Africa, as coordinated by South African National Botanic Institute (SANBI). It will also form the basis for the capturing of vegetation data as part of the fixed site monitoring system, discussed under the next point.

Fixed site monitoring

Due to the unavailability of long-term quantitative data on the status of natural agricultural resources in South Africa, a National Fixed Site Monitoring System (NFMS) has been developed. The aim of the fixed site monitoring system is to determine long-term trends regarding the status of natural agricultural resources and to provide data for the calibration of satellite data. Within the constraints of a stratification layer, derived from land capability and accessibility, 2000 monitoring sites have been randomly selected in South Africa of which 1000 sites are located on cultivated land. At each site a visual status assessment has been conducted, supported by photographs, as well as the collection and analysis of a soil sample. The visual assessment of the status of the natural resource include inter alia the type, extent and severity of water and wind erosion, overgrazing, bush encroachment and infestation of alien invasive plants. A comprehensive vegetation survey will be conducted at the sites located on natural vegetation within the next year.

The soil information, gathered at all 2000 points, has been captured in a spatial database within the NFMS and is deployed on AGIS. This information will also be incorporated in the new soil information system that is currently under development.

Land capability and high potential agricultural land

The Land Capability Information System is accessible from the AGIS home page. Schoeman et al. [2] defined land capability as “...the extent to which land can meet the needs of one or more uses under defined conditions of management”. Land capability is the classification of a group of land units with similar potential, limitations or hazards for rain-fed agricultural production. The classification is done according to soil and terrain characteristics as well as climate variables. Social and economic variable are not taken into consideration. Eight land capability classes are defined that are further grouped into land capability groups namely arable land, grazing land and wildlife. The modelling and classification of the classes were done within a desktop GIS.

The AGIS land capability web page provides information on the methodology and criteria used, the displaying of the distribution of the classes and the identification of a class with supporting attribute data. Fig. 2 illustrates the land capability map for South Africa.

AgriLand
(www.agis.agric.za/agriland)

AgriLand was developed to support the management of applications related to the Sub-division of Agricultural Land (Act 70 of 1970) [3]. Activities that are governed under the Act include inter alia the subdivision and zoning of agricultural land, change of land use and the registering of a servitude. The AgriLand system consists of two main areas, namely the management system and the public application and tracking system. The development of phase 1 of the system was completed in 2006.

The management system is used by the national Department of Agriculture in administrating applications that reside under the jurisdiction of Act 70 of 1970. The management portion allows for the capturing and progress tracking of applications including the uploading of supporting documentation, the identification of relevant farm portions and the registered owners, decisions taken pertaining to the application and where applicable, the stipulation of conditions. It also allows for the compilation of progress and performance reports relevant to the administration of applications.

The public system is used by applicants and is available via the internet. Access is restricted by means of a login system making use of an applicant’s e-mail address and a “one-time” password. Applicants have the option to register an application on-line and to upload the required documentation. They can also follow the progress of the application and are able to see the final decision pertaining to the application. Only applications registered against the e-mail address of the applicant can be accessed by the applicant.

Fig. 2: Land capability map for South Africa.
The second phase of the system is currently under development. Added functionality that will be included are the on-line capturing of applications and the evaluation of the application against certain criteria. One of the main additions to this system is the on-line digitising of the proposed changes requested for a selected farm portion and the current as well as proposed land use. It will also allow for the overlay of additional data layers, such as land capability and grazing capacity. This will allow for a more in-depth review on the impact of the proposed changes to the status of the natural agricultural resource.

**Agro-climate Information System (www.agis.agric.za/climate)**

The spatial and temporal variability, within and between seasons, of climatic conditions in South Africa is the single most inhibiting constraint faced by the agricultural sector. Reliable long-term climatic data and the monitoring of near real-time climatic conditions is therefore an important factor for sustainable agricultural production. The comprehensive long-term agro-meteorology database, managed by the Institute of Soil, Climate and Water (ISCW) of the Agricultural Research Council (ARC), is regarded as a national asset. The aim of the agro-climate system is to provide access to this data in order to assist the agricultural community with the management of the impact of climate on agricultural activities. This system provides access to up-to-date climate information including information derived from satellite images, updated on a ten-day interval as well as data logged at all the climate stations maintained by ISCW. Functionality is provided to users to query daily, ten daily, monthly and annual values for the climatic variables captured at a station for a specified period. The results are displayed in a graph and in a table format. Users can also download monthly reports as well as advisories.

**Virtual herbarium (www.agis.agric.za/herbarium)**

**Weed and invasive plants (www.agis.agric.za/wip)**

Both the above-mentioned websites aim to provide detailed information on selected plant species. Users are assisted with the identification of a specific plant by means of an identification guide and can obtain information on the plants’ characteristics, such as descriptions of their growth form, leaves, seeds, fruit and flowers. The information is supported by photos on the various aspects of the plant and presented as fact sheets that can be printed for personal use.

The weeds and invasive plants website indicates the status of the plant species as per the relevant regulations of the Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983 [4]). The distribution of alien invasive plants are captured in the SAPIA database and illustrated on a map per quarter degree block. The general public can add locality information to the SAPIA database online, but the data will only become part of the system once the entry has been approved by a professional.

**Development currently in progress**

A number of systems are currently under development within AGIS. These include:

**Locust web**

The main purpose of this system is to provide a national repository for data on the severity, extent and impact of locust outbreaks within South Africa. This second phase development of the system will focus on the deployment of an early warning system based on historical outbreak data, the previous seasons’ and current climatic conditions.

**Resource auditors information system (RAMS)**

The development of this system will support officials of the Department of Agriculture responsible for the administration of the Conservation of Agricultural Resources Act [4]. Activities, as provided for in the regulations of the Act include identifying, monitoring and management of the status of agricultural natural resources. Actions regulated by Act and incorporated within the system are applications pertaining to cultivation of virgin land, the rehabilitation of degraded land, adhering to the allocated grazing capacity norms for an area and the control of weeds and invasive plants.

**Soil web**

Soil is essentially a non-renewable resource and the amount of land, and thus soil available for food production, is limited and must be regarded as a precious resource. A need has been expressed for a structured information system pertaining to soil and the natural terrain. A comprehensive soil data model is currently in a conceptional design phase. The soil web aims to structure and provide access to land type information, available soil surveys and the national soil profile database. This data combined with long-term climatic data will form the basic building blocks in the development of a model for the zoning of agricultural land at municipal level that is currently in progress.

**References**


