

4.2 IDA

4.2.1 IDA: A non-technical overview

The Image Display and Analysis (IDA) program is widely used in the analysis of satellite data because it is versatile, easy to use and does not require large amounts of computer disk space or processing power. IDA's history began in the mid-1980's with the initiation of the Famine and Early Warning System (FEWS) project by USAID. The aim was to monitor food production and availability in the developing world using [NDVI data](#). A program was written that offered most of the functions that would be necessary in day-to-day analysis of Early Warning activities.

Initially it was intended just for display and map overlay, but in the early 1990's it was substantially upgraded, with the addition of new functions and made to support languages other than English, notably French. The most recent version of IDA is Version 4.2 and there is also now a version for WINDOWS. However, IDA remains true to its basic purpose of providing a powerful but easy-to-use and small image analysis package.

IDA's most basic function is the [displaying](#) of satellite images on a computer screen. It also allows the user to overlay maps on a satellite image, and show the co-ordinates and values for a particular pixel or region. A series of images can be examined visually using an [animation routine](#).

IDA can perform mathematical [image manipulation](#) like finding the average or standard deviation of the pixels in a region. IDA can produce graphs of data files such as those produced by the statistics tools. [Time-series graphs](#) are a good example of the statistical uses of the graph package.

IDA can also be easily programmed to perform repetitive image analysis tasks that would otherwise consume a lot of time and patience.

4.2.2 Technical Details

This section gives a brief overview of the technical aspects of using IDA. For a more detailed explanation of IDA the reader is advised to consult the IDA manual.

IDA is disseminated (free of charge) either on a single diskette or it can be downloaded on the internet from the [FAO FTP site](#). The files can be transferred from the diskette to the hard disk. The IDA manual (distributed with the diskette) gives full instructions on the installation procedure, although there are problems with reading the digital manual if you don't have WordPerfect for DOS. Trained personnel at [ARTEMIS](#) may be able to help.

IDA is a DOS based program and will run on any IBM-PC compatible computer that contains an EGA, VGA or SVGA graphics card, a colour screen and a hard disk with a few megabytes of free space. All processors in the 8088 range of Intel (8086, 80286, 80386, 80486 or Pentium) are supported, although a fast processor (80386 or above) will considerably speed up the IDA functions. IDA does not even require the use of a mouse as all the commands can be operated by the arrow keys.

IDA image files have what is known as the 8-bit IDA format. In this format the file starts with 512 bytes called the header, describing certain aspects of the image. The header contains information on the height

and width (number of pixels down and across), the image title, the image type, and the projection. The header is followed by the image data beginning at the top left of the image and progressing row by row. Each pixel takes up a single byte of memory. Within each byte there are 8 bits which means the pixel can take $2^8 = 256$ integer values (between 0 and 255).

Certain numbers are set aside to indicate particular things, such as missing data. The image type (given in the image header) determines the convention used for missing data values. For example, in ARTEMIS data the two highest values (254 and 255) are reserved for non-image data. The IDA manual discusses the IDA image format in more detail.

4.2.3 Viewing images with IDA

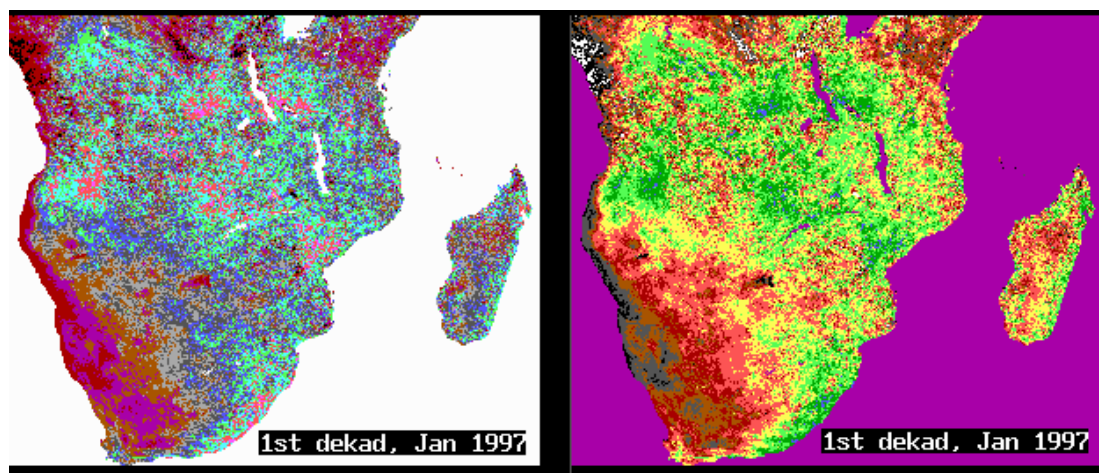


Figure 4.2.1

IDA allows the user to display satellite imagery on the screen. The example above is the dekadal NDVI image for southern Africa for the first dekad of January 1997. IDA assigns a colour to each pixel on the basis of its value. As discussed in the [technical details section](#) each pixel can have 256 values. IDA can show only 16 different colours. This means that each colour usually corresponds to a range of similar values which can be assigned by the user.

Which colour goes to which pixel-value is defined by a colour look-up table. This allows the user to examine the detail over the range of values most important for his application. These colour look-up tables are contained in files with the extension .LUT. The examples above show the same image but with different lookup tables. The right hand image shows the regions of high NDVI in the green colours while low NDVI is indicated by the red.

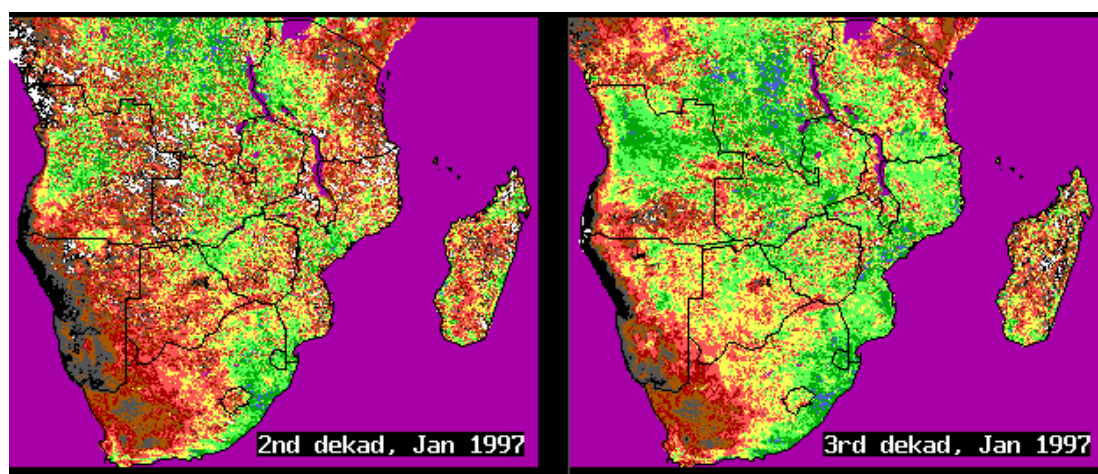


Figure 4.2.2

The images in Figure 4.2.2 are the NDVI images for the second and third dekads of January. These have been overlain with the country borders (in black). Maps are usually contained in files with the extension .BNA. The way the map is drawn depends on the image over which it is loaded. The contents of the image header are used to locate the map. This makes it impossible to (for example) load a map file for Malawi over an image of Zimbabwe. Maps are available for most continents and may give detail down to administrative districts.

4.2.4 Visual analysis with IDA

IDA has a number of functions that allow the user to analyse and compare images visually. It is possible to 'toggle' between two images. Figure 4.2.3 below toggles between the monthly average NDVI images for southern Africa in February and July, 1997. This function highlights the regions where there was a large annual change in NDVI in 1997.

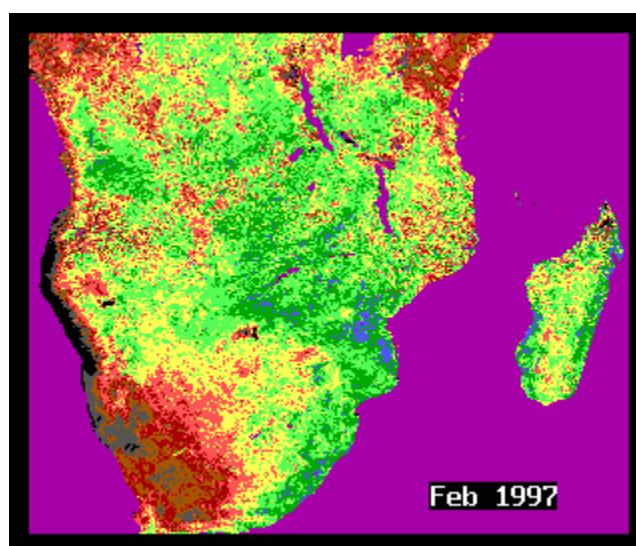


Figure 4.2.3: Toggle between monthly average NDVI for February and July.

A second useful visual analysis tool is the film loop. Any number of images can be input into a film loop. IDA will display the images in the order they were input in a kind of film or animation. The film can be speeded up or slowed down as required. Figure 4.2.4 is a film loop of all the monthly NDVI

images in 1997. In this way, the seasonal shifts in NDVI can be monitored.

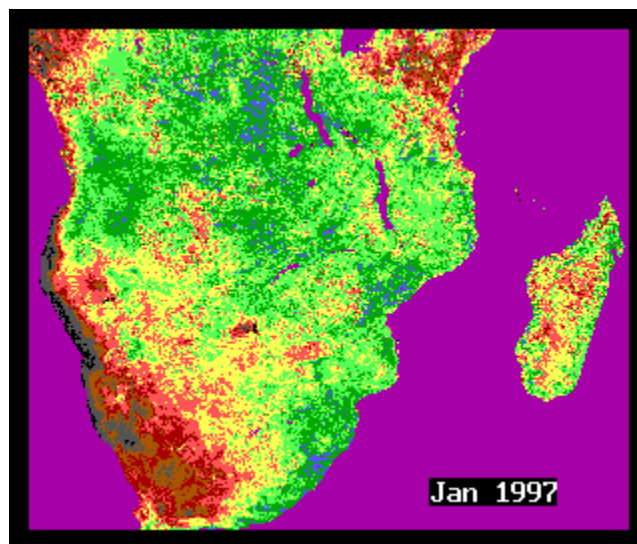


Figure 4.2.4: Animation of monthly NDVI for 1997

4.2.5 Image manipulation with IDA

IDA has a number of built in functions which can be used for image analysis. The first image in Figure 4.2.5 is the mean and the maximum NDVI for the month of January. IDA calculates these quantities for each pixel from Figures 4.2.1 and Section 4.2.3 [Viewing Images with IDA](#). IDA can also find the standard deviations and the range of values of each pixel, and the minimum values for the month. IDA can perform these functions on any number of input images. This may allow the user to create a seasonal, annual or long-term average image.

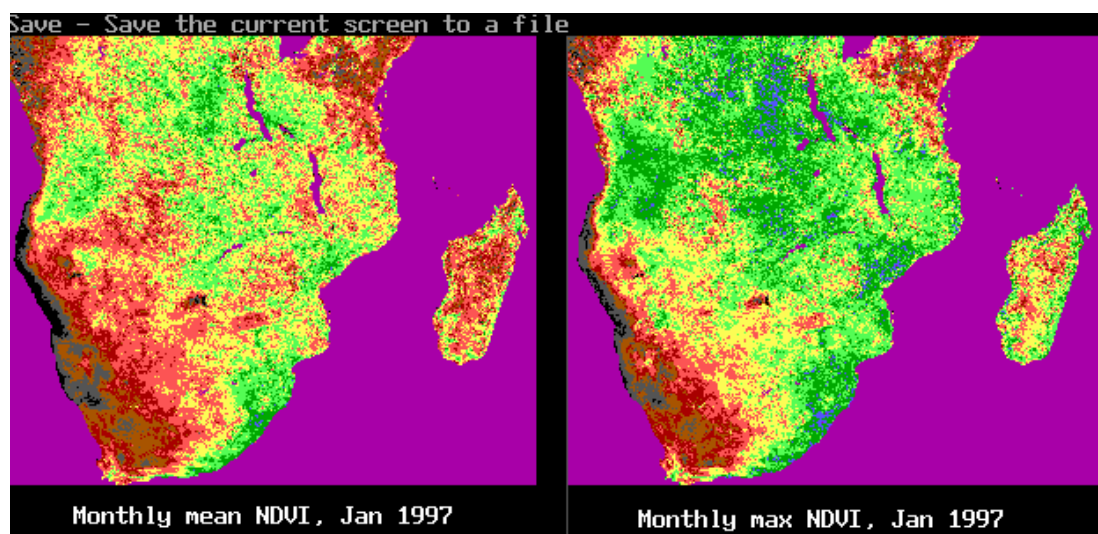


Figure 4.2.5: Monthly mean and monthly maximum NDVI for southern Africa

Subtracting one image from another is a very useful way to compare two images. Figure 4.2.6 shows the long-term monthly mean (based on data since 1983). Alongside is the image for the long-term mean for January subtracted from the image for January 1997. The regions of unusually high NDVI in January 1997 are shown in green, while regions with low NDVI are in red.

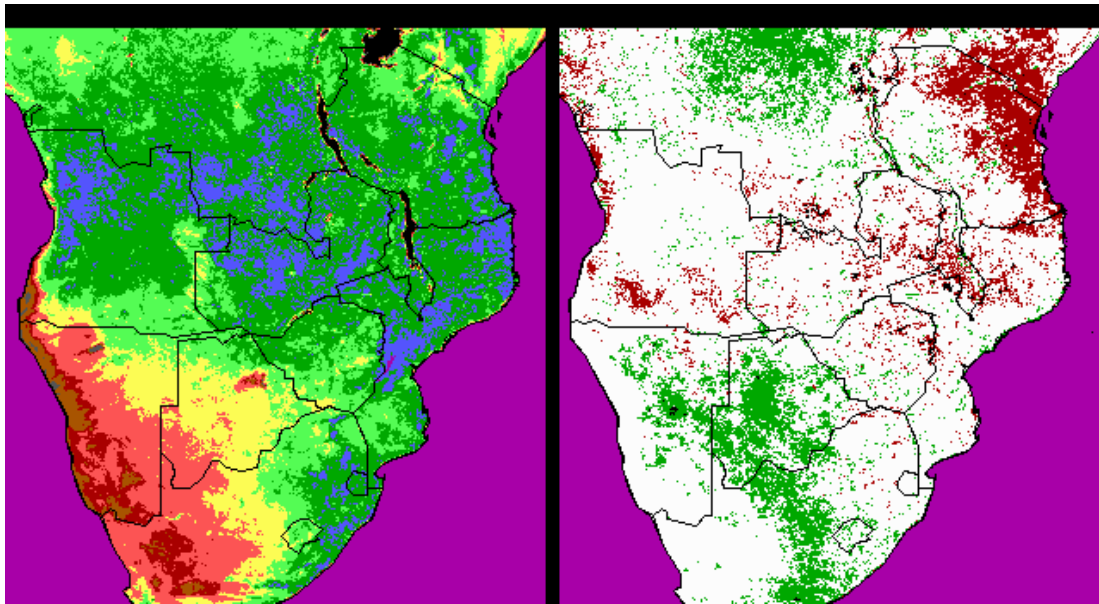


Figure 4.2.6: The long-term monthly mean in NDVI for January, and the difference between the January 1997 and long-term mean images.

4.2.6 Statistics with IDA

IDA has a number of functions that can be used to extract statistics from an image file. By providing a reference map file, the user defines a region in the image (it may be a country, a box, polygon or even a single pixel) and IDA takes the pixel values in the defined region and produces the required statistic. IDA can produce the average and standard deviation, the maximum and minimum, and the range of the pixel values. IDA also has the ability to count the number of pixels within the region. If the user inputs a series of image files, IDA will calculate the statistics for each image consecutively.

The statistics are output to a standard ASCII file which can then be imported into a spreadsheet package such as EXCEL or LOTUS 123. Figure 4.2.7 below shows the graph of the average NDVI for Zimbabwe calculated from the monthly NDVI images of 1997. The seasonal change in NDVI is clearly visible with low NDVI in the dry winter months (August/September) and high NDVI in the rainy, summer months (January/February).

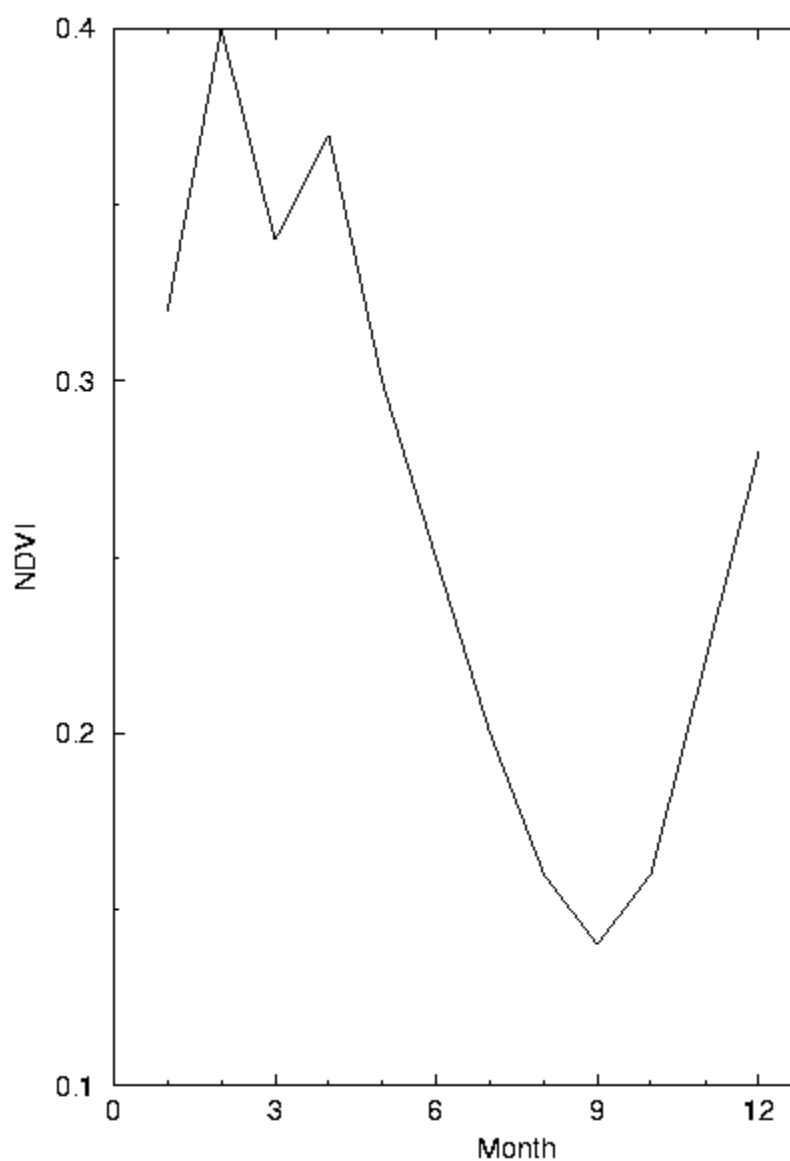


Figure 4.2.7: Monthly NDVI average for Zimbabwe, 1997

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