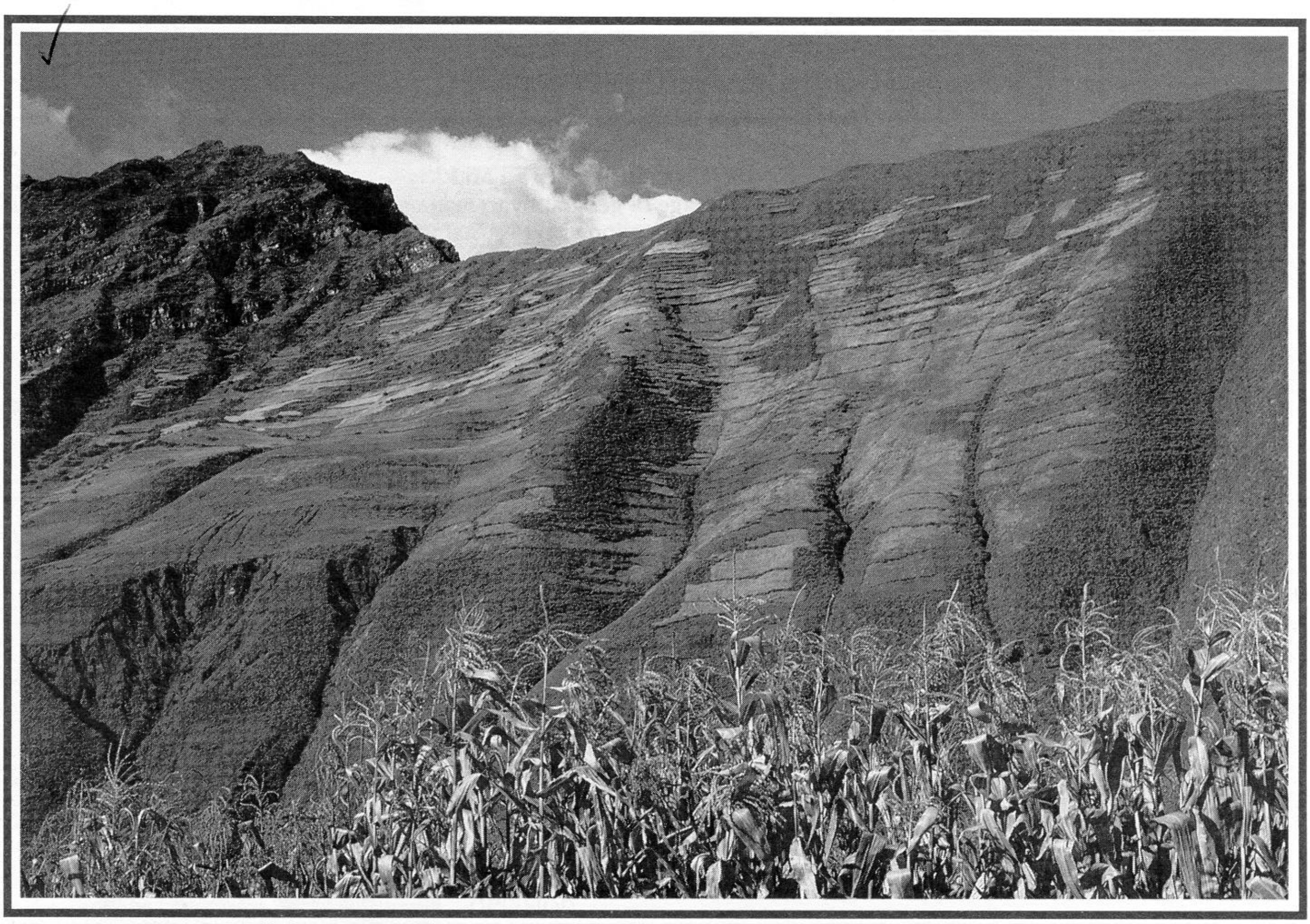
INFORMATION FOR DECISION MAKING



GIS uses geography, mathematics and electronics in applications such as soil resource management. Potentially, it could assist in decisions about cultivating mountain hillsides such as this one in Cuzco, Peru.

It is impossible to have sustainable and equitable development without free access to reliable and accurate information.

The information required for decision making was the topic of an entire chapter of the Agenda 21 action plan drafted during the recent Earth Summit held in Rio last June. Information is a common theme throughout the Agenda 21 document as well as in other conventions and agreements negotiated during the Summit.

Information has its own technologies, which are developing so rapidly they are difficult to track, particularly for developing countries. A Geographic Information System (GIS) provides the best example of this. This technology, created to process and manage spatial data originating from a variety of sources, facilitates the extraction of the information necessary for decision making in almost all areas of development.

The growth in environmental awareness, as well as the desire to protect the environment and to implement sustainable development, is currently leading decision makers to seek out tools to assist them. The tool of choice is GIS.

Structurally, GIS may be defined as an effective combination of software, hardware and knowledge which can harmonize spatial data from a diversity of sources, and facilitate decision making.

Conceptually, it represents the point where geography, mathematics and electronics meet and combine to catalogue, superimpose, examine and visualize physical, social and economic phenomena, and assess their impact in space and time.

Functionally, it is a tool to collect, analyze and process spatial data, and to derive the information that provides the basis for action.

Let us assume that you want to study the agricultural improvement of a specific region to ensure that it is self-sufficient in providing food for its inhabitants. You would require physical data (soils, vegetation, topography), hydro-climatic data (precipitation, winds, temperature, sunshine, infiltration, evaporation, run-off), information on the economy and infrastructure (access routes, fertilizers, energy, transport, equipment, proximity of markets); as well, you would need information regarding the environment (pesticides, herbicides, capacity to absorb pollutants), society (regulation, taxes and duties, labour availability, population, eating habits) and agricultural practices (seeds, optimal production conditions, bank loans). Using a geographic information system, data at a variety of levels, originating from a variety of sources and collected in a variety of ways, can be aggregated, organized, structured, analyzed and compared on a map, so as to provide, after processing, various agricultural development scenarios, set out as a function of goals stated and development models selected.

In 1989, Hurricane Hugo devastated the Antilles and the south-west of the United States, leaving dozens of dead and billions of dollars in damage. In the aftermath, several universities and government agencies (both municipal and regional) used GIS to assess the damage and design restorative measures. GIS was used to: develop assistance programs for victims; assess the impact on coastal forests; determine the changes in the river banks; establish the jurisdiction of the states along the coast; develop reforestation programs; create databases for soil use and economic development; set up impact and remediation studies; analyze the drainage pattern and the damage suffered by bridges. This example gives an idea of the multiple capabilities of GIS as an analysis and management tool.

GIS also facilitates access to cartographic databases and to interdisciplinary exchanges, as well as between sectors. Adopting GIS to manage data and information inevitably leads to changes in the structure of the institution and this frequently results in greater precision and efficiency.

However, it would be presumptuous to suggest that GIS could settle all the problems of the developing countries. Other techniques such as remote sensing by satellite are also essential. GIS imposes a rigorous logic on an organization and allows multiple scenarios to be drawn based on physical, social or economic parameters. GIS gives free rein to the intuition and creativity of the user. Remote sensing and GIS now allow us to better understand the dynamic relationship between different components of the environment. These tools allow us to open the door to modelling the consequences of the development of a region.

Given its 20 years of experience in information sciences, IDRC is very much involved with GIS. Since 1986, IDRC has selected geographic information systems as the focus of its Geomatics program. IDRC has financed more than a dozen applied research projects in Africa, Asia and Latin America. The projects have involved subjects as varied as the study of coastal zone development, the management and conservation of water and soil resources, municipal management, fertility and erosion, flood control, assessment of socio-economic changes and the mapping of malaria. Some of these projects are the subject of articles in the present issue of IDRC Reports. IDRC undertook pioneering work in several countries, and before long, there were experts in this technology including senior government officials.

As an Agenda 21 agency, IDRC intends to enhance support for research and development of GIS, to bridge the existing gap between the availability of data and their interpretation for sustainable development.

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GIS: WHAT IS IT?

GIS stands for "Geographic Information System", an information technology designed to collect, structure, analyze and manage large volumes of spatial data and their attributes. It is similar to having a map library, statistical data, drawing, map overlay and analysis tools all at hand; and all of these on a computer. There are a number of systems on the market, something for every taste and pocketbook, ranging from a few hundred to several thousand dollars. Some of these are intended for specialized uses or for sectoral applications such as forestry, engineering, land registry; others are more general. Some emphasize the quality of their graphics, while others claim to have more analytical power.

A complete, functional GIS work station generally includes a microcomputer with 2 megabytes of RAM memory, a colour monitor, a digitizer, a printer, a plotter and an extra data storage device; in addition, it has an operating system (DOS or other) and the GIS software.

Even though a great deal of effort has been devoted to making GIS easy to use, it still is aimed primarily at information specialists and technicians. To become a GIS user, one must have training in spatial science (cartography, geography or another geography-based discipline) and a sound knowledge of information science. Even with all this background, at least six months of training is required to be able to use GIS effectively.