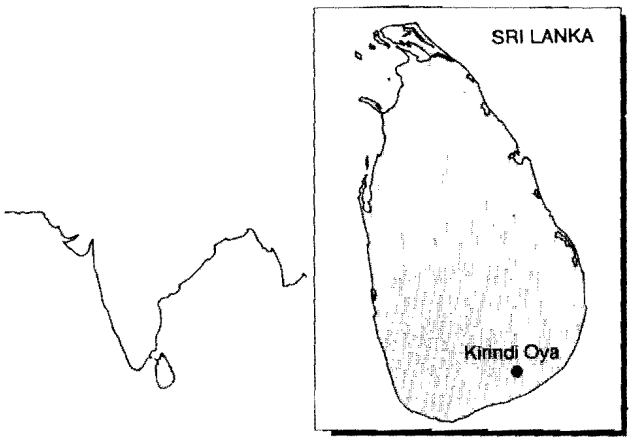
**SRI LANKA**




# GIS for Irrigation Schemes Management: Sri Lanka Experience

## INTRODUCTION

Management of irrigation systems demands the handling of large amounts of data. As most of these data are spatially distributed, one can expect that the quality of decisions made by irrigation managers could be promisingly improved by applying Geographic Information Systems.

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Purposely simple, generic, and user-friendly, with a geographic interface allowing direct visualization of the current situation, NAGA is intended to be a first step tool towards improved water management, by upgrading monitoring capacity and by organizing daily data for any further time series analysis and diagnosis. It is currently being tested in Thailand and will be tested soon in Vietnam.

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The stage of the application of GIS capabilities to irrigation water management is at its infancy, at least as far as Sri Lanka is concerned. Therefore, the IIMI-ITIS unit, together with the Irrigation Department of Sri Lanka launched a pilot study in mid-1995 in the Kirindi Oya Irrigation and Settlement Project (KOISP). The main objective of the study was to develop an appropriate information system to improve the decision making in the operation and management of the irrigation scheme.

The studied irrigation scheme presents a high degree of complexity in the water flowing paths which go with good opportunities for improving water use efficiency. Therefore, the case appears to be interesting in developing a GIS approach addressing:

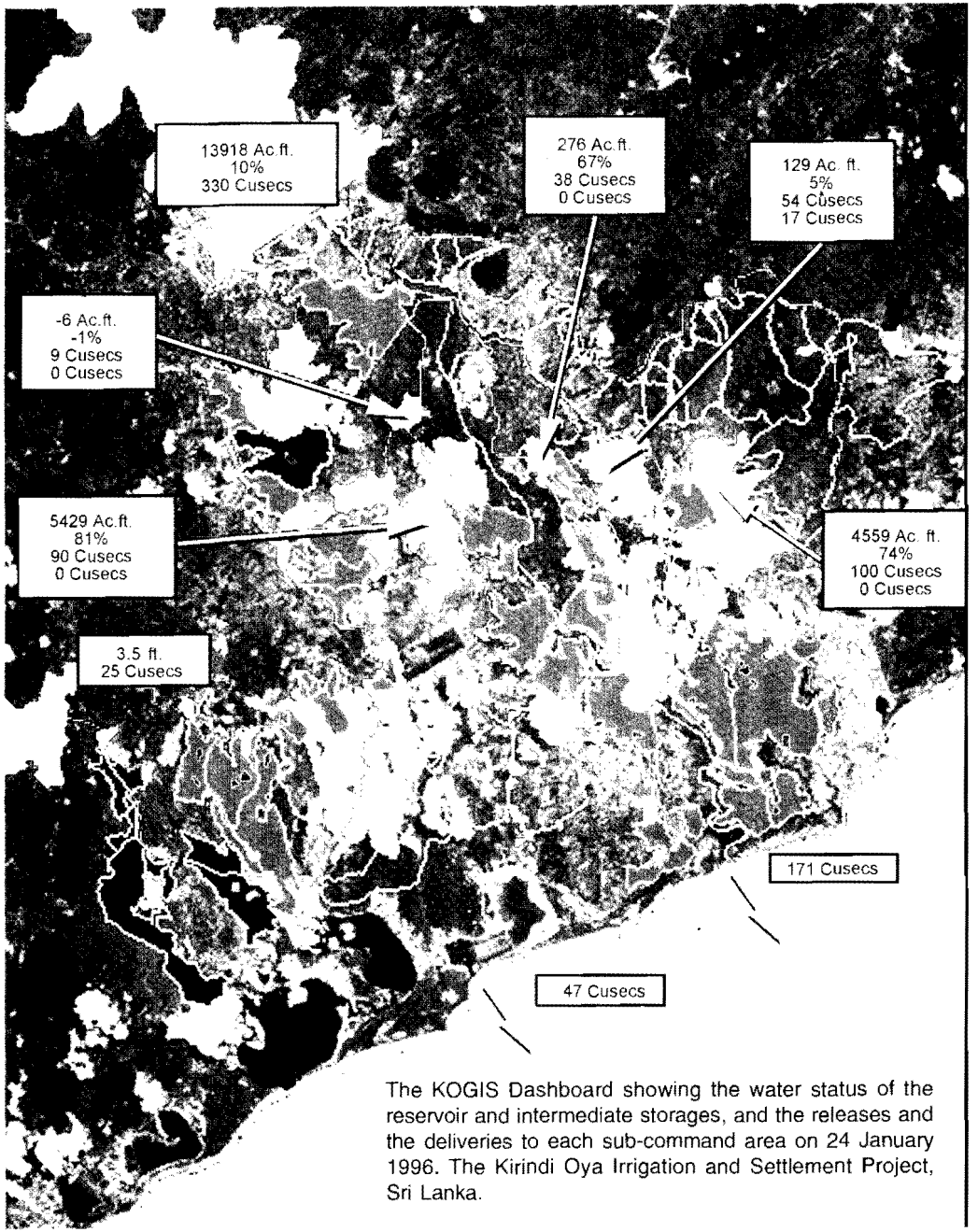
- strategic decisions in mobilizing and allocating resources throughout the area (water, human, etc.)
- tactical decisions in operating the infrastructure

As it was the first study of this nature, the manageable size of data, required spatial scale, cost of implementing such a program, and the training requirement of the project staff for a GIS-based information system were also attempted to be understood.

## KIRINDI OYA IRRIGATION AND SETTLEMENT PROJECT

The study took place in an irrigation scheme located in the southern part of the island. This project, commissioned in 1986, is one of the largest agriculture-based development undertakings of the Government of Sri Lanka. The project area is about 20,000 ha, with an irrigated extension of 10,000 ha, covering old irrigation areas and newly developed areas. The infrastructure is composed of one large reservoir used as the main supply, seven intermediate tanks, and two main canals.

KOISP is a complex irrigation system as it is always associated with many technical, social, and political problems. Therefore, the system managers frequently face many difficulties in managing the system.




The KOGIS Dashboard showing the water status of the reservoir and intermediate storages, and the releases and the deliveries to each sub-command area on 24 January 1996. The Kirindi Oya Irrigation and Settlement Project, Sri Lanka.

## DAILY ACTUAL ISSUE/TARGET (%) AND TANK WATER STATUS (01/24/96)

- < 80%
- < 90%
- > 90 and < 120%
- > 120%
- > 140%

***Information***

| | |
|---|---|
| Ac.ft. | : Actual Capacity |
| % | : Actual Capacity/Total Capacity |
| Cusecs | : Discharge |
| ft. | : Water Level |

Meters

6,168.00

Grid North

## CONSTRAINTS AND OPPORTUNITIES

Three main characteristics of KOISP are fundamental with respect to constraints and opportunities for water management:

- It is a cascade system common in Sri Lanka. It implies that runoff, overflow, and drainage coming from upstream irrigated areas, are, for the most part, collected and stored in downstream reservoirs.
- It is a basin open to the sea which means KOISP is the last user of water before it reaches the ocean. Hence, these water savings in the area are 'true savings.'
- It is a multiple use water scheme, which means that water resources are used for purposes other than seasonal field crops: domestic consumption (water network for the new areas, recharging of the groundwater in old areas); use of water by the environment (wetland sanctuary, downstream wildlife park, and lagoons); bathing facilities in tanks and canals; fishing in downstream lagoons as well as in inland tanks; and consumptive use for perennial vegetation (homestead garden and natural trees).

## PROJECT IMPLEMENTATION

Basic maps were digitized on Arc-Info software and later converted into IDRISI files. The whole GIS was built on IDRISI (for windows version 1.1) platform, mainly because of its low cost and the availability of spatial analytical tools. Basically, spatial information regarding command areas, soil distribution, irrigation storage tanks and distribution network, drainage network and other related map data such as roads, lagoon areas, rainfall station locations, etc., were digitized. All layers of information were built with the available maps and later corrected using a satellite image.

## FINDINGS AND ACHIEVEMENTS

### Spatial Diagnosis for Strategic Decisions

GIS appears to be very useful to partition the irrigated area in homogeneous units based on hydrological properties relevant to the managers. In particular, it has been possible to map the sensitivity of the infrastructure with respect to operation by overlaying several layers of information. Command areas for which drainage flows are recycled, are separated from those having no recycling facilities and for which more inputs for operation are required. Furthermore, the drainage network was mapped with respect to different types of drainage (rice field spilling, rainfall streams, overflow from irrigation canals etc.).

Current discussions with the managers are bearing on the allocation of 'efforts' for operation according to the sensitivity map (more care in operation, on-farm enhanced techniques, implementation of recycling facilities, etc.).

Another output of the GIS approach was to design an enhanced information system network based on a limited number of recorded points within the irrigation scheme.

### Dashboard for Tactical Decisions

GIS had been used as a data visualization tool, 'a dashboard,' by connecting the existing database with all the water releases to the GIS interface.

The pictorial presentation of the water status of the reservoir and intermediate storages, the releases and the deliveries to each sub-command area in the KOGIS dashboard give a very comprehensive knowledge of the whole project area in an attractive manner. The color codes used in the dashboard were very easily understood and interpreted by the manager at a single glance. Therefore, with a minimum time he is in a position to give orders to his operating staff.

Despite the initial success in introducing the GIS dashboard at manager level when supported by IIMI staff, it is felt that GIS software may not be the most appropriate and sustainable tool for this particular function. Hence, it is planned to test another version of the dashboard developed on a spreadsheet software, with which managers are more familiar.

## LESSONS LEARNED

As this was the first attempt in using GIS-based tools for the management of irrigation systems, many practical problems arose during the initial stages. Lack of data and reliable maps was a shortcoming and not surprisingly, the investment for creating numerical layers of information is important. However, with many field verification studies, it was possible to overcome most of these difficulties. It was found that, maps available at the Irrigation Department and field visits would give fairly accurate information to correct the digitized map layers. These map layers are accurate enough for the building of a GIS-based information system for irrigation scheme management and operation.

A simple dashboard, summarizing the key information required for the day-to-day management of a complex irrigation project appears to be a very practical decision support tool.

It is worth noting that the Irrigation Department officials were highly enthusiastic in grasping the essentials of new technologies for the management of irrigation systems.

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