IRRIGATION WATER MANAGEMENT

With the advent of satellite remote sensing technology, mapping of irrigation command areas for various crops during different season has become very easy. It is a very cost-and-time effective promising techniques.

GIS is an analytical tool, which can be used to evaluate the performance of irrigation command and its management.

Data required

For irrigation command management, we need certain data, which is as follows:

1. Crop acreage
2. Crop calendar
3. Soil map
4. Evapotranspiration
5. Crop coefficient
6. Canal network
7. Rainfall data

Creation of database in GIS

1. Crop Acreage

This is the basic input required for irrigation command area management. This information can be collected by visual interpretation of satellite image. This information is then digitized in polygon mode. Real world coordinate should be used to georeferencing the map. This map can directly be taken from satellite digital data. The digital data can be classified by using supervised and unsupervised classification procedure. This image should be georeferenced with real world coordinate.

2. Crop Calendar

This has to be obtained from the concern field authorities or from a nearby agricultural research station. This is useful to know the crop growth stages at the time of satellite data acquisition. Irrigation water requirement depends upon the growth stage of crop hence, this information is very much useful to calculate the irrigation water requirement. This data is stored in tabular form.

3. Soil Map

Soil map can be obtained either from concern field authorities or by remote sensing data with field truth. Soil map should be digitised and codified in polygon mode. This map is helpful in determining the percolation loss as well as to derive the hydrologic soil group map.

4. Evapotranspiration

Evapotranspiration denotes the quantity of water transpired by plants during their growth or retained in the plant tissue, plus the moisture evaporated from the surface of the soil and the vegetation. In other term, Evapotranspiration is the water consumed by crop for its growth. Hence, this is very essential to calculate crop water requirement. This data can be obtained from meteorological station. This data will be stored in tabular form.

5. Crop Coefficient

It is defined as the ratio of actual crop water requirement to potential Evapotranspiration. At various stages of crop growth the coefficient changes. Standard tables are available. These tables should be entered into GIS environment.

6. Canal Network

Canal network map and command area boundary map which are obtained from the concern field authorities are to be digitized using a coordinate system. The command area boundary becomes the boundary of the study area. The canal network is a ‘line’ feature and the canal command area is a ‘polygon’ feature, and the canal outlets are point feature. During the digitization, if these feature are not digitized separately, they should be separated after digitization.

The areal extent of each canal command area can be obtained by looking at the polygon information file. The length of the canals can be obtained by using the no. of pixels in raster GIS (ILWIS), of course do not forget to digitize the different canals with different feature codes. In case of vector GIS (ARC/INFO) the length of the canal is directly available in the attribute table (different canals are to be given different IDs) By adding the lengths of different canals in a canal network, the total length of the canals from the various outlets can be obtained using distance functions. This is useful in computing the conveyance losses.

7. Rainfall data

This data can be obtained from meteorological station. Seasonal as well as annual rainfall data is required. In the command area point map is digitized and then Theisean polygon method is applied to get the spatial information of rainfall.

Main problems of irrigation command area

- ✓ Inadequate and unreliable water supply
- ✓ Wide gaps between created and utilized irrigation potentials
- ✓ Temporal imbalances of water demands and supplies
- ✓ Excessive seepage losses
- ✓ Rise of groundwater table leading to problems of water logging and salinity.

Methodology