

Necessity of remote sensing to improve the water management system in Pakistan

Pakistan has an area of 79.66-Mha. Nearly 13.55Mha can be brought under plough for all kinds of crops. 78% of the cultivable area is irrigated by canal and groundwater and the rest of the land is rainfed.

Pakistan has to encounter the floods of severe, high and medium intensity every year during the monsoon due to heavy downpour over catchment areas of the rivers and north eastern plains. The floods inundate numerous villages causing loss of hundreds of valuable human lives, property and livestock and bring damage to the large areas of standing crops. Apart from other miseries of flood disaster the soil and water resources are seriously and badly effected.

To obtain maximum benefit out of our irrigation resources it is necessary to stop the seepage, leakage and wastage of water through different stages of irrigation. This way not only can we provide the requisite quantity of water to obtain bumper crops but also supply water to additional areas and receive increased agricultural products at country level.

The canal irrigation system of Pakistan is spread over a large area but it lags behind in regard to its working, service and benefits. Out of 17.5 million hectare metre of water diverted and received from rivers only 5 million hectare metre is supplied for irrigation purposes and all the rest is not only wasted and lost to leakage and seepage due to defects at any stage but also causes serious harm. Waterlogging and salinity are the biggest agents plaguing and causing most injurious damage to our highly fertile land. The aforesaid defects originate from obsolete and outdated methods or irrigation. Consequently the farmer not only fails to bring extra land under plough but is also sometimes deprived of the tillage of legitimate cultivable areas.

Water Management Problems

Many problems are faced in dealing with irrigation schemes and water management. The problems must not necessarily be related to distributaries, minors or water courses etc. but are also connected to water quality, type of soil, kind of crop and area, level and situation of field.

Soil and crops are closely interlinked with water management problems. A summing up of some characteristics which form that linkage:

- Lack of quantity of water at proper place and proper time
- Lack of repair, maintenance and de-silting of canals, outlets and other structures etc. of the network
- Defective routine patrolling and negligence towards, on the spot, emergent repair of the system
- Waste of canal water in large quantity due to seepage
- Lack of education or information of farmers in the use of irrigation water
- Non-existence of well established and forceful Water User Associations
- Negligence of the governmental agencies

- Ignorance of modern irrigation technology and watering processes or practising not according to scientific methods

Problems discussed

Irrigation water must reach at each and every field. In certain areas, farmers who own large areas of land cannot cultivate all of it due to shortage of water and till only small parts in view of the availability of water. In winter the water supply position worsens due to further shortage in canal water and dry weather so that timely watering for rabi crop is considered impossible.

Scarcity of water may be made up with groundwater but administrative and financial problems impose difficult obstructions such as drilling of bore holes, provision of pumping equipment and supply of electricity etc.. Then not all of the groundwater is fit for irrigation due to injurious chemical contents. The quality of water however, varies according to concentration of chemical contents in different areas. At places facing a dearth of water people are compelled to use even unfit groundwater. At some places where a diminished quantity of water is

Water is essential for life, may it be mankind, fauna or crops. When there is no water, there is no life. Where there is plenty of water, life flourishes. Scarcity of water withers life and, in case of extreme excess floods devastate.

Ours is one of the oldest and largest canal irrigation networks but we have not been able to obtain and enjoy all its benefits. In order to utilise our water resources in a scientifically and methodically correct manner, improving the canal irrigation system and increasing the agriculture produce, it is of vital importance to introduce and put into function remote sensing technology at broad spectrum throughout the country. Remote sensing is a satellite-related technology. Spacecraft fitted with remote sensing cameras generate and transmit images of the Earth in black and white or multi colours. Imagery thus received is made to interpret much information about land, soil, water resources and crops, etc.. With the help of remote sensing techniques we can set, improve and develop the water management which is of paramount importance for agriculture.

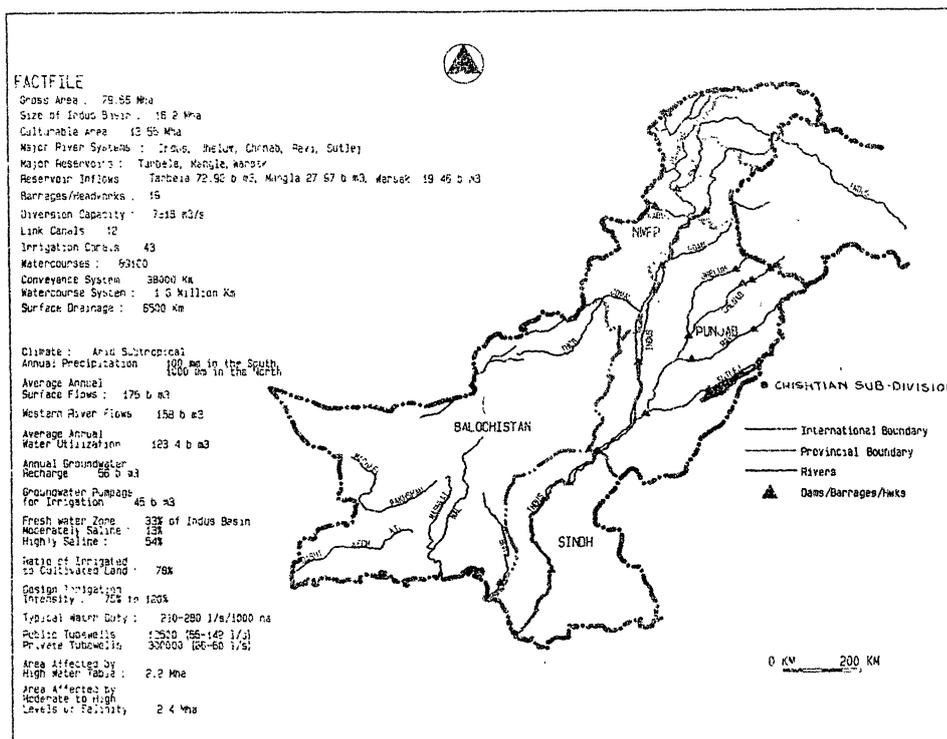


Figure 1: Hydrological layout of Pakistan.

available farmers supplement the watering by supplying additional quantities from groundwater sources. Chemical analysis of groundwater and precise ratio and proportioned mixture of surface and groundwater is important. It is necessary to regulate the water management of the related area to overcome the above-mentioned problems.

Water management via remote sensing techniques

The intensive and country-wide efforts to boost food production has focused attention on the use of remote sensing technology which delivers accurate and timely information and affords guidance for better management of agricultural systems.

Remote sensing involves Earth Imaging Satellites equipped with electronic scanners which move around the Earth and monitor, scan and generate the imagery and produce data with potential multi-purpose applications. It helps the various governmental functions including resource and land management, weather forecasting,

mapping urban planning, fishery management and agriculture. Much research work has been done on remote sensing applications of hydrology. All stages in the process of the hydrologic cycle have been practically investigated to determine the magnitude of water storage and its cyclic variation.

Scientific and modern methods of storage, distribution and use of water play a key role in the successful agricultural production. Remote sensing systems have proven valuable tools for acquiring requisite hydrologic information for water resource management and for complementing the ground base data collection which can provide adequate, reliable and timely means in regard to:

- Determine the volume and availability of water for agriculture
- Determine the distribution of irrigation water
- Determine the quality of water
- Determine the ways and means to control floods

Thus a perfect water management scheme can be evolved.

Satellite data vs field data

Geostatic data provided through field survey serves very useful purposes in agricultural management. Practical field survey is an outdoor and a difficult job, it involves much time and manpower and yet only a few types of information may be collected. Different departments work in collecting field data but all of them have their own priorities which result in lack of co-operation and co-ordination and thus a joint result is pushed aside. Moreover, compilation and reconciliation of various data is a time-consuming process. Whereas with the help of remote sensing technology a large area can be scanned and imagery obtained. The imagery delivers all sorts of relevant information and data, simultaneously and in the shortest possible time. Also trouble spots can be reached easily after having been located in the imagery.

Difficulties also occur there in the usage of remote sensing technology. For recording imagery, however, we are dependent upon the help of developed countries that own the space vehicles mounted with sophisticated instrument units beaming data for requisite purposes. Unfortunately Pakistan has no Earth Observing Satellite in space. Secondly, imagery is very costly. Thirdly, sometimes it is difficult to get imagery of any specific area due to its strategic importance.

Organisations working on remote sensing techniques

International Irrigation Management Institute (IIMI), Pakistan was established in 1986. It applies remote sensing technology and has been using satellite imagery for different projects in Chistian subdivision. Chistian subdivision has an area of 70,000 ha in the southern Punjab, Pakistan (Figure 1). The irrigation system consists of 1 main canal (Fordwah Branch), 14 distributaries (secondary canals) and 470 water courses (tertiary canals). In the area there are numerous private tube wells, used for ex-

tra irrigation with groundwater. Imagery is used to map various geographic features such as land-use, crop patterns, types of soil and classification of salinity areas. The imagery is recorded with the help of SPOT satellites, launched and owned by France.

IIMI also conducts field survey. Field data is collected to interpret and validate the satellite data and both are stored and matched using Geographical Information Systems. Results received from mutual contribution through statistical approach towards collected data from various disciplines serve as a benchmark to obtain the above-mentioned features in respect to all the areas.

Conclusion

Pakistan lags far behind in remote sensing technology. The quantity of work, done so far at government level, is negligible. It will be prudent if work is accelerated in this field without further delay. Pakistan should launch its own Earth Imaging Satellite and introduce remote sensing technology in WAPDA, Soil Survey of Pakistan, Survey of Pakistan and Irrigation Departments, etc.. Now is the time to discard obsolete and outdated methods and endeavour to adopt new techniques in agriculture.

Ultimately, to have thriving crops, to become self sufficient in grain production and agricultural

development of the country. There is no alternative except to have the water management to use modern techniques without any more loss of time. The motto should be "That not a single drop of water be wasted and not a single inch of land be left unwatered".

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