

# THE ROLE OF GIS & REMOTE SENSING IN RENEWABLE NATURAL RESOURCES OF IRAN

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commissoin VII,WG VII/3- Renewable Resources

key words : " REMOTE SENSING, RESOURCES, INTEGRATION,  
GIS,RASTER,THEMATIC,VECTOR, PROBLEM

## ABSTRACT

One important key to the economic development of the ISLAMIC REPUBLIC OF IRAN and to the simultaneous protection of its enviroment and its productive capacity is the ongoing assesment of state of changes in its rich array of land resources. The country of IRAN lies in semi-arid region of S.W Asia. It has a total area of 165 million hectares. Due to steady increase in village population which has resulted in demand for more arable land,the area of forest and rangeland has decreased drastically. Over 80% of natural resorcesof contry including forest ,range and desert are managing by FRO (Forest &Range Organization) which are consider of govermental properties.But the aggerssion of nomads and native peopel to occupy these land for cultivation and animal feeding are serious problem and make some changes in area.

To monitoring and regestering these changes the only tool,is field surveying which requiers time consumption ,more manpower,high expences. In recent years with relation of severe stae of natural resources degradation ,the requirements for up-date information on land characterstics such as type ,conditon, location value ,specially ownership or land tenure,productivity,changes and damages to environment has become quite evident.

It is clear that an itegrated land resources informatoin system,and associated technology like modern Remote Sensing sequencial satellite data with integration of GIS is one realastic way of meeting these data requierments and other needs in future.But still,for small area less than hectar these system can not be used properly ,in additon the incompatible of GIS files (vector) and RS files (raster) are another case that makes useres dissatisfy ,even for those who are using two compatible software .

This paper is two case study in SHAROD and CHALUS in central and north part of Iran,that shows application of this new technology can be used for whoie country to achive the up-dated maps in a short time with high accuracy in reconnaissance and semi-detail survey.

## Introduction:

The country of Iran located in semi-arid region of S.W.Asia ,according to Forest and Range Organization,54% of this can be classified as rangeland,the majority of which (60%) can be categorized as being infair to poor category i.e.having a production of 150-450 kg./ha. only 7.4% of Iran's land area is classified as forest,21% as desert or unproductive land, 14.4% arable and 3.2%categorized as water surfaces and urban areas.The country now consists of 26 provinces, which extend from latitude 26 to 38 north and from 44 to 36 east. Because of this wide range in latitude and longtiude,Iran is also one of the most variable from the standpoint of phisography,climate vegetation and biological productivity.Although Iran cimate is characterized by aridity, with more than 30 percent of country receiving less than 100 millimeters of precipitation annually, some northen provinances such as Gilan receive as much as 1000 to 2000 millimeters annually the perpetual snows of a number of mountain summits contrast storngly with the intense summer heat of the low elevation desert.Plant cover varies from the sparse sand dune and salt desert vegetation to lush Caspian Flora and the forests of oak,beach and other species on the slopes of the Alburz Mountains.

This project covers the assesment and monitoring of resources within 3 inter-related field i.e. rangland ,forest,and desertification.

## Status of Resources

### Rangeland:

The total range area that is regularly grazed by livestock,for exampel ,is a basis statistic,but there is no agreement as to its magnitude among those who have studied the problem.In part,this is due to lack of agreement as to definitoins, also ,there are continuing changes in grazing patterns in response to

competition between stockman and farmers,and becuse of erratic weather changes.The grazing area,therefore ,is constantly channingg.Current estimates vary between 90-100 million hectares up to 56% of total land area.

Rangelands contributiute between 20-25% of total feed requirements of the national herds and flocks which are numbered at 8.3 million cattle ,48 million sheep,22million goats,0.3 million camels and unknown number of horses and donkeys.

### Rangeland Degradation

Is due to:

- Grazing by excessive number of livestock.
- Grazing too early in spring.
- Grazing year-long or too long.
- Increased fuel gathering and widespread ploughing and cultivation of rangelands unsuitable for sustained cereal production.

## Forests:

According to other available estimates ,the total area of the forests in Iran extends to about 12 million hectares , spread mainly throughout the north,north-west and west of country. Of this total area 1.9 million hectares are located in the north,and in other areas like Zagros Mountain and forests in the sub-tropical area along the Persian Gulf and Oman Sea. However,the area under forests has drastically decreased in the last few decades .

### Forest Depletion

is due to:

- Grazing in forest
- Clearing for ceareal production
- Fuelwood
- Illigal logging

### Desertification :

Most parts of the country are covered by arid and semi-arid lands in which the average annual rainfall is less than 300 mm,and evapotrspiration potential is many times more than precipitation .for instance ,the average annual rainfall

in central part of Iran and Dasht-e-Lut is less than 50mm, while the evapotranspiration is more than 4000 mm. land degradation and soil erosion in the anterior plateau of Iran has been closely associated with man's settlement and his activities. There is much evidence to prove this occurrence during past centuries. However the land degradation and desertification has accelerated during the last centuries and especially during the last 25 years.

The following comprise the most important causes of desertification :

- Demographic exploration
- Increase in herds and over grazing
- Conversion of rangelands to croplands and increase of dry farming
- Uncontrolled use of farm machinery
- Fuel gathering
- Irregular exploration of water resource and mismanaged irrigation.

**Aim:**

The aim of this paper is to describe the role of GIS & Remote Sensing to up-date, assessment and monitoring the renewable natural resources of Iran in two projects (Shahrod & Chalus in central and north part of Iran) in order to extend for whole country.

**Data Acquisition:**

For these two projects we used multispectral landsat (TM july 1988) and panchromatic SPOT (june 1993) to produce the land cover map and also photomap in scale of 1:50000 in order to up-to-date the information of approximately about 150000 hectares of land.

**Image Processing:**

All the satellite images corrected, through reliable software (PCI), using existing maps, to the coordinate system of Iran.

**Classification:**

Supervised classification used and we could identify 14 classes of features such as vegetation, (forest, rangeland, shrubland, agriculture, and etc.) infrastructure, desert, waterbodies, and some other sources.

**Field Work:**

In project involving classification field reconnaissance have to be carried out in order to understand the images and to correlate image features with ground features. As part of project 10 surveys were performed. During the field work, the classification system with logical structure and suitable both for the image interpretation and a statistical analysis of the result, was created.

**Application Of GIS:**

To delineate the change detection and monitoring land resources we digitized old maps and previous information through Geographical Information System (PC ARC/INFO). Although the vector format of GIS files creates some difficulties in integration with raster files (image processing), still there are more reasonable procedure of achievement. Altogether 15 Thematic maps such as Land Cover map (fig. 1)

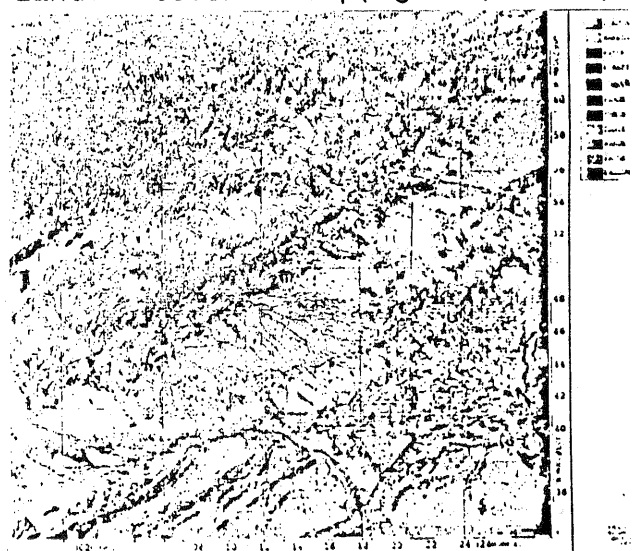


Fig. 1

,vegetaion,land use,land suitability,Hidrological map produced. Also 10 Photomaps on 1:50,000 were produced during the projects which was finalized in1992 The project overview indicates the procedure that we followed (fig.2

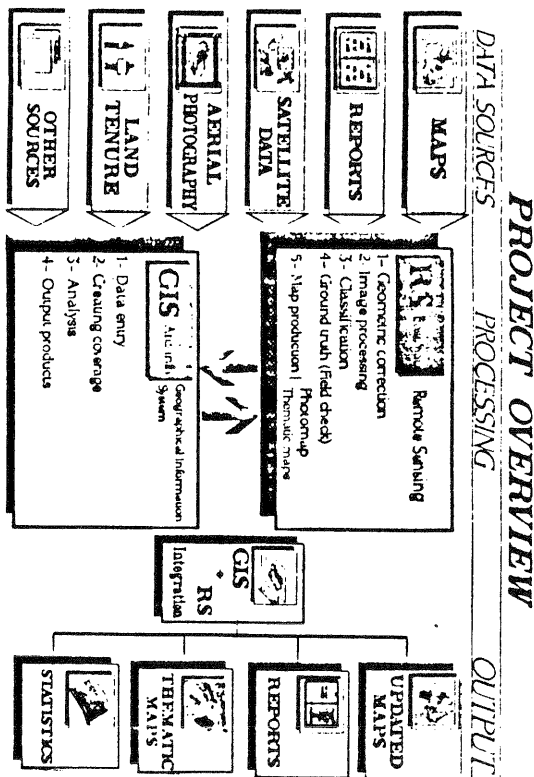


Fig.2

**Conclusions:**

The following coclusions can be drawn from the projects:

- 1-Satellite remote sensing is an oprational and reliable tool for land use and vegetaion mappings on scales between 1:50,000 and 1:25,0000.With fusion of areial photographs and satellite images up to 1:25000 maps is possible.
- 2-Only geometrically corrected images,and especailly Satellite Image Maps, should normally be used in satellite based thematic mapping projects.
- 3- With high requirements on the classification system and on accuracy of the result,the txture of the SPOT image is of decisive importance to the choice of sensor.
- 4-An important problem that has to be consider is cloudness, especially

in tropical area such as north of country,in this case its better to chose another extra sets from other sensor.

5- Image acqisition shuld be done during priods with suitable vegetation.This limits seriously the priod of times suited for image acqisition.In pllanning and when inventories availability is done this must be considered.

6-Mapping directly in GIS systems combining raster and vector are technique already suited for decentralized solutions and for the revision of GIS database. But still for small area (less than hectare ) is not suitable . (Fig 3)

7-Time saving in map production and high qualities of maps presentation, accuracy of data in any form such as tables, text and graphs are quite possible,and also technolgy transferring is another advantage .

8- In spite of these benifis some disadvantages like high expences for software and hardware ,satallite data ,and trined peopel should be considered.

نقشه جاده‌ها و خطوط مین آن منطقه (شهرسج - شاهرود)

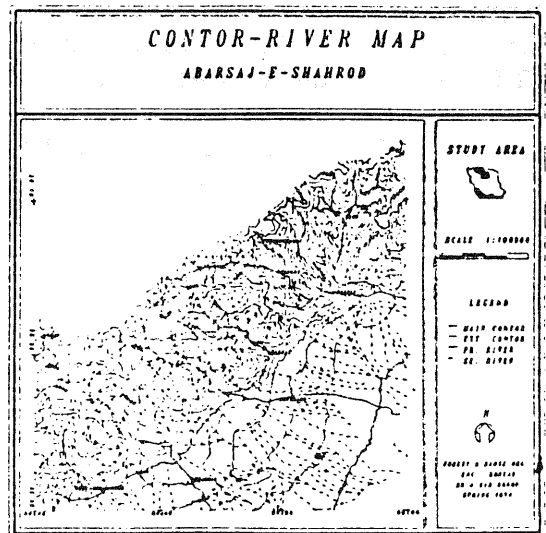
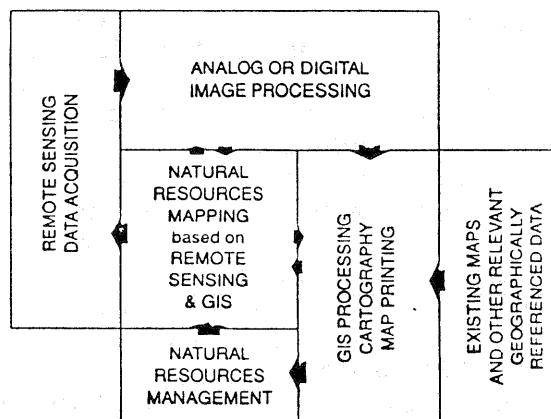


Fig. 3

4-Schematic flowchart of Natural Resources Mapping (fig. 4) proposed for whole country.



Schematic Flowchart of Natural Resources Mapping by Remote Sensing and GIS

Fig 4

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