

# **Cadastral mapping of Agricultural lands and Natural Resources by using image and non-image data**

Ali Farzaneh

Senior expert of Agricultural, Natural Resource Engineering Organization (ANREO) Tehran, Iran.  
alifarzaneh@hotmail.com

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## **ABSTRACT**

One of the big challenges to land degradation is due to natural or manmade structures disaster events. Beyond that is due to lack of inaccurate data gathering, unpredictable of lands borders and deficiencies of proper definitions of various lands, such as farms lands, forests, range lands, shrub lands, watersheds, and protected area, particularly in developing countries. Each nations use their own local definitions, and criteria for crop production and even for loss estimations. To avoid of mixing of statistics and getting accurate data, we used satellite image and non image data for legitimacy of agricultural lands and registration of natural resources boundaries. The results showed that the outcome maps and statistics are more realistic than conventional methods and it could be legalized, and would not be affected by mandate anymore. Perhaps the small satellites would help more in these specific issues.

### **1. Introduction:**

Natural resources, environments and agricultural lands are suffering from either too much rules, or insufficient and incomplete rules particularly in developing countries. There are different numbers of direct and indirect strategy and policies which are running by ministries, organizations, or NGOs. on these lands. But the only people, who are involved to these lands, are poor farmers and rural people who are scattered in forest, beaches, and living in desert area, they get their benefits from lands. Most of times they are treating by natural hazards events, like tsunami, stream flooding, or implement of new projects like road construction, mines activities, and etc. Both governments and people they like to know where and how are their lands and how was it in the past. This is not possible unless to an accurate surveying and register

them. Then put it in legalize maps. These maps should indicate the historic plus present situation and the capabilities of land as well. That could be a natural resources cadastral map. Some American and European countries have already started creating and legalizing their lands. But most of Asian and particularly developing countries still are negotiating and discussing which ministries or organizations should be in charge and what data should be included in these maps.

Nevertheless, to cover all people and government's requirements, we started a pilot project in small area of Iran by using image and non-image data. Consequently we achieved to a proper result in terms of map production including attributes of natural resources related to maps.

## 1. Objective

According to adopted laws by parliament, Ministry of Agriculture is responsible to define what the natural resources are. And then recognize and indicates where the main borders between government and farmer's lands are. It is better to say, the objectives are which lands should be managed by private sector or government.

### 1. 2 Conventional Existing Data

Concerning historical lands data, an old aerial photograph was the only available source.

The first step was a difficult task of surveying and recognition of what and where the natural resources are. This was done by specialist experts and gathered all local information. Other sources such as Ground Control Points (GCP), the land's owner data, laws and acts of regulation related to regions or any changes collected as non image data and added to map.

The below preliminary map produced by Forest and Range Organization of Iran, illustrates only private and government land's sectors with minimum of data.

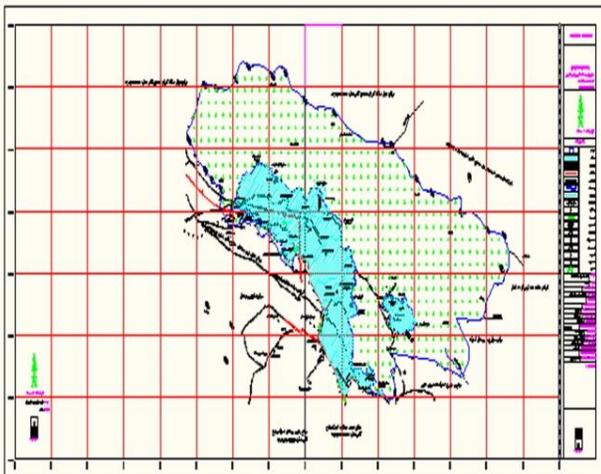


Fig 1 a section of preliminary map of private lands (blue) and natural resources (green, mainly forested) of small province

In spite of problems and claims by authorities and farmers, this approach was more applicable.

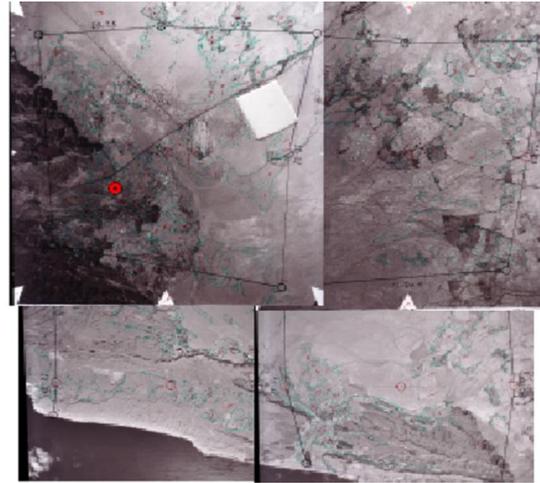


Fig 2 Aerial photography in large scale shows GCP and location of field plot in red

### 1. 2 Image data

The new ortho-rectified large scale aerial photographs were used as an image data in order to confirm registered borders, plus collecting new land's information.

According to present land use, all new gathered information plays important role in GIS digital layer format. Layers like forest, agricultural land, range land, rivers, riverbed, rocks and etc.

The new produced map with different layers, particularly registered borders of natural resources (forest, range land, rivers and private farms...) derived from interpretation on aerial photos. These new areas would protect of any intervention and

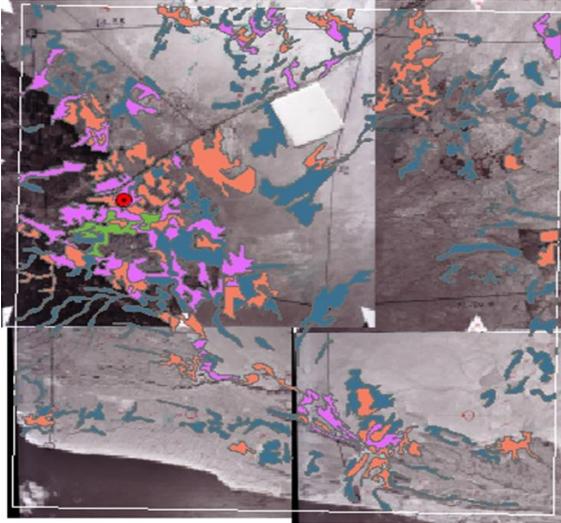


Fig.3. New information interpreted on aerial photographs

Aggregation and prevent from destroy of national's lands specially resources.

Although these borders are a virtual and there are no signs in real nature to find them (except small regions), but there are mechanisms such as GPS or control points in aerial photograph for monitoring.

Then legalization of these maps would be possible.

These days there are new policies to align all borders in real nature, either to make fence, or put a concrete benchmark around private farms or national's lands. But due to extensive of lands, costs, time consuming, data collection procedures and used instruments, still there are many discussions exist around it.

## 2. New Maps

Although the new maps consist of most historic old documents and new data, still there are some users that are not happy with them. While all natural feature has been collected and mapped by expertise and specialist in order to create a real natural cadastre maps. It might be due to mix functions of parallel organizations which have overlap tasks with each others, like forest and environment organization.

For instance there are some protected areas which are managed by two different organs. One protects animal wilds life and the other protects and manage land and flora.

It means there are no clear definitions for them. While all similar function could be active in one unit and one management.

Therefore a complete cadastre- map could cover all needs and different user requirements.

According to new aerial photographs, new measurements and new statistics of natural resources, let's say all related features in nature would be updated and accessible.

The only problem is, this procedure could be applied only for small area which has new photographs, but it is not applicable for a large country. In this case the proper solution could be replacing satellite images instead of aerial photographs.

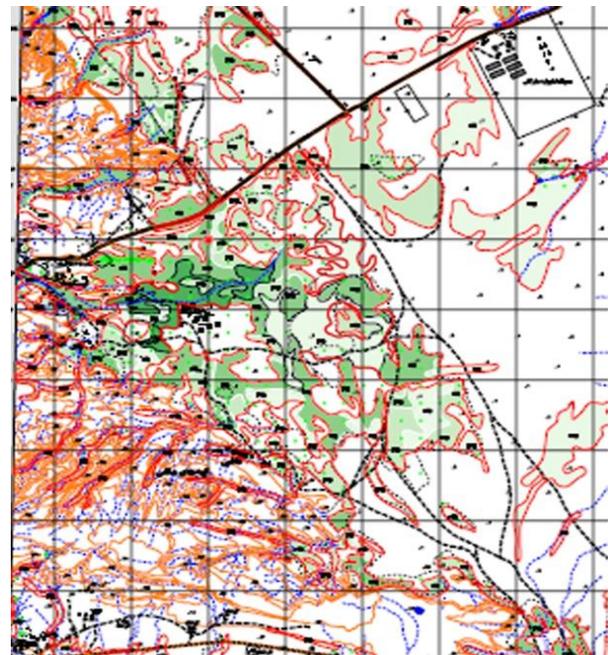


Fig.4 A digital natural resource cadastre- map

Despite of new updated maps, there are many problems and challenges which have to be solved by users, particularly rural people and government authorities, like legalization.

### 3. Conclusions

- Most of natural resources like forests, range lands, agricultural, and other features environments are facing with many risks annually.
- There are no urgent facilities and proper tools in developing countries in order to calculate and get accurate data for abandoned, destroyed and aggregated lands, when a natural or physical events occurs, it is just estimation, of course that is beyond of human losses.
- One of the appropriate ways is to have a unique definition for natural resources, to have proper and achievable tools such as small satellites and low-priced images data and last not least, the commitment specialist additionally, in order to produce up dated maps, and to get accountable data.
- The natural resources of any countries are very important and they are renewable sources, thus according to gross increase of population and future anticipation, the natural cadastral map production and legalization is unavoidable. And government authorities should be aware and take these issues seriously for next generation.

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