

Evaluation and Monitoring Annually Changes of Agricultural Cadastre Map Using GIS Techniques

A case study in khosheh Mehre agricultural lands, Eastern Azerbaijan,
Northwestern Iran

By

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Abstract:

Agricultural cadastre maps of 1:5000 scales in Iran are prepared for land information, ownership, land use evaluates or kind taxes propose. Such maps may help to governmental organization to managements for agricultural land in rural regions.

One of the most important points concerned with these maps are changes occurred on them, due to time changes. Agricultural land is due to different changes in terms of crop types, operation types, area, as well as ownership.

During the present research different aspects of changes with use of GIS studied in Khusheh Mehr agricultural land in East Azerbaijan province in northern part of Iran within 2002 – 2003 crop calendars.

Introduction:

Global environment is a dynamic feature influenced by natural phenomena as well as human activities. Industrial development considerably accelerates the rate and speed of such changes. Agriculture lands are due to significant changes in different aspects. Land use changes are the result of several factors. Population increase requires more need for food thus more lands are needed to go under cultivation. Land use changes are influenced by several factors and some complicated processes are involved in this concern. Dividing agriculture lands into small sizes according to Islamic heritage law, urban and industrial development or any other improper land use changes are all factors which may affect the case. Updated cadastre maps are needed to show these changes particularly in rural area for efficient management of agriculture lands. Cadastre maps as well as its application have already been discussed, but temporal changes of different land use have not yet been considered. The present study focused on annual changes of cadastre maps from several points of view.

Study area:

Study area (Khosheh Mehr Village) occupies an area of about 455 hectares in Eastern Azerbaijan, around the city of Bonab and lies between northern latitude of 37 18 17 - 37 19 46 and eastern longitude of 46 8 11 -46 10 47 . The area is completely a flat land overlies Sofi River alluvial deposits. The main reason for such study in this area is considerable changes occurred in the area between year2002 and2003.

Material and methods:

Aerial photo of 1:10000 scale were used to prepare cadastral maps in the area. First of all the photos were transformed and interpreted. Then attributes for different land segments were assigned using ground truth field data. Finally GIS based database were created and also the prepared maps were updated through fieldwork. Consequently overall changes were evaluated using cross tabulation method. The following chart shows major steps of the research.

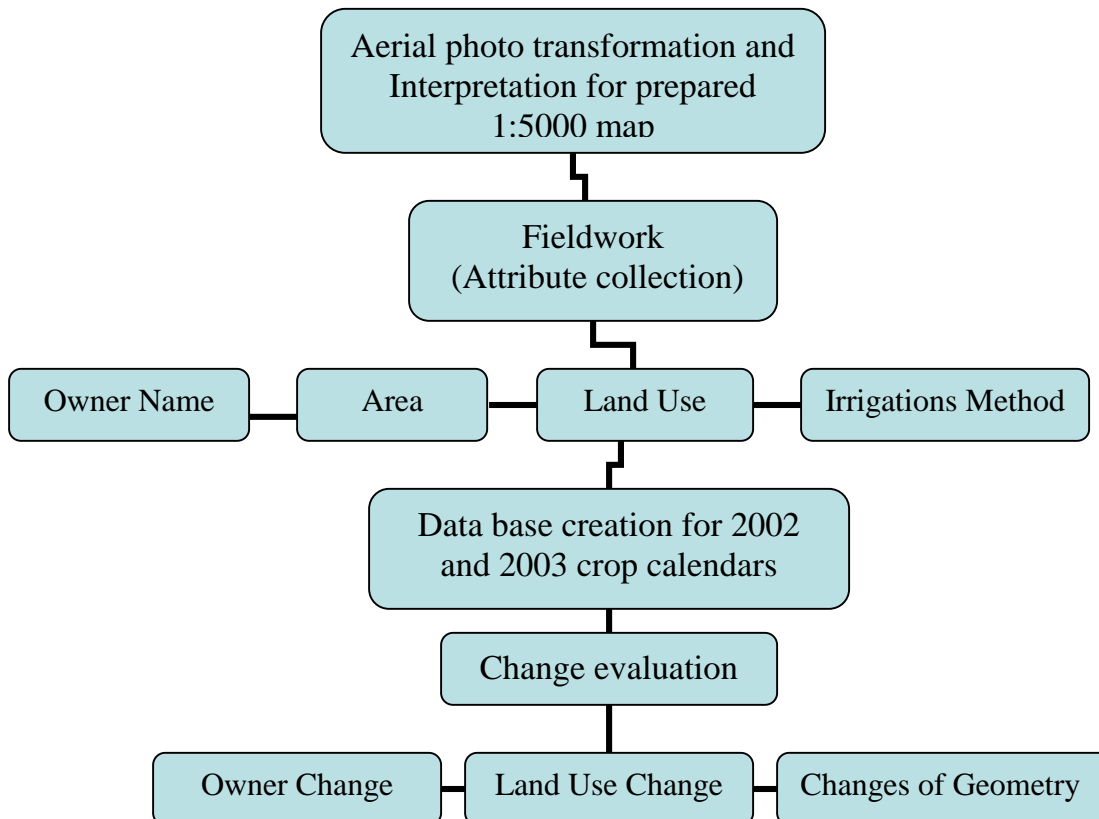


Fig 1: Flow chart showing the major steps of research

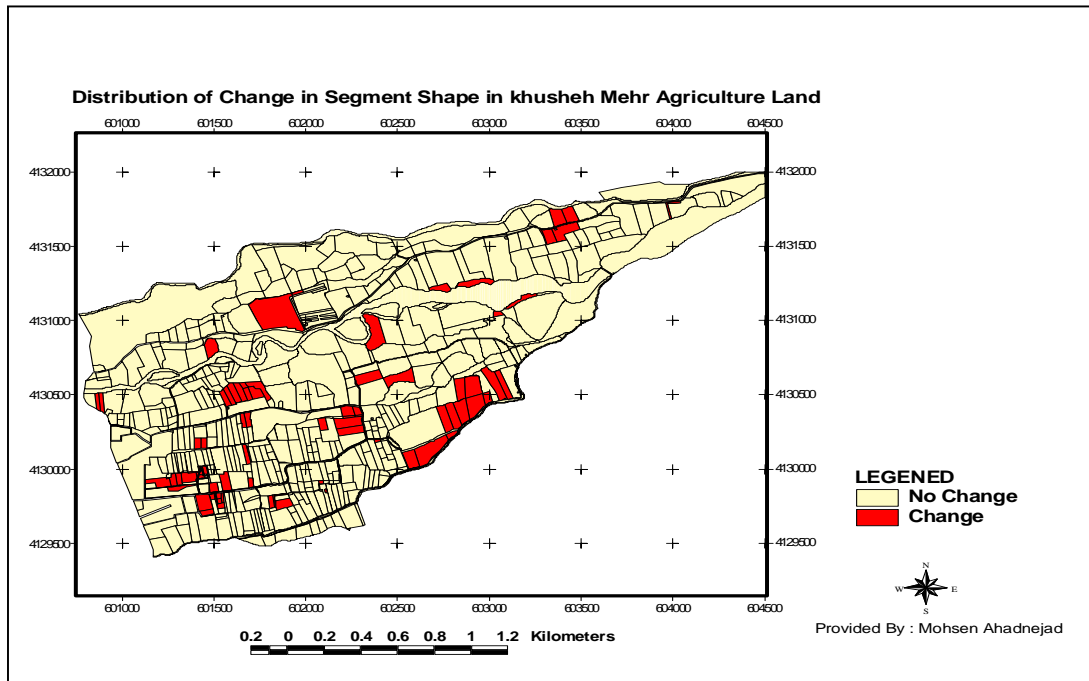
Evaluation and assessment of changes:

Different kinds of changes in terms of geometric as well as non-geometric changes (attribute) were evaluated considering the aim of study from the following point of view:

1) Changes occurred in shape and number of land parcels

The results of study revealed that the number of agricultural land parcels have been increased from 349 in 2002 to 406 in 2003. Also the average areas of parcels have changed from 8666 in to 9876 within this period. The main reason for such a change may be sought in two factors. The first is the Islamic heritage law in our country that results to splitting of land parcels into small sizes after a few generations. The small size land parcels are less valued from agriculture point of view. The other reason is the poverty in rural area that makes the people to sell part of their lands to compensate their living expenses.

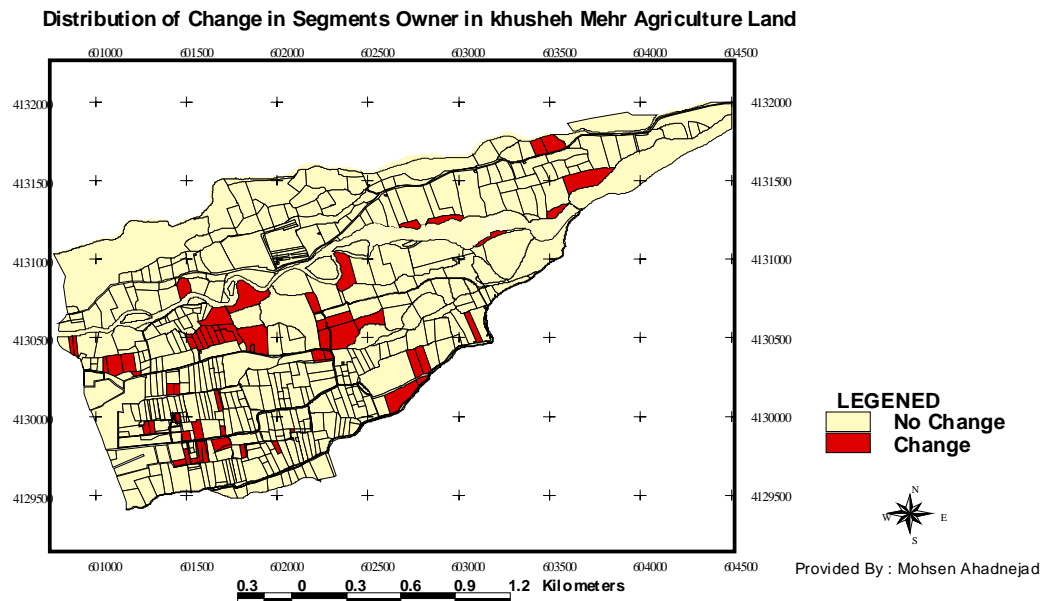
Map 1 shows distribution of agricultural lands, which were changed in shape and size within year 2002-2003.



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2) Ownership changes:

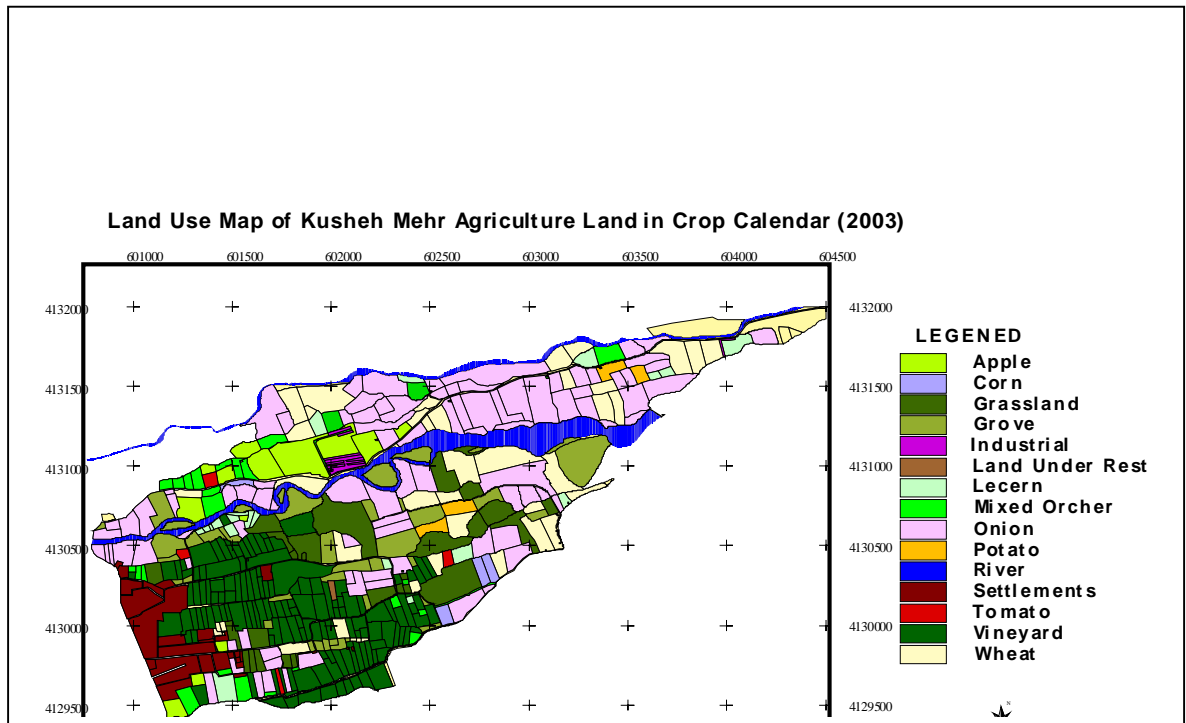
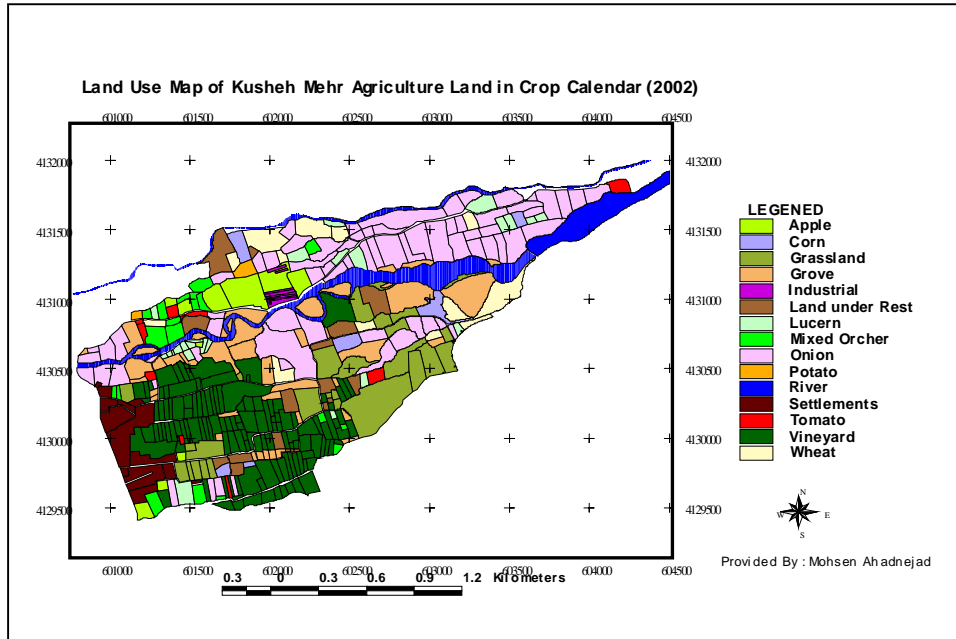
The comparison of ownership data reveals that 75 pieces of land parcels from 406 agriculture lands have been changed within this period. The major reason for these changes is unregistered deals made by the local farmers. Map number 2 shows the distribution of the changes occurred in the farmlands. With comparison of this map and the map number 1 it may be concluded that ownership changes has a high as well as direct relation with changes of farm land shape so that most changes have been occurred among the neighboring parcels.

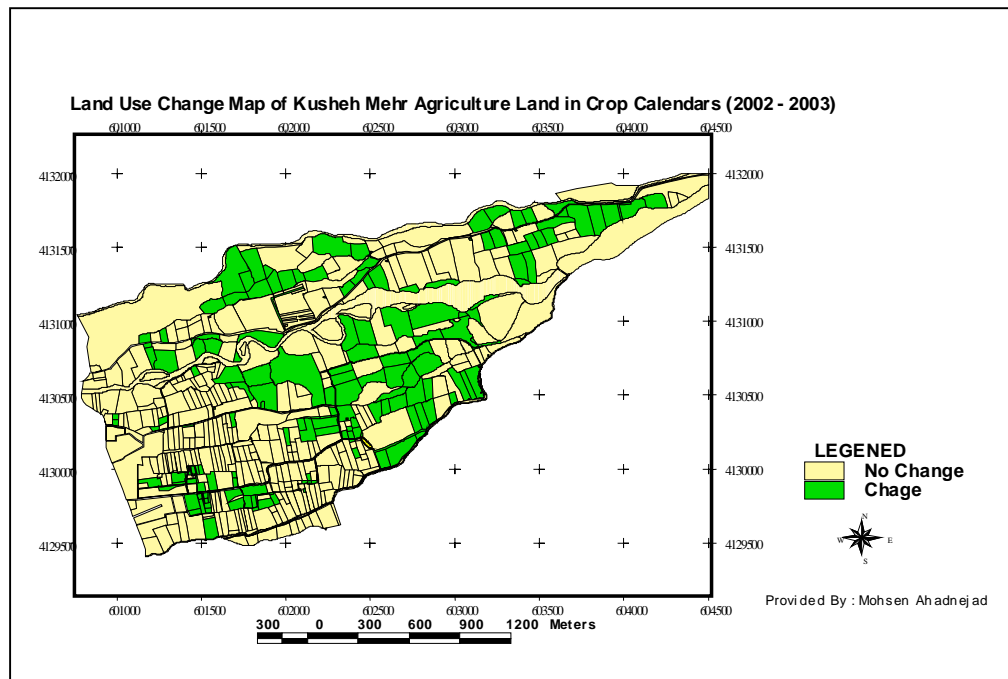


**Map no 1: distribution of farmlands that their ownership has
Been changed during year 2002 – 2003**

3) Land use changes

Land use changes are one of those cases that may be occurred through human activities as well as natural phenomena. Some of the annual changes are related to alternate cropping patterns. Another factor is related to changing farmland to other uses such as orchard or settlement and industrial sites. These changes usually occur very gradually. Maps number 3 and 4 show distribution of present land uses in the area. Assessment of land use maps using cross tab method show that about 8233 hectares of total land have been changed within one year. This change is about 18 percent of the whole area. Map number 5 shows distribution of changed area during 2002-2003.





Different changes are categorized into following groups for better definition:

- Changes in concern with alternate cropping: Such changes occur in the area due to annual cropping pattern. The area of this change type is about 29.69 hectares.
- Changes related to orchard: This type of changes occupies about 21.31 hectares which occurred due to changing of agricultural land as well as rangeland to orchard.
- Changes related to rang land and woodland: around 19.4 hectares of woodland have been changed to agricultural land and orchard.
- Changes in relation to urban development: According to the results of present study about 3.66 hectares of the area belongs to this class that is occurred due to settlement and industries in the area. This class is mainly the result of changes occurred in orchards. Table no.1 compares different land use in 2002 and 2003.

Table no. 1 results of comparison between different land uses in 2002 and 2003

2002 2003	Apple yard	Mixed Orcher	Vine yard	Grove	Grass land	Lecern	Land Under Rest	Onion	Corn	Tomato	Potato	Wheat	Settlement	Industrial	River	Total	Percent
Appleyard	31900	5980	55	0	75	0	0	1035	0	0	0	0	0	3	0	39048	4.78
Mixed Orcher	0	16055	0	0	465	2205	0	3080	0	0	815	0	0	0	0	22620	2.74
Vineyard	0	0	137100	4690	1090	695	0	0	0	0	0	0	0	0	0	143575	17.43
Grove	0	0	310	49255	7475	0	80	1485	3325	0	0	0	0	0	0	61930	7.52
Grass land	0	0	5625	7355	37600	0	1700	21220	0	0	0	0	0	0	0	73500	8.93
Lecern	0	0	0	465	85	12570	0	4320	0	1860	0	0	0	0	0	19300	2.34
Land Under Rest	0	0	730	0	0	0	0	0	0	0	0	0	0	0	0	730	0.09
Onion	0	1390	8515	4605	23180	3935	18050	129740	5985	3720	0	9910	0	0	0	209030	25.39
Corn	0	0	0	0	5080	0	0	0	0	1060	0	0	0	0	0	6140	0.75
Tomato	0	0	0	0	0	1005	0	0	0	2435	0	0	0	0	0	3440	0.42
Potato	0	0	0	2160	0	0	0	4705	1535	0	0	0	0	0	0	8400	1.02
Wheat	0	0	495	15240	8705	3640	14715	28045	4650	320	2580	30050	0	0	0	108440	13.17
Settlemen ts	0	0	5015	0	2715	0	0	85	85	0	0	0	34805	0	0	42705	5.19
Industrial	0	0	0	0	0	0	0	370	0	0	0	0	0	1850	0	2220	0.27
River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82320	82320	10.00
Total	31900	23425	158745	83770	86470	24050	34545	194085	15580	9395	3395	39960	34805	1853	82320	823398	
Percent	3.87	2.84	19.17	10.17	10.50	2.92	4.20	23.57	1.89	1.14	0.41	4.85	4.23	0.23	10.00		100.00

The table of land use changes clearly reflects that only 40% of occurred changes belong to alternate cropping. The remaining 60% is related to other land uses. Such changes occur in rural area every year due to lack of a valid policy in concern with land use changes. Therefore some drastic measurements are needed to control the situation; otherwise agriculture lands are going to change to other useless land uses in long term.

Conclusion and suggestion:

The results of present research disclosed that agriculture lands are due to annual changes. Precise updated maps are required to study and monitor all these changes. Therefore high-resolution satellite data as Ikonos and Quick Bird are needed to monitor the trend of changes. It will be time consuming and expensive if such study is conducted in small scale. Besides a continuous monitoring possibility satellite imageries will also reduce the time as well as expenses in these types of studies. Besides that land Information systems (LIS) is needed for better management of agriculture lands in rural area.

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