



Agriculture Cadaster Map of Al-Shehimea

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Abstract

The cadastral map is very important because it has technical and materialist specification of the property borders and these maps which are land registration based on it in Iraq, the problem is an ancient maps and unfit for use, despite its importance, Therefore the updating and digitize the cadastral map is very pivotal, this is what we have done in the present work.

In the present work, we have an old cadastral map (as a paper) was made in 1932 with modern satellite image (Quick Bird) 2006, which has 61 cm resolution for the same area after. Geometric correction technique has been applied by using image-to-image method or (image registration) and after that we get new agricultural cadaster map and connect them with their own the information for the study area (shehimea) in the medial of Iraq. So that we get new digital cadastral map from old map and satellite image. This research is carried out by using programs ERDAS and ArcGIS.

Key word: cadastral information, digital cadastral map, design, spatial data, land parcel identification system.

خرائط الكادسترو الزراعية في الشحيمية

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الخلاصة

الخارطة الزراعية المساحية مهمة جدا لانها تمتلك المواصفات الفنية والقانونية للحدود الملكية، وهذه الخرائط على اساسها تم تسجيل الاراضي في العراق. والمشكلة هي ان الخرائط قديمة و غير صالحة للاستخدام على الرغم من اهميتها لذلك تحديثها و تحويلها الى خرائط رقمية مهم جدا، حيث هذا ما قمنا به في البحث الحالي في البحث الحالي نحن نمتلك خارطة ورقية قديمة رسمت في عام 1932 مع صورة فضائية حديثة (QuickBird) 2006، والتي لها دقة حيزية 61 سم لنفس المنطقة. وقد تم تطبيق تقنية التصحيح الهندسي للخارطة باستخدام طريقة صورة -الى-صورة (تسجيل الصورة) وبعد ذلك، تم الحصول على خارطة مساحية زراعية لمنطقة الدراسة (الشحيمية) في وسط العراق وربطها بالمعلومات الخاصة بها. وبذلك حصلنا على خريطة جديدة من الخريطه القديمة والصورة الفضائية وأجريت هذه الدراسة باستخدام البرمجيات ERDAS و ArcGIS

Introduction

Cadaster is a French word originating in the Latin *capitastrum*[1], meaning a register of poll tax. Later it came to mean "an official register of the owner-ship, extent, and value of real property in a given area, used as a basis for taxation, "or "survey...showing or including boundaries, property lines, etc. "The cadaster was thus the means used by rulers to collect data on the division of landed property[2]. Cadastral is a parcel-based system, i.e. information is geographically referenced to unique, well-defined units of land. These units are defined by the formal or informal boundaries marking the extent of lands held for exclusive use by individuals and specific groups of individuals (e.g. families, corporations, and communal groups)[3]. Each parcel is given a unique code or parcel identifier [4]. In Iraq we have been made the cadastral map in the thirty of the last century in many projection systems like first sampling /major, second sampling / secondary, triple sampling old and new, Lambert projection, global and Local Square sampling, and coordinates of the British Army where in the south of Iraq they used triple sampling while in north of Iraq they used Square sampling this that means that is no united system to the cadastral survey these make many problems in the map like overlap and gaps between border of the provinces that's mean we never have match between the provinces.

This is a big problem because the Iraqi Land rights of settlement law 43/1971 in its corrected 25th section (The cadastral map are the maps which Land Registration based on it) which shows the legal force of this map. So it is very important therefor we should maintenance them and transform them paper map to digital map that is the purpose of our work which we will illustrate it in simple way.

3- Description of the study area and Data used

3-1 Province 16 eastern Shehimia in Kut governorate it lies on the west bank of Tigris River, it's overloaded by the property rights according to settlement securities some of it detachment and appropriated from the farmers and registered to ministry of finance of Iraq for agrarian reform and the Settlement population according to the contract that deal with the ministry and the farmers. The agriculture ministry plays the role that makes it between the ministry of finance and the farmers.

On the other hand the land which relate to the peoples have the property rights, this lands divided to small area because its own by the peoples, part of it orchards and for human use.

All of the land irrigated by Tigris through small rivers and its divided into three part according to their proximity to Tigris first the lands which near the river have ample fertility and the second types of land have less fertility

And the last have no fertility because of frequent salt and water is very slight so that they create irrigation project to irrigate the land which in province 16 and the neighbors.

3-2 program used

ArcGIS, ERDAS desktop includes a suite of integrated applications that allow you to preform your tasks, from simple to advance including mapping, geographic analysis, data editing and compilation, data management, visualization, and geoprocessing.

ArcGIS provides a scalable frame work for implementing GIS for a single user or many users. The main application in ArcGIS is Arc Map which is used for all mapping and editing tasks as well as for map-based quire and analysis.

ArcMap represents geographic information as a collection of layers and other elements in a map view. Common map element includes the data frame containing map layers for a given extent and we can control the layer's option like symbology, fields etc. It is a great program and we have benefited very much from it.

4- Input Data

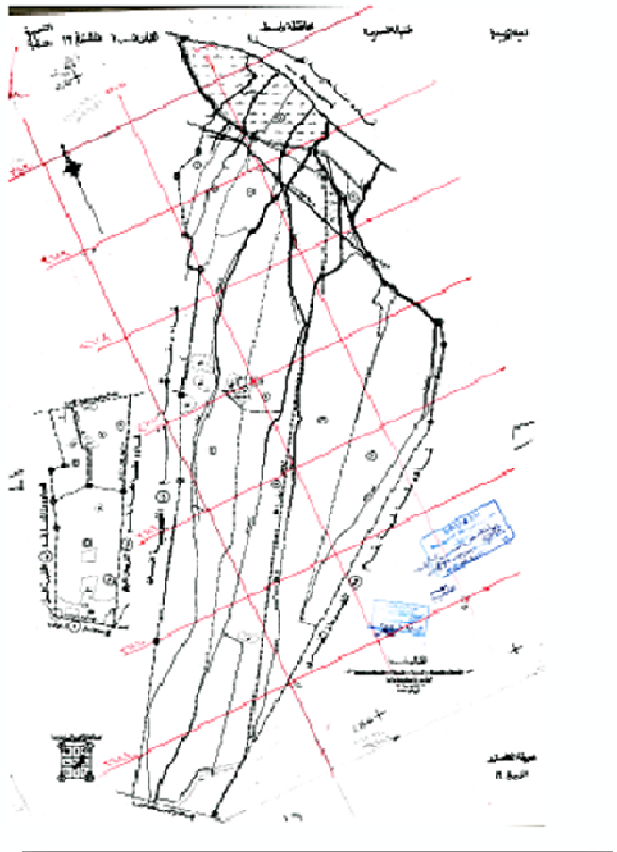


Figure 1 - illustrates the old map of study area which draws during the 1932.



Figure 2-- The quick bird satellite image including the study area which named alshihamia.

5- Methodology

Geometric Correction

Digital images collected from airborne or space-borne sensors often contain systematic and non-systematic errors that arise from the earth curvature, platform motion, relief displacement, non-linearity in scanning motion, and the earth rotation [5]. Some of these errors can be corrected by using ephemeris of the platform and precisely known internal sensor distortion characteristics. Other errors can only be corrected by matching image coordinates of physical features recorded on the image to the geographic coordinate of the same feature collected from a map [1].

Polynomials

A polynomial is a mathematical expression consisting of variables and coefficients. A coefficient is constant, which is multiplied by a variable in the expression. The variables in polynomial expressions can be raised to exponents. The highest exponent in a polynomial. A polynomial with one variable, x , take the following form [1]:

$$A + Bx + Cx^2 + Dx^3 + \dots + \Omega x^t$$

Where

$A, B, C, D, \dots, \Omega$ = coefficients

t = the order of polynomial

The following first-order polynomial transformation equation can be used to determine the coefficients required to transform pixel coordinate measurement to the corresponding other coordinate value.

$$x_0 = a_1 + a_2 X + a_3 Y$$

$$y_0 = b_1 + b_2 X + b_3 Y$$

Where (X, Y) are the input pixel coordinates and (x_0, y_0) are the output (geographic) coordinate.

The order of the polynomial used in this process is the order of the transformation. Polynomial equations are used to convert the source coordinate to rectified coordinate. The pixel coordinate system has an x coordinate (column) and y coordinate (row). Using a polynomial transformation, the relationship between the pixel coordinate system and the geographic coordinate system can be defined. The best order of transformation can be

obtained using a trial and error process. Initially, a few (at least three for first-order polynomial) ground control point (GCPs) are required to determine six transformation coefficient ($a_1, a_2, a_3, b_1, b_2, b_3$). The resulting six coefficients can then be transform each set of row (X) and column (Y) pixel coordinate to output (geographic) coordinates. We use in our work second-order transformation equation (where at least 6 number of GCPs are required to determine 12 transformation coefficient) for X and Y are

$$x_0 = a_1 + a_2 X + a_3 Y + a_4 X^2 + a_5 XY + a_6 Y^2$$

$$b_0 = b_1 + b_2 X + b_3 Y + b_4 X^2 + b_5 XY + b_6 Y^2$$

6- Results and Discussion

Figure 3 obtained when applying the geometric correction using polynomial method and getting some ground control points which linking the reference satellite image with old map for study area. Form four includes group of shapes that show the corrected map, satellite image and figure three shows cadastral map, which includes a large number of parcels. While figure 4 produced both the corrected old map and satellite image.

Arc Map program has been used to draw cadastral map of Shehimia according to the old cadastral map figure 5-1 which made in 1932 and sketch by hand. And we have high resolution satellite image as in figure 5-2 to the same area, the work is very hard and we have to draw very carefully and it have so many parcels to produce a new cadastral map as in fig 5-3 .Figure 6 showing all parcels with their number which existing in province one.

Then we linked the cadastral map With information belonging to that region through table 1 and that qualifies this map to be an official document approved by the Department of Real Estate Registration. Figure 7 includes the left figure which represents the drawing of all the parcels within the desired area while the adjacent figure represents the parcel No. 47 after zooming shows how important and useful the new map. We want to show one of the 247 parcels that have been drawn in the cadastral map. Figure 8 and 9 shows cadaster map of the parcel No.47 and viewing this parcel in the satellite image, respectively.

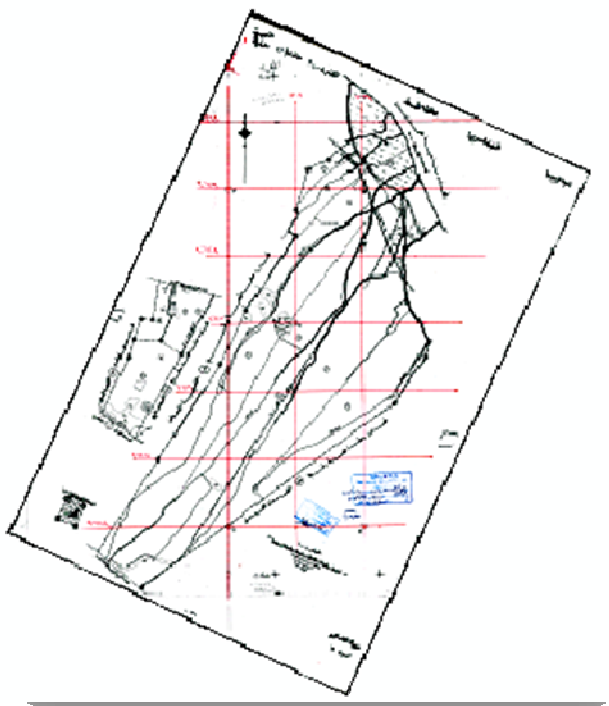


Figure 3 - Corrected old map for AL-Shihamia area.

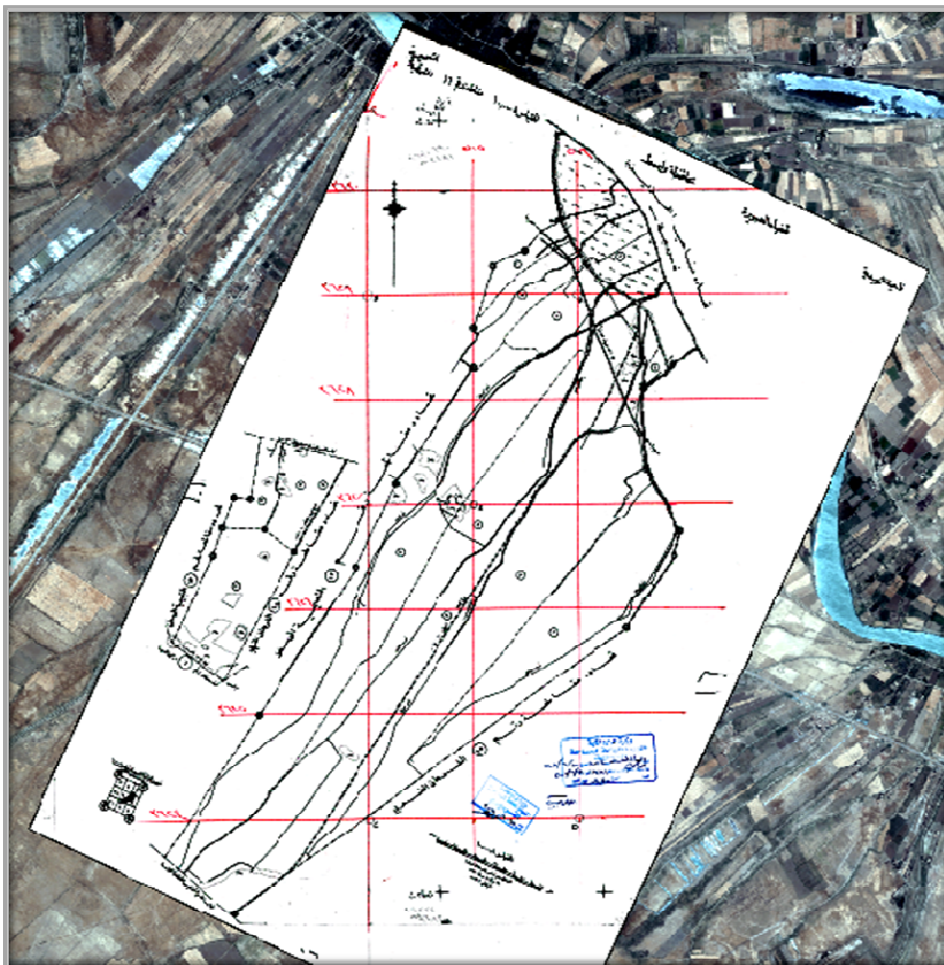


Figure 4 - The corrected map with satellite image.

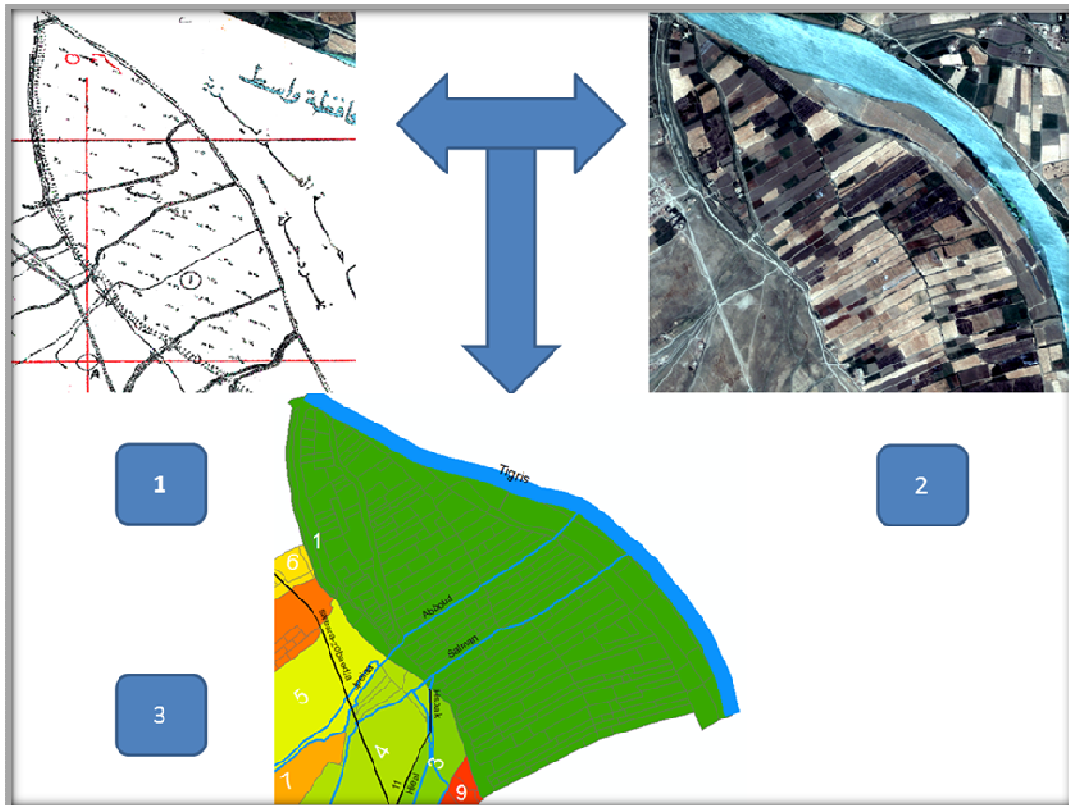


Figure 5 - The old cadastral map 1, the satellite image 2 and the digital cadastral map 3.

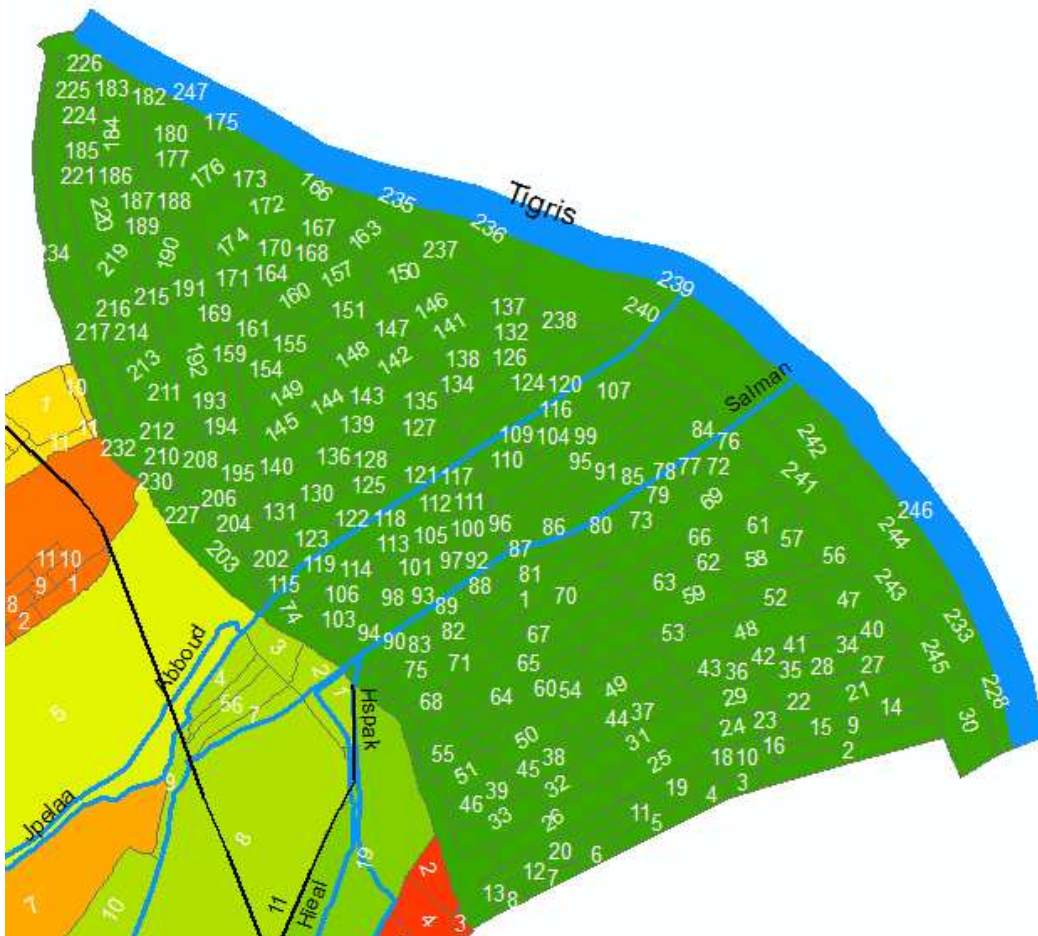


Figure 6 - Producing province 1 with number of parcels.

Table 1- Illustrates the general information about province one.

ID					
1	Owner name	parcels number	land area	Property type	Irrigation type
	####	47	13917	downright	Tigris
	The cultivable area	The non-cultivable area	Amount of wheat crop	Amount of barley crop	
	900	13017	20	33	
	Amount of jet crop	Amount of trefoil crop	Amount of orange crop	Amount of palm crop	
	16	0	0	0	
	Amount of bitter crop	Amount of lemon crop	Amount of pomegranate crop	Amount of apricot crop	
	0	0	0	0	
	Amount of olive crop	Amount of fig crop	Amount of mulberry crop	Amount of apple crop	
	10	34	12	7	
	Amount of summer vegetables	Amount of winter vegetables	Livestock type	Fish Lake	Apiary
	5	10	sheep raiser	0	0
	Poultry	Number of Farmers	Number of Wells	Number of Fodder plants	Number of Tunnels
	0	5	0	0	0
	Number of Greenhouse	Number of Tractors	Number of Massacres	Number of Pumps	Price of acre
	5	0	0	0	17000000

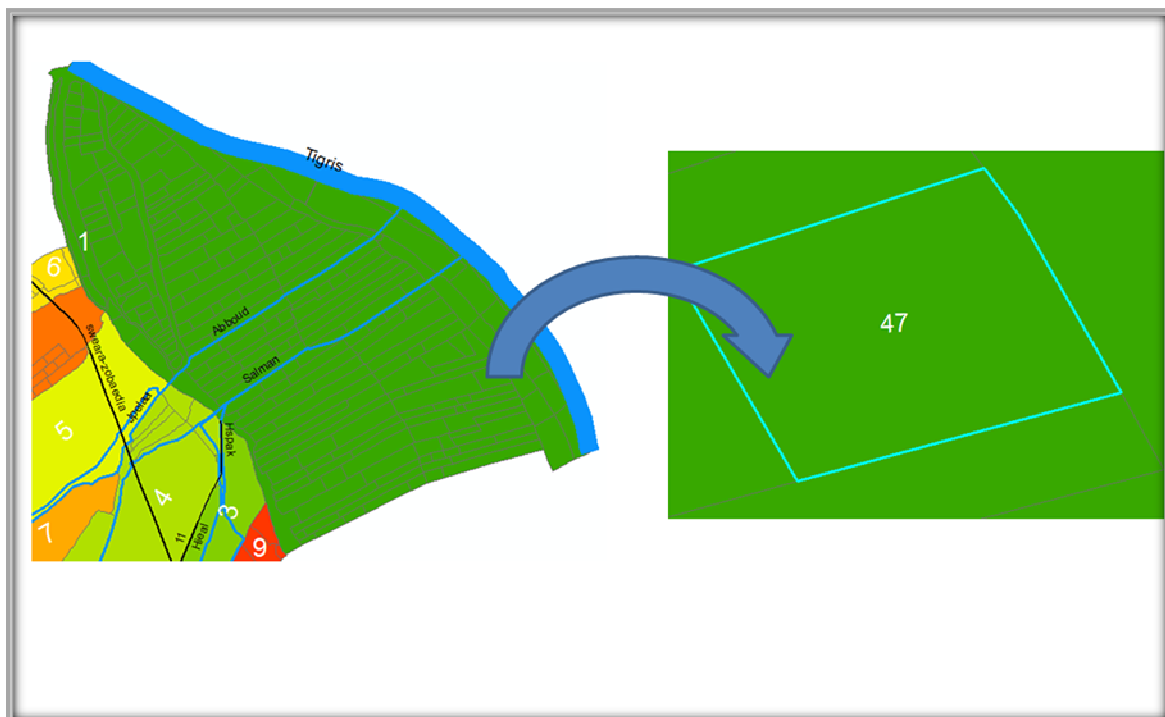


Figure 7 - Left picture produces all parcels containing in province number one , the picture on the right illustrated the selected parcel number 47.



Figure 8 - produce the parcel number 47 on satellite image.

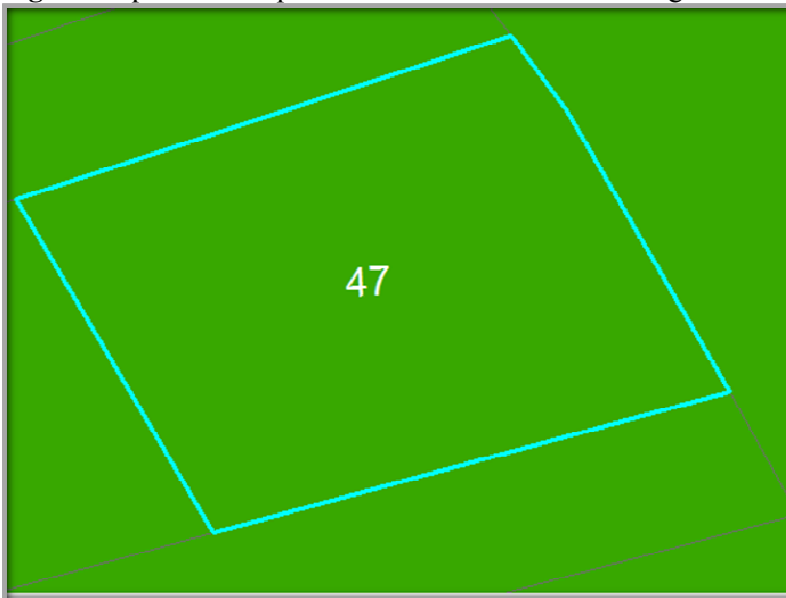


Figure 9 - Produce a map of the borders of the parcel No 47.

Conclusions

1. We get new digital cadastral map of the study area and relate it to database.
2. This work can be applied to all areas of Iraq, to get updated maps, similar to developed countries.
3. The features in old map belong to the 1932 while features in satellite image at 2006, so it is natural that there will be a big change during such a long period of time.
4. Ancient map lacks the terms of a map and almost sketch in terms of the lack of conditions cartography. Therefore, the process corrected and converted to the standard map which is very important to the Department of Agriculture and Land Registration in Kut.

References

1. Bhatta B. **2011**, *Remote Sensing and GIS*, Second Edition. Oxford University Press. pp.323-330.
2. Effenberg, W, **2011**, Spatial Cadastral Information Systems The Maintenance of Digital Cadastral Maps, Ph. D. Thesis, Dept. of Geomatics. The University of Melbourne. pp. 1-32
3. Darwish, A, Leukert, K, and Reinhart W. **2003**, Image segmentation for the purpose of object-based classification. Proceeding of IGRASS, IEEE, p:90-95
4. Tesfay A. **2008**, Preparation of Coordinate Based Cadastral Map, Msc. Thesis, Dept. of Earth Sciences GIS and Remote Sensing Program, Addis Ababa University. pp.20-30
5. Clive, F and Dorji, T. **2003**. High resolution imagery for spatial information generation in Bhutan. pp:197-200.