

Second Cadastre Design For Turkey

Tayfun CAY, Selim ADIBELLI and Fatih ISCAN, TURKEY

Key words: Cadastre, Cadastral Problems, Title Deed and Cadastre Information System, Second Cadastre

SUMMARY

Today, both the world and Turkey are on the verge of a great change due to developing capital trends and information technologies. Turkey has to take its place within the World Trade Organisation in order to integrate into the world. Turkey is in the process and efforts of accession to Europe. There is a need to reorganise cadastre with a new approach by evaluating the developments in the world and within the perspective of European Union. With this approach, the following goals are set.

- Cadastral and title deed services constitute the basic information for all kinds of design and implementation about land such as taxation, judiciary, urbanisation and development practices, nationalisation, plot and landscape planning, preparation of engineering projects about land and their implementation on land, and social, tourism and economic planning. Thanks to this property, such information and documents are needed by all public institutions and organisations in their endeavours.
- Cadastre will be assigned to perform and observe transactions of nationalisation, property taxation, buying and selling fees and property evaluation.
- Title deed and cadastral services will be so organised that they will be able finance themselves in generating, archiving and updating title deed and cadastral documents.
- A Title Deed and Cadastral Information System, which is supported by information technologies, has a spatial dimension and consists of ownership and topographic information, will be established. Also, a network of ground control units proposed by the Turkish Civil Code will be set up to ensure border security.

It is proposed that reorganisation efforts for cadastre in Turkey be planned.

Second cadastral efforts have a significant place in the collection of new information in accordance with the system standards. Therefore, it is necessary that second cadastral activities be planned and implemented.

In this study, the historical development of the Turkish cadastre, its present state, its current shortcomings, problems and expectations from today's cadastre were given. The study proposed suggestions as to what should be done for a solution to the current problems of cadastre in Turkey. At this stage, an attempt was made to make a projection about how the present cadastre should be in the future, how second cadastre, which is suggested as an alternative solution today for the transformation of the present cadastral system into a modern cadastral system, its feasibility and what its scope should be. The results of the second cadastral efforts made in the selected area were evaluated and suggestions were made.

Türkiye’de İkinci Kadastro Tasarımı

Anahtar Kelimeler: Kadastro, Kadastro problemleri, Tapu ve Kadastro Bilgi Sistemi, İkinci Kadastro

ÖZET

Bugün hem dünya hem Türkiye, gelişen sermaye akımları ve bilgi teknolojilerinin etkisi altında, büyük değişim noktasındadır. Türkiye, dünya ile bütünleşebilmek için Dünya Ticaret Örgütü içerisinde yerini almak zorundadır. Türkiye Avrupa Birliğine katılım süreci ve çabası içerisinde. Kadastroya yeni bir yaklaşımla, hem dünyadaki gelişmeleri değerlendirerek ve hem de Avrupa Birliği yaklaşımı içerisinde kadastroyu yeni baştan düzenleme ihtiyacı vardır. Bu yaklaşımla kadastro hizmetlerinin;

- Kadastro ve tapu hizmetleri; vergi, yargı, kentleşme ve imar uygulamaları, kamulaştırma, arsa ve arazi düzenlemesi, yeryüzü ile ilişkili mühendislik projelerinin hazırlanması ve araziye uygulanması, toplumsal, turistik ve ekonomik planlama gibi toprakla ilgili her tür tasarım ve uygulama için temel alt yapı bilgileri niteliğindedir. Bu niteliği nedeniyle tüm kamu kurum ve kuruluşlarının çalışmalarında bu bilgi ve belgelere gereksinim bulunduğu,
- Kamulaştırma, emlak vergisi, alım-satım harçların yararlanılacak taşınmaz değerlendirme işlemlerinin yapılması ve izlenmesi ile görevlendirilmesi,
- Tapu ve kadastro bilgi ve belgelerinin üretimi, arşivlenmesi ve güncellenmesinde, bu hizmetlerin kendi kendini finanse edebilecek yapıda düzenlenmesi,
- Mülkiyet ve topoğrafik bilgileri de içeren, bilgi teknolojileri destekli mekânsal boyutlu, Tapu Kadastro Bilgi Sistemi oluşturulması, Türk Medeni Kanunu’nda öngörülen sınır güvenliğini sağlayabilecek yer kontrol noktaları ağlarının kurulması ve yaşıatılması,

hedefleri göz önünde tutularak, Türkiye kadastrosunun yeniden yapılandırılması çalışmalarının planlanması öngörülmektedir.

Sistem standartlarında yeni bilgilerin toplanması çalışmaları içerisinde ikinci kadastro çalışmalarının yeri önemlidir. Bu nedenle ikinci kadastro çalışmalarının tasarlanması ve uygulamaya geçirilmesi gerekmektedir.

Bu çalışmada, Türkiye kadastrosunun tarihsel gelişimi, mevcut durumu, mevcut durumdaki eksikleri, problemleri ve günümüz kadastrosundan beklenenler ortaya konmuştur. Türkiye kadastrosunun mevcut problemlerinin çözümü için yapılması gerekenler ortaya konulmuştur. Bu noktada gelecekte mevcut kadastrosunun nasıl olması gerektiği, şu andaki kadastral sistemin çağdaş kadastro sistemine dönüştürülebilmesi için günümüzde alternatif bir çözüm olarak ortaya atılan ikinci kadastro’nun nasıl yapılacağı, uygulanabilirliği ve kapsamının ne olması gerektiği konusunda bir tasarım yapılmaya çalışılmıştır. Seçilen çalışma alanında yapılan ikinci kadastro çalışmalarının sonuçları değerlendirilerek öneriler getirilmiştir.

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1. INTRODUCTION

Determining the locations, positions, areas and values of and all kinds of rights and liabilities on all lands and properties of a country on earth and putting them in a plan is called cadastre.

Article 1 of Cadastral Law no: 3402 which last was amended by Law no: 5304 defines cadastre as follows.

Article 1- “The objective of this law is to establish the title deed registry as proposed by the Turkish Civil Law no: 4721 and set up the infrastructure of its spatial information system by specifying the boundaries of properties on land and maps based on the cadastral and topographic cadastral map of the country according to the country’s coordinate system.”

Since it does not exist explicitly in today’s laws and rules and regulations, it must be stated explicitly and in clear terms that the objective of cadastre must be taken outside of this definition and handled in the context of an information system whose geographical unit is parcel and in which all information regarding parcels can be found. In this framework, it has now become a necessity to make definitive and clear changes beginning with the definition of cadastre. Cadastre must undertake a mission in accordance with today’s conditions.

Besides being a guarantee for the property of people in a country and protecting this through state guarantee, cadastre is a service-producing sector that plays a primary role in endeavors of all land-based production activities, creation of space and provision and regulation of areas that will serve the public sector. While the data produced by cadastre bring solutions to citizens’ problems with their property, they also constitute the basic infrastructure in the implementation of state affairs and make financial contributions to the state budget. The data that cadastre generate are limited by the expectations from cadastre and the existing facilities. Besides their accuracy, sensitivity and reliability, the variety, quality and quantity of these data are also important. Therefore, multi-purpose cadastre was developed because with multipurpose cadastre a large number of data about property are gathered and they are made use of in the current and prospective works and projects.

Today, drawing has become secondary while figures have come to the foreground. In other words, digital cadastre, multipurpose cadastre, information system and automation have become a necessity. In order for this to happen, second cadastre must be implemented.

In this study, the current state of Turkish cadastre, its shortcomings and problems and expectations from today’s cadastre have been demonstrated. Furthermore, a framework has been prepared about what future cadastre must be like, how second cadastre, which has emerged today as an alternative solution in the transformation of the present cadastral system into a contemporary one, will be implemented, to what extent it will be feasible and what its scope must be. The results of the second cadastral works conducted in the selected area of

study have been assessed and suggestions have been made.

2. THE PRESENT STATE OF TURKISH CADASTRE

Cadastré in Turkey is “Judicial Cadastre”, which undertakes the tasks of drawing boundaries of real property and determining claims and rights on them. Therefore, the cadastre that has been implemented so far serves two goals (DPT, State Planning Organization, 2001).

- Making a plan of the property boundaries of the land and re-demonstrating these boundaries upon demand
- Determination of true owners

Today, cadastre is an important institution that ensures the generation, preservation and presentation of most of the basic information needed by law, economy, social life, statistics and science and constant monitoring of the changes. The fundamental base of the systems that are presented as information systems and gather together location-specific or non-location-specific data is the data generated by cadastre and title deed registry offices. Since these data are subject to registration, such qualities as accuracy, sensitivity and up-to-dateness are required of them. In order to attain these qualities, firstly existing problems must be determined objectively and lasting solutions must be found for them (Bıyık, 1999).

It is understood from the studies conducted that cadastral map sheets, which are products of cadastral activities, are obtained by virtue of various different geodesic and photogrammetric measurement evaluation methods and systems in accordance with 13 laws, 4 by-laws and 15 regulations passed at different times, on 11 different scales varying between 1/200 and 1/10000 using map sheet supports of various sizes and different materials (Baz and Geymen, 1999).

Cadastral information established 40 to 50 years ago fail to fulfill its objective, which was specified as giving state guarantee to real property ownership and remains insufficient in the face of the multifaceted expectations and requirements of projects and investments. 14 % of the cadastral activities conducted are of graphic system. It is also known that 60 % of the existing information and documents need to be renewed (HKMO, 2003).

Percentages of completed cadastre in Turkey, which reached 97 % in cities and 77 % in rural settlements as of 2006, are expected to reach the targets of 99 % in cities and 82 % in the country by the end of 2007 within the Agricultural Reform Application Project (ARIP Project).

Briefly, the following can be said about the current state;

- The variety and quality of the acquisition methods that cadastre used during the generation periods and the validity and usability of many of the documents in hand are open to discussion.
- Even in the documents generated in recent past, no information other than the ownership dimension is encountered.

- Due to the fact that the scope of the renewal law no: 2589 dated 1983 prepared for the elimination of such problems was very limited, it was enforced only to a very limited extent and could not meet the expectations.
- The existing cadastral maps are not eligible to serve as a base for any development activity unless new maps are acquired or maps are completed.
- Since different standards and methods are used in procedures of forestry, pasturing land and
- Deforestation, a uniformity can not be attained.
- Although activities concerning technical infrastructure facilities that are among municipal services are defined within the scope of “Technical Infrastructure Cadastre”, there is no such thing in practice.
- In places where cadastre was completed, post-cadastral changes could not be monitored and updated as required. Therefore, map sheets of maps usually do not match the land.
- There are intolerable errors arising from measurement and drawing in old maps.
- While the foundation cadastre was being made, when the proprietor could not be determined in many of the real estates, they were taken to be dead. They were preserved in the registers in the same manner and they still have not been adapted (Dikici and Inam, 2002).
- Title Deed and Cadastre services can not generate the procedures and data of property evaluation. Therefore, they can not act as a base for nationalization, land and plot regulations, integration, valuation and accurate determination and collection of property taxes and fees.

When problems are analyzed, it appears that many of the problems originate from the fact that cadastre generated in accordance with different laws and regulations can not meet the requirements of today. Therefore, cadastral works done previously must be brought to the level of contemporary cadastre. If this stage is attained, the technical problems that are experienced (measurements, drawings, calculations, limitations etc.) will stay behind to a great extent. On the other hand, problems concerning ownership and proprietorship and many of the legal problems encountered in title deed registers and documents will disappear on their own. Social problems caused by technical and legal problems will also disappear. In this case, the ownership problems that are encountered will be solved through applications of land and plot regulations, and in cases where this is not possible, through second cadastre (Pınar and Cay, 2005).

“Cadastre 2014 Study Group”, which was formed under the title of “Cadastre and Land Management” of the FIG-7 Commission convened in 1995, set forth 6 major goals as a result of its endeavors in order to determine the cadastral concept of the future. These goals define the probable vision of the cadastral system in 2014 in accordance with the developing technology and needs.

Cadastre 2014 report has been adopted in all countries and by its definition, Cadastre 2014 prepares a systematic public inventory of the data in a country or an area belonging to all legal objects of land whose boundaries have been determined on the basis of a measurement system (Yomralioglu, Uzun and Demir, 2003).

The Title Deed and Cadastral Information System (TAKBIS) Project, which was launched by the General Directorate of Title Deeds and Cadastre and which aims at collecting, storing and processing Title Deed-Cadastral information by the help of Geographical Information System (GIS) and serving users through analyses, forms one of the indispensable steps of the procedures for Cadastre-2014.

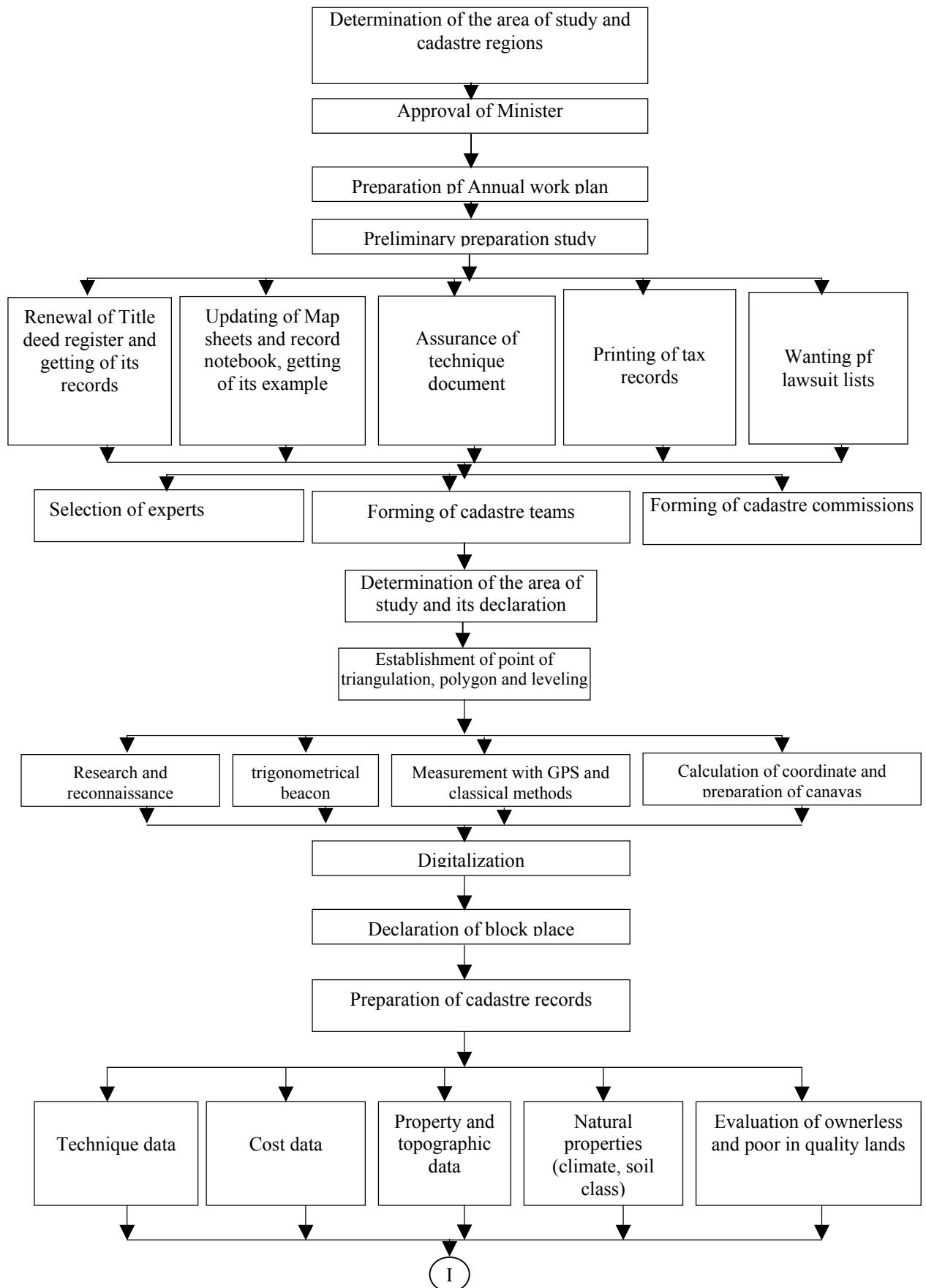
3. SECOND CADASTRAL DESIGN IN TURKEY

As a result of the legal and institutional regulations, procedural steps in the second cadastral law will not be much different from the foundation cadastre. However, certain additions must be made to efforts of installation cadastre and certain operations must be removed in the second cadastral efforts in order to obtain accurate and sensitive data that conform to certain standards and will meet the needs in certain fields such as conditions of the day, advances in science and technology, population rise and urbanization, physical planning and projection, needs of local administrations, land management and evaluation of real estate. Basic activities in the Second Cadastre may be the following:

- Determination of the area of study and its declaration
- Preliminary preparation study
- Establishment of point of triangulation, polygon and leveling
- Digitalization
- Preparation of cadastre record
- Operations of measurements, calculations, drawings and control
- Preparation to Geographic Information System of Cadastre and title deed register data
- Real estate

Second cadastre will be especially useful in matters that lack in technical aspects. Thus, map sheets prepared as a result of the measurements made with today's technology as well as those made with old technology will be entirely digitalized. Moreover, since the latest state of the real estate will be determined, types will be changed and the state's loss of tax will be avoided. These efforts will be directed through regulations and directives that will be prepared in accordance with the requirements of the day. Economywise, records will have been updated. Thus, records will have been updated both technically and proprietarily.

A work flow chart as in (Figure 1) can be drawn for second cadastre.



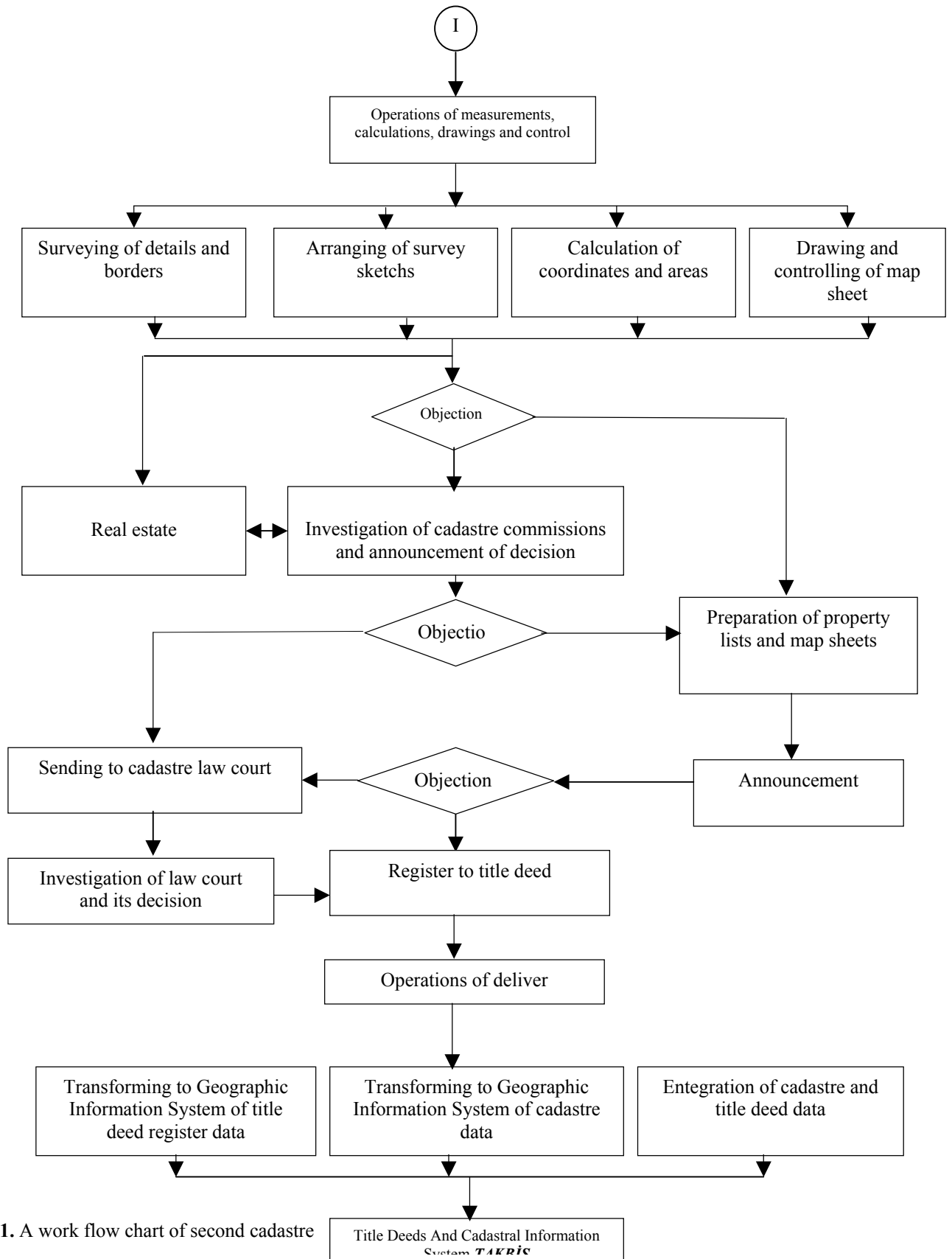


Fig. 1. A work flow chart of second cadastre

4. APPLICATION

4.1. Description of the Area of Study

The village of Asagipinarbasi in the Selcuklu district of Konya-Turkey was selected as the area of study. This village is located on the 25th kilometer of the Konya-Ankara highway. The population of the village is 500 according to the census taken in the year 2000. Although there are no health facilities in the village, there is an operational primary school. Tap water and a sewer system exist. Transportation is conducted via municipal buses. The predominant economic activity in the village is farming though animal husbandry is the major source of income. Buildings in the village are made mostly of clay bricks. Even though the farming lands in the village are predominantly flatlands, irrigation of the farmlands is performed using water from the wells.

4.2. Application on Farmland

The photoplan map sheet of the area of application, which is located in the Selcuklu district of the province of Konya-Turkey and where agricultural endeavors continue, was produced on 17.10.1957 for cadastral purposes. The area reflects the characteristics of the Konya plain and has an almost flat topography. The photoplan was drawn on an astrolon base on a scale of 1/5000. The activities were implemented on a block that covered more than half of the map sheet called Konya-Asagipinarbasi Map Sheet 12 (Figure 2).

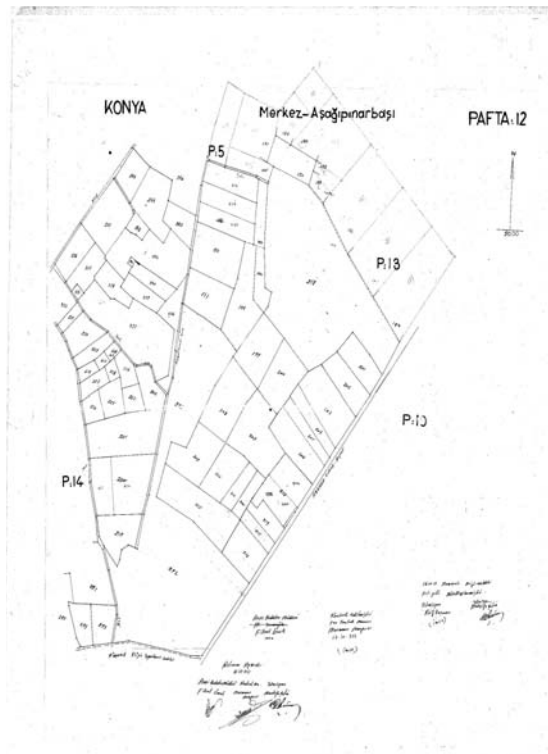


Fig. 2. Cadastre map sheet of farmland

4.2.1. Implementation of measurements, calculations and drawings

Measurements of the corners and broken points of the parcels on the area of study were made from the triangulations that existed on the ground and polygon points that were set up. Besides, measurements of details such as wells, pools and buildings in some parcels were made. Calculations of these measurements were made in the office and the coordinates of corners and broken points in the parcels were calculated. From these coordinates, the surface area of each parcel was calculated. Drawings of the parcels, which were obtained in entirely digital form, were performed in the state map sheet division system. Digital map sheets of scale 1:5000 (L29-d-23-a, L29-d-23-c, L29-d-23-d) were obtained.

4.2.2 Evaluation of the Real Estates

In the evaluation of the lands outside the village, income capitalization method was used. Evaluations in the lands outside the village were performed on the basis of criteria such as questionnaires, ownership, topography, nature of the soil, fertility, crops in the parcel and buying and selling. Since the crops cultivated in the area of study were barley, wheat and beets, their unit prices were used in the evaluation (Table 1).

Table 1. Unit cost of crops

Name of crop	Unit cost (YTL/kg)
Arpa	0,280 – 0,300
Buğday	0,320 – 0,350
Pancar	0,100 – 0,120

*1 YTL=1,83 EURO

The annual net revenues collected in the area of study and **current values** were calculated on the basis of the unit prices given in Table 1. Using the 20 sampling groups, k (capitalization interest rate k: 0.226428719) was determined. The parcels seen in Table 2 were tested according to the k values obtained. It was observed that the calculated values came close to current values at a rate of 73 %.

Table 2. Current and calculated values of agricultural real estates

Parcel number	Current values (YTL.)	Calculated values (YTL.)
184(1)	7462,268	5520,501
185(2)	42717,848	34227,107
186(3)	16746,138	15678,223
187(4)	38893,649	24290,205
188(5)	340,932	441,640

4.2.3. A comparison of installation cadastre (1st cadastre) and current state (2nd cadastre)

The following can be said about the map sheet used in practice and the current state (Figure 3):

- A large portion of the topographic details such as roads that go through fields do not exist in the map sheet

- There are no parcel broken point facilities in determining boundaries and boundaries that establish neighborhood relationships have been formed with tonches of 0.50-1.00 m in width,
- In the map sheet, curved parcel boundaries were used as linear boundaries on the ground and map sheet-ground relationship could not be established in broken points in some parcels,
- The map sheet is not based on any coordinate system. It only displays scale (1:5000).
- Production was made with drawings.
- The map sheet was produced in a drawing other than city block, map sheet and standard map drawing techniques.
- Map sheet margin notes were not formed in accordance with their standards.
- Diameters of encircled balastro in broken points are not appropriate.
- There are ambiguities in the junctions of parcel boundaries.
- City block numbers were not given; only map sheet number was provided.
- When a comparison was made between the title deed surface areas and the surface areas calculated using the coordinates obtained from land, it was seen that the 30 % discrepancy between the two was within the allowed error margins. It is obvious that this arose from a discrepancy between land boundaries and the map sheet.
- Using the common points between the land and the map sheet, it was seen that there was overlapping in the boundaries.
- It was found that parcel use on land was made on the basis of unregistered parceling out and parcels adjacent to pastures were used by those who transgressed boundaries.

When a comparison was made between the title deed surface areas (1st cadastral state) and the surface areas (2nd cadastral state) calculated using the coordinates obtained from land, it was seen differences among parcel area. These differences were given in Table 3.

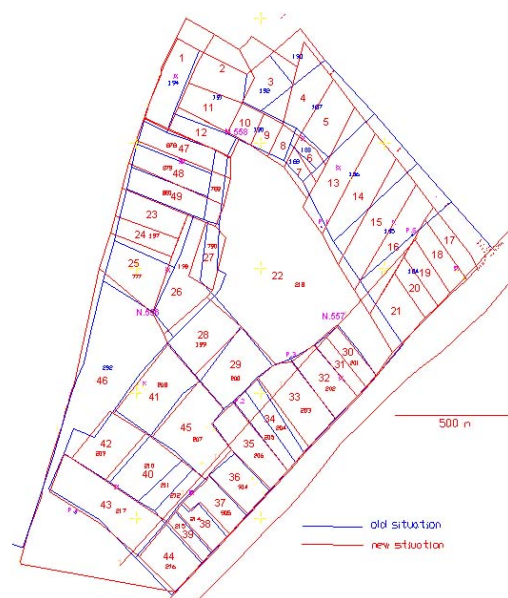


Fig. 3: Overlapping of the 1st and 2nd cadastral states on agricultural land

Table 3. Comparison of 1st and 2nd cadastral states

Old Cadastre (1 st Cadastre)		Changes	New Cadastre (2 st Cadastre)		Difference	Result	Limit of error
Parcel and Area			Parcel and Area				
184	107220,90	Parcelling out	15	18821,31	-4899,90	REJECT	687,0583
			16	22753,84			0
			17	18610,09			0
			18	15785,87			0
			19	36149,69			0
185	107198,88	Parcelling out	13	55248,79	863,50	REJECT	686,9845
			14	51086,59			0
186	107080,89	Parcelling out	11	52998,60	-2264,75	REJECT	686,5886
			12	56347,04			0
187	86566,60	Parcelling out	4	36997,02	14602,71	REJECT	614,414
			5	34966,87			0
188	10070,67	On site	6	10228,95	-158,28	ACCEPT	203,7267
189	8353,97	On site	7	11855,11	-3501,14	REJECT	185,3063
190	33730,19	Parcelling out	8	11054,97	-2284,15	REJECT	377,4347
			9	11466,97			0
			10	13492,40			
191	54911,19	Parcelling out	2	41632,62	-13240,94	REJECT	485,1361
			11	26519,51			0
192	28327,99						345,1168
193	24488,36	Parcelling in	3	47449,36	5366,99	REJECT	320,3217
194	38358,32	On site	1	51109,32	-12751,00	REJECT	403,2131
195	21941,92	On site	12	24251,89	-2309,97	REJECT	302,8387
							506,225
197	59618,84	Parcelling out	23	30106,03	9829,42	REJECT	0
			24	19683,39			
198	55393,31	On site	26	52153,16	3240,15	REJECT	487,3337
199	47911,83	On site	28	49962,97	-2051,14	REJECT	452,149
200	45616,49	On site	29	52181,96	-6565,47	REJECT	440,8453
201	31501,81	Parcelling out	30	16313,10	731,89		364,4255
			31	14456,82		REJECT	
202	32879,03	On site	32	32459,83	419,20	REJECT	372,5152
203	56368,45	On site	33	48338,17	8030,28	REJECT	491,7514
204	20771,17						294,4755
205	18683,39	Parcelling in	34	45118,92	-5664,36	REJECT	278,9794
206	43302,81	On site	35	40474,38	2828,43	REJECT	429,1774
207	66895,19	On site	45	63947,65	2947,54	REJECT	537,3506
212	13709,77						238,2904
210	37176,83						396,7789
211	15750,47	Parcelling in	40	72069,26	-5432,19	REJECT	255,7269
208	58800,35	On site	41	60147,41	-1347,06	REJECT	502,6158
209	50443,75	On site	42	40136,60	10307,15	REJECT	464,3268
214	17631,38	On site	38	18123,46	-492,08	REJECT	270,8558
215	13206,24	On site	39	12408,57	797,67	REJECT	233,7987
216	37825,70	On site	44	35195,52	2630,18	REJECT	400,3243

217	75296,78	On site	43	75530,41	-233,63	ACCEPT	571,3942
218	377254,24	On site	22	342718,14	34536,10	REJECT	1341,597
292	235575,95	On site	46	271878,50	-36302,55	REJECT	1041,396
777	44839,50	On site	25	49738,66	-4899,16	REJECT	436,9586
790	17526,97	On site	27	22494,94	-4967,97	REJECT	270,037
878	28993,59	On site	20	33740,66	-4747,07	REJECT	349,2482
879	29880,27	On site	21	41741,01	-11860,74	REJECT	354,6823
880	30193,29	On site	22	39586,69	-9393,40	REJECT	356,5823
904	28801,41	On site	36	30126,43	-1325,02	REJECT	348,06
905	27502,20	On site	37	25366,95	2135,25	REJECT	339,9264

When Figure 3 is viewed, it is observed that the cadastre map sheet fails to represent the land accurately and some borders have changed completely. Since there are pasturing parcels adjacent to private property on land, there are excesses in areas (Table 3). Areas of parcels that have borders with pasturing lands are calculated by offsetting on the basis of the parcel areas obtained as a result of digitalization. Treasury parcels have been transgressed by neighboring parcels. The treasury parcel no 789 is under occupation due to such transgression. By doing a parceling out on the basis of this parcel and the areas of transgressing parcels, treasury parcel is formed. The parcels other than this have been determined on the basis of the current uncontroversial state.

5. CONCLUSION

Second cadastre has emerged recently as an alternative solution to the problems of cadastre in Turkey. It was observed that in the planning and application of the second cadastre

- There are transgressions of 1 to 3 meters in property borders,
- Title deed areas and the areas of use on land are different,
- Some buildings have been recorded in cadastral map sheets,
- Fields outside of cadastre began to be used for farming in time and remained unregistered,
- Permanent facilities on cadastral map sheets did not exist on land and there were not enough points to make transformations,
- It was difficult to implement the new development plans in residential areas,
- Transfers were not made; changes were not made in cadastre and title deeds to reflect the de facto situation on land,
- Buying and selling prices of property do not reflect their true values in respect of title deed fees,
- Information on elevation has not been recorded in cadastral map sheets in the cadastral works done so far,
- Current cadastral data are not sufficient for the Title Deeds And Cadastral Information System (TAKBIS) project.

When no solution can be attained through existing methods, it is necessary to implement the second cadastre. In the second cadastral works that will be implemented for this purpose;

- The current proprietary state will be determined without violating the rights gained in the installation cadastre.

- Lands that were initially left outside registration and later increased in value when they were incorporated into urban areas will be possibly acquired by the treasury.
- Works of property evaluation will be taken as the basis of the second cadastre and the values of all property will be determined objectively.
- Various data will be collected in accordance with the objective of a multi-purpose cadastre.
- All parcels will be determined in the country coordinate system.
- The data obtained will be in the Title Deeds And Cadastral Information System (TAKBIS) format.

Unless layout problems experienced in the cadastral works implemented in Turkey and the activities in the existing structure are not corrected legally, the use of the updated cadastral map sheets can not be ensured judicially and in respect of TAKBIS. Making cadastral charts into layout compatible with TAKBIS and implementation of the second cadastre as an alternative method to the solution of the problems in Turkish cadastre will be useful.

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CONTACTS

Assis.Prof.Dr.**Tayfun CAY**

University of Selcuk

Faculty of Engineering –Architecture

Department of Geodesy and Photogrammetry

42075 Konya

TURKEY

Tel. +90 332 223 19 44

Fax +90 332 241 06 35

Email:tcay@selcuk.edu.tr

Mr. **Selim ADIBELLI**

University of Selcuk

Faculty of Engineering –Architecture

Department of Geodesy and Photogrammetry

42075 Konya

TURKEY

Tel. +90 332 223 19 44

Fax +90 332 241 06 35

Email: selim4280@yahoo.com.tr

Res.Assis.**Fatih ISCAN**

University of Selcuk

Faculty of Engineering –Architecture

Department of Geodesy and Photogrammetry

42075 Konya

TURKEY

Tel. +90 332 223 19 87

Fax +90 332 241 06 35

Email:fiscan@selcuk.edu.tr