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THE IMPORTANCE OF AGRICULTURAL DEVELOPMENT AND INFRASTRUCTURE PROJECTS

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Abstract. The use of agricultural land is decreasing continuously due to misuse of agricultural land other than agricultural purposes in Turkey. Therefore, the geographical-based information systems have become mandatory making farmland identified across the country and creation of farmer registration system. For this purposes, it aims to establish an "integrated administration and control system" (IACS) and agricultural supports accurate control and management will be developed. In this way, farmers will consist of the actual figure statements, payments made to farmers will be guaranteed, they have taken the necessary facts to support agricultural production. The identification of agricultural land in the European Union countries is employed as classed as one of the components "Land Parcel Identification System" (LPIS). The LPIS system is an essential component for land based supports (subsidies) control and management (direct support, promote production in the less supported area farmers to be directed to sectors such as organic farming, deforestation, pollution prevention, etc.). In this study, some information of the standards about making 1/5000 scaled orthophoto maps will be given for backing the proposed establishment of LPIS system prepared across the country in Turkey.

Keywords: Agricultural land, Farmer Registration Systems, Geographic Information Systems, Land Parcel Identification System, Orthophoto maps.

INTRODUCTION

According to reference [1]; about 13 billion hectares of the Earth's surface is covered by land. And 37 % of these 5 billion hectares are agriculture land. The distribution of the agriculture land is as follows:

1.5 billion hectares field crops

1.5 billion hectares annual plant

2 billion hectares of meadows and grassland.

In a study done by the United Nations Food and Agriculture Organization (Food and Agricultural Organization of the United Nations-FAO) World Agriculture: Towards 2010 mentioned, that besides the above-defined land distribution there is another 1,8 billion hectares of potential agriculture land to be used for agricultural purposes in the coming period, especially located in Sub-Saharan Africa and South America.

Considering the possibility of the expansion of agricultural land apart from the above mentioned areas in the world, it has been established that the agriculture land has come in many countries such as Turkey to the final frontier. Whereas, a significant amount of the worldwide agricultural land each year goes out the agriculture usage due erosion, salinization and other reasons. On the one hand, it is mentioned the possibility of the extension of agricultural land while the other hand each passing day the world is threatened by the misuse of agricultural land and agricultural land degradation more and more.

Today, due to overgrazing, deforestation, improper agricultural activities and land use, 2 billion hectares corre-

sponding to 26 % of the world land parts are faced with the problem of corruption. In the framework of ISRIC, GLASOD it has been obtained that 15 % land part of the earth have been destroyed as a result of human activity at various levels. 55,7 % of these areas have water erosion, 27,6 % wind erosion, 12,5 % chemical changes (loss of nutrients, salinization, pollution, acidification), and 4,2 % the physical changes (flooding, jams, crashes) problems. Worldwide the amount of the transported soil is estimated at 0,5 to 2,0 tons/ha/year, while the amount of the lost land is estimated at 24 billion tons [2].

Arid and semi-arid regions of the world cover about 46 % of the total area. 50 % of irrigated area in these regions has the problem of salinity at different levels. Both in Turkey as well as more than 20 % of the world's total irrigated agricultural lands has been exposed to excessive salinity due to irrigation. Worldwide 954 million hectares of salt affected land are reported. This kind of problematic land parts are located 50,8 million hectares in Europe, and 320 million hectares in the Asian continent and 4.2 million hectares in Turkey. Aridity and the accompanying problems emerging in many places and continues to grow. 1.5 million hectares of irrigated land in the world each year are affected by salinization. Population growth, global warming and climate change with increase in water-based requirements, affects water resources used in agriculture adversely [3].

As an estimation in the next 75 years the agriculture land will increase 10 %, whereas the world's population will doubling in the world's semi-arid and arid areas where the, salinity is very common. This scenario shows the importance of the sustainable management of natural resources [3].

Development of soil classification systems are required due to increased knowledge about soils. 1938 American soil classification is a pedogenic system and do not include new defined and categorized soil types. Therefore a newly defined Soil Taxonomy and FAO-UNESCO and the WRB (World Reference Base) were raised. In Turkey searching's for a new classification system which is recognized internationally, are continuing. According to the nature of the land one of the methods used in classification is "Land Classification of Conformity" In this method, potentially existing and current usage patterns are determined by soil survey. In agricultural use the needs of plants for soil, climate, and topography is requested. For the non-agricultural land use is the other features of the soil to be determined [1].

Another standard for the determination of the soil properties is the, "Agricultural Land Classification". According to these standards, the legal ground based classification of land is as follows: Real agriculture land, agriculture land of specialty products, planted agricultural land, marginal agricultural lands, covered agricultural lands, or greenhouses [4].

In this context, the Food, Agriculture and Livestock Ministry classified the agriculture land parts at the scope of "Determination and Rehabilitation of the Problematic Agricultural Land Parts" project using the data obtained under the Geographic Information System (GIS) environment [1].

The most important aim of the orthophoto project is to collect and record appropriate data useable in GIS for the Determination and Rehabilitation of the Problematic Agricultural Land Parts. This Project is the largest geographically based infrastructure project in the history of the Turkish Republic.

The planned Integrated and Control System (IACS) covers mechanisms composed for the right administration and control of agricultural support, while securing correct payments to farmers and preventing false declarations. Land Parcel Identification System (LPIS) is a component of IACS (Integrated And Control System) and has been used for the identification of agricultural land. In general all the

measures taken on the agricultural sector are managed through IACS. As the most of the measures (data) are related directly or indirectly with land, LPIS is a very important component of the process [5].

A seamless updated and homogeneous base data (Orthophotos &DEM) for the whole country is the basic source material or graphical infrastructure for LPIS generation.

OBJECTS AND METHODS

Turkey is a country located between 36°-42° north latitudes and 26°-45° east longitudes and has a surface area of 779452 km². 23764 km² of this total area is on the European and 755688 km² is on the Asian continents. The shape of the country is a rectangular with dimensions 1600 km east-west and 800 km north-south directions. Turkey is divided into 7 regions according to climatic conditions and geographic location. These regions are Marmara, Aegean, Mediterranean, Central Anatolia, Black Sea, Eastern and South Eastern Anatolia.

According to the 2009 census, the country's population is 72,5 million and 17,7 million live in villages. People dealing with the agricultural sector are usually residing in the villages. Agricultural sector is the most important component of the Turkey's economy. The ratio of the Agriculture sector's revenues in 2010 is in the gross national product 10 % and in the total product also 24,7 %. According to the census of Agricultural Sector 2001 over 3 million agricultural business organizations is available. The average land size of these businesses is 6 hectares. The average land size of 83 % of the agricultural businesses is smaller than 10 hectares. The average land size of 59,5 % of agricultural enterprises in Turkey is 6 hectares and they are in the form of three or more parcels. Therefore, 33 % of the agricultural enterprises own land part smaller than 2 hectares. This value corresponds to 5,3 % of the country's 18,4 million hectares of arable crops area [6].

Turkey's agricultural area is approximately 20,7 million hectares. 26 % of this area is the forest area and 99 % of the forest areas are under state control. There are 20550 villages in the forest areas and 7,6million people are living in these villages. Turkey is an important producer of grain sector. In 2009, 33,6 million tons of grain production has been realized and this amount corresponds to 11,4 % of the total production of 27 members of the European Union. Turkey is one of the largest wheat and barley grower in the world and also one of the biggest growers of fruit and vegetable, 60 % of production of is exported to 27 European Union countries. Turkey is the largest hazelnut grower in the world. Besides has significant contribution by many industrial products like cotton, tobacco and sugar beet [6].

In Turkey, the use of agricultural land is decreasing continuously due to non agricultural purposes. Therefore, agricultural land across the whole country must be registered in the sense of geographic-based information systems and g the creation of farmer registration system has to be conducted. An "Integrated Management and Control System" (IMCS) established for this purpose will organize proper management and control of agricultural support.

In this way, the actual value is made up of farmer's declarations, payments would be secured and agricultural production would have taken the necessary facts to support. The "Land Parcel Identification System" (LPIS) is one of the components of LPIS system and used in European Union countries. This system supports area-based supports (subsidies), control and management directly. This system is also very important for the support in the less supported areas, to redirect the farmers to organic agriculture sector, decrease pollution and deforestation.

Objectives of the IACS/LPIS project:

Nowadays, the demand for the use of high-resolution satellite images is in-

creasing every day parallel to the need for spatial and terrestrial location information in public institutions. Received satellite imagery can not be shared enough by constraints including particularly licensing and copyright issues. Due to the lack of adequate coordination between the institutions the same or similar image records are made.

On the other hand, Since 1950's, the ongoing aerial photography has come to compete with satellite imagery through the use of digital cameras and as a result of this competition orthophoto production with higher spatial resolution and positional accuracy has become possible. Given this situation, to ensure the country's resources effectively and to build a geographic data layer based on the required satellite images or aerial photographs "Integrated Administration and Control System" (IACS) is targeted by the Agriculture and Rural Affairs Ministry. "Land Parcel Identification System" (LPIS) is one of the most important components of this system [5].

In order to establish LPIS system "production of orthophoto maps" as a geographical base associated with spatial data across the country are intended to perform. This project will facilitate the supply of digital aerial photo data providing the continuity of agricultural projects and investments. With this project, it is aimed to develop basic orthophoto data set with the required resolution for a nationwide orthophoto map production and accuracy (GSD 30 cm or less determined by the administration)

Thanks to recent advances in technology, digital aerial camera images are containing many of the advantages of satellite imagery. Today, digital aerial photographs with higher spatial resolution and positional accuracy can be produced. These data can be used in many different areas, even in cases where the high-resolution satellite images become insufficient. In addition, digital aerial photographs taken with digital aerial cameras integrated with GPS - IMU systems need less geodetic control points compared to analogue photographs and this way geodetic works is reduced by about 90 %. Furthermore, the failure of aerial photo film supply, laboratory services, duplication and printing has reduced costs. Therefore, digital aerial photographs and orthophotos give for operations needed only visible and near-infrared bands better technical and cost effective solutions than the analog aerial photographs and satellite images.

The intended Goal of orthophoto maps production using LPIS system is to establish "Integrated Administration and Control System" by the Ministry of Agriculture and Rural Affairs (IACS). One of the most important components of this system is to create the spatial infrastructure of "the Land Parcel Identification System" (LPIS).

Given the present studies, project in question can be expressed rather than a new production as an economical Project. At the beginning and the realization stage of the project some investments will be made. However, when this project is completed, all agricultural businesses and land will be registered and especially supports given to agricultural purposes will be recorded and the unnecessary expenses reduced.

Therefore, the amount spent for the establishment of such a system will reduce the total cost and savings through the use of all projects that use spatial data the project. In addition the supply of digital data which is essential for the continuity of information systems will be ensured. The demand for the information and communication technologies in the public sector will be increased and inactivity in the sector will be prevented.

Continuous data availability is a phenomenon that will as well as to increase its profitability of information systems in the public sector and guarantee the presentation of services. One of the

basic products of the system targeting the production and presentation of Aerial photographs and derivative products is a layer of orthophoto covering the entire country. This layer, is one of the INSPIRE thematic layers. This layer will be installed to suit the needs of our country to be used in this project.

With this system Turkey's seamless orthophoto data base with 30 cm GSD will be provided. The established system will be the spatial infrastructure of the planned IACS system at country level and becomes the reference for other geographic data. This topic is important both economically and socially. Because institutions will not have to spend unnecessary time and money for the supply of the base data, they will spend more resources after the research, development and implementation activities for many applications providing data [7].

On the other hand, easy access to the data will increase interest to this topic. Usage of GIS and aerial photographs across the country will increase and as a result the benefits of investment in the country will increase. Online data will be updated continuously and the inability to obtain data on projects will be avoided. That will provide the sustainability of the project.

IACS orthophoto map production project is an economical project. This system is a planned and request oriented production process. The data will be provided from a single source. From this system delivered aerial photographs compared to satellite images will have a better positional accuracy and higher spatial resolution. Also, conditions taking aerial photographs are more flexible [8].

RESULTS AND DISCUSSION

The area of the Republic of Turkey is 779452 km^2. 13.977 km^2, of this area is natural and artificial lakes. It has been been foreseen by the Administration that the orthophotos of a 10-km corridor along the borders and the military zones must be established high-resolution stereo satellite images. The total area of this field is 35,000.km^2. Therefore, whole area of Turkey for taking photographs (except water-covered areas and buffer areas) can be considered as 730,475 km^2.

In this project, Photographs will be taken based on control points. The coordinates of these CP's will be determined using Turkey's National Fundamental GPS Network (TUTGA) and continuous observation stations (TUSAGA-active). Production of aerial photographs of different kinds, continuous presentation and archiving will be provided [9, 10].

•The expletory sheets, referencing and computation summaries of planned GCPs in the whole project area,

•High-resolution satellite imagery (SI) of all the country and Pan (grayscale) image, the NIR (near infrared), R, G and B bands as separate image files belonging to aerial images (AI) taken by digital aerial cameras. This images will not be more than 6 months old since the date of the contract,

•The exterior orientation elements of satellite images(SI) and with digital aerial camera taken aerial images (AI),

•Pan-sharpened (coloured from grayscale) RGB or NIR, R, G, B image,

•Digital elevation data (5m resolution) belonging to (SI) and (AI), also SRTM elevation data for the Turkey's geography with 90 m interval,

•Ortho photo image (pan sharpened three bands RGB. Seamless lines will be created using this images and mosaic assembly will be carried out. All this information will be kept in the same data base.

According to the geography of Turkey, flight planning of the orthophotos capturing area using aerial photographs or satellite images are planned and scheduled in accordance with the instructions of the administration as follows;

— The area under the average land elevation 2000 m,

— The area is above average terrain elevation 2000 m,

— The country's land border buffer zone in accordance to the regulations (a total of 2949km) 10km wide strip along the border area,

Calculated project parameters are given in Table 1 for 730.475.km^2 aerial photography taking area. ULTRACAM-X Vexcel digital aerial camera parameters are taken into account for the parameter calculations [11, 12].

As known, Turkey is a country with a surface area of 779452 km^2 located between 36^o-42^o north latitudes and 26^o-45^o east longitudes. Within this framework 388 sheets at scale 1/100.000 consists except water-covered areas.

Flight planning also will be prepared at 1/100.000 scale. According to "Large Scale Map and Map Information Production Regulation" GRS80 ellipsoid and GNSS ITRF96 datum Calculations will be calculated at epoch 2005,0 and projection coordinates will be computed based on the TM-3^o.

Table 1 – Project Parameters

Total area (km^2)	730475
GSD (Ground Sampling Distance)	30cm
Forward Overlap	70 %
Side Overlap	30 %
Number of columns	19083
Number of Photographs	468100
Number of Ground Control Points (GCP)	2983
Flight time (hour)	2686
Transition time (hour)	600
Data Size (GB)	190818
GPS/IMU data process (hour)	1193
Aerotriangulation (hour)	47705
DEM production (hour)	117025
Orthophoto Production (hour)	117025
Flight planning (hour)	1045
Approximate photograph scale	1/41500
Approximate flight height (above ground) (m)	4200
1/100.000. Number of sheets	388
Aerial Camera	Vexcel UltraCam-X
Focal length	100,5 mm
Pixel size	7.2 µm
Image format size	9420 x 14430 pixel
Datum	ITRF96
Ellipsoid	GRS80
GNSS Computing Epoch	2005.0
Projection	TM (Transversal Mercator)

Time duration of the project is 24 months and is divided into four stages. Each stage is summarized as below in Table 2 [13-15].

Table 2 – Project Schedule

	T_o+6 month	T_o+12 month	T_o+18 month	T_o+24 month
Aerial photograpy and satellite imagery	10 %	50 %	40 %	
Ground control points and control points measurements	10 %	50 %	40 %	
Aerotriangulated blocks and exterior orientations of satellite images	8 %	32 %	30 %	30 %
DEM production	5 %	25 %	35 %	35 %
Orthophoto production	5 %	25 %	35 %	35 %

CONCLUSIONS

When the entire project is completed 1/5000 scaled orthophoto maps will be produced with the 30 cm sampling locations spaced all around the national territory. These maps will be the base of the LPIS system and will also be used for spatial planning of the farmer registration system that will be established. Thus, proper management and control of agricultural subsidies will be carried out, farmers will consist of the actual figure statements, and payments made to farmers will be guaranteed. Thus, farmers will also have received real support needed for agricultural production.

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ТҮЙІН

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АУЫЛ ШАРУАШЫЛЫҒЫН ДАМЫТУДЫҢ ЖӘНЕ ИНФРАҚҰРЫЛЫМДЫҚ ЖОБАЛАРДЫҢ МАҢЫЗЫ

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Түркияда ауыл шаруашылығына бағытталған жерлер оларды дұрыс пайдаланбаудың салдарынан жылдан-жылға аз пайдаланылып келеді. Осылайша, географиялық-ақпараттық жүйелер мемлекет аумағында ауыл шаруашылығына пайдаланылатын жерлерді анықтауда және шаруаларды тіркеу жүйелерін жасауда міндетті құрал болып табылады. Олар «басқарудың және бақылаудың интергациялық жүйесін» (IACS) жасауға көзделген және ауыл шаруашылықты қолдаудың және басқарудың жүйесі әзірленетін болады. Осылайша, шаруалар нақты жүзіндегі көрсеткіштерге ие болады, шаруаларға төлемдер кепілдендіріледі, олар ауыл шаруашылығы өндірісі үшін қажетті қолдау алатын болады. Еуропалық Одақ елдерінде ауыл шаруашылығы жерлерін сәйкестендіру «Жер телімдерін сәйкестендіру жүйелерінің» (LPIS) компоненттерінің бірі ретінде жіктеледі. LPIS жүйесі бақылауға және басқаруға жерден қолдау көрсету (субсидиялар) қызметтері үшін маңызды компонент болып табылады (тікелей қолдау көрсету, аз қолдау көрсетілетін облыстарда өндірісті ынталандыру, шаруалар органикалық егіншілік, ормандарды кесу, ластанудың алдын алу сияқты салалардың дамуы бойынша нұсқаулықтар алуы керек және т.б.). Бұл зерттеуде бүкіл Түркия аумағы бойынша LPIS жүйесін жасау туралы ұсынысты қолдау мақсатында 1/5000 масштабтағы ортофото карталарын жасау туралы ақпараттар ұсынылатын болады.

Түйінді сөздер: Ауыл шаруашылығы жерлері, шаруалардың тіркеу жүйелері, географиялық ақпараттық жүйелер, жер телімін сәйкестендіру жүйелері, ортофото-карталар.

РЕЗЮМЕ

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ЗНАЧЕНИЕ СЕЛЬСКОХОЗЯЙСТВЕННОГО РАЗВИТИЯ И ИНФРАСТРУКТУРНЫХ ПРОЕКТОВ

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Аннотация. В Турции земли сельскохозяйственного назначения используются все меньше ввиду неправильного их использования. Таким образом, географические информационные системы стали обязательным инструментом для определения сельхозугодий по всей стране и создания системы регистрации фермеров. Они нацелены создать "интегрированную систему управления и контроля" (IACS) и будет разработана система сельскохозяйственной поддержки и управления. Таким образом, фермеры будут иметь фактические показатели, фермерам будут гарантированы платежи, они будут получать необходимую поддержку для сельскохозяйственного производства. Идентификация сельскохозяйственных земель в странах Европейского Союза классифицируется как один из компонентов "Системы идентификации земельных участков" (LPIS). Система LPIS является важным компонентом для наземных служб поддержки (субсидий) контроля и управления (прямая поддержка, стимулирование производства в менее поддерживаемых областях, фермеры должны получать руководства по развитию таких секторов как органическое земледелие, вырубка лесов, предотвращение загрязнения, и т.д.). В этом исследовании, будет предоставлена информация о стандартах создания 1/5000 масштабных ортофото карт с целью поддержания предложения о создании системы LPIS по всей Турции.

Ключевые слова: Сельскохозяйственная земля, фермерские системы регистрации, географические информационные системы, системы идентификации земельного участка, ортофото-карты.