DEVELOPING OF LAND INFORMATION SYSTEM FOR SUPPORTING AND MANAGING OF AGRICULTURAL SECTOR IN VITI MUNICIPALITY

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ABSTRACT

The purpose of this paper is to present: the role of LIS technology and its application in agriculture, the presentation of data and farming information through LIS, land management and their use by using **LIS** technology, the use of LIS applications to achieve the objectives, the use of GIS applications for creating maps of cultures of land, classes of land, the use of land and the land cover also we are going to design and construction a geographical database.
In this paper we have created database with GIS with existing data in the context of benefit of maps for cultures, classes, suitability. Aim of the paper is seen as such base to helps agriculture.

Keywords: LIS, GIS,Agriculture,Viti Municipality, ArcGIS, farmers,land, map.

1. INTRODUCTION

Soil survey data and Geographical Information Systems (GIS) are important tools in land use planning [Coleman, A. and Galbraith, J., 2000]. The soil based-GIS made the decision-making process more accurate, automated, and efficient. It is a dynamic product that serves to convert verbal communication into visual communication while preventing information overload [Kukaj, Y. et al., 2014]. Traditional land-use planning involved many different sources of printed information such as soil survey manuals, topographic maps, aerial photographs, vegetation surveys, flood maps,

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hydrology maps, and property surveys to name a few [Coleman, A. and Galbraith, J., 2000].

GIS has a significant role to play in agriculture at several scales from local to global [Coleman, A. and Galbraith, J., 2000]. The development of several new digital databases at regional and larger scales, the advent of new continuous data collection and remote sensing techniques at the farm scale, and the continued migration of GIS to more and more powerful desktop computers have caused an explosive growth in the number and variety of agricultural applications during the past few years [Willson, J.]. One of the misconceptions about GIS is that it is only a map-making tool [Maliqi, E. et al., 2015]. The most important applications are probably those connected with precision or site specific farming, which aims to direct the application of seed, fertilizer, pesticide, and water within fields in ways that optimize farm returns and minimize chemical inputs and environmental hazards [Willson, J.]. The establishment of this GIS will integrate diverse geospatial data, such as topographic, hydro graphic, land and soil suitability, street network, vegetation cover, land use and others in GIS database and their joint analysis, increases the quantity as well as quality of derived information [Dushaj, L. et al., 2009]. The use of technologies such as GIS will also enable us the analysis of trends, such as trends in overgrazing, land degradation, land use change, and urbanization of agriculture land. This will be a powerful tool to get solution of problems and building a land use planning in commune level [Dushaj, L. et al., 2009].

A Land Information System (**LIS**) is a Geographic Information System for cadastral and land-use mapping, typically consisting of an accurate, current and reliable land record cadastre and associated attributes. A LIS comprises spatial data that represent the legal boundaries of land tenure and provides a vital base layer for integration into other spatial information systems or as a standalone solution that permits users to retrieve, create, update, store, view, analyze and publish land information [www.compass.ie].

Map-based Land Information Systems deliver real benefits to a range of organizations [www.compass.ie]:

- for land owners – including estate managers, agro business cooperatives, and government authorities,
- for natural resource use companies – including forestry, extraction and wind energy companies,
- for local and central government requiring accurate land and building use inventories.

A good LIS system is it system which supports the resolution to the following additional questions:

- Agricultural monitoring,
- Disaster monitoring,

- Water resources monitoring,
- Modelling data from many sources,
- Share data between stakeholders.

2. CASE OF STUDY

Territory of Vita municiplaty consists of 43 settlements, spread in a surface area of 297 km^2. Viti municipality lies in the southeastern part of Kosovo, crossed by the river "Morava Binçës" between the triangle Gjilan northeast, on south Kacanik and Ferizaj on west. Land area of Viti Municipality is 29,700 ha [Ferati, B., 2014]. From all agricultural area out of 17,962 is farmed agricultural land, where 13,190 ha are private and 250 ha are State owned. From all this area in general, only 175 ha are fallow. Area of arable land per capita is estimated to be around 0.25 ha, while the size of land per family on average is estimated around 1.8 ha, per family. Below is the graph that shows the value of the property expressed in hectares [Ferati, B., 2014].

Figure 1. Geography position of Viti

3. METHODOLOGY

3.1. Geodatabase

A database is collection of data organized in a structured way, so that; information can be retrieved quickly and reliably [Ullah, K., 2014]. The invention ofInformation Technology has led the database to be used in a management system, which is called Database Management System

(DBMS) [Ullah, K., 2014]. DBMS is a set of programs, in other words software systems that enables following actions to be performed in a database - stores and extracts information from a database, Modification of database by adding, editing, deleting and sorting of data [Ullah, K., 2014]. Modern GIS uses Spatial Database to integrate the geometry or features data with other types of data, spatial database facilitates storing and querying data that is related to objects in space, including points, lines and polygons [Ullah, K., 2014]. The collection of data that have common features and attributes are placed within a separate group [Ferati, B., 2014]. Depending on the geometry of data the sub organization is divided into: polygon, line and point. Attributes of the data in each group of data have three different areas: automatic software attributes, attributes for data connection with key and attributes that describe the object [Ferati, B., 2014]. At ArcGIS 10.1 software as we define the coordinate system (KOSOVAREF01) we have called the initial data and then we create the database by using the possibilities of this software in order to benefit graphical data (maps) for: culture, class, cover and suitability of land.

We created the graphical data in ArcGIS within a geodatabase with intention that this geodatabase to content graphical data for: the cultures of lands, classes of lands, following agricultural objects, network communications, hydrography, settlements, public buildings, educational facilities, religious buildings, land suitability, and borders. All these layers are represented by a geodatabase followed with "Feature Class". Paste is calculated based on scale of mapping on the dimensions of the map and the territory that is developed where most appropriate value reduction factor for mapping emerged: Scale 1: 80000. In the end we have created some maps and they have view as Figure 2 and maps content: the coordinate system, the legend, symbols, title, north direction, etc. These maps can be used for various agricultural needs for the territory that is presented. Elements that will be presented in maps this paper will be: cultures, classes, agricultural accompanying facilities, network communications, hydrography, settlements, religious facilities, suitability and borders. The mathematical model for maps is the model in follow table:

Table 1. Mathematical model of maps.

Coordinative system	Datum	Projection	Scale
KosovaRef01	ETRS 89	Transverse Mercator	1:80000

3.2. Source data

Basic data of achieving this paper are obtained from the relevant institutions of Republic of Kosovo. The table below shows data obtained, type of data, format of data and source data.

Table 2. Source data

Data	Format	Source data
Ortophoto	Ecw	Kosovo Cadastral Agency
Cadastral maps	Tiff	Viti Municipality
Roads	Vector	Viti Municipality
Boundary of Cadastral zones and parcels	Vector and Raster	Viti Municipality
The data for cultures, classes,use and coverage of land	Text and Image	Kosovo Satistical Agency
The data for hydrography, settlements and traffic	Text and Image	Viti Municipality

3.3. The methodology used in the research

In order to achieve desire results we have inserted in ArcGIS different data as needed.Creation of graphical presentation – mapshas been divided into several layersas you can see in Chapter 4. Graphical data aredividend into different layers which are included within the maps in Chapter 4. ArcGIS options makes possible the achieving outcomes. In this paperare used many options of ArcGIS for managing spatial dataincluding using the spatial analysis options or the creation of buffer zones.

The following figures show visually passing of these data through the various processes requiredand thematic layers that have appeared with GIS.

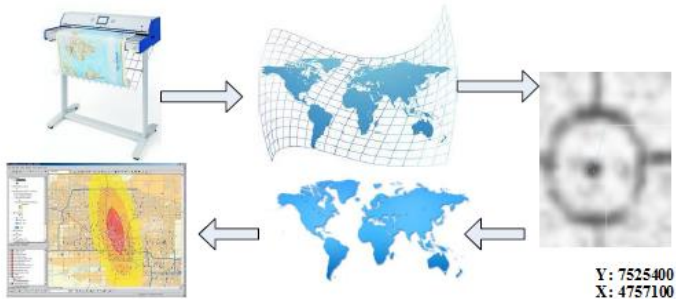

Figure 2. From analog to digital format

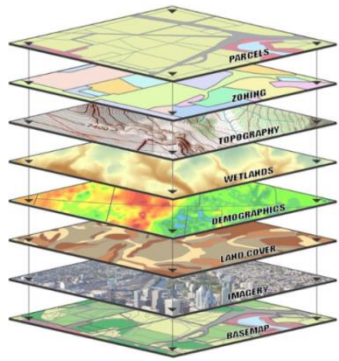

Figure 3. Presentation of data in layers.

4. RESULTS AND DISCUSSIONS

Based in the research we can say that overall about 60% of the population in Viti municipality work in agriculture from the total area of about 61% is agricultural land while the rest is used for other purposes.
Based on the analysis know Viti municipality has considerable fund of agricultural land, forest and pastures that represent significant economic potential the municipality the figure below.

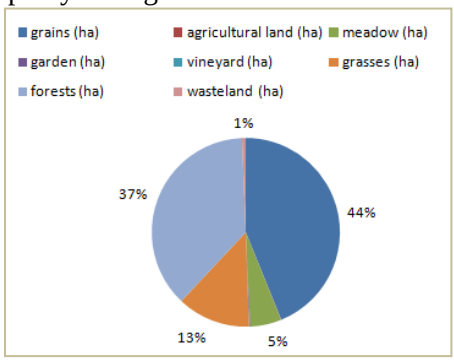

Figure 4. Agricultural crops by areas (ha)

The entire territory of Viti municipalitycategorized according to the degree of fertility expressed on the surface ranging as we see in Figure 3.

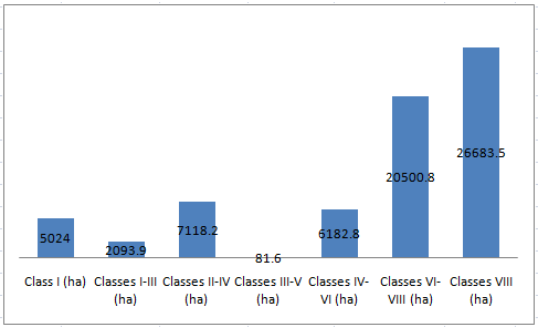

Figure 5. The area of land by fertility classes (ha)

It should be mentioned that in 1982 Viti land consolidation is applied (regulation and collection of land) in some villages of the municipality generally ten cadastral zones and unlike other towns in Kosovo only in Viti municipality was developed consolidation without irrigation system and also in areas that is applied has all remaining without registering Immovable Property Right Register (IPRR) and it is worth mentioning that a considerable part of the municipality has remained free land consolidation completed. The map below shows the land consolidation in Viti municipality and most of the municipality is out mass land consolidation.

Analysis of data is done for a relatively long time initially did the data analysis of the data after digitization, these data we processed in the ArcGIS software and then we won the paper maps that are seen in Figure 6-10.

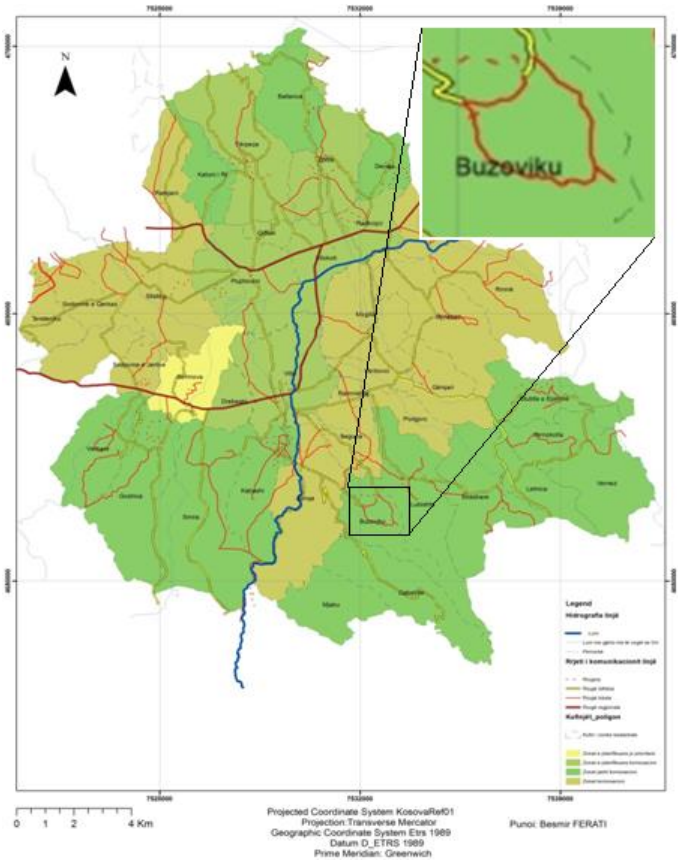

Figure 6. Map of land consolidation

By analyses and the followed methodology, in Figure 6 we have showed map of Viti municipality according cultures and in this map we can see that appeared some layers as boundary of cadastral zone, all categories of roads, all water sources also are appeared possible cultures like: farming, grain, grass, arboriculture, forests and construction land. From the map we can see that the biggest area of municipality is covered with grains.

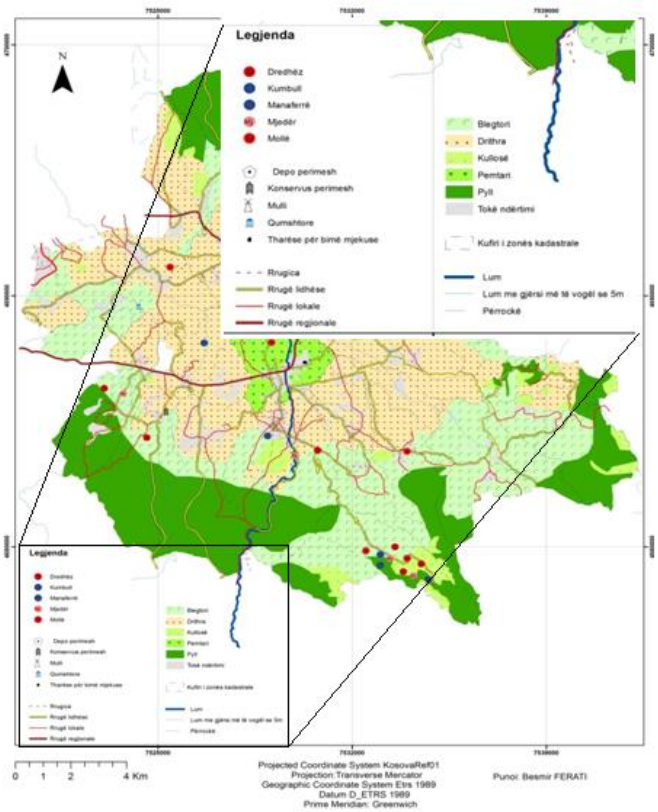

Figure 7. Map of culture

In Figure 7 are appeared classes of land for Viti municipality, from 1 to 7 class, also are appeared road and water sources for Viti municipality. So whole area of Viti municipality is appeared according data that we have used and followed methodology of the paper.

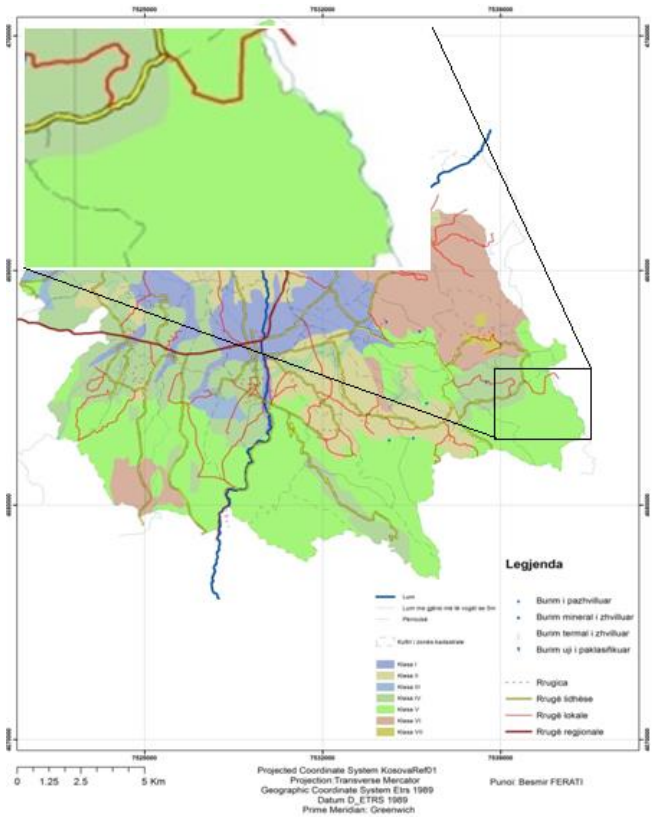

Figure 8. Map of classes

Also in Figure 8 we have created some layers that includes: roads, water sources and land cover and if we look carefully it seems that the biggest areas of Viti municipality is agricultural zone.

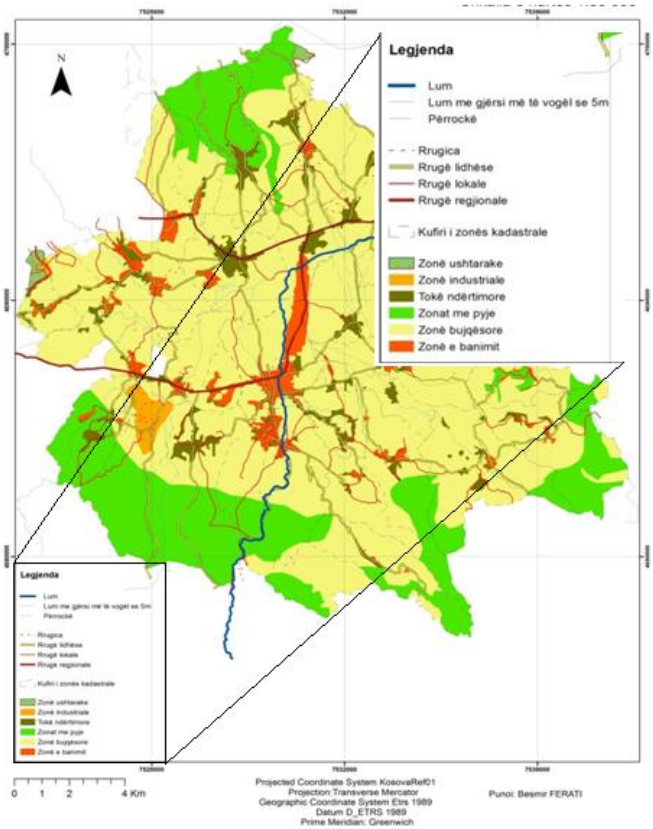

Figure 9. Coverages map

In Figure 9 is appeared suitability of land and from this map we may conclude that area of municipality according suitability is the biggest percentage with land "very good" and "average", and we can say the land of Viti is suitable for agricultural activities. Creation of coverage map for Viti municipality is important for urban planning because it represents the clear state of the municipality.

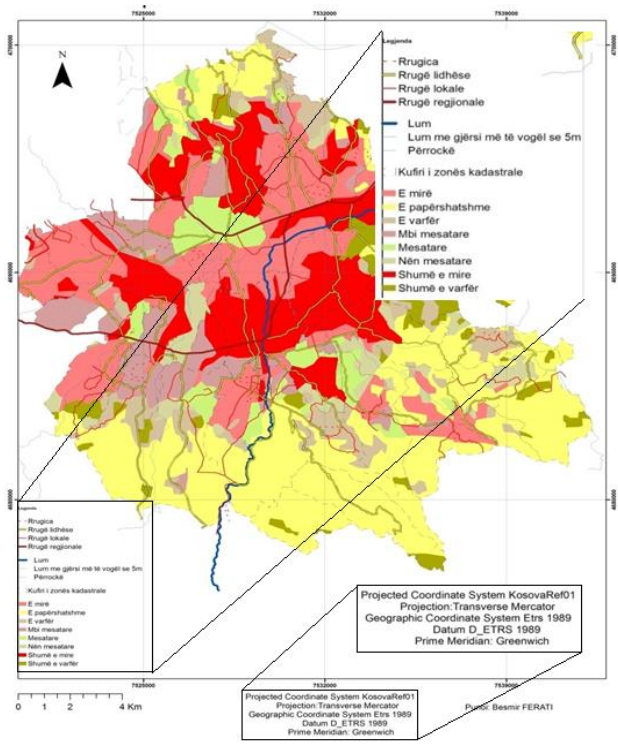

Figure 10. Suitability map

The farmers with the help of LIS, they use and analyze all the data that have been gathered in the pre-planting phase and receive results that have to do more with the control of the land, if it is risked from any bacteria or other harmful risks that can affect the production. Then for harvesting, farmers use a special technique called "monitor the production" used to analyze the overall data. From that it is understood if the agricultural seasonal plan was functioning. These data are then entered into the LIS by helping farmers to reach the desired maps and information.

One such example is shown in the figure below (Figure 11).

Figure 11. LIS and its role in agriculture

In Figure 11 see a farmer who conducts field according to a plan of action coordinated with a database and graphical part to prepare the land, it is resulting in productive agricultural crops.
We are illustrate an example It will be served to farmers this paper of ours with graphical and textual data that have Farmers can manage their work in the field in this way, example if at different times irrigate agricultural crops they have the opportunity with the data referred in order to know which areas are irrigated and which are not for example if you want to know for certain surface what kind of culture that comprises and also create different maps after you presented to stakeholders.

5. CONCLUSIONS

LIS is important in the management of land and this technology is important in agriculture.
During the discussion on this topic we have seen how much important the system of land management is and the significance of what else this system can do in Agriculture. Seeing the importance of this, we have created several maps; as the map of cultures of land, map of classes of land, map of land use and map of land cover and with the help of these maps enabled us a rational, economical and a right way of use of land.
The importance of this system is not only that what information we may have, this system today is spreading its relevance also as much rational and economical use of land. Implementation of this system has made it possible nowadays that all data about property to be digitized, and this theme is carried out in this way where firstly the data are analyzed than processed and finally digitized and today we have agricultural spatial data for municipality of Viti.
The decisions were made with a more accurate knowledge base and were more efficient thanks to the power of the LIS.
In this paper explained Geographic Information System (GIS), it is application in agriculture, the importance of this system, data analysis, ta processing, and finally reached the permission result of this application. By establishing a database for this municipality we have managed to see quite clearly all agricultural land in this municipality as cultures, classes, compatibility, usability, etc.
Through LIS technology, we see all agriculture of the territory of the municipality a form which we will define us what we want to see and GIS technology enables us to have only a few clicks. Opportunity to enriched LIS

for the municipality of Viti is undisputed because we already we createda sustainable basis.
Opportunity management of agricultural lands in Viti is simple since in we created various data which are easily manipulated form and these data have settled down in database and different layers through GIS.
Developing of the geo data of Viti Municipality in this form is a sustainable resource for investors to have a clear picture on the lands of municipality knowing the different data for different cultures, classes, suitability, land consolidation, irrigation systems, roads, etc.
We see an ugly phenomenon as is conversion of some agricultural land into construction land, and this is destructive phenomenon.
Finally municipality of Viti urgently need to take precautions against this destructive phenomenon.

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