The Establishing of Geospatial Database for Agricultural Lands of Islamic WAQF In Iraq: Case Study Babil Province

Ali Husain Hashim 1, Prof. Dr. Oday Zakariya Jasim 1, Prof. Dr. Mohammed Mejbel Salih 2

1 University of Technology, Civil Engineering Department, Baghdad, Iraq
2 University of Technology, Laser and Optoelectronics Engineering Department, Baghdad, Iraq

Corresponding Author Email: bce.19.76@grad.uotechnology.edu.iq

ABSTRACT. In numerous countries, one of the most significant pieces of background records is a religious endowment that usually called (WAQF), which have a cultural, and economic value. For instance, in Iraq, religious endowments comprise a large number of dispersed real estates and lands usually required effective administration methods. Agricultural lands that belonged to religious endowments lack of sufficient systems, which are combined statistical and spatial information in terms of spatial monitoring and informatics updating such as ownership and existing condition. Recently, geospatial techniques such as GIS showed a feasibility in the management of information belonged to lands management. Therefore, in this study we proposed a method based on GIS technology for the management of lands of Islamic endowments in Babil province, Iraq. The proposed methodology included the integration between field works using GPS equipment and Geospatial database. The developed database is considered as the first geodatabase related to the agricultural lands of the religious endowment in Iraq included almost all coordinates and specific details for each piece of agricultural lands that owned by the endowment. Furthermore, the output geodatabase is a flexible database included various features like query, search, and statistical computation.

Keywords: GIS, Lands, Geodatabase, endowments, GPS, relationship class

1. Introduction
The general definition of endowments or (WAQF) is the permanent commitment of movable or immovable property for religious, pious, or philanthropic purposes. On the other hand, the basic concept of WAQF depends on the charity. Which refers to the Muslim endowment of immovable and mobile goods for the benefit of the poor and needy, as well as the upkeep of properties dedicated to graves, mosques, shrines, orphans [1]. In Iraq's religious activities, Islamic endowments play a dominant role. There are two types of Islamic endowments. The first are religious sites such as shrines, mosques, and churches. Second, lands and real estate [2]. Mosques and holy shrines are common locations, which enable Islamic leaders to spread their opinions and establish themselves in religious sectors. In addition, they have business facilities and real estate, as well as benefactors and pilgrims who give to them. Prior to 2003, the Ministry of Endowments and Religious Affairs (MERA) supervised all Iraq's Islamic endowments, but after 2003, official policy embraced a new paradigm that acknowledged religious organizations' autonomy and freedom to function freely in the public arena. Among the assets are buildings, agricultural lands, and commercial sites in Iraqi which are affiliated with a religious entity, like the Shiite endowment. Recently, the administration of these properties like agricultural lands has been confronted with a number of problems, including the complexity of document preservation, forgery, and tampering with the real estate registration. Furthermore, decision-
makers lacked adequate tools for monitoring and managing Islamic endowment performance. As a result, the proposed study predicts a shift in managing from article to electronic, as either method provides significant benefits in terms of lowering hard work time and reducing overall adulteration and deception in the land management system, as new property records are digital.

2. Related works
Several studies based on various techniques have been conducted for land management operations. The creation of records on assets, their proprietors, and their current state, the ownership issues and rental values have attracted land management agencies. For example, in an attempt to uphold China's geographic and climatic knowledge, Jiyuan and colleagues et al., 2002 [4] established a geodatabase for land use/land cover at national level. On the other hand, Poursaeed et al., 2018 [5] created a method for estimating the amount of luxury in real properties using a database system comprised of photographs and data. Because possessions are so important in the productivity expansion of several countries, including Iraq, an Islamic assets database is among the most important databases. Various research have been developed in order to regulate and manage real estate related Islamic endowment. For example, a study conducted in terms of the evaluation of business serves rental properties in Egyptian, Pioppi et al 2004 [6] examined at the link among assets and the Egyptian economy by analyzing information using scientific calculations. Furthermore, Sanusi et al., 2015 [7] examined the usage of zakat Payment in Muslim nations to develop a technique for evaluating assets in Malaysian. In another study, Ahmad et al. 2012 [8] they were aimed for using information technology to develop a system to administer and govern (WAQF) residential properties in Bangladesh. In a study conducted in Iraq, Hasan et al., 2019 [9] analyzed the Muslim assets in Iraq using data and operational procedures. While, Ali et al., 2012 [1] proposed a geodatabase for real estate’s utilizing endowments records. The research findings previously get a lot of weaknesses, along with a long necessary to finish and the capacity to handle places or do analyzes. With the development of advanced technology such as geospatial techniques, which already are commonly used in a number of industries [10-16]. According to the literature, there are no geographical control methods for agricultural lands belonged to Islamic endowments. The main contribution of this study is to present a geospatial database for agricultural lands belonged to Islamic endowments in Iraq considering Babil governorate as a case study.

3. Methodology
3.1 Study area
That research was done in the rural area of Hilla district, which is part of the Babil Governorate. Babil Governorate is located in the heart of Iraq, south of Baghdad, geographically found between 43° 58' 10" and 44° 38' 35" east of Greenwich and 32° 7' 25" and 33° 0' 35" north of the Equator. Hillah city is the administrative headquarters of Babil province and is located 89 kilometers south of Baghdad. In addition, it is located in zone (38 N) (UTM). The entire area is 5119 km2, and the population in 2018 was estimated to be 2,065,042. Babil Province is divided into five districts (Hillah, Mahaweel, Musaiab, Hashimiya, and al Hamza Al-Gharbi). Provinces of Wassit, Najaf, Anbar, Qadissiya, and Kerbala are all bordered by Babil. In Babil province, the Euphrates River is divided into Hilla and Hindiyah to the south of Musayib city. Many farms and orchards in Babil governorate were served by a large irrigation network. Typically, the climate in Babylon province is dry, with summer temperatures exceeding 40°C. Precipitation, on the other hand, is limited between April and November. Economically, Agriculture is considered one of the most important resources in Babylon province. Figure 1 shows the geographic location of Babil province and the agricultural lands belonged to Shiite endowment in Babil province.
3.2 The Overall Methodology

The suggested methodology is described in terms of the study area's location, data collection, data transformation, constructing a geospatial database, modeling procedure, and data validation with verification in this study. The suggested approach is divided into two components; the first is the creation of a geospatial database for Islamic endowments in Iraq's Babil region. The second section contains sophisticated analysis and modeling based on Islamic endowment's geographical geodatabase, such as real estate valuation analysis in terms of physical conditions and geographic regions. There are numerous stages in each component. The spatial dataset was generated in the first phase based on a field survey utilizing a combination of questionnaire approaches and geospatial technologies such as GIS and GPS included the building of the geospatial database and create a relationship with digital data resulted from the field survey based on relationship class tools. The geospatial database was specially founded for agricultural lands that belong to a religious institution in Iraq (Shiite endowment in Babil province). Figure 2 shows the overall methodology. This geodatabase was then connected to the recommended forms using ArcGIS software and the relationship class method. In the final step, data is extracted from the intended Geo-database and customized reports are created in response to stakeholder requirements. The Proposed geodatabase is highlighted in figure 3.
Figure 2. The Overall methodology.

Figure 3. The proposed geodatabase of agricultural lands.
3.3 The field survey
The data collection was conducted based on field works. Where the field survey was performed within the study area, during November 2020 by covering all agricultural lands related to Shiite endowment in Babylon governorate. The field survey work was mainly performed depending on multiple steps; the first step included the observation of the spatial location for each agricultural land that belongs to Shiite endowment based on the GPS. And then the collected data is transferred to two types of forms. A first one contains information about lands, including the land Identity, title, quantity, quality, area. While the second contains data particular to every unit inside a small land deal, such as the price of the unit (contractor’s name, contract’s number, contract’s date, the duration of contract, rental values, etc.). The final step is data input, which includes transforming materials to electronic files using a Microsoft excel application to generate the proper information for geodatabase input data.

3.4 GIS works
This study presents the establishing of geodatabase for agricultural lands of Shiite endowment in Babil governorate in a GIS environment as a (polygon) that so-called polygon feature class by utilizing a specific software such as ArcGIS depending on the collected coordinates of agricultural lands. Moreover, we developed a unique field for the data joining issue, which mainly included similar data between geodatabase and forms collected from fields. This kind of fields called (join code). And then we applied a special kind of techniques called relationship class technique to relate geographic objects represent agricultural lands with multiple forms included detailed information of agricultural lands of Islamic endowments in Babil governorate. In general, the data where related geodatabase represents the locations of agricultural lands with forms based on (one-many) relationship. This can produce a database included both spatial and text data. Moreover, it can relate one location with multiple information.

The cardinality categories are depicted in Figure 4. A unique value obtained in both objects' key fields links each item in the origin to each object in the destination. Because all of those documents have the same parcel ID, parcel 789, for example, joins permits 2 and 3. See Figure 5

![Cardinality Types](image)

**Figure 4.** The cardinality types.

Origin class with a number of items in the destination class. There are three cardinalities in a relationship:
1. One-to-one: Only one origin object and one delivery object can be connected. A parcel, for example, can only have one legal description. This column also includes many-to-one in ArcGIS. A set of parcels with the same legal description is referred to as a many-to-one link.
2. One-to-many relationships: A single source item might have several destinations. A parcel, for example, may have a lot of constructions on it. The origin class must be on one side and the destination class on the other in a one-to-many connection.
3. Many-to-many: A single destination object can have many origin objects, and a single origin object can have numerous destination objects. A single property, for example, a single property can have numerous users, but a single owner can possess multiple properties. Relationship cardinalities are demonstrated.
4. RESULTS AND DISCUSSION

The developed database is considered as the first geodatabase related to the agricultural lands of the religious endowment in Iraq included almost all coordinates and specific details for each piece of agricultural lands that owned by the endowment. Furthermore, the output geodatabase is a flexible database included various features like query, search, and statistical computation. Users may also engage with information in a variety of ways, including spatially and statistically. We could, for this, see all of the facts about each real estate property, such as (land use, tenant names, area, etc.). Each land has been connected to a range of tenant information in the proposed geodatabase; we can rapidly reach to the renter data if we need it. Analyze it using ArcGIS software (Arc Map). An agricultural land, for example, might be made up of small lands. All units can be linked to a single piece of land using the relationship class technique. Figure 6 shows a computerized representation of information and the link between a single land and numerous information belonged to this land. Geographically, the Shiite endowment's real holdings in Babylon province contained 40 land in Babil governorate, according to the geo-database. We may extract a variety of statistical information about geographical places, such as the name of tenants, type of the agricultural lands. For example, the agricultural lands belonged to the Shiite endowment in Babil province are classified for several types (agricultural lands, orchards, abandoned, informal residential, cemetery). Another output is the debt value, according to the result the highest debt value was 10.3 million IQD.

Table 1: sample of the created geodatabase

| sequence | Taxpayers | Parcel no. | division name | area | Property type | WAQF type | Tenant name | income 2003 |
|----------|-----------|------------|---------------|------|---------------|-----------|-------------|-------------|
| 1853     | 94/9      | 2/3 G      | Imam sharefa 32 | 29.16 | Illegal booth | Correct   | Abbas Ibrahim Hussein Falah | 0           |
| 1847     | 88/9      | 2/3 G      | Imam sharefa 32 | 80   | Illegal booth | Correct   | Hussein Falah Hussein Falah | 0           |
| 1851     | 92/9      | 2/3 G      | Imam sharefa 32 | 24   | Illegal booth | Correct   | Hussein Falah Hussein Falah | 0           |
| 1852     | 93/9      | 2/3 G      | Imam sharefa 32 | 24   | Illegal booth | Correct   | Hussein Falah Ali Qassim    | 0           |
| 1845     | 86/9      | 2/3 G      | Imam sharefa 32 | 12   | Illegal booth | Correct   | Ali Qassim Haider Abd        | 0           |
| 1846     | 87/9      | 2/3 G      | Imam sharefa 32 | 12   | Illegal booth | Correct   | Haider Abd                  | 0           |
| 1848     | 89/9      | 2/3 G      | Imam sharefa 32 | 12   | Illegal booth | Correct   | Haider Abd                  | 0           |
| 1849     | 90/9      | 2/3 G      | Imam sharefa 32 | 12   | Illegal booth | Correct   | Haider Abd                  | 0           |
| 1850     | 91/9      | 2/3 G      | Imam sharefa 32 | 12   | Illegal booth | Correct   | Haider Abd                  | 0           |
| 1854     | 95/9      | 2/3 G      | Imam sharefa 32 | 12   | Illegal booth | Correct   | Ali Qassim                   | 0           |
| No.  | Code | Type | Name            | Correct (Type) | Name            | Correct (Type) | Score |
|------|------|------|-----------------|----------------|-----------------|----------------|-------|
| 1855 | 96/9 | 2/3 G| Imam sharefa 32 | Illegal booth  | Abbas Ibrahim   | 0              |
| 1856 | 97/9 | 2/3 G| Imam sharefa 32 | Illegal booth  | Abbas Ibrahim   | 0              |
| 1435 | 7/143| 11 G | Mahanawiya shikaer 11 | Agricultural farm | Correct | Hadi Sabbar | 3.75 |
| 1436 | 7/144| 11 G | Mahanawiya shikaer 11 | Agricultural farm | Correct | Hadi Sabbar | 3.75 |
| 1233 | 6/234| 6 G  | Shwemli and bazil 8 | Agricultural farm | Correct | Alwan Gadef Razak saleh | 30 |
| 711  | 4/82 | 119  | Husseiniya 41   | Orchard        | Correct         | Hadi Sabbar   | 26.5 |
| 812  | 4/175| 96   | Hussein Gharbi 32 | Orchard        | Correct         | Ali musa      | 1     |
| 1246 | 6/257| 30 G | Shakha 42       | Orchard        | Correct         | Hamid Khalil Saif Raad | 2.25 |
| 691  | 4/63 | /7 G | Dabha 4255      | Orchard        | Correct         | Zuhair Nah Nahi | 4    |
| 323  | 2/104| 6    | Barthawel 52    | Orchard        | Correct         | Hadi Sabbar   | 1.5   |
| 595  | 3/170| 1    | Alia and Batra 8 | Orchard        | Correct         | Hadi Sabbar   | 1.5   |
| 598  | 3/170| 1    | Alia and Batra 8 | Orchard        | Correct         | Hadi Sabbar   | 1.5   |
| 3    | 1/3  | 23   | Hussenia 13     | Agricultural farm | Correct | Abduljalil ali | 5.5   |
| 4    | 1/4  | 24   | Hussenia 13     | Orchard        | Correct         | Laith abduljalil | 15.5 |
| 20   | 1/20 | 86   | Hussenia 13     | Orchard        | Correct         | Abduljalil ali | 12    |
| 919  | 5/87 | 10   | South Jomjoma 14| Orchard        | Correct         | Hassan abd | 21.625 |
| 441  | 3/21 | 53G  | Mohamad Ibn alhassan 23 | Agricultural farm | Correct | Sami Hadi | 10 |

**Figure 6.** The Objects relationship process.
According to the proposed geodatabase, users can see the spatial variation of the land types of the agricultural lands belonged to the belonged to Shiite endowment in Babil province, for example figure 7 shows the land types within the study area, almost all lands were used for agricultural requirements while other were used for another requirement such as commercial, residential, and educational. Furthermore, we can produce thematic maps related to any information related to the agricultural lands of endowment. Figure 8 as an example for a map showed the number of illegal buildings within agricultural lands, the map showed that the number of illegal buildings were ranged from 1-9 buildings while other lands didn’t include any illegal building, therefore based on this geodatabase, decision makers can monitor and make a decision related to their agricultural lands. The proposed geodatabase can facilitate the work of employers in the Shiite endowment office.

Figure 7. Land types within the study area.

Figure 8. The number of illegal buildings within agricultural lands.
5. CONCLUSION

In every country on the world, religious endowment is among the most major sources of historical, cultural, and economic value. In maximize information administration and real-time recording properties belonging to the Shiite endowment of Babil province, a geodatabase has been proposed for the better administration of religious endowment lands (non-transferable assets). The recommended solution created an a spanning that is linked for Shia endowment lands and structures by using one-to-many cardinality and a relation class approach to combine Data model was combined with field data in two different formats. In general, the output geodatabase is recognized as a one-of-a-kind geo-database for a Muslim endowment in Iraq, as it offers addresses as well as comprehensive information about each tract of land owned by the endowment. In other words, this geo-database is the first geo-database built utilizing geospatial techniques for the Iraqi Office of the Endowment. In addition, the resulting geo-database includes features like query, search, and statistical computation. Furthermore, users may interact with data both geographically and statistically with ease. As a result, we proposed geographical data bases as a key method for monitoring and controlling Islamic endowment lands in Iraq. Future development can be added based on the web-based systems and real time monitoring.

Acknowledgments

Authors wish to show their appreciation for Shiite endowment office in Iraq for the logistic support.

REFERENCES

[1] Hashim, A.H., Jasim, O.Z. and Salih, M.M., 2021, April. Developing and establishing a geospatial database of the religious endowments in Hilla, Iraq. In IOP Conference Series: Earth and Environmental Science (Vol. 754, No. 1, p. 012026). IOP Publishing.

[2] Hasan, H., 2019. Religious Authority and the Politics of Islamic Endowments in Iraq. Carnegie Endowment for International Peace.

[3] Jiyuan, L., Mingliang, L., Xiangzheng, D., Dafang, Z., Zengxiang, Z. and Di, L., 2002. The land use and land cover change database and its relative studies in China. Journal of Geographical Sciences, 12(3), pp.275-282.

[4] Poursaeed, O., Matera, T. and Belongie, S., 2018. Vision-based real estate price estimation. Machine Vision and Applications, 29(4), pp.667-676.

[5] Pioppi, D., 2004. From religious charity to the welfare state and back. The case of Islamic endowments (waqfs) revival in Egypt.

[6] Sanusi, S. and Shafiai, M.H.M., 2015. The management of cash waqf: toward socio-economic development of Muslims in Malaysia. Jurnal Pengurusan (UKM Journal of Management), 43.

[7] Ahmad, M.M. and Safiullah, M., 2012. Management of waqf estates in Bangladesh: Towards a sustainable policy formulation. Waqf laws and management (with special reference to Malaysia), pp.229-262.

[8] Jasim, O.Z., Hassoon, K.I. and Sadiqe, N.E., 2019. Mapping LCLU Using Python Scripting. Engineering and Technology Journal, 37(4A), pp.140-147.

[9] Mohammed, Z. T., Al-Anbari, R. H., & Jasim, O. Z. (1970). Air Temperature Modelling Depended on Remote Sensing Techniques. Engineering and Technology Journal, 38(3), 352-360.

[10] Jasim, O.Z., 2019. Using of machines learning in extraction of urban roads from DEM of LIDAR data: Case study at Baghdad expressways, Iraq. Periodicals of Engineering and Natural Sciences (PEN), 7(4), pp.1710-1721.
[11] Hashim, A.H., Jasim, O.Z. and Salih, M.M., 2021, April. Developing and establishing a geospatial database of the religious endowments in Hilla, Iraq. In IOP Conference Series: Earth and Environmental Science (Vol. 754, No. 1, p. 012026). IOP Publishing.

[12] Jasim, O., Ali, A.R.B. and Hamed, N.H., 2020, February. Urban expansion of Baghdad city and its impact on the formation of Thermal Island based upon Multi-Temporal Analysis of satellite images. In IOP Conference Series: Materials Science and Engineering (Vol. 737, No. 1, p. 012215). IOP Publishing.

[13] Jasim, O., Hamed, N. and Abdulgabar, T., 2018. Change detection and building spatial geodatabase for Iraqi marshes. In MATEC Web of Conferences (Vol. 162, p. 03021). EDP Sciences.

[14] Hilal, A.H., Jasim, O.Z. and Ismael, H.S., 2021, August. Determination of the optimum number and distribution of the ground control points in stereo imaging to achieve precise positions. In Journal of Physics: Conference Series (Vol. 1973, No. 1, p. 012191). IOP Publishing.

[15] Lavanya, K., J Obaid, A., Sumaiya Thaseen, I., Abhishek, K., Saboo, K., Paturkar, R. (2020). Terrain Mapping of LandSat8 Images using MNF and Classifying Soil Properties using Ensemble Modelling. International Journal of Nonlinear Analysis and Applications, 11(Special Issue), 527-541. doi: 10.22075/ijnaa.2020.4750.

[16] M. Küçük and F. Findik, “Selected ecological settlements”, Heritage and Sustainable Development, vol. 2, no. 1, pp. 1-16, Jun. 2020.