Unplanned Urbanization and Agricultural Land Degradation in Baghdad City from 2003 to 2017
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Abstract
Several problems have emerged as a result of urban expansion or the connection of urban areas with rural areas. This process has led to the urbanization of rural areas, and to have overlapping edges and margins of areas, which were outside the basic design of the city. Accordingly, the present research assumes that the accelerating growth of Baghdad population has contributed significantly to the process of unplanned urbanization. Thus, the study aims to examine the factors that have led to an increase of urban sprawl at the expense of the agricultural land. The study has thus adopted the descriptive, analytical, and historical approaches relying on the simple linear regression method to predict the phenomenon of urban expansion and its impact on the agricultural land. It has also included illustrative maps used in the preparation of geographic information technology (GIS). The study has concluded that the events of Iraq after 2003, the absence of legal rules, weak legislation, and the successive large immigrations from the countryside to the city have all led directly to a great increase in the process of housing expansion at the expense of agricultural lands. The research recommended the necessity of finding final solutions to the problem of encroachment on agricultural lands, establishing new and low-cost urban housing with full facilities and services, simplifying the procedures of building licensing, and reducing fees.

Keywords: Basic plan, housing factor, Land use, Legislation, Urban expansion, Urban Planning

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المستخلص
برزت مشكلات عدة تنتهي إلى توسع الحضري غير المخطط له بفضل تدفق الحضر والتحضر غير المخطط له وتهور الأراضي الزراعية في مدينة بغداد لمدة من 2003 إلى 2017.

Keywords: التحضر غير المخطط له، وتهور الأراضي الزراعية، مدينة بغداد، توسع الحضري غير المخطط له

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المفتاحية: التحضر غير المخطط له وتهور الأراضي الزراعية، توسع الحضري غير المخطط له، مدينة بغداد، التخطيط الحضري
1. Introduction

Studying the use of agricultural lands in the city of Baghdad, and understanding the urban expansion is an essential and important requirement for preserving the city. It further helps to formulate appropriate policies to supply the best resources, and increase the production to counter the rapid growth of population. Planners and agricultural policy makers seek to prepare appropriate plans and developmental programs to meet the needs of the city residents and the development of natural resources to reduce the differences between its parts. The increasing need for new lands for housing purposes is a major problem in front of the shortfall in the areas of agricultural lands. Such an increase leads to change the land from being agricultural to residential. This case accompanies the wheel of development, and raises the need of new lands for housing and recreation purposes. Accordingly, these agricultural areas will lose large parts for the calculation of human settlement (Taha, 2017).

What indicates the change in the use of city land is the increase of areas designated for construction within the organizational structure. Such a problematic change has significantly and influentially emerged as a result of the absence of law and legislation authority, who are supposed to be responsible for regulating the construction processes. The process of urban expansion at the expense of agricultural lands (whether those lands surround the city or are located on its outskirts) is a general problem. This problem confronts all countries that are characterized by a rapid increase in population growth due to either births or immigrations from the countryside to the city. The importance of the study is that Baghdad is one of the agricultural areas known for its ancient history, and the use of its agricultural lands is not a coincidence. Besides, important factors are available in this site, among which are the appropriate natural ingredients. Therefore, the study will address the problems faced when using the lands of the city, and try to present the most important and appropriate directions to solve those problems (Abdullah, 2014).

Consequently, the study aims at:

- Examining the urbanization issue in rural areas;
- Investigating the urbanization causes; and
- Exploring the causes of rural areas urbanization.

2. The Theoretical Background

2.1 Urban Expansion

The process of change in land uses comes largely and essentially as a result of: 1. the population increase in response to their main requirements. Such an increase is said to be natural due to the difference between births and deaths; and 2. the abnormal source that is no less important than its predecessor represented by the positive immigration towards the city of Baghdad. Hence, it has become urgent to the population to have housing, transportation, commercial centers, factories, and recreational centers. The availability of these facilities varies according to the need for each of them (Yasser, 2001). The urban expansion is defined as a general multi-faceted concept that refers to the expansion of a city and suburbs. It comes at the expense of the agricultural lands and the surrounding areas. This phenomenon leads to a gradual development of the rural areas adjacent to the big cities, and so to gradual increase of its population density (Al-Tamimi, 2014). The urban expansion is also defined as the continuous increase of the population number, whether according to regular housing or not. This ultimately has led to an increase of the demand for agricultural lands, creating, as a result, an imbalance in the environment (Al-Azzawi, 2012).

2.2 Urban Land Uses

The uses of the land inside the city are one of the foundations of its existence and the continuity of its permanence in life. This is because the city does not exist primarily without function. Al-Hilli (2010) represented the change in a person’s relationship with the land, creating a balance between them. Moreover, the human dependency on earth increases with time due to
population growth. This is because such a dependency represents the spatial dimension that man settles on, and occupies its wealth and resources for the sake of his needs, achieving ultimately luxury which he aims to reach (Seda, 2008).

2.3 Factors Affecting Land Use

There are a set of factors that affect land use as illustrated below:

a) Natural factors that the site draws in the city are among the important factors in the distribution of urban uses. This is because its impact is highlighted in some important sites, according to the surface requirements, building composition, soil, climate, and others (Al-Sammak, 1985).

b) Economic factors, which are represented by the price of the land may have the greatest effect on determining the type of use of that land (Sabri, 1986).

c) The behavior of individuals and their decisions. This is because the use of land inside the city is constantly changing, and the decisions of individuals in this city regarding the uses of land is the result of social processes (Jabber, 2003).

d) The changes taking place in the prevailing investment pattern. That is; the expansion is in the form of far-flung waves abroad, and residential use is one of the most rapid urban uses to change its position due to lack of competitiveness (Taha, 2017).

2.4 Housing Factor

Baghdad has recently witnessed a steady horizontal expansion, as new neighborhoods emerged. Thus, it had a great impact on urbanization, especially in the areas surrounding the city of Baghdad. This expansion occurs in a manner that lacks careful scientific planning. Accordingly, the residents of the new neighborhoods suffer from a shortage of the basic services (Al-Ashab, 1976). The increasing need for new lands for housing purposes is a big problem. It represents a main reason for the shortage of agricultural lands due to the process of converting them into new lands for housing and recreation. Safe and affordable housing is one of the essential necessities for every family. Without proper housing, a person cannot be a productive element in his society. In this context, housing is generally defined as a study of housing units in which people live. It is a study of the housing production market as well as of people's desires and requirements for their housing and problems (Jubara, 2004). In this respect, Brahms added that housing is creating an integrated environment via the process of urbanization and development. For example, housing is not just a shelter, but also a part of the social life in the society as a whole which affects many aspects of development and economic activities. In this context, a team of researcher concluded that housing is an organized and inhabited area of human societies to develop their material and cultural production. It is built within the limits of the capability and has an enjoyable residence which has three functions: productivity, the field of work, and the field of life (Al-Dulaimi, 2009). It is considered vital for the formation of the individual's personality and a factor that affects his psychological, physical and social health.
2.5 The Master Plan

The importance of the master plan arises from the interest in studying the components of the city which are the distribution of land uses and future changes. Thus, master plan is a practical framework that deals with the two units of time. The location of these variables and any change in the components of the urban fabric must be consistent with what was determined by the basic design of the city. However, if the opposite happens, it would confuse this fabric (Seda, 2008). The basic design is defined as a type that does not regulate the uses of land and the type of buildings that determines their characteristics and methods of transportation in a way that guarantees the highest practical degree of economy, comfort and beauty (Al-Jabri, 1987). Cammouna (2000) stated that the architectural prestige is also known as the set of design principles of the city, including the principles that reconcile human requirements with material needs (as cited in Al-Nabulsi, 2000). The basic plan includes a set of long-term planning goals, a presentation of the urban structure of the city, and a measurement of development trends. It further sets out the policy necessary to achieve those goals. It is also
necessary to determine short and long term goals and expects future changes. Furthermore, setting certain recommendations that appear in the form of plans and maps is essential for establishing the necessary standards for different uses (Hassan, 1988, p. 65).

2.6 Reasons of Urbanization in Baghdad

There are numerous reasons that have clearly contributed to the process of Baghdad city growth and its encroachment into the surrounding agricultural lands. These include:

1- population growth of cities, where rapid population growth is one of the most important challenges facing the world, especially in developing countries. This is because the population is increasing at great rates at the expense of agricultural lands (Al-Azzawi, 2012).

2- state policy and laws that represent one of the factors that leads to urban expansion and encroachment through the development of new residential neighborhoods near agricultural lands (Al-Tamimi, 2014).

3- poor planning and lack of commitment to structural plans. The lack of structural planning of cities and the extension and growth of urban communities have led to a pattern of urban growth. Here, the risk specifically lies because the expansion is often at the expense of productive lands, environmental systems, and their balance (Kenana, 2009).

4- social factors that play a prominent role through the desire of some urban residents to live in the outskirts of the city. Residents usually take up certain areas of agricultural land and turn them into recreational and residential lands without benefiting from them in agriculture (Abdul-Qadir, 1989, p. 90).

2.7. Previous Studies

Abdullah (2014) studied the effects of urban expansion on educational services provided in the city of Fallujah. He further examined the way this expansion comes at the expense of fertile agricultural lands. The researcher concluded that the urban expansion comes as a result of population growth and displacement towards these areas. He further recommended the necessity of stopping the wave of immigration and the encroachment on agricultural lands.

• Al-Maliki (2011) examined the causes and factors that have led to housing expansion. The research concluded that all the increase in land use is outside the basic design of the city of Baghdad. Therefore, the researcher recommended stopping to waste agricultural lands for any reason whatsoever. He also recommended finding out suitable solutions to stop the process of urban expansion, and prevent its inappropriate continuation.

• Al-Tamimi (2014) conducted a study to determine the amount of defect occurring in the use of land on the basic designs as a result of the continuous change of these uses. The study has concluded that changing the urban laws, the increase of population growth, and the lack of commitment to the basic design of the city of Baghdad have altogether led to an increase in the rate of desertification. In this respect, the researcher recommended a set of mechanisms to solve the problem of expansion following the correct planning methods.

Reviewing some of the previous studies, the researcher recognized that they all shared many matters to the subject of their study. Cases in point are the effect of the urban expansion, the extension of Baghdad city, and changing the basic designs of the fixed land at the expense of agricultural lands. The current research diverges from those studies in some important and essential issues that have not been addressed. These issues can be represented by the following queries:

1. When did the process of urbanization in those previous studies take place? What are the most important periods of time for the expansion process? What are the areas affected by the expansion process? What is the extent of the lost agricultural lands?
2. What is the risk resulted from poor planning?, and is it the lack of commitment to structural plans, or lack of cities’ structural plans that leads to communities’ expansion and growth?

3. What are the population growth factor that affect the design over different periods of time according to the administrative and environmental use of Baghdad city?

3. Methodology of the Study

The study has adopted a descriptive analytical and historical approach to clarify the factors affecting urban sprawl at the expense of agricultural lands. Besides, the study relied on a simple linear regression method to predict the phenomenon of urban expansion, and its impact on the agricultural land. The events that Iraq went through after 2003 (the absence of legal authority, the weakness of legislation, and the successive large immigrations from the countryside to the city due to the lack of job opportunities and the search for decent housing) has greatly led to a significant increase in the process of housing expansion at the expense of agricultural lands.

This research deals with the city of Baghdad as a case study. It examines the urban expansion that has extended beyond the green belt and the surrounding agricultural lands during successive periods of time.

3.1 Reasons for Choosing the Study Area

The study area includes the spatial boundaries of Baghdad city and the surrounding agricultural lands that are part of the green belt surrounding the city. That is; the study includes the outskirts of the main municipal boundaries of Baghdad city, whose use has been changed from agricultural to residential or to any other use. There is a set of reasons which have led to the selection of the study area:

a. The state promulgates laws in successive periods of time by distributing lands of agricultural use, dividing them as residential use, and giving building approvals within these lands without paying attention to the basic design or to the nature of land uses.

b. The construction area of Baghdad is expanding enormously at the expense of the surrounding agricultural lands.

c. Irregular abuses have appeared on the agricultural lands surrounding the city of Baghdad, which are part of the green belt. This has increased migrations and the transgression on the lands surrounding it due to the security conditions that Iraq has undergone in general.

d. Thousands of orchards surrounding Baghdad, which contain many palm trees and citrus fruits, have been bulldozed (Hassoon, 2013, p.29)

3.2 Data Analysis

3.2.1 Reasons for Urban Sprawl in Baghdad

1. Population growth in Baghdad has witnessed a rapid population and urban growth due to its dominance in all of Iraqi cities. Or, it might be because of the administrative, economic and political position, which plays an essential role in the process of attracting activities, events and residents to it. This rapid urban phenomenon has coincided with the period of unrest. It was preceded by the year 2003, which led to an acute housing crisis in the city of Baghdad and consequently to the emergence of a widespread deficit in the basic services provided, as represented by lack of drinking water, energy, services, and communications; consider Table 1:

| Year | Population/person/million | Growth rate |
|------|---------------------------|-------------|
| 1987 | 3.8                       | 4.42%       |
| 1997 | 4.42                      | 1.36%       |
| 2007 | 7.14                      | 2%          |
| 2017 | 8.7                       | 6.2%        |

Source. (Municipality of Baghdad: A Panoramic View of Baghdad, 2014-2030, 2007)
It has been noted from the above table that the population of Baghdad increased to 3.8 million in 1987, with a growth rate of 3.8%, whereas the population of the city in 1997 reached a growth rate of 4.42 million; i.e., 1.36%. The reason was due to the low rate of growth, and to the abnormal conditions that the country went through, such as the war with the neighboring countries. In (2007), the population growth was also observed; it had a growth rate of 2%. This was attributed to the unstable security conditions in that period. However, the population growth has risen after the improvement of the security conditions. In brief, the city of Baghdad witnessed an abnormal displacement wave in search of job opportunities, bringing the population growth in 2017 to 8.7 million, at a growth rate of 6.2%.

**Fig. 2**

Areas of Baghdad according to the Basic Design of the City

*Source:* (Baghdad Municipality Design Department: Urban Planning Department Map, 1971).

2-Weak Laws and Legislations

The process of dividing and distributing land by the state due to the housing crisis is the result of weak urban laws and weak implementation. This, in turn, has affected the future and size of the urban plan for the city of Baghdad and the its enormous expansion at the expense of the area of agricultural land and the green belt. Table 2 shows the areas of agricultural land that have been distributed by the state.
Table 2
Numbers, Areas, and Type of Land Changed according to the Resolution 117 of the Year 2000

| No. | Area /acre | Land no. and Location | Type          |
|-----|------------|-----------------------|--------------|
| 1   | 211        | 7363/3/10and10/3/7376Abu Disher 2/27/3455 Abu Disher 3/3/111Abu Disher | Agriculture |
| 2   | 800        | 3/10/5857and3/10/5820 Abu DISHER | Agriculture |
| 3   | 3092       | 4/1/22Sabit            | Agriculture |
| 4   | 320        | 1/695/22Sabit          | Agriculture |
| 5   | 80/11      | 8/2and3/22Sabit        | Agriculture |
| 6   | 845        | 1/1/22Zakia and Fadhil | Agriculture |
| 7   | 685        | 14/8/22Sabit           | Agriculture |
| 8   | 420        | 1/21/28/Sabit          | Agriculture |
| 9   | 2000       | 2/5Salamyat            | Agriculture |
| 10  | 332        | 4/2Thaaliba            | Agriculture |
|     | 431        | 4/6Thaaliba            | Agriculture |
|     | 300        | 4/8Thaaliba            | Agriculture |
|     | 620        | Thaaliba172/10         | Agriculture |
| 11  | 470        | 4/3Wildaya and Munsaf  | Agriculture |

Source: Baghdad Municipality (2007, p. 11).

It has also been noticed from the above table that there are plots of land with large areas and small areas as well. This, in turn, reflects a major imbalance in the uses of the land, especially the plots that were agricultural and green. These were distributed mainly on the perimeter of the city and this, in turn, indicates a great impact on the city, and a negative one on the planned green belt surrounding the city of Baghdad. It further necessitates the necessary environmental balance for the city. Figure 2 represents the amount of agricultural land affected by the distribution process.

Poor planning and lack of commitment to the structural plans were laid down by a group of planners and specialized companies. These were contracted to develop the basic plans for Baghdad city in comparison with the violations of the green belt and the agricultural areas that were mentioned. Moreover, the following figure which shows the size of the agricultural land transformed into urban areas.
3.2.2 Solutions for the Problem of Baghdad City Urbanization

Below are a number of solutions that have been suggested by the researchers to reduce the process of urbanization in Baghdad; consider also Tables 3 & 4:

1. Issuing legislating laws that help regulate the process of dividing the land use within the cities and the surrounding areas, and give a consideration to the expansion and growth of residential communities.
2. Establishing institutions specialized in urban planning within the city to be responsible for the urban expansion.
3. Directing future urban expansions towards areas that are classified as non-agricultural or of poor productivity and encouraging the policy of satellite cities. That is; farmers need to be encouraged to work on agricultural
lands, and provided with all forms of material support.

4. Stopping the laws that are responsible for changing the gender of the land classified in the basic designs as agricultural lands and for converting them into a residential title deed.

5. Adopting the vertical residential extension to limit the horizontal extension and preventing excesses on the agricultural lands.

Table 3

*Stages of Urban Expansion at the Expense of Agricultural Lands: the first Stage for the Period Between (2003) and (2009)*

| Rank | Name of Municipality | Total Area/ km² | Agricultural % Use Rate | Percentage of Other Uses | Population Preparation (Attended) | Resettled (Countryside) | Rank |
|------|----------------------|-----------------|-------------------------|-------------------------|----------------------------------|------------------------|------|
| 1    | Alshaeb              | 78.085          | 80.35                   | 19.65                   | 174,595                          | 4,750                  | 4    |
| 2    | Alghadir             | 40.71           | 37.89                   | 62.11                   | 79,545                           | —                     | 17   |
| 3    | Baghdadajaljida      | 69.3975         | 63.35                   | 36.65                   | 1,034,534                        | —                     | 7    |
| 4    | Alrasafa             | 22.7325         | 2.85                    | 87.15                   | 1,486,799                        | —                     | 14   |
| 5    | Karrada              | 65.2175         | 58.23                   | 41.77                   | 271,977                          | —                     | 8    |
| 6    | Alsd1                | 14.1725         | 39.97                   | 60.03                   | 582,067                          | —                     | 10   |
| 7    | Alsd2                | 28.615          | 50.15                   | 49.85                   | 413,683                          | —                     | 9    |
| 8    | Adhamiya             | 25.6075         | 35.25                   | 64.75                   | 956,629                          | 32,371                | 13   |
| 9    | Al-Mansour           | 1258275         | 68.72                   | 31.28                   | 371,189                          | —                     | 6    |
| 10   | Alrasheed            | 12016           | 89.98                   | 10.02                   | 13,311                           | 57,179                | 2    |
| 11   | Alshaela             | 89.8875         | 87.54                   | 12.46                   | 52,245                           | 87,697                | 3    |
| 12   | Alkarakh             | 25.5475         | 37.12                   | 62.88                   | 1,309,488                        | —                     | 12   |
| 13   | Aldawra              | 83.12           | 91.74                   | 8.26                    | 12,764                           | 70,110                | 1    |
| 14   | Al-Kadhimiya         | 56.42           | 78.89                   | 21.11                   | 626,504                          | 114,180               | 5    |

Total area of land use for the city of Baghdad by administrative units for the period (2003) (2009).

| Rank | Name of Municipality | Total Area/ km² | Agricultural % Use Rate | Percentage of Other Uses | Population Preparation (Attended) | Resettled (Countryside) | Rank |
|------|----------------------|-----------------|-------------------------|-------------------------|----------------------------------|------------------------|------|
| 1    | Alrasafa             | 349.5375        | 850.5 km²               |                         |                                  |                        |      |
| 2    | Alkarakh             | 500.9625        |                         |                         |                                  |                        |      |
| 3    | Total population of the city of Baghdad between the time period (2003) (2009) and according to environmental use. | Rural | 860,220 | 6,702,538 | Urban | 5,842,318 | |

Table 4

*Effect of Urban Expansion on the Proportion of Agricultural Land Use*

| P value | Level of Significance (P Value) | Calculated (F Value) | Calculated (t Value) | Constant Term (α) | Regression Coefficient (β) | The Coefficient of Determination (R²) |
|---------|--------------------------------|----------------------|----------------------|-------------------|--------------------------|--------------------------------------|
| High significant | 0.003 | 13.800** | 3.715** | 79.154 | 3.874E-5 | 0.534 |
Diagram 1

Relationship of Agricultural Land Erosion Resulting from the Increase in Population Numbers

Source: The researchers’ work is based on the data provided by the numerical tables 3&4

Table 5

| T   | The name of the municipality | Total Area/km² | Agricultural %use Rate | The Percentage of Other Uses | Population Preparation (Attended) | Resettled (Countryside) | Rank |
|-----|------------------------------|----------------|------------------------|------------------------------|----------------------------------|-------------------------|------|
| 1   | alshaeb                      | 83.085         | 66.51                  | 33.49                        | 189,264                          | 5,092                   | 4    |
| 2   | alghadir                     | 25.62          | 31.23                  | 66.77                        | 86,228                           | ---                    | 12   |
| 3   | baghdadajadida               | 45.706         | 64                     | 36                           | 1,121,454                        | ---                    | 7    |
| 4   | alrasafa                     | 28.566         | 23.11                  | 100                          | 1,611,717                        | ---                    | 14   |
| 5   | Karrada                      | 60.72          | 56.57                  | 41.44                        | 294,828                          | ---                    | 9    |
| 6   | alsd11                       | 21.38          | 58.79                  | 41.21                        | 630,971                          | ---                    | 8    |
| 7   | Alsd22                       | 25.62          | 47.65                  | 52.36                        | 448,440                          | ---                    | 11   |
| 8   | Adhamiya                     | 82.085         | 66.51                  | 33.49                        | 1,037,003                        | 34,700                 | 5    |
| 9   | Al-Mansour                   | 352.4521       | 49.14                  | 33.51                        | 402,376                          | ---                    | 10   |
| 10  | al rashid                    | 117.6365       | 66.46                  | 21.8                         | 14,429                           | 61,292                 | 6    |
| 11  | alshaela                     | 893657         | 78.2                   | 23.38                        | 56,635                           | 94,005                 | 1    |
| 12  | alkarakh                     | 31.5476        | 67.64                  | 76.8                         | 1,419,509                        | ---                    | 2    |
| 13  | aldadawa                     | 84.1275        | 23.2                   | 23.37                        | 13,836                           | 110,225                | 13   |
| 14  | Al-Kadhimiya                 | 504025         | 66.88                  | 33.13                        | 679,142                          | 122,394                | 3    |

Total area of land used for the city of Baghdad by administrative units for the period (2003) - (2009):
- alrasafa: 352.412km²
- alkarakh: 500.9225km²
- Total: 853.335km²

Total population of the city of Baghdad between the time period from (2003) to (2009) and according to environmental use:
- Rural: 922,100
- Urban: 6,333,179
- Total: 7,255,278
Table 6
Effect of Urban Expansion on the Proportion of Agricultural Land Use: The Second Period between 2009 –and- 2012

| P Value | level of Significance (P Value ) | Calculated (F Value) | Calculated (t Value) | Constant Term (a) | Regression Coefficient (β) | The Coefficient Of Determination(R²) |
|---------|----------------------------------|-----------------------|----------------------|-------------------|---------------------------|-------------------------------------|
| Not significant | 0.942 | 0.006 | 0.075 | 55.112 | 0.87E-7 | 0.049 |

Diagram 2

Relationship of Agricultural Land Erosion Resulting from the Increase in Population Numbers
Source: The researchers’ work is based on the data provided in the numerical tables 5&6.

Table 7
Stages of Urban Expansion at the Expense of Agricultural Lands: The First Stage for the Period between 2012-and-2017

| T | Name of Municipality | Total Area/ km² | Agricultural %Use Rate | Percentage of Other Uses | Population Preparation (Attended) | Resettled (Countryside) | Rank |
|---|----------------------|-----------------|------------------------|-------------------------|----------------------------------|------------------------|------|
| 1 | Alshaeb              | 88.0875         | 58.9                   | 41.1                    | 218,437                         | 5,573                  | 4    |
| 2 | Alghadir             | 43.2075         | 25                     | 75                      | 99,319                          | -----                  | 11   |
| 3 | baghdadaljadida     | 66.41           | 61.6                   | 38.4                    | 1,294,313                       | -----                  | 3    |
| 4 | alrasafa             | 21.235          | 0                      | 100                     | 1,860,146                       | -----                  | 13   |
| 5 | Karrada              | 62.7175         | 55.94                  | 44.6                    | 340,273                         | -----                  | 7    |
| 6 | alsdr1               | 19.92           | 26.04                  | 73.96                   | 728,229                         | -----                  | 10   |
| 7 | Alsdr2               | 30.245          | 37.9                   | 62.1                    | 517,562                         | -----                  | 9    |
| 8 | Adhamiya             | 28.1075         | 19.76                  | 80.24                   | 1,196,846                       | 37,982                 | 12   |
| 9 | Al-Mansour           | 128.33          | 56.61                  | 43.39                   | 464,397                         | -----                  | 5    |
| 10| alrashid             | 96.125          | 53.24                  | 46.76                   | 16,653                          | 67,090                 | 8    |
| 11| alshaela             | 97.385          | 68.05                  | 31.95                   | 65,364                          | 102,898                | 1    |
| 12| alkarakh             | 28.8            | 0                      | 100                     | 1,638,311                       | -----                  | 14   |
| 13| aldawra              | 65.6175         | 66                     | 34                      | 15,969                          | 120,652                | 2    |
| 14| Al-Kadhimiya         | 58.9175         | 56                     | 44                      | 783,824                         | 133,971                | 6    |

Total area of land use for the city of Baghdad by administrative units for the period between (2003) and (2009)

| Name of Municipality | Total Area/ km² | Agricultural % Use Rate |
|----------------------|-----------------|-------------------------|
| alrasafa             | 359.93 km²      |                         |
| alkarakh             | 495.175 km²     |                         |

Total population of the city of Baghdad between the time period (2003) and (2009), and according to environmental use

| Name of Municipality | Total Area/ km² | Agricultural % Use Rate |
|----------------------|-----------------|-------------------------|
| rural                | 1,009,325       |                         |
| Urban                | 7,309,369       |                         |

| Name of Municipality | Total Area/ km² | Agricultural % Use Rate |
|----------------------|-----------------|-------------------------|
| alrasafa             | 359.93 km²      |                         |
| alkarakh             | 495.175 km²     |                         |

| Name of Municipality | Total Area/ km² | Agricultural % Use Rate |
|----------------------|-----------------|-------------------------|
| rural                | 1,009,325       |                         |
| Urban                | 7,309,369       |                         |
Table 8

Effect of Urban Expansion on the Percentage of Agricultural Land Use: The Third Period between 2012 and 2017

| Nature of Relationship | Significance Level p | Calculated F Value | Calculated t Value | Fixed Limit α | Regression Coefficient β | The Coefficient of Determination R² |
|------------------------|----------------------|--------------------|-------------------|---------------|--------------------------|-----------------------------------|
| High morale            | 0.005                | 11.728**           | 3.425 **          | 59.512        | 2.685E-5                  | 0.501                             |

Diagram 3

Relationship of Agricultural Land Erosion Resulting from the Increase in Population Numbers

Source: The researchers’ work is based on the data provided in the above numerical tables 7 & 8

Table 9

Stages of Urban Expansion at the Expense of Agricultural Lands: The First Stage for the Period between 2017 and 2020

| T | Name of Municipality | Total Area / km² | Agricultural Use %Rate | Percentage of Other Uses | Population Preparation (Attended) | Resettled (Countryside) | Rank |
|---|----------------------|------------------|------------------------|--------------------------|-----------------------------------|------------------------|------|
| 1 | alshaeb              | 80.5775          | 36.15                  | 63.85                    | 237,759                           | 5,873                  | 7    |
| 2 | alghadir             | 42.305           | 18.08                  | 81.92                    | 108,322                           | -----                  | 11   |
| 3 | baghdadajadida       | 76.565           | 25.48                  | 74.62                    | 204,503                           | -----                  | 9    |
| 4 | alrasafa             | 25.4325          | 1.95                   | 98.05                    | 2,024,687                         | -----                  | 13   |
| 5 | Karrada              | 67.315           | 20.75                  | 79.25                    | 370,372                           | -----                  | 10   |
| 6 | alsdr1               | 19.8175          | 25.84                  | 74.16                    | 792,645                           | -----                  | 8    |
| 7 | Alsdr2               | 29.66            | 36.48                  | 63.52                    | 563,344                           | -----                  | 6    |
| 8 | Adhamiya             | 33.7775          | 8.17                   | 91.83                    | 1,302,714                         | 40,027                 | 12   |
| 9 | Al-Mansour           | 124.58           | 40.51                  | 59.49                    | 505,476                           | -----                  | 5    |
| 10 | alrasid              | 90.16            | 45.72                  | 54.28                    | 18,127                            | 70,703                 | 3    |
| 11 | alshaela             | 92.3925          | 40.9                   | 59.1                     | 71,146                            | 108,438                | 4    |
| 12 | alkarakh             | 30.5475          | -                      | 100                      | 1,783,229                         | -----                  | 14   |
| 13 | aldawra              | 80.6175          | 59.63                  | 40.37                    | 17,382                            | 127,148                | 1    |
| 14 | Al-Kadhimiya         | 59.42            | 46.86                  | 53.14                    | 853,158                           | 141,185                | 2    |

Total area of land use for the city of Baghdad by administrative units for the period (2003) (2009)

|                   | Total area of land use for the city of Baghdad by administrative units for the period (2003) (2009) |
|-------------------|--------------------------------------------------------------------------------------------------|
| alrasafa          | 375.45 km²                                                                                     |
| alkarakh          | 482.7175 km²                                                                                    |
| Total             | 858.1675 km²                                                                                    |

Total population of the city of Baghdad between the time period (2003) (2009) and according to environmental use

|                   | Total population of the city of Baghdad between the time period (2003) (2009) and according to environmental use |
|-------------------|-----------------------------------------------------------------------------------------------------------------|
| Rural             | 1,063,673                                                                                                    |
| Urban             | 7,955,928                                                                                                     |
| Total             | 9,019,600                                                                                                     |
Table 10
Effect of Urban Expansion on the Percentage of Agricultural Land Use: The Fourth Period from 2017 –and-on

| Nature of Relationship | Significance Level p | Calculated F Value | Calculated t Value | Calculated t Value | Regression Coefficient β | The coefficient of determination R² |
|------------------------|----------------------|--------------------|--------------------|--------------------|--------------------------|-----------------------------------|
| High morale            | 0.00 **              | 15.493 **          | 3.963 **           | 43.334             | 1.991E-5                 | 0.564                             |

Note. It means that the relationship is very high with 99% confidence.

Diagram 4

Relationship of Agricultural Land Erosion Resulting from the Increase in Populations Number

Source: The researchers’ work is based on the data provided in the above numerical tables 9&10

3.2.3 Statistical Analysis

Table 11
Correlation Coefficients between the Percentage of Agricultural Land Utilization and the Number of Urban Residents according to Time Periods

| Time Period     | 2003-2009 | 2009-2012 | 2012-2017 | 2017-2020 |
|-----------------|-----------|-----------|-----------|-----------|
| O.731**         | 0.222     | 0.708**   | 0.75**    |

Note. It means that the relationship is very high with 99% confidence.

The above table demonstrates that:

1. In the first, third and fourth time periods, there was a positive correlation of high significance between agricultural land use and urban population. The larger the urban population was, the greater the urban expansion was at the expense of agricultural land, in addition to the weak measures taken by the governments.

2. In the second period, the relationship was weak, and this indicates that the government’s actions were strong against the process of exploiting agricultural lands.

4. Conclusions

It has been concluded that

1. Based on the analysis of the data, it has become clear that there is a direct and significant relationship between the use of land and the number of urban residents. That is; the greater the number of urban residents is, the greater the proportion of agricultural land exploitation for residential use purposes is. Such a relationship can be attributed to the limited number of housing units and the increased competition between different types
of land uses; a matter that has overridden the basic design for the city of Baghdad
2. There are large lands with residential use outside the city’s master plan.
3. The emergence of the phenomenon of urban expansion of the city has greatly affected the general landscape of the city.
4. There is a great shortage in the municipal departments. Besides, the lack of an information system for the process of studying the phenomenon is due to the poor planning and to the limited number of necessary studies.
5. The limited effect of the governmental decisions issued on converting the gender of agricultural land into housing. This, in turn, has led to a destruction of large areas of agricultural land for the benefit of housing expansion.

Fig. 4

Stages of Urban Expansion at the Expense of Green Cover
Source: The map of the researchers’ work is based on the data provided in the above numerical tables 3, 5, 7, & 9

5. Recommendations
The study has reached a number of recommendation as illustrated below:
1. Finding final solutions to the problem of encroachment on agricultural lands. Such a step can be done by concentrating on building new and low-cost housing units with full facilities and services to attract the largest possible number of residents to them.
2. Facilitating building licensing procedures and reducing the fees.
3. The authorities should take firm and strict measures against any violations. Moreover, they should set timetables to limit the encroachment on agricultural lands.
4. Encouraging reverse immigrations by finding serious development projects in rural areas, creating job opportunities, and by particularly supporting the agricultural sector and farmers to be stabilized on their lands and not immigrate to cities.

5. Working on the necessity of implementing special legal projects to protect agricultural lands by enabling the administrative agencies in the study area to directly interfere to deter such violations.

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