

Use Geotechnical to Analyze Agricultural Use Changes to Support Urban Planning Policies

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Abstract: The study aimed at analyzing satellite data to track the change in agricultural use in Gaza governorates by using geographic information systems and remote sensing techniques, in addition to determining the land plots that are considered the most appropriate in directing urbanization away from the waste of agricultural lands. The study also showed an overview of information systems Geographic and Remote Sensing As an optimal technical technique used in analysis, the study showed that the use of remote sensing technology cannot be dispensed through the analysis of spatial visualization to calculate the area of agricultural land in ancient times Recently, the study showed that the use of cartographic modeling to arrive at the identification of appropriate vouchers for agricultural activities is more efficient than the methods used in local institutions.

Key Words: Geotechnical-Agricultural-GIS-Remote Sensing-Farmland- Model Builder.

1. INTRODUCTION

Urban growth is one of the most important human phenomena, and the rapid growth of urban populations has become a major danger. The population of cities with more than 10,000 people jumped from 700 million in 1950 to 2.3 billion in 1990. According to UN estimates, Cities of this category to about 5.5 billion people in 2025.(1)

This rapid increase of the population will inevitably lead to a rapid expansion of the urban mass and may be at the expense of agricultural land. The study of land use is one of the subjects that require high accuracy and great potential in producing detailed maps and detailed databases to include the development of chronological analysis of maps. Of the use of remote sensing techniques because it is capable of handling a huge amount of space images and conducting many computerized statistics and processes.

1.1 Subject of study

The governorates of Gaza witnessed a significant urban expansion at the expense of agricultural land and did not stop the urban growth as long as there are needs of the population of the urban cluster so the subject of the study in answer to the following questions:

1. Is the expansion of the urban block has a negative impact on agricultural land?

2. Can maps be provided showing the distribution of current and future agricultural land?

3. How geotechnical techniques are used to analyze satellite data?

1.2 Objectives

1. The use of GIS technology and remote sensing in the analysis of satellite data
2. Study of the change in the area of agricultural land from 1975 to 2018 using remote sensing.
3. Expected calculation of agricultural land in 2030.

2. Method of analysis

Remote sensing programs vary among themselves in terms of accuracy in the analysis of satellite images, but there are software gaps vary from one program to another, but Eardas Imaging the most accurate and comprehensive programs, and the process of building the database in the programs of the sensor pass through many stages, combining, merging, initial processing and interpretation.

The spatial data collection for the periods 1975-1985-1995, 2005-2015-2018, according to UTM-WGS 84 ZONE 36N, was done by four readings per period to meet the need of the sequential analysis of the average seasons of the year because there are plants grown in the summer and another in the winter, A visual rating of each period was completed and then collected and a network map of the analytical medium was produced.

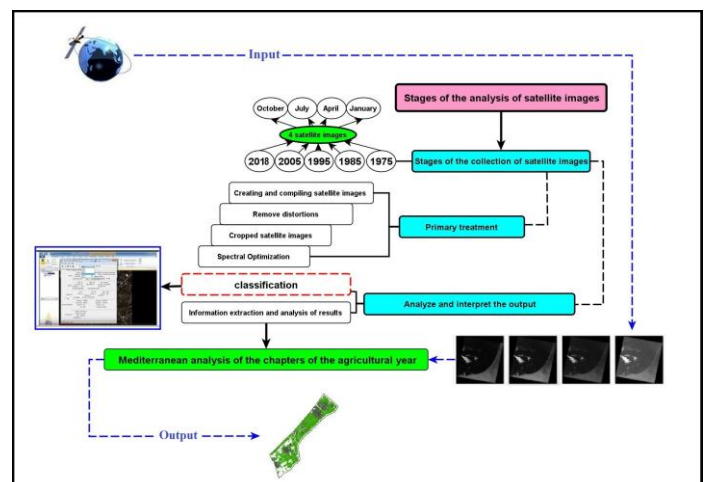


Fig -1: Stages of data analysis and satellite images

The reflected radiation from agricultural land is influenced by several factors, the most important of which is the roughness and softness of the vegetation cover and the materials it contains. The radiation reflected from the green trees is different from the radiation reflection of dry trees. Therefore, it is possible to estimate the area of agricultural land and tree density (2).

Analysis of chlorophyll in the water, which reflects the cycle of amphibian plants that affect the nature of the reflected radiation. Water containing large quantities of suspended sediments reflects visible wave radiation more than pure water. Here in the Gaza Strip, In satellite images accurately when applying the average analytical approach to classifications by seasons of the year.

Table-1: Results of analysis of satellite images of Farmland

year	Governorate Gaza km2				
	North	Gaza	Middle	KhanYounes	Rafah
1975	30.16	29.41	22.38	33.36	12.01
1985	20.72	26.03	23.08	30.67	11.18
1995	15.38	24.16	21.76	28.41	11.15
2005	11.22	19.18	18.22	23.84	9.32
2015	9.51	13.37	19.20	28.08	17.57
2018	9.66	13.10	13.37	29.13	17.31

The table shows that there is a decline in the area of agricultural land from 1975 to 2018 for urban use. It is also evident that there is an increase in agricultural land in Khan Younis and Rafah from 2005 to 2015 due to the withdrawal of the Israeli occupation from the settlements in the Gaza Strip. A slight increase in the agricultural area from 2015 to 2018 at the level of most governorates in view of the encouragement of the Ministry of Agriculture on agriculture and the identification of crops for self-sufficiency.(3).

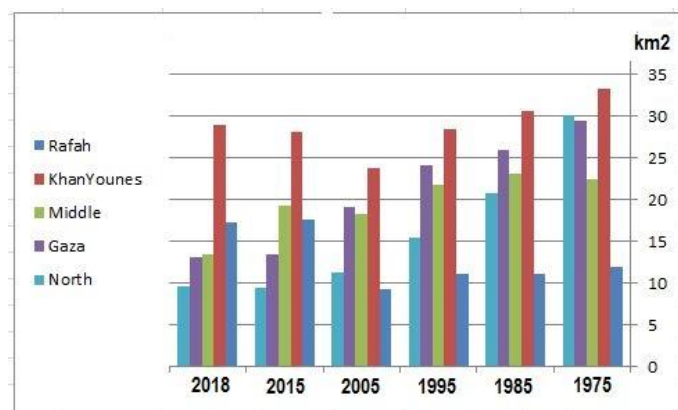


Chart -1: Development of the agricultural land area

3. data analysis

The results of the analysis are used for the years 1975-1985-1995-2005-2015 using the output data produced by the Markov chain analysis within the IDRISI environment. An application model was implemented for the first half of 2015. This model uses the results of the years preceding this model. Which shows the expectation and change in the expansion of the urban mass, the standard KAPA model is used to test the validity of this data. If the reliability ratio is more than 70% here we acknowledge its validity. If the KAPA model is a measurement of less than 70% correct.(4)

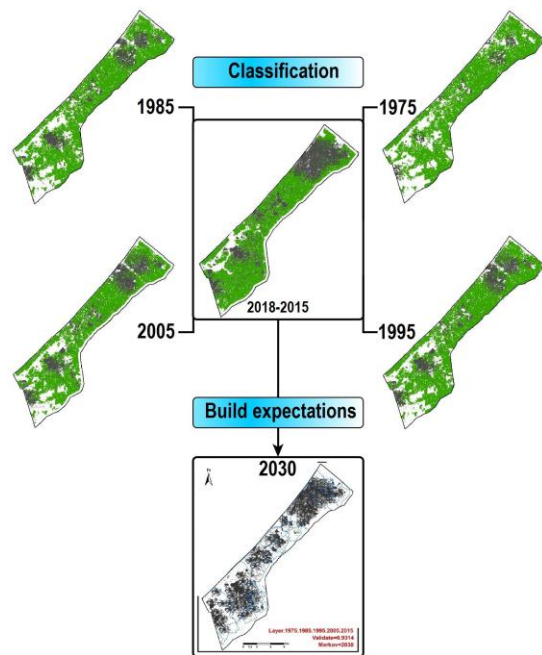


Fig -2: classification and analysis of satellite images

In terms of the data of this research, the measurement of the Kappa IDRISI model using a validated tool was given a kaba level of 0.9314, a kappa for the information used 0.8229, a kappa for the cell level of 0.8325 and a kappa for the class accuracy of 0.8951, all above 0.7. This gives a high analytical index. Forecasts for 2030.(5)

Table-2: Classification of agricultural use by seasons / km2

Year	January	April	July	October	average
1975	144.25	137.56	122.32	105.26	127.35
1985	118.85	116.56	112.21	98.99	111.66
1995	113.86	110.97	98.59	79.99	100.87
2005	91.26	89.19	82.69	63.99	81.79
2018	101.86	100.19	80.26	68.71	87.75

4. Predict

Table-3: Expected results 2030 / km2

Governorate Gaza 2030					
Type	North	Gaza	Middle	KhanYounes	Rafah
Urban	36.60	34.50	37.81	43.49	26.17
agricultural	2.68	5.46	1.45	13.47	9.15

The above table shows that there are expectations of a further decline in agricultural land according to the projections of 2030. It is also noted that there are provinces where agricultural lands may be exposed to extinction, such as the northern and central governorates.(6)

5. Use cartographic modeling to reduce waste of agricultural land.

One of the basic requirements for building the cartographic model is the formulation of criteria or the conditions necessary to evaluate the land for the future development process, which ensures the fulfillment of the needs and the maintenance of the standard of land ownership. The use of GIS technology here in determining the areas that can be employed as new residential areas and according to special criteria in the region.(7)

In this study, criteria were carefully formulated after reviewing previous studies, field visits, comparison with international standards, conducting a series of personal interviews and working with correspondents.(8)

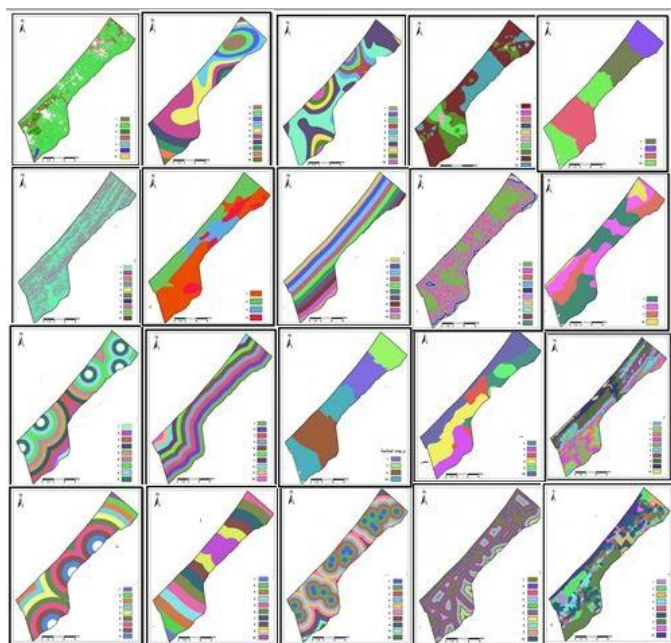


Fig -3: Results of applying the study criteria

5.1: Building Model Builder.

After building the hierarchical model and defining the criteria, types, levels and degree of weight, the cartographic model was built in the ArcGIS and through the structural model, which is based on the simplification of complex problems and the overlap of the data and their spatial and descriptive relationships. Therefore, this model is formulated to simplify the problem and formulate the method of solving it through So-called graphical layout of the stages of work.(9)

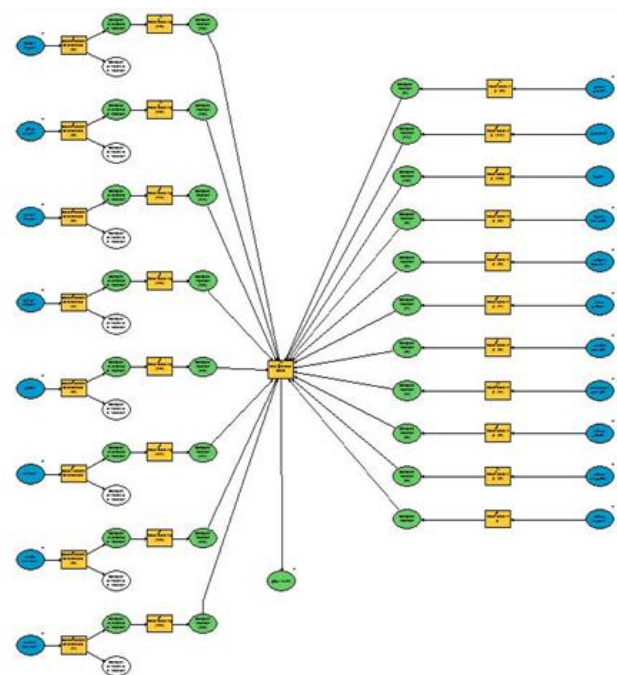


Fig -4: Modeling and charting

5.2: Analysis proposed sites

After setting the criteria for deliberate guidance for the agricultural and urban growth of the Gaza governorates and after applying the weights, the process concluded to devise the appropriate sites as follows.(10)



Fig -5: Map relevance 2030

6. CONCLUSIONS

6.1. Gaza Strip is a rapidly growing population, one of the highest in the world, and this is the main reason for the rapid decline of agricultural land.

6.2. The study showed that there is a very strong relationship between the expansion of the urban mass and the steady increase in the number of population in the Gaza Governorates. This is the main determinant of the planned agricultural planning.

6.3. The study succeeded in preparing a detailed study to show the evolution and change in the spatial distribution of land use maps since 1975.

6.4. The study showed the ability of GIS and remote sensing technology to study the evolution of agricultural and urban land area through the production of accurate maps.

6.5. The use of analysis according to the Markov Applied Mathematical Chain and the confirmation of results according to this Kappa accuracy index gives accurate results for relying on the results of the research in government decision making.

6.6. The use of cartographic modeling to determine the future agricultural and urban growth areas is more efficient than the methods used in local institutions, optimizing the use of resources, achieving the highest returns and minimizing land losses.

6.7. The process of relying on the distribution of the questionnaire to the planning and GIS specialists is one of the best ways to obtain the weights of the planning standards accurately.

7. Recommendations study

7.1. Adopt a strategy to increase the absorptive capacity of existing urban centers by encouraging the vertical expansion of buildings.

7.2. Focus on public awareness to realize the importance of commitment to urban planning and conservation of agricultural land according to the provisions of the structural plans and interest in popular participation in the preparation of future plans.

7.3. Use of geographic information systems and remote sensing in all local institutions because it has proved successful in the preparation of spatial databases

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