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Review article

THE ROLE OF REMOTE SENSING TECHNIQUES (RS) AND GEOGRAPHIC INFORMATION SYSTEMS (GIS) IN THE DEVELOPMENT OF AGRICULTURAL LAND USES

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Abstract

Geography has witnessed significant development in all its divisions by adopting (RS) techniques And geographical information systems (GIS) obtained the geography of agriculture share in both the research and production aspects and manifested in the contribution of these technologies in the areas of planning and agricultural use of land,Soil survey and classification, micro-sampling, control of irrigated land and irrigation associated with changes in some soil properties, desertification control, drought and land degradation, Assessing the general state of agricultural crops, adopting them as a means of early warning, contributing to the development of environmental assessment maps, monitoring the desert locusts and predicting its activity, studying surface and groundwater water, contributing to rationalizing the consumption of fertilizers and pesticides, protecting safe crops from harm and improving animal husbandry and control. Of the ability to record data in the visible and non-visible range, thus contributing to the improvement of agricultural data collection and extraction systems and the provision of studies that will help decision makers to take decisive solutions to the problems facing the field Agricultural.

Key words : Remote sensing techniques (RS), geographic information systems (GIS), agricultural land.

Introduction

Agriculture is the oldest and most important aspect of human life and human societies and its continuation as the resource that provides the basic elements of life. Therefore, caring for and developing this aspect should be a priority for the attention of individuals and nations, It may be argued that the use of geographic techniques of remote sensing (RS) and geographic information systems (GIS) has made a quantum leap in this aspect and in several areas (Saud, 2011), which contributed to increase the efficiency of work and reduce the time and effort and cost and get more quality results, prompting us to choose this subject to shed Highlighted the role played by these technologies in developing agricultural land uses and the experiences of some countries.

Research problem

The research problem was determined by the following question: What role do remote sensing techniques (RS) and geographic information systems (GIS) play in the development of agricultural land uses?

Search hypothesis

The hypothesis of research (that RS technologies and GISs play an active role in the development of agricultural land uses from both research and production).

Purpose of research

The research aims to review the possibilities offered by modern geographical technologies in the development of the agricultural sector, which constitutes a fundamental pillar of the national economy of any country.

Research importance

The importance of research is twofold: first, the importance of modern geographical techniques in bringing about a qualitative and quantitative shift in agriculture; and secondly, the importance of agriculture as the most important food security indicator at the local and international levels and for developing and developed countries alike.

Search limits

The spatial and temporal boundaries of research have

Image 1 : The simplest types of remote sensing aircraft.

transcended the local and regional scope to see the role that modern geotechnical techniques have contributed since their discovery and use in agriculture and until the date of preparation of this research worldwide to give a picture of the experiences of most countries and the results were successful in this area.

Research Methodology

The descriptive geographical approach was adopted in most sections of the research and the historical approach in other paragraphs.

Structure of research

The research in the introduction and two topics, the first topic explained the importance of remote sensing techniques (RS) and geographic information systems (GIS) for the uses of agricultural land. The second topic highlighted the importance of applied areas for the use of remote sensing techniques (RS) and geographic information and GIS in the development of agricultural land uses. The research ended with several conclusions, proposals and list of sources.

The importance of remote sensing techniques (RS) and geographic information systems (GIS) in agricultural land uses

Agriculture means care and effort in the production of agricultural crops and animal husbandry through the investment of natural and human capacity (Ali, 2009) a method that guarantees the human life to provide him with food and achieve stability which is the path to the development of human civilization, and the geography of agriculture in the forefront of branches (Nabil, 2003), and since each phenomenon or object on the surface of the earth has a different reflectivity and emission of energy, and by observing the radiation of that energy can be identified changes in these phenomena and objects, Because geography is the most interesting science in the uses of different land, it has been a great need to use modern technologies that allow the collection and collection of data on phenomena and uses in real time and provide accurate information about their locations, which contributes to reducing the effort and time and cost and allows accuracy and great potential in the work and establishment A digital database that can be continuously updated.

This is one of the first functions of remote sensing techniques and geographic information systems. Therefore, it has been used in all be used in all sections of geo-science, especially the geography of agriculture, and the importance of the role of this technology S in the development of agricultural land use should clarify all of the following:

The definition of remote sensing (RS) and geographic information systems (GIS)

Remote sensing is the process of obtaining measurements of a given object or phenomenon without any direct contact with it, depending on the devices spectral waves, electromagnetic radiation and electronic scanners and multi-spectral aircraft (Kang, 2005) (Image 1). Geographic Information System (GIS) consists of computer technology and related software, and the information represented by spatial, descriptive and geographic data, which is the spatial component of this system. 6 GIS is defined as an applied computer technology Inventory, process and process multi-source data, and obtain final results in the form of maps, graphs, images, images, tables or scientific reports. This will eventually lead to the development of multiple scenes that help planners to prepare, develop and modify rational plans, Decisions and implementation.

Aspects of the use of remote sensing techniques (RS) and GIS in agriculture

The importance of these technologies for agricultural land uses is reflected in two aspects:

Research side

This is important in the use of remote sensing techniques (RS) and geographic information systems (GIS) for conducting scientific research easily and efficiently, providing data and databases and assisting in the analysis of studied samples of soil, water, plants and animal control with extreme accuracy and maximum speed. These techniques in the field of agricultural research are spatial spatial applications of vegetation, providing a set of statistical indicators that are useful in assessing the safety and degradation of vegetation such as the NDVI vegetative diversity index and DI dry indicators such as TI, Plant case VCI indicator phytosanitary VHI) index biological cortex CI index ratio of the vegetation cover of the infrared IPVI vegetation index and the rate of soil OSAVI (Ahmed, 2014).

The most common plant diversity index (NDVI). The spectral areas used for this indicator are the fourth red channel and the near infrared channel. The state of the equation is the description of the vegetative state, showing high reflectivity The TI is based on the actual value of the BT range and the highest and lowest values shown in the plant heat stress (Wang *et al*., 2016). The possibility of a digital land cover classification by analyzing Turning Assia spectral space-visual components to see in the area, especially the types of soils and characteristics of terrestrial species, which is useful in identifying and measuring suitable for agricultural investment spaces (Mohamed and Ali, 2003).

The productive side

Remote sensing techniques (RS) and geographic information systems (GIS) are used to raise the volume and quality of production through comprehensive farm planning, field mapping, soil sampling tractor guidance, crop exploration, application of crop change methods, crop yield mapping, animal monitoring and allow farmers to work during Times of low visibility in the fields such as in the cases of rain, dust, fog and darkness and contribute to the detection of insects and pests and microorganisms pathogenic, which reduces the possibility of the spread of diseases and material losses resulting from it (Vanneschi *et al*., 2017). This was confirmed by the National Remote Sensing Authority, the Mediterranean Agricultural Institute of Greece, the Center for Agricultural Research and Services in Arid Regions and the Association of Producers and Exporters of Horticultural Crops, which aimed at promoting modern GIS applications in the agriculture and environment sectors in the north-western Mediterranean basin, The spectral footprint of as many plants as possible and their inclusion in integrated databases can be replicated in various crop improvement and hybridization processes, which has been applied in most US commercial farms (Kunal *et al*., 2016).

Applied fields of remote sensing techniques (RS) and geographic information systems (GIS) in the development of agricultural land uses

Remote sensing techniques and geographic information systems (GIS) have demonstrated their scientific and applied feasibility in the agricultural sector in a wide range. Some of these can be identified in the following areas:

1. **Planning and agricultural use of the land:** The uses of agricultural land are constantly changing according to economic and social variables. Therefore, planning and updating the studies and maps of use from time to time becomes of great importance. The remote sensing techniques have been used at all levels and integrated with geographic information systems to serve this purpose by establishing databases helps to present, compare, monitor and identify changes in agricultural use and work on the optimal mapping of such uses, such as the transformation of vast lands in the state of Nebraska. As it revealed the environmental qualifications for it (Nuri, 2000).
2. **Survey and classification of soil:** These techniques are used in the study of soil and mapping, and then can be separated between different types of soils, and can know the processes of composition and growth through the study of natural characteristics and determine the validity of agricultural use and productive capacity to put them within the framework of economic and productive correct as well as the possibility of Contribution of land contour maps and assessment of reclaimed areas and their follow-up on a regular basis. study by the International Organization for Agricultural Development indicates the economic feasibility of using remote sensing techniques and information systems in land classification, Rating in Japan from 50% to 200% as well as saving time and effort necessary for the selection of soil samples, analysis and description of its components and the development of soil maps and problems faced by salinity and lack of organic matter or some types of minerals in which (Ali, 2008)

(Image 2).

3. **Precise soil sampling:** Data collection and analysis of these techniques can be used to identify local differences in the fields, making it possible to provide a different treatment depending on the conditions of each field location and to change the density of the plantations as well as the characteristics of each area in the field. Replicate the application in areas of the field or neglect other areas, and enable the best possible ground coverage in the shortest time possible (Mohamed and Ali, 2003).

4. **The control of irrigated land and the accompanying irrigation process of change in some soil properties:** Some of the physical and chemical properties of the soil, such as drainage, drainage, effluence, salinity, surface crust and subsequent changes in the spectral characteristics of the soil, Which has helped to identify the problems of irrigated land, the selection of better land and the optimal irrigation system controlled by remote sensing techniques and geographic information systems (Hussain and Amal, 2005).

5. Observing desertification, drought and soil degradation by observing changes in vegetation density, quality and other surface indicators. The movement of sand dunes and desert creep can be monitored based on the shape, pattern, spectral reflection and time-frequency of space data. The Committee to Combat Desertification In the United Nations has adopted this method of monitoring desertification, drought and soil degradation in the Sudan and work is continuing on this aspect (Nabil, 2003).

6. **Estimation of the overall state of crops:** These techniques inform the general situation of crops and control their vulnerability to disasters such as floods and cyclones, and assess and follow up the incidence of pests and diseases and help to protect and treat them through analysis of the organic matter in the crops as well as monitoring the size of nitrogen and other elements to determine the need for Irrigation and fertilization through its thermal and photovoltaic properties, which has been applied in Canada and has yielded good results (Ali, 2009) (Image 3).

7. **Early warning method:** The means of geographical techniques are used to estimate and limit the area cultivated with a given crop and to predict production by tracking crop growth stages and to develop an optimal marketing policy that ensures obtaining the highest price or yield through spatial data, which is an effective tool in estimating yield before seasons Harvesting at the local and regional levels and working to market surplus and catch up for economic balance and food security, as in Australia's vast wheat farms (Kang, 2005).

8. **Contribution to the development of environmental assessment maps:** These maps show the types of plant clans present in an area and are used to monitor the annual cycle of grazing areas, assess changes in them and protect degraded areas, as well as monitoring of pasture situations such as soil erosion,Epidemics and all this helps to control the implementation of the grazing plan and the appreciation of pastoral load and these efforts have succeeded greatly in the French countryside (Amal, 2012).

9. **Desert Locust Monitoring and Prediction of its Activity :** The control strategy is based on identifying optimal areas for egg hatching and insect development, which are wetland areas covered with green cover. Soil moisture can be sensed in the desert regions. The plant biomass (NDVI) in order to follow the movements of the Desert Locust, as adopted by the competent authorities to control the Desert Locust in Algeria and with the assistance of institutions from South Africa (Ammar, 2018).

10. **Study of Surface and Groundwater :** Determination of the quantity and quality of surface and groundwater water, the intensity and quality of pollution, the determination of areas of ice concentration and quantity, and the location of fish gathering and fish estimation, as in Britain for three decades (Shaker, 2018).

11. **Rationalize the consumption of fertilizers and pesticides and protect the sound crops from harm:** It provides the possibility of precise control over the flight of spray aircraft fertilizers and pesticides equipped with the system of the world sites in precise flights over the areas to be sprayed so that chemicals fall only in the prescribed places, reducing the potential for the spread of chemicals to adjacent positions and reduces used chemicals, which is beneficial to the environment, as well as providing the possibility of eliminating the need for human guides to guide spray aircraft increases the efficiency of air spraying and reduces excessive spraying (Eman, 2013).

12. **Field of animal husbandry and control:** The use of surveillance aircraft and observation towers and remote sensing devices small and high-precision in the field of animal husbandry and control, especially

Image 2 : Soil sampling process.

Image 3 : Process of measuring the characteristics of plants.

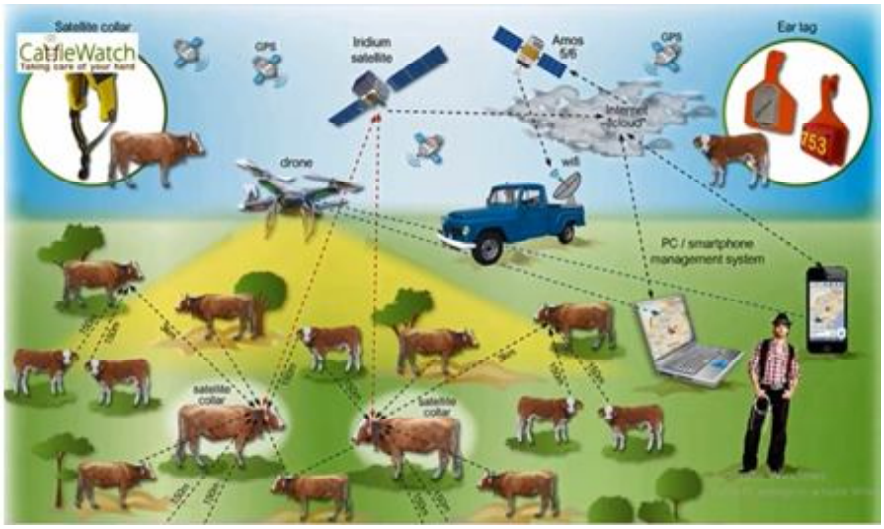

Image 4 : Remote sensing network for animal surveillance.

at night through sensitive thermal cameras mounted on those aircraft and towers and devices through which to find animals that move away from the herd, On the health of the animal disease as well as follow-up to carry animals in barns of cows, sheep and horses and isolation, which was close to birth dates to prevent injury from the rest of animals, as well as control hatching chambers in poultry and generate conditions for this process and one of the first countries in the world to use these technologies in the field of animal production is the United States of America, Western Europe, Australia and New Zealand (Saud, 2011) (Image 4).

Conclusion

1. The research showed the efficiency of using GIS & RS techniques in the research of the extraction of vegetation cover from the land cover components and the identification of the spatial changes that occur during a specific period of time and the detection of the

deterioration through low density of the vegetation and moisture content and increase the dry stress suffered by the plant.

2. The research presented the possibilities of these techniques in the study of soil and some of its characteristics, monitoring and planning of desertification operations, organizing and controlling irrigation and drainage operations and other agricultural operations.

3. The research explained the usefulness of these techniques in the prevention of plant diseases and pests and contribute to the treatment of infected plants without harming healthy plants.

4. The research shows the importance of using these techniques in the field of animal husbandry and facilitate the process of care and protection.

Proposals

1. The use of techniques (GIS & RS) and statistical application and spatial modeling in the study of vegetation cover to achieve accurate and real results on the status of plant and production quantities.

2. Expanding the use of geographic techniques in the survey, classification and characterization of virgin soils in order to know the good for agricultural investment and determine their productive potential, as well as the use of these techniques in assessing the state of the cultivated soils and to identify the current and future problems that may be exposed in order to find early treatments.

3. Interest in livestock that is compatible with the environmental and economic importance through the use of these techniques in the continuous monitoring and attention to the need to maintain and develop.

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