

Chapter 24

Analysis of the Vegetation State of the Territory of Central Iraq Using Landsat Data

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ABSTRACT

In agricultural production, there is a change in the properties of soils and the problem of land degradation is rising. It is especially important for Iraq, whose economic well-being is in oil and agriculture. The objects of authors' study are the territories of Central Iraq; the subject of authors' research is the temporary-territorial variability of vegetation. This chapter analyzes the vegetation dynamics of the five provinces' territory of Central Iraq by determining the values of the Normalized Difference Vegetation Index (NDVI) from remote sensing data in the period from 2003 to 2017. Regional features are reflected in the variability and change rate of these processes and in the valley plots occupied by vegetation of different state classes, from the total area of the province. The differences in the state classes of vegetation on the territories of Central Iraq are conditioned not by natural, but by other reasons, in particular, by the state of meliorative systems.

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INTRODUCTION

Agricultural production affects the properties of soils and can cause the problem of land degradation (Bogdanov et al., 2016, Manshard, Ruddle, 1981). It can lead to decreased yields (Johnson, Lewis, 1995) or restriction of land use, such as cattle overgrazing (Behnke et al., 1993, Pomelov et al., 2015). For instance, desertification of arid, semi-arid and dry sub-humid areas under the influence of such factors (Barrow, 1991, Barrow, 1995) as climate change and human activities (United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa, 1994). Land degradation begins with damage of the vegetation cover (Barrow, 1995), which biomass is considered to be its most dynamic characteristic (Opustynivaniye zasushlivykh zemel Rossii: novyye aspekty analiza, rezultaty, problemy/ otv. red. akad. V.M. Kotlyakov, 2009). In dry areas of the planet, where plants exist near the boundaries of ecological tolerance, even minor changes in environmental factors can lead to degradation (plowing, cattle grazing, deforestation, etc. (Barrow, 1995; Skoupy, 1993). The growth of deserted area, which, a decrease of biological productivity of ecosystems, plant biomass, crop and livestock production take place here. To prevent them, a complex of organizational, economic and technical measures for radical land improvement (artificial irrigation of soil, reclamation of saline lands, new agro technical methods and technologies) are used.

The above-mentioned problems are especially important for Iraq, which economic well-being basis is lies in oil and agriculture (Agriculture in Iraq, 2017). Agricultural lands cover about a fifth of the territory of Iraq, half of which is in the valleys of the Euphrates and Tigris and belong to irrigated lands (Tokareva et al., 2016). Until 1995 Iraq was one of the ten top countries of the largest area of irrigated land (3.5 million hectares). The key irrigated summer crops are rice, maize, cotton, vegetables and fruits as well as winter crops (Agriculture in Iraq, 2017). Forage crops (alfalfa and other legumes) are grown for cattle breeding as an addition to barley. In summer, less than 3% of the area of agricultural crops is occupied by seed cotton, clover, vegetables, including eggplant and pumpkin, leguminous plants, including beans and peas, even smaller – apple, potato, onion, grapes and sesame. In the course of military operations taking place on its territory since 2003, a part of meliorative structures has been destroyed. For the most effective agricultural production under extreme conditions of natural and anthropogenic origin, reliable data on the geographic and temporal variability of the state of vegetation is needed.

It is possible to use remote sensing and GIS-technology of spatial analysis of data as a powerful and effective land monitoring means. The use of time-varying data allows us to quantify the dynamics of the processes of the state of the object based on the found differences (Mjachina et al., 2018). For example, in a work (Al-doski et al., 2013), by analyzing images of Landsat-5 Thematic Mapper, changes in the vegetation classes of the city of Halabja (Iraq), fired on by chemical weapons on March 16, 1988, were revealed. It is determined as sharp decrease in dense, rarefied and moderate vegetation by 55%, 7% and 9%, respectively, and an increase in the territory on which vegetation is absent (No vegetation) is 5%. As a result of distant studies between 1990 and 2001, in the province of Baghdad, the growth of planting areas from 44760.25 hectares to 75410.67 hectares and a reduction in the areas of degraded land was detected (Najeeb, 2009). Then (Saleh, 2012) obvious ecological changes have occurred to the vegetation cover of the Mesopotamian and southern Iraq in period between 1973 and 2004. Areas of vegetation cover and surface water were decreased, and infertile arid and waterlogged were increased.

The need to assess the effectiveness of destroyed economy restoring for maximum savings in natural and anthropogenic conditions calls for monitoring the status of irrigated agricultural lands, concentrated primarily in Central Iraq. In the literature there is no information about such systemic observations to

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