



Theme 2 | Advances in soil mapping and monitoring

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Monitoring of irrigated soils affected by military actions for management decisions and restoring their fertility

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Introduction

Data on the state of soils, in particular irrigated soils, play an important role in making management decisions rational use of soils, the application of measures to improve their condition and increase soil fertility.

One of the powerful anthropogenic factors that affects the state of soils, their properties and development is military action. The hostilities taking place in Ukraine cause significant losses and damages to the soil and affect the food security of both Ukraine and other countries of the world.

Analysis of information support and obtaining reliable, constantly updated information about soils is one of the priority tasks of scientific research for making management decisions.

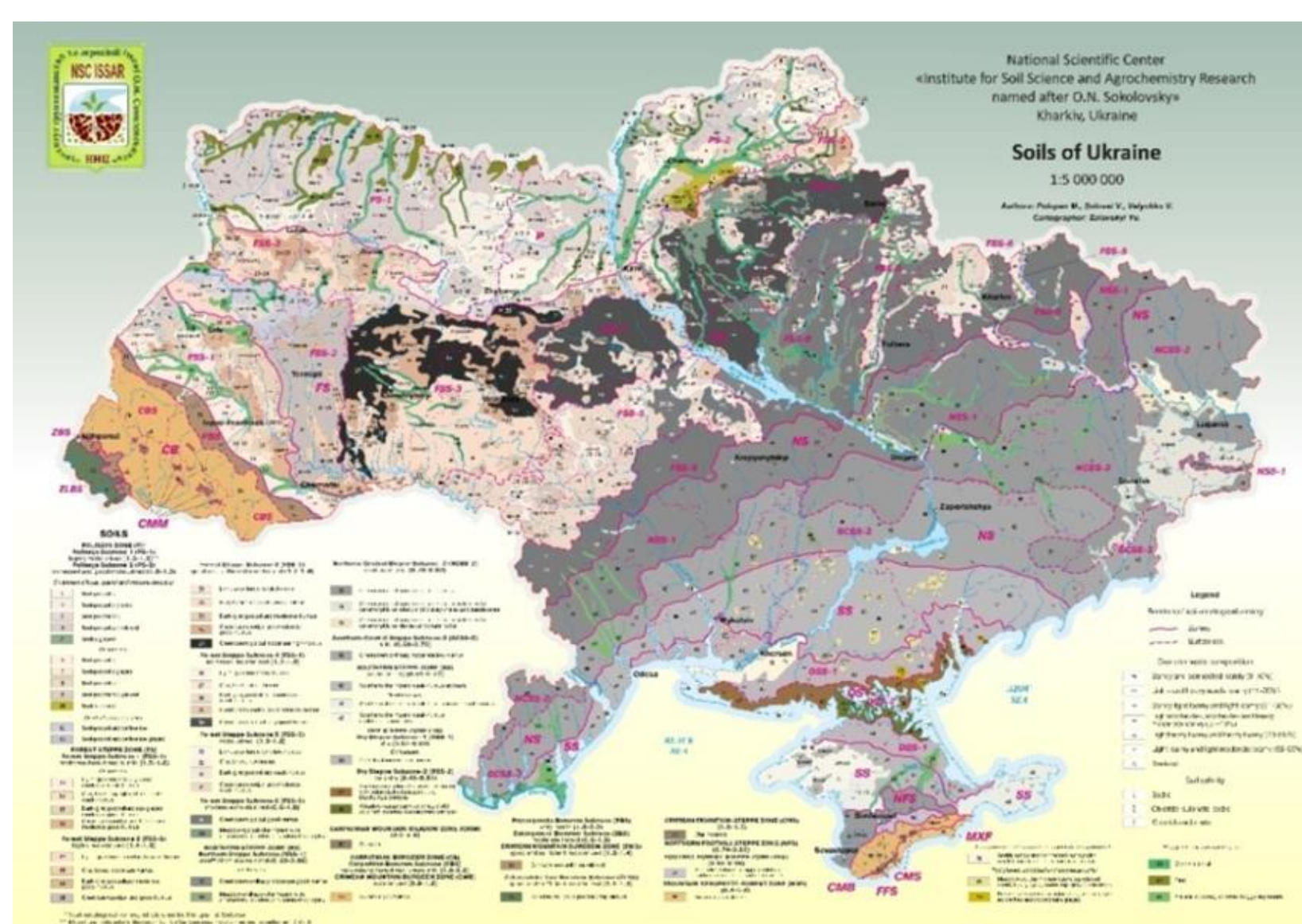


Fig. 1: Map of Ukrainian soil types (Scale 1:1 500 000), 2005
Source: NSC ISSAR, Kharkiv

Methodology

The **objects of research** were irrigation water, soils and crops. The site is located in the southern part of the Left-Bank Forest-Steppe of Ukraine, Chuguyivskiy district of Kharkiv region. The object of our research was the soil of the pilot area irrigation zone, represented by chernozem typical light clay granulometric composition. The research region was subjected to powerful military actions, which affected the state of water sources, soils, plants and the environment. In the work we combined various research methods. The method of remote sensing of the earth, a field with soil sampling were used. Irrigation water samples from natural sources were also taken to determine the chemical composition and quality of the water. Soil samples were taken to a depth of up to 1 m every 25 cm.

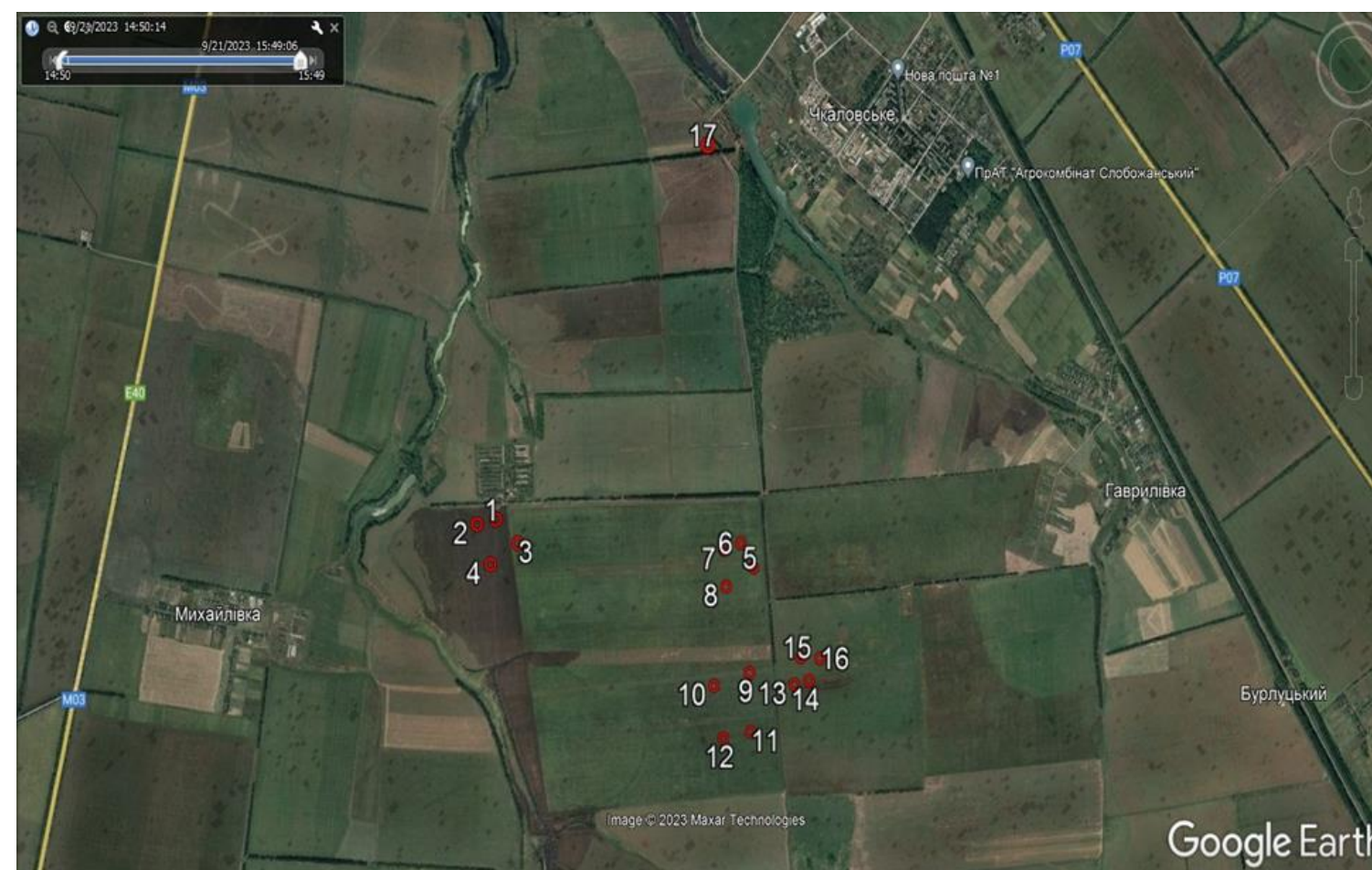


Fig. 2: The object of research

Results

The organization of a system of military and post-war soil monitoring to assess the impact of military actions on the physical, physico-chemical, and biological properties of the soil is extremely important. For diagnosis and identification of the state of irrigated soils, systematic monitoring is used using field and remote methods, digital mapping methods. Systematic provision of objective, comprehensive and constantly updated information about soils is a necessary prerequisite for sustainable and effective state management in the field of irrigated agriculture.

Ukrainian chernozems are under the influence of hostilities. This led to their destruction, military degradation, deterioration of quality and health. An important aspect of research is the assessment of the damage caused to soils as a result of this increased anthropogenic impact.

Remote and field research methods were used in this study to determine the impact of military operations on the condition of the soil cover of the irrigation zone. On the basis of space images, the damage zones due to the formation of craters, the passage of equipment, the density of craters, zones of potential contamination, etc. were determined.

According to calculations, the burning area on the irrigated lands of the pilot area is about 89 hectares. The development of biological, physical and chemical soil degradation is likely in these territories.



Fig. 3: Satellite image of irrigated lands of the Chkalovska Territorial Community with a selection of territories affected by military actions

Discussion

Under an increased anthropogenic factor, for example, military actions, soil monitoring is the basis for assessing their state, the ecosystem services level, fertility, health, and developing a plan for soil restoration.

Data of satellite images can be used to track changes of the state of the soil cover over a certain period of time and create cartographic materials, assess the development of soil degradation.

Conclusions

Monitoring of irrigated soils is the main sources of obtaining information about their condition. In the conditions of martial law, it is necessary to combine remote and field methods, the creation of digital cartographic materials, the use of devices and artificial intelligence.

The publication contains the results of the research obtained during the implementation of the project "Assessment of the impact of armed aggression on the state of black soils and the development of measures for the accelerated restoration of soil fertility in the context of ensuring food security" № 2022.01/0031 of the competition "Science for the recovery of Ukraine in the war and post-war periods" under the grant support of the National Research Foundation of Ukraine.

