

Brief information about the project

Name of the project	GIS Modeling of Winter Cereal Crop Yields in the Southern Regions of Kazakhstan Based on Remote Sensing Data under Climate Change Conditions
Relevance	
Purpose	The project aim is to develop a GIS based winter wheat yield forecasting modeling support for the Turkestan region. Agrometeorological conditions and trends in their deviations from climatic data, crop conditions, weed infestation levels, based on satellite monitoring will be used for the analysis
Objectives	1. development and adaptation of a GIS model for forecasting the winter wheat crop yields, by processing satellite and ground-based data (meteorological and climatic data, as well as biometric parameters of crop conditions and weed infestation based on field inspections). 2. preparation a database of long-term key meteorological and climatic parameters, characterizing the hydrothermal conditions of the wheat vegetative period with trends change analyses over recent years. 3. conducting a combined analysis of RS , meteorological and climatic indicators, field crops observations with the proper modeling forecasting. 4. testing the modeling field data from the Turkestan region to evaluate its accuracy for the calibration and verification use. 5. carrying out RS assessment of winter wheat targeted sowing areas with efficient satellite indices, preparing user-friendly maps for farmers. 6. preparing user-friendly maps of winter wheat crop conditions during the spring and summer vegetative periods with yield forecasts by using RS and ground-based data , which should support the efficient agricultural practices in south Kazakhstan.
Expected and achieved results	1. An adapted model will be developed to forecast the yield of winter cereal crops based on remote sensing data, climatic factors, crop conditions, and weed infestation levels. The model will take into account the specific soil and weather conditions of the southern regions of Kazakhstan, providing more accurate and well-grounded yield forecasts; 2. Key parameters, such as satellite data, climatic indicators, crop conditions, and field weed infestation, will be analyzed. These parameters will be integrated into the model to enhance the reliability of yield and crop condition forecasting; 3. Based on the collected data and analysis, a prototype model will be created to forecast the yield and condition of winter crops at various stages of their development. This approach will become an important tool for agricultural enterprises, enabling more precise decision-making in crop management; 4. The research results will be published in two articles in international peer-reviewed scientific journals with a high percentile in the Scopus database or in journals ranked in the top three quartiles by impact factor in Web of Science.

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Usage	
Priority compared to real-world alternatives	
List of publications with links to them	1. Arystanov, A., Sagin, J., Karabkina, N., Arystanova, R., Yermekov, F., Kabzhanova, G., Bekseitova, R., Aktymbayeva, A., & Kutymova, N. (2025). Automatic Classification of Agricultural Crops Using Sentinel-2 Data in the Rainfed Zone of Southern Kazakhstan. <i>Agronomy</i>, 15(9), 2040. https://doi.org/10.3390/agronomy15092040 Arystanov, A., Sagin, J., Kabzhanova, G., Sarsekova, D., Bekseitova, R., Molzhigitova, D., Balkozha, M., Yeleuova, E., & Satvaldiyev, B. (2026). Winter Cereal Re-Sowing and Land-Use Sustainability in the Foothill Zones of Southern Kazakhstan Based on Sentinel-2 Data. <i>Sustainability</i>, 18(2), 1053. https://doi.org/10.3390/su18021053
Patents	