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WHEAT YIELD FORECASTING IN UKRAINE

N. Kussul[2,3], A. Shelestov[1,2,3], A. Kolotii[1,2,3], D. Yashchuk[2]

[1]National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
[2]Space Research Institute NASU-SSAU, Kyiv, Ukraine
[3]National Technical University of Ukraine "Kyiv Polytechnic Institute", Kyiv, Ukraine

Crop yield forecasting is one of the main components of agriculture monitoring and an extremely important input in enabling food security and sustainable development [1–4]. Providing timely and reliable crop yield forecasts is equally important at global, national and regional (local) scales.

The use of remote sensing data from space for crop yield forecasting is motivated by wide coverage, near-real time delivery of data and products, and ability to provide different vegetation indicators. Many studies have shown that forecasting models based on remote sensing data can give similar or better performance comparing to the more sophisticated crop growth models. Usually, remote sensing derived indicators are connected to crop yield using empirical regression-based models. Traditionally, vegetation indices such as Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), and Vegetation Health Index (VHI) are used as input parameters into empirical models. Recently, however, more attention has been brought to the usage of biophysical parameters such as leaf area index (LAI) and fraction of absorbed photosynthetically active radiation (fAPAR). It is stated that biophysical parameters more adequately reflect the state of the crops and thus could be better suited for predicting crop yield and production.

It should be however noted that in many studies satellite data from space are used at global or national scales. In our previous study, we have estimated efficiency of using predictors of different nature (vegetation indices, biophysical parameters, and a crop growth model adopted for the territory of Ukraine) at oblast level. No previous studies assessed efficiency of satellite-derived indicators at multiple scales.

Our investigations are devoted to winter wheat yield forecasting problem in Ukraine at different scales. Since reliable statistical data are available for Ukraine only since 2000, we use a single factor regression model for crop yield estimation. Our previous study has demonstrated the effect of overfitting when more complex models are used. The main goal of the paper is to determine the best predictors for regression models at different scales among satellite and biophysical model (WOFOST) input parameters. We consider three levels of investigation for the best predictor selection in yield forecasting problems: region, county and fields of concrete farm. Oblast is a sub-national administrative unit that corresponds to the NUTS2 level of the Nomenclature of Territorial Units for Statistics (NUTS) of the European Union, county corresponds to NUTS3 level.

Therefore, the objective of the study presented in this paper is to assess the efficiency of satellite and biophysical model based predictors assimilation into winter wheat crop yield forecasting models at different scales (region, county and field).

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