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INTRODUCTION OF THE GEPIC MODEL TO OPTIMIZE LAND-USE IN ODESSA REGION

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At present, under conditions of climate changes and such anthropogenic factors as irrigation and fertilizers application to soil, modelling of spatial and temporal dynamics of the main processes in the system soil-plants-atmosphere-agriculture acquires essential importance in order to forecast socioeconomic development of the country and efficiently use natural resources, in particular - land. Used to forecast crop yields and other land-use parameters for Odessa Region GEPIC model (GIS-based Environmental Policy Integrated Climate) is an adapted for GIS variant of biophysical model EPIC (Environmental Policy Integrated Climate). The GEPIC model was elaborated in 2004–2005 by Swiss Federal Institute of Aquatic Science and Technology (EAWAG). In the framework of the project "Water Scarcity – Its Measurement and Implications for Virtual Water Import".

As input data we prepared sets of rasters of spatial resolution 30x30, 15x15 and 5x5 minutes, as well as text files with soil and climatic characteristics. The data used on elevations were taken from the site of U.S. Geological Survey (www.usgs.gov), data on slope – from the site of HYDRO1k Elevation Derivative Database (eros.usgs.gov), soil data – from the site of World Soil Information (www.isric.org), climatic data – from the site of the project European Climate Assessment & Dataset (eca.knmi.nl). The information on quantity of fertilizers applied and irrigation were taken from the reports of the Statistics Department in Odessa Region and reports of the State Committee of Ukraine on Statistics, as well as from the reports of the Odessa Regional Water Management Department. To build the map of irrigated areas spatial distribution in Odessa Region digital map from the site of the Food and Agriculture Organization of The United Nation (www.fao.org) was used.

As the result of calculations for each cell data about winter wheat yield, wind and water erosion, humus content in soil, surface run-off, residues of nitrogen and phosphorus in the soil, harvest crop index, biomass, evaporation + transpiration etc (62 parameters altogether) were modelled.

The data received as the result of modelling for the period 2000-2010 are showing that the strongest influence on crops yields and other land-use parameters is produced by irrigation, properties and characteristics of soils, climatic data. Hawing prognostic climatic data, one could model for the nearest future such land-use parameters as crop yield, water consumption, changes in N and P content in soil, erosion and other parameters, which can be used for land-use optimization and specific programs development to preserve and restore fertility of soil cover and decrease its pollution and erosion.