Monitoring of Soil Nutrient Status and GEO data-base

IPNI Project for Bulgaria "Best Management Practices for Sustainable Crop Nutrition in Bulgaria"

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During the last 20 years (after the transition to market economy) the soil nutrient monitoring of agricultural land was not organized in systematic way. Based on the soil nutrient status fertilizer recommendations for individual field allow achieving optimum crop production with high quality and without soil fertility or environmental risks. Soil nutrient levels vary within fields, even on fields that seem to be uniform. It is therefore necessary to follow certain recommended steps for soil sampling and testing and GIS processing to develop a sound ongoing soil fertility spatial management programs. In order to have actual information about the soil nutrient status in the project, soil test survey of pilot regions was organized and GEO data-base with soil and field data attributes was created.

Because of great variety of soil units through whole country area, and with connection to actual Land Use, there were selected dominant soil units and parcels sizes for two pilot Regions – Region of Veliko Tarnovo and region of Sliven. Both were chosen as a more representative AOI with respect to zonal soil units distribution for north and south part of the country. Selection and extraction of the representative dominant soil units was made in GIS environment from large scale Digital Soil Data Base maintained in Soil Resources Agency. Selection of the right places for soil sampling was processed in GIS environment with overlaying the actual aerial images corresponding to Land Use Types, dominant soil units distribution vector layer and digital layer for Physical Units under Land Parcel Identification System (LPIS). As a result the three main factors were selected and used as a criteria for choosing soil sampling plots – i) dominant soil units /*Alfisols, Mollisols, Vertisols*/, ii) representative land cover and crops /*Wheat, Barley, Maize, Sunflower, Oilseed rape, Potatoes, Tomatoes, Pepper, Apricots, Peaches, Chokeberries, Vineyards*/ and iii) distribution of parcels under LPIS /small one vs. big one/. To guarantee the maximum representativeness and reliability of soil sampled data a great number (above 320) of soil sample plots were selected for testing the nutrients contents, pH and organic matter.

The results from field soil sampling and lab analysis were built into spatial GEO-database for post GIS processing. The results from lab were added to point layer and then spatial processed with GEO-statistical analysis, to be covered areas without sampling data. As a result the areas/zones with different classes (from low to high contents) of nutrients (K_2O, P_2O_5) contents was modeled, extracted, measured and then mapped. These areas were then overplayed with digital layer for parcels under LPIS to be visible: i) the magnitude of areas with low and high nutrient contents, ii) the distribution of small and big parcels in each zone, iii) the extend of participation of each soil type units per different zones.

Taking into account the present results and time remaining to the end of the current project, the final results are clearly visible and seems completely attainable.