Transformation of traditional agriculture on digital in the Republic of Moldova using advanced techniques

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2.3.4 Transformation of traditional agriculture on digital in the Republic of Moldova using advanced techniques

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- The research estimates suitable belts for grape and sunflower growth in Moldova with included climate change until 2050, according to the established CMIP6 prediction.
- The areas not suitable for grapes will increase by 35%, while the sunflower has better possibilities for growth.
- The most useful land for grape growth would move to the north and penetrate the territory of Ukraine in the Valley of the Dniester River, as well in the territory of Romania on the other side.
- The most valuable areas for sunflower growth will move to the territory of south-east Romania and south Ukraine.
- Climate change (1990-2020) resulted with changes in sunflower and grape fields. The effects of the temperature rise may be more dangerous in the period 2025-2050.

The Republic of Moldova has a small territory of 33,843 km2. Due to the increase of temperature in Europe by more than 1.0 °C, the number of drought periods was increased dramatically. Recently, there has been a shift in the climate of Moldova, manifested in the change of precipitation and extreme temperatures. According to this the agricultural sector in Moldova is vulnerable. The water resources in Moldova are quite limited due to pollution, degradation influenced by climate change, and unwise human activity to their biodiversity and ecosystems, availability, and accessibility. The traditional watering of crops is now reduced and depends on weather conditions in the spring and autumn. These areas are vulnerable because of the deficit of water and in the suburban areas the agricultural potential is very low of doesn't exist. Two main plants in the Moldavian agricultural sector are grape and sunflower. In Moldova, 3% of the territory belongs to grapes and, 7% of agricultural production is connected with the export of wine. The Moldavian export of wine is the 6th place in Europe and 3rd place in the region of the Black Sea. Moldova is also the 19th producer of wine in the world since every fourth active Moldavian from the agricultural sector is involved in the wine sector. The sunflower areas are planted on 9% of the territory. 12% of the export belong to the export of sunflower oil. In this research we included climate condition in the last thirty years (1990-2020) and climate prediction until 2050. This climate model we established using CMIP6 prediction (the Sixth Coupled Model Intercomparison Project). In that way changes of meteorological parameters especially air temperature and precipitations were including too. After GIS (Geographical Information Systems) procedures and Remote Sensing analysis, the following steps were numerical calculations and estimation of digital and meteorological data. The final step was the estimation of suitable belts for grape and sunflower grow with included climate changes. The areas suitable for the growth of grapes are located in the northeast and northeast parts of the country. The central city in this area is Bălți. The other four cities Dubăsari, Chișinău, Tiraspol, and Cahul will move to the belt not suitable for grapes growth. The central part of the country presents the border between two zones. In comparison with analysed areas when temperature and precipitation decrease, would decrease the areas excellent for grapes breeding by 35%. At the same time areas not suitable for grapes will increase by 35%. The sunflower has a better possibility for growth in the territory of Moldova with included climate change properties. 90% of the territory has excellent potential for sunflower growth, 0.5% suitable, 9% very marginal and 0.5% not situated. Only the areas near the city Cahul in the southwest and areas in the southeast have a low potential for sunflowers plantation. On the other hand, an increase of precipitations by 15% would decrease areas suitable for sunflower by 22.5% or 7,615 km2.

Sunflower has the following results-the excellent 52%, very suitable 5%, suitable 11%, marginal 2%, very marginal 24%, and not situated 6%. With the increase of cloudiness by 15%, almost 32% of the Moldova territory will not be useful for sunflowers' growth and plantation. The excellent areas for sunflower growth are in the territory between Bălți and Dubăsari. The low possibility of growth of sunflower is on the territories in the southeast and southwest near the city Cahul. The statistical analysis using matrices can give specific and valuable results of this research. This statistical approach can help in estimating the crops changes with the support of sophisticated digital methods. The areas of vineyards and sunflowers will move from the border of Moldova. The most useful land for grapes growth would move to the north and penetrate the territory of Ukraine in the Valley of the Dniester river. This valley has a good possibility for the plantation of grapes, even in Moldova. On the other side, the potential land for grapes growth will penetrate the territory of Romania. Sunflower territories have slightly different routes. The most valuable areas will move to the territory of south-east

Romania and south Ukraine in the triangle between cities Odesa, Izmail, and Tarutyne. If temperature will more increase and precipitations decrease. Sunflower and grape present 70% of all Moldavian agricultural potential. The changing of climate in the last thirty years (1990-2020), showed the changing of fields with sunflowers and grapes. In the last ten years (2010-2020) the increase of temperature was pronounced in the central and south-east and partly in the north part of Moldova territory. In the period (2025-2050), these effects may be more dangerous. The Republic of Moldova is an agricultural country and influenced by ecological indicators which are important for the growing of plants. The methods of GIS analysis, digitization of cadastre data of crops, and remote sensing may give satisfactory results. The Moldavian agricultural sector with the support of the European Union, must be transformed from traditional to digital in a very short time. This research showed some potential ways of that changing.