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Short Communication

The Importance of Determining the Soil Moisture Reserve

Cojocaru Olesea*

Associate Professor, Department of Agronomy and Environment, State Agrarian University of Moldova, Moldova

***Corresponding Author:** Cojocaru Olesea, Associate Professor, Department of Agronomy and Environment, State Agrarian University of Moldova, Moldova.

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Calculation of the dynamics of soil moisture is used in hydrological models to calculate the inflow of water into the channel network, in hydrophysical models to take into account the physical processes of moisture movement and evaporation, as well as in agrometeorological models to obtain information on the processes of moisture and desiccation of the soil of an agricultural field.

The gross moisture content of a territory is an integral indicator characterizing the general moisture content of a given territory and combining a part of the expendable elements of the water balance, total evaporation and the underground component of river runoff, it characterizes that part of atmospheric precipitation that was delayed on the surface of vegetation and soil cover, accumulated in the soil and seeped into the depths of the underlying soils.

W = P-S - U+E-------(1)

Where: W - is the gross wetting of the territory; P - atmospheric precipitation; S - surface component of river flow - R; U - is its underground component.

The total moisture content is determined by the ratio of atmospheric precipitation and the surface component of the river runoff. The values of the latter depend in the most essential way on the state of the soil and vegetation cover. In this case, an important role is played by the infiltration and water retention capacity of the soil cover.

The ratio between the amount of precipitation flowing down the slope and penetrating into the soil, i.e. of its constituent gross moisture, first of all, depends on the permeability of the soil cover. The latter is determined by the water-physical properties of the soil, the mechanical composition of which can be an indirect characteristic.

The change in water reserves in the soils of the aeration zone is determined from the data of observations of the moisture content of the upper meter layer of soils. Moisture reserves in the aeration zone below the upper meter layer of soil are usually not measured.

In water-balance calculations and analysis of the conditions for the formation of runoff, the change in moisture reserves in soil-grounds should be taken into account for the entire layer in which it occurs under the influence of evaporation. The thickness of this layer is not the same in different physical-geographical regions and is not constant in time for each region. For the southern regions of the ETS (areas of insufficient moisture), changes in moisture reserves in soils during especially high-water and dry periods occur in a thicker layer than in ordinary periods, in which fluctuations in moisture reserves are limited to the upper 2-3-meter layer. In the central regions (areas of moderate moisture), the thickness of the upper layer, in which the moisture reserves change, is usually 1.5 - 2m. In areas of excessive moisture, characterized by the close occurrence of groundwater of the upper aquifer (2 - 5), the distribution of moisture reserves in the zone aeration is determined by the course of evaporation, precipitation and the regime of groundwater.

The change in moisture content in the 0-100 cm soil layer at two successive steps of the model calculation is determined as:

Wk+1 = Wzk+zF0zk-WsLowzk*t, Wz0 = W0--------(2)

Where: k - is the number of the time step of the model; t is the duration of the time step of the model, days; W - moisture content in a meter layer of soil, mm; W_0 - initial stock, mm; F_0 - moisture exchange between the soil (sowing) and the atmosphere, mm/day; WsLow - moisture exchange at the lower boundary of the calculated soil layer, mm/day. In the presence of precipitation, moisture

exchange at the upper boundary of the soil is equated to their daily value P_r: $F_0 = P_r$, and in the absence of precipitation, it is defined as evapotranspiration with the opposite sign: $F_0 = -E_{real}$.

Climate change on Earth causes an urgent need for a better understanding and forecasting of the processes that control the transfer, transformation and exchange of heat and water in the climate system and their interactions.