

SNOW MELTING, SURFACE RUNOFF AND DEGRADATION OF SOIL

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Researches conducted in 1992-2008 years on sub-watersheds (25-50 ha), with a soddy podzolic silt loam soils, In a zone southern taiga a water erosion is one of components of the general process of physical degradation soils and it is observed usually during melting of snow in March – April. Erosion is defined both natural and anthropogenic factors. Stocks of water in a snow before melting varied within limits of 10.0-154.1 mm, in ice on a surface of soil – 0.0-92.1 mm, quantity of precipitation during a surface runoff – 6.6-60.5 mm. Variability in stocks of water in a snow was caused by meteorological conditions and geomorphologic features of landscape. The greatest quantity of a snow has been concentrated in the lowered elements of a relief. The depth very strong freezing of soil (0-100 cm) depend on temperature of air and height of a snow cover. Before runoff the upper part of a profile soils was over-saturated by moisture. Its content in a layer 0-10 cm made 33.6-53.8 %, a layer 10-20 cm – 25.3-51.2 %, a layer 20-30 cm – 23.9-48.4 % and in the most cases considerably exceeded the least field moisture capacity. It is practically completely excluded an possibility of infiltration of snow water in soils. In this connection the volume of a surface runoff corresponded to total stocks of water in a snow, in an ice and partially or completely in precipitations. Hence the index of a surface runoff was equal 1 or 100 %. The positive balance of a moisture for the period of a runoff in a layer of soils 0-100 cm on upper parts of slopes was observed only in 3 cases (19.4-52.6 mm), negative in 13 cases (-1.3,-106.6 mm). The volume of a runoff practically did not depend on duration of melting snow, changes of daily average temperature of air, an exposition and a steepness of a slope. The runoff had positive value in maintenance of the general water balance in the ecosystems and in prevention of washing away of nutrients of soil at its transition to subsurface runoff. At the same time at infringements in the landscape organization of territory and soil-conservation technologies of crop production the surface runoff can lead to destruction and loss of fertility of soil. In a soil-conservation crop rotation: silage corn - barley – perennial grasses (2-3 years) – winter wheat on a slope of a northeast exposition by a steepness up to 2⁰ washout of soil, defined by a volumetric method of measuring of wash-ins, was minimal and on the average for 13 years made 1.7 t/ha/low part of a slope/year and its was observed only at a runoff upon the bare surface of soil (moldboard plow by autumn). On a slope of east exposition by a steepness up to 4⁰ (monoculture of the silage corn, bare surface of soil) the intensity of snow melting and kinetic energy of a runoff have been expressed a much greater degree, than on northern slope. Washout of soil reached on the average for 3 years made 118.7 t/ha/low part of a slope/year. It occurred in process of thawing of the soil and led to losses of total and available forms of nutrients and organic matter. The suspended material, except for colloids, was accumulated in the buffer strips of perennial cereal grasses or natural ranges, that's close to the lowest elements of a relief along streams. Erosion represents a special case of process of global carry of substances from the upland to lowland and cannot be checked completely. Losses of soil can be reduced to a minimum at sod cover of the basic water-runoff-ways and the parts of slopes, that's exposed to erosion. The estimation of physical degradation of the soils demands perfection of methods and methodology of researches, including scale erosive mapping and accumulation of washout in a bottom sediments.