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Cultivation of energy crops on degraded drained lands as an effective way of improving of their agriecological state

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There are about 4,5 million ha of hydromorphic soils (marsh, wetlands, flooded ones) in Ukraine. Drainage irrigation systems were built on the bigger part of those soils in the 60s of the XX century. The total area of drained lands at that time was about 3,3 million ha, of which 2,8 million ha had been used in agriculture. The main goal of this large-scale project was the involvement of wetlands to agricultural production. At the initial stage that goal was realized on some territories. However, in many areas of drained lands the levels of designed productivity of crops were not able to reach, thus soil cover suffered significantly because of environmental damage.
Failures with technical regulations of maintenance of reclamation systems network caused a partial failure of some of them. This was the reason of detrimental impact on the agriecological soils condition. In the last decade, this problem is further aggravated by the excessive displays of degradation processes – secondary swamping, halogenization, colmatage, soil compaction, overgrowing of lands with poor quality vegetation, etc. Also, significant factors of poor agriecological condition of drained soils are: late terms of diversion of spring waters; the evolution of erosion processes and peat fires. All said above leads to weak demand of drained lands in agricultural production and to their alienation from society. Nowadays about 1,1 million ha of degraded in varying degrees drained soils are not being used by appointment. It is important to note, that such lands can be classified as marginal.
One of the ways of marginal and unprofitable drained soils usage is the cultivation of energy crops. The extension of bioenergetics in Ukraine can solve not only the problem of energy security of the country, but also such general planetary issues as the reduction of climate negative impact on soil cover; reduction of organic carbon into the atmosphere; the ecological improving of environment.
In the National Scientific Center «Institute of Soil Science and Agrochemistry Researches named after O.N. Sokolovsky» (Kharkiv, Ukraine) we are researching the impact of energy crops on soil properties. Studies show that the cultivation of energy crops (short-rotation willow and giant miscanthus) improves the soil structure and its physical and physical-chemical indicators and also significantly eliminates soil erosion.
The important point is also the fact that due to global climate change topic of reduction of organic carbon income from the soil needs to be solved. In this aspect, increasing of the number of cultural short-rotation willow plantations plays an important role in the ecology of agricultural landscapes. It's important to notice that this energy crop is able to eliminate the ethanol and benzene from the water-bearing soil horizons. Besides, willow and miscanthus production is carbon-neutral. That means that after the combustion of any kind of fuel obtained from these crops, the atmosphere gets the same amount of carbon that has been assimilated by plants during photosynthesis. It should be noted that soil carbon sequestration is largely dependent on the development of oxidation processes in it, the smaller they are, the more soil retards carbon. To reduce this, we have to decrease air mixing with the soil during tillage. This process causes carbon oxidation and it's returning to the atmosphere as carbon dioxide. Growing willow and miscanthus contributes the retention of soil organic carbon, as their plantations mortgage for 25-30 years and all this time, plowing is not carried out. Besides energy crops almost completely cover the soil, thereby reducing the loss of organic carbon. For example, between the rows of willow leaf litter accumulates, which also prevents carbon dioxide emissions.
Growing willow and miscanthus is particularly important from the point of view of their remediation features and, in general, improves the ecological condition of agricultural landscapes.