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SOIL: OUR COMMON FUTURE

ABSTRACTS

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The first runs along the depression line, heading from the peak to the deepest point of the study area. The second catena consists of a more marginal course, beginning beneath the easterly ridge. In total, the profiles of eight locations were probed. Cores were excavated until depths between 120 cm and 520 cm. Test pits were arranged additionally at three representative sites. Three Reference Soil Groups were specified: Vertisols, Phaeozems, and Chernozems. The denudation sites of the upper slope are represented by Protocalcic Chernozems. Translocation sites, consisting of Pellic Vertisols, are spread on steeper positions of the middle and lower study area, alternating with local accumulation sites. The latter are situated in the back of the slumpings and contain enormous colluvial concentrations (up to 230 cm thickness). They led to the development of Pellic Vertisols and Phaeozems (Hyperhumic). Especially these Vertisols have Stagnic properties and contain the highest amounts of clay and SOM (up to 62% and 19,5%, respectively). The mainly deep and organic matter rich soil cover results from a specific interplay of certain favouring factors: (1) grassland vegetation (high above- and belowground biomass production), (2) the related abundant soil biota (soil deepening through bioturbation; forming of stable organo-mineral complexes), (3) clayey substratum (forming of organo-mineral complexes; soil deepening through peloturbation; trigger for soil creep), (4) episodic, anthropogenic induced vegetation fires (black carbon source; trigger for sheet erosion), and (5) solid matter shift (sheet erosion and soil creep leading to a colluvial conservation of pedogenic material at the accumulation sites).

ELEMENT OF THE LANDSCAPE AND NON POINT POLUTION IN GROUND WATER

Szajdak, L.W.[1]*, Gaca, W.[1], Meysner, T.[1], Styła, K.[1], Szczepański, M.[1], Inisheva, L.I.[2]

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In agricultural landscape large amounts of migrating nutrients are leached out from cultivated soils (Szajdak, 2011). Agricultural pollutants can be considered as two major groups: land based and management related. The land-based pollutants are associated with the soil and result from erosion and subsequent movement of soil particles to surface waters.

Long-term investigations carried out in Wielkopolska region (West-Polish Lowland) by the Institute for Agricultural and Forest Environment of the Polish Academy of Sciences in Poznań, Poland revealed high contents of chemical compounds including mineral and organic forms of nitrogen and phosphorus, calcium, magnesium and mineral carbon quantities in the ground water crossing the shelterbelts. Shelterbelts are rows of trees and groundcover shrubs planted on agricultural land primarily for agronomic and environmental reasons (Maryganova et al. 2010). Shelterbelts impact on the global carbon cycle because of their capacity to mitigate the green-house effect by sequestration of carbon and nitrogen. The conversion from arable cropping to shelterbelt was shown to cause the accumulation of soil organic matter (SOM) and changes in chemical structure and physicochemical properties of humic substances with the age of shelterbelts being the principal factor (Szajdak et al. 2002, Szajdak and Gaca 2010, Szajdak et al. 2015).

Strong effect of trees on the limiting of spreading of chemical pollution in ground water is a result of developed root system, in which effective range there is more ground water than in root's system of cereal plants.

Our investigations shown, that biogeochemical barrier in the form of shelterbelts separating cultivated fields from water-courses as well as small ponds are significantly impacted on the spread of the chemical pollutions in agricultural landscape. Shelterbelts efficiently decrease the concentration of chemical substances in ground water.

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Szajdak L.W., Maryganova V., Skakovskii E., Tychinskaya L. (2015). H and 13C NMR specrtoscopic studies of hexane-extractable lipids from soils shelterbelts of different age and composition of plants. *Chemosphere.* 119, 1422-1427.

AGROECOLOGICALLY SMART LAND MANAGEMENT PLANNING IN RF CHANGING ENVIRONMENT

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Mutual for the first decades of XXI century global climate, economy and farming changes sharply actualized novel IT-based approaches in soil quality evaluation and agroecologically smart land management planning in RF sharply changing agricultural environment. In projected climate changes (Valentini, Vasenev, 2015), RF boreal and subboreal regions will benefit from predicted and already particularly verified temperature warming and increased precipitation due to essential increasing of growing season length and mild climate conditions favorable for prospective crops and best available agrotechnologies in conditions of principal agricultural regions of Russia.

However, the essential spatial heterogeneity is another mutual feature for most natural and man-changed soils at the Central European region of Russia which is one of the biggest «food baskets» in RF. In these conditions potentially favorable climate circumstances will increase not only soil fertility and workability features but also their dynamics and spatial variability that determine crucial issues of IT-based soil quality evaluation development and agroecologically smart land management planning. Developed and verified within the LAMP project (RF Governmental projects #11.G34.31.0079 and #14.120.14.4266) regionally adapted DSS (ACORD-R – RF #2012612944) gives effective informational and methodological support for smart farming agroecological optimization in global climate and farming changes challenges.

Agroecologically smart land management practice refers to sustainable balance among 7 principal groups of land agroecological functions: (a) Agroclimatic ones of plant supply with photosynthetic active radiation, effective heat and available moisture; (b) Agrochemical functions of crop supply with available macro- and micro-nutrients; (c) Agrophysical ones of favorable condition support for farming effective workability and trafficability; (d) Hydrophysical functions of plant seasonal supply with available moisture and soil air exchange; (e) Phyto-sanitary functions of favorable condition support for crop minimum damage by pathogens, pests and weeds; (f) Ecogeochemical ones of soil resistance to contamination; (g) Ecopedomorphogenetic functions of plant and farming support with soil agroecological quasi-homogeneity in space and time.

Realized in frame of DSS ACORD-R integral algorithm of land current and predicted quality evaluation includes 4 particular ones: (i) the principal agroecological parameters assessment by their modeling or adapted to concrete soil/land type logistic equation; (ii) agroecological function assessment as corrected harmonic mean from its parameters assessment values; (iii) homogeneous land unit assessment as combination of its agroecological functions values; (iv) heterogeneous land