

Paleoecological Aspect of the Kastanozem Soils of Eastern Mongolia

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Vast plain of Eastern-Mongolia with 240 thousand km² area was begin to form in Mezozoic era, since this time on this place formed undulated hilly plain with some places rock outcrops and Cretaceous red sediments. The end of Mezozoic era before the Ice Age time, on this territory dominated more humid climate condition with wide spread of the river systems, fresh flow lakes joined by the rivers and channels. Present dry walleyes and channels has a water flow up to the Pleistocene time. After glaciations on this territory disappeared or dried out river systems result of aridization of climate condition.

Present time, on this territory dominated dry steppe landscape with Kastanozem soils. This soil formed under grass-forb steppe vegetation covers. Plant fitomass about 1,0 to 2,7 tn/hectares, underground rootmass reaches up to 17,0 to 40,0 tn/hectares.

The specific features of the Kastanozem soil in Eastern Mongolia are the result of the following:

- deep freezing of the ground-soils (up to 3-4 metr) and the protracted (6-7 months in year) frost-bound state of soils;
- periodical (once 4-5 year) summer rain-water penetration by full soil profile;
- stony gravelly light texture (silt, loam, sand) content;
- short soil profile and humus horizon;

- low humus content (2-4%);
- carbonate migrations down to the soil profile, meal like miceller form of them;
- low content or absence of dissolved salts, gyps and solonetsic properties.

In the profiles of Kastanozem soils very often occur relictic properties of paleocryogenic and paleohydromorphic nature. Also, very often can meet buried soils result of climatic change, (possible pasture degradation) deflation process and covered by of sandy silty materials.

There are following formations belong to the paleocryogenic origin:

Crack wedge, usually begin from 20-40cm depth of soil profiles down to the 60-80 cm of depths.

Cryoturbation- in low part of soil profiles,

Gravelly loamy sandy lens like layers in the subsoil's (4-11m. length, 2-3.5 m. width), topography of upper boundary of them has irregular (zigzag like) features result of cryogenic fissure.

All of this cryogenic formations created by result of strong freezing processes in glacial periods. The south boundary of distribution of kastanozem soils with paleocryomorphic properties in the territory of the Eastern Mongolia reach to the 46o northern latitude. Paleocryomorphic processes usually developed on the strong carbonated sediments, that way possible

to conclude that, active accumulation of carbonates in soil-grounds occur before the Last Glaciation period.

The paleohydromorphic features of Kastanazhem soils represented by more dark layers or mottles in low part of recent humus horizon or under them. Such dark coloured subhumus horizon in the Kasatanozem soils most likely connected by before present soil forming (meadow) process in more humid climate conditions. This soils we distinguished as a residual meadow kastanazhem soil. Also, some soils with paleohydromorphic properties identified as a residual solonchastic kastanazhem soil. This is usually occurred places where after glacial periods was meadow condition (periglacial).

In to the formations relictic genesis, possible to include very thick (50-150cm) carbonate layer in soil profiles, containing very high content of carbonates (CO₂ up to the 10-30%). Comparatively shallow (10-40cm.) humus horizon layered on the carbonate horizons. Accumulation of such big amount of carbonates not possible to explain by recent soil forming process. It is seems to be, carbonates settled down after evaporation of water from high saturated grounds and carbonates fully penetrated basic soil-ground material. This is also proved by some geological exposures (Baganuur, Chandgan tal, Bajan teeg coal mining), where comparatively thick carbonate horizons layered on the coal layer.

There are, some profiles with buried soils In Eastern Mongolia, this is very clear evidence of climatogenic deflation of the sands in Holocene.

In Mongolia, beginning of Holocene period dated 11,5 thous, year before present. First climatic period (increasing warm, dry climate) finished 10 thous, year BP. Next climatic period (cold and wet) continued from 10 thous. to the 8 thous. year BP. End of the this period occurred short arid period. From 8 thous. to the 4 thous. year BP climate was cold and humid (Holocene optimum in Mongolia). Last 4 thous. years characterized by increase of continentality,

aridization of climate condition, degradation of forest area and general steppeization process.

Result of field investigations and radiocarbon dating of buried humus layers of soils on the aeolian sandy sediments of Erdenetsagaan soum with ages between 6150 \pm 70 yr. and 5350 \pm 130 yr. BP show that, this time formed loamy-sandy chernozem like soil with hydromorphic features. After, this soils changed by light Kastanazhem soils, on the this soils layered humus horizon of leached chernozem like soil which formed between 3770 \pm 130 and 1050 \pm 50 year BP. Humus horizon of leached chernozem soil's covered by aeolian sands and on the this sediments formed recent Kastanazhem soils. In the Molzog-els sand dune fields on the old aeolian sands (5290 \pm 300 year BP) begin to form humus horizon of sandy chernozem like soils. Middle part of this layers dated 4450 \pm 120 year BP by the radiocarbon analyze. This soil covered by sandy sediments, on the them formed Kastanazhem soils which humus layer was dated 2640 \pm 220 year BP, this soil again covered by sands. On the this sands developed light Kasatanozem soils with age of 1490 \pm 170 year. This soil covered by recent Light Kastanazhem soils. In the sand dune fields of Avdar-Manh found buried Kastanazhem soil covered by sandy sediments 3680 \pm 50 year BP.

That way, in the south part of Eastern Mongolian plains possible to distinguish 4 period of sand accumulations. The end of 1-st period formed chernozem like soils dated 6150 yr BP (sand massive of Erdenetsagaan). Second period of active aeolian sand accumulation beginning 3600-3800 yr BP and continued relatively long period. Third period of active sand accumulation recognized only in the sand fields of Molzog els. This period begin 2640 yr BP and finished 1490 yr BP. Fourth period of sand accumulation marked in the regions of Erdentsagaan. This period begin 1050 year BP and ended by development of recent soils. First 2 periods of sand accumulation has a

very clear climate change influence, last 2 periods probably connected by antropogenic origin or overgrazing and pasture degradation process.

Result of this investigations possible to conclude

that, more old (4500-5000 year BP) buried soils characterized by high humus content with hydromorphic properties, this is very well correlated by climatic optimum of Holozen period.