OVERGRAZING IMPACT UPON RANGELAND ECOSYSTEMS OF KAZAKSTAN DESERTS

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ABSTRACT
Vegetation dynamics trends are studies in connection with natural and human-induced factors. Interrelation of rangeland ecosystems with climate and grazing type is revealed. Degression, demutation and dynamics regulation diagrams are given for different conditions of use. Some quantitative and qualitative criteria were elaborated for rangeland ecosystems assessment. Ecosystem degradation indicators were identified, methods were elaborated for making subject maps for environmental assessment and sustainable management of grasslands. A method of seasonal cartographic rangeland cadastre was elaborated by the example of Volga - Ural sands on the basis of the map (S. 1:500,000)

KEYWORDS
rangeland ecosystems, pasqual dynamics, degradation, demutation, rangeland cadastre, "biote-environment", human-induced changes, desertification.

INTRODUCTION
Being one of the largest countries of the world (2725,0 ths. sq. km or 1048 ths. sq. miles) (9-th place), Kazakstan is situated on the frontier of the two continents - Europe and Asia (45^0 and 87^0 E.L.; 40^0 and 55^0 N.L.) stretching 3000 km (1105 miles) from west to east and 1700 km (650 miles) from south to north. Natural grasslands, mostly of desert and semi-desert regions, make up 1890 ths. sq. km or 189 mln. ha, annual renewable feed capacity being assessed from 30,0 to 32,5 mln tons of feed units. The forage reserve is the main source of raw materials for the population.

The lack of purposeful environmental policy for natural use and extensive animal husbandry in the late half of the 20^{th} century have caused the degradation of rangeland ecosystems and aggravated the environment of the republic in which deserts occupy over 55% of the area. Arable lands have lost 20-30% of humus. About 30 mln. ha of rangelands are exposed to soil blowing and erosion, 15 mln. ha are stamped out, 63 mln. ha - degraded (30% of the whole grazing area). Total area of desertificated lands makes up about 182 mln. ha or 60% of the republic's area. Scientific basis of land protection and sustainable management, soil fertility rehabilitation is needed to solve the problems.

STUDY SITES AND METHODS
Rangeland ecosystems of sandy deserts of Kazakstan were studied. Natural and human-induced changes were identified ecologo-anthropodynamic rows of permanent sites under unsystematic and regulated grazing in enclosures and in fenced monitoring sites.

Phytocoenotic study is based on methodic directions by L.G. Ramenskiy (1937), E.M. Lavrenko (1952), B.A. Bykov (1962), vegetation classification by L.Ya. Kurochkina (1978). Besides the agreed-upon methods (Alexandrova, 1964), new methods were used when revealing the changes: identification of communities integrity, making maps of protection (Karibayeva, 1982) and diagrams of aridity and productivity by seasons (Karibayeva et al., 1990). Grazing impact upon vegetation is identified by comparing geobotanic desoriptions with different degression stages. Attention was focused on the mechanical impact of animals upon the soil. Assessment of grazing impact (enclosures, free grazing, comparing sites with control) was done in the following way: control (no grazing) - moderate use (regulated grazing in enclosures) - severe use (stamping out, anthropogenic versions). As the result, some ways of grazing regulation were elaborated (Karibayeva et al., 1991).

Grazing impact upon rangeland ecosystems causes changes of vegetation, its processes, and environmental damage. Information about ecosystem functioning and environmental damage is very scarce. Primarily, grazing leads to productivity increase and intense metabolism processes in the soil-plant system, but overgrazing damages herbage and ecotype development, the degradation being simultaneous which prevents the complex assessment of changes. Environmental impacts of pasqual successions can be partially assessed: undesirable changes in biocoenoses functioning, soils.

Environmental changes of ecosystems under grazing can be considered with respect to the conformity to the environment: edaphic, microclimatic, geomorphological and hydrological (ground waters quality, freshet conditions, etc.). Stable communities are the indicators of such a conformity as well as total use of resources, normal type of coenopopulations, optimal productivity and renewability of rangelands (hayfields).

With causes of ecosystem changes ascertained, changes degree, their structural and resource indicators can be revealed. Relations of system stability or, on the contrary, changes are difficult to ascertain. There fore it is necessary to consider metabolism type, water regime, ecobiomorphes, production process and trophycs as ecological phenomena. However, when studying ecosystems dynamics, the attention is focused on structural, but not functional (ecological) changes, i.e. metabolism type, nitric nutrition, water regime change, resources utilization, etc. The gap can be filled in only with regime monitoring using mathematical methods of analysis.

Diagram of degressions. In different rangeland types pasqual disturbance occurs in different ways. Two diagrams for North Turanic deserts were used when studying human-induced changes of vegetation. Such diagrams could be developed for other regions as well.

Economic losses from rangeland degression are usually not estimated. There is an interesting example for rangelands of Artemisia arenaria (several millions of hectors in Kazakstan). With intensive use during four years, the productivity of A. arenaria was 0,15 tons, that is loss makes up a half of livestock production, in each hectar there is only 15 kg of mutton produced instead of 30 kg; 15 tons is the loss of one thousand of hectars. The rehabilitation of the damaged rangeland will take a dozen years which involves great losses.

Losses from underuse can be estimated as well. Thus, use of sandy rangelands in winter involves losses of 0,2 t., while autumn fattening of young animals in October is 4 to 6 kg per sheep; losses - about 3 tons of meat in every hundred of hectors. In South Pribalkhashie (5 mlh ha) the losses of secondary production in winter grazing and without alternation of season make up 100 tons mutton a year.

The situation of rangeland livestock production has currently deteriorated. The role of rangeland ecosystems, in spite of livestock number reduction is important due to the transition to new economy/ Former collective livestock was privatizated, which makes roaming in distant sites impossible, animals are kept pressure exceeds the norm many times.

CONCLUSIONS

To regulate dynamics and protect sandy ecosystems, the following is proposed:

- To carry out regular monitoring, making maps of "use intensity" and "change degree" of grasses (pasqual changes) every 5 years.
- To reveal feed capacity by seasons (for productive, average, dry years).
- To identify grazing borders, to allot permanent rangeland sites to farmers.
- To regulate grazing by alternating grazing sites for keeping rangelands in economically profitable state.
- To graze sheep basing on conditions (productive, dry) and degression stage; to compile prediction schedule maps of grazing.
- To establish control of rangeland state and prediction facilities.

Thus, conservation of rangeland ecosystems capacity is possible only with a permanent rangeland management system. Such a system includes environmental control: monitoring, use regulation, improvement, information service and protection.

Figure 1
Grazing impact on vegetation