

Ecological Farming and Ecological Risk-Factor in Georgia

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Ecological Agriculture provides for practical exclusion of usage of chemicals during cultivation of certain agricultural crops among other objectives aiming at increase of land fertility.

Difficulties of the situation is related to set of various reasons, one of the main of them is low fertility of certain soil intensively used in agriculture.

Soils of Georgia are distinguished by diversity related to mixed character of soil formation. Geological, geomorphologic and climatic conditions change there on comparatively short distances what conditions rich spectrum of soil formation together with diverse vegetation, animal world and surface age.

Soil cover of Georgia has been studied more or less in detail by national as well as foreign researchers. It is important to note that a range of new soil has been outlined (cinnamonic, meadow-cinnamonic, yellow-brown, brown-black soils); later on some of them received world rights of citizenship. Based on the existing data and indexes we, together with O. Zardalishvili and A. Tkhelidze have accepted 5 gradations: very poor (poor gradation index), poor (poor and medium index), medium (medium gradation), rich (medium and rich gradation) and very rich (rich gradation index).

By means of the mentioned data the descending range of supply of main soil varieties of Georgia with nutrients (nitrogen, phosphorus, and potassium) was detected.

By general forms of nutrients: mountain-meadow, chernozems, brown forest, raw-humus, red soils, alkaline soils, cinnamonic, meadow-cinnamonic, grey-cinnamonic, black soils, yellow-podzolic.

By assimilability varieties (hydrolyzable nitrogen, absorbed phosphorus, metathetical potassium): mountain-meadow, meadow-cinnamonic, cinnamonic, grey-cinnamonic, red soils, black soils, raw-humus, brown-forest, alluvial, yellow-podzolic, chernozem, alkaline soils.

The following descending range of fertility of main soil varieties of Georgia was defined by correlation of general and digestible varieties: mountain-meadow, meadow-cinnamonic, brown forest, red soils, chernozems, black soils, cinnamonic, grey-cinnamonic, raw-humus, alkaline soils, alluvial, yellow-podzolic soils.

Low fertile soils represent risk factor category for ecological agriculture as temptation of solving the problem with chemicalization is very high.

Soil management problems encounter not only during solving the problem of increase of stock of nutrients in soils but during their contamination with a set of toxins including heavy metals as well as eroded soils, secondary salinization etc. Soils with various conditions require differentiated attitude. In order to efficiently use modern means and methods of preservation and increase soil sustainability it is necessary to divide soils of agricultural zones of Georgia into 3 main categories of ecological risk factor:

High risk (yellow-podzolic, alluvial, alkaline, raw humus)

These soils develop in comparatively favorable climatic conditions – mainly in humid subtropics (except alkaline soils).

Yellow-podzolic soils are characterized by low contents of humus, total nitrogen and phosphorus what respectively rarely exceeds 2.85; 0.15; 0.10 % in upper humus horizon. Total potassium contents are of medium level or high.

Alluvial soils: total nitrogen contents is low or of medium level, total phosphorus contents is low, moderate or high, total potassium contents is low or moderate. Hydrolyzable nitrogen contents is moderate or high, absorbed phosphorus – low and metathetical potassium – low or moderate.

Alkaline soils comprise saline soils and solonchaks.

Saline soils are distinguished by medium humus contents. Total nitrogen contents is low and medium, total phosphorus - medium and high, total potassium contents is high. . Hydrolyzable nitrogen contents are low, absorbed phosphorus – moderate and metathetical potassium – high.

Solonchak soils are also characterized with medium humus contents. Total nitrogen contents are low or medium? Total phosphorus – medium and high, total potassium contents is high. Hydrolyzable nitrogen contents are low, absorbed phosphorus – moderate and metathetical potassium – high.

Raw-humus soils: total humus and total nitrogen contents are moderate or high. Hydrolyzable nitrogen contents is moderate, total phosphorus contents is moderate, metathetical phosphorus – low; total potassium contents is high, metathetical potassium – medium. Mobility of boron, manganese and zinc depends on a range of reasons such as: oxidation-reduction conditions, acidity of soils, humidity of soils, activity of soil micro-fauna, fixation of organic substances in soils.

Moderate risk (grey-cinnamonic, cinnamonic, black, chernozems, red soils, brown forest)

These soils are also developed in comparatively favorable climatic conditions – mainly dry or humid subtropics.

Brown forest soils mainly have limited agricultural usage.

Grey-cinnamonic soils are characterized by low humus contents. Total nitrogen contents are low and moderate, total phosphorus is – medium, total potassium – high. Hydrolyzable nitrogen contents is moderate, absorbed phosphorus is low and metathetical potassium – high.

Cinnamonic soils are characterized by medium and deep humus contents. Total nitrogen contents are low and moderate. Hydrolyzable nitrogen contents in low humus soils is low or moderate; in medium humus soils hydrolyzable nitrogen contents is high. Total phosphorus contents is low, moderate or high and absorbed phosphorus contents is low or moderate. Soils have low zinc contents, high boron contents and medium copper and cobalt composition.

Black soils (i.e. plane chernozems) are characterized by high humus contents. Total nitrogen contents are medium, total phosphorus – low, total potassium – medium. Hydrolyzable nitrogen contents is medium, absorbed phosphorus – low, medium and high, metathetical potassium contents is high.

Chernozem (i.e. mountain chernozems) soils are characterized by high humus contents. Total nitrogen, phosphorus and potassium contents are high. Hydrolyzable nitrogen contents is medium, absorbed phosphorus – low, medium and high and metathetical potassium contents is medium.

Red soils are characterized by quite high humus and nitrogen contents. Total phosphorus contents are low and total potassium contents are medium. Hydrolyzable nitrogen contents are enough. Absorbed phosphorus contents are medium and high, metathetical potassium contents are low or medium.

Brown forest soils are characterized by medium humus contents. Total nitrogen and potassium contents are high; Hydrolyzable nitrogen and absorbed phosphorus – medium.

Soils of satisfied condition (meadow-cinnamonic and mountain meadow).

Mountain- meadow soils have very limited agricultural usage.

Meadow cinnamonic soils are characterized by low or medium humus contents. Total nitrogen contents are low or medium, total phosphorus – low or medium, total potassium – medium or high. Hydrolyzable nitrogen contents are medium or high, absorbed phosphorus in virgin soils is low and in developed soils – medium, metathetical potassium contents are high. Soils are supplied with boron, copper and cobalt. Zinc contents are low what is related to presence of carbonates in soil and transformation of zinc into heavily digestible forms.

Mountain-meadow soils are of high humus composition. Total nitrogen, phosphorus and potassium contents are high. Hydrolyzable nitrogen contents are high, absorbed phosphorus – medium and high, metathetical potassium contents are low and medium.