

## **Making Innovative Techniques in Improving the Degraded Soils in Rainfed Agriculture**

**Hakimova Muabara Xalilovna<sup>1</sup>**

**Chorieva Asila Alisherovna<sup>2</sup>**

**Uzoqova Mushtariy Gulom Kizi<sup>3</sup>**

**Bekhruz Abdullo Ugli<sup>3</sup>**

**Abstract:** This paper highlights issues of implementation of agro-technologies which focuses on increasing the efficiency of degraded soils in rainfed agriculture, cleaning the environment, providing the principles of effective systems of “green economy”, “developed agriculture”, and “carbon conservation” in economic, and ecology in accordance with the soil and climatic conditions of the region

**Key words:** soil, ecology, water, agriculture, erosion, microorganism, heavy metals, watering, wheat, plants, agro-chemical composition of soil..

<sup>1</sup>chairperson, Associate Professor, researcher, Department of Technology Storage and Primary Processing of Agriculture Products, Karshi Engineering-Economic Institute

<sup>2</sup>1st year student, Faculty of English language, Uzbek State University of World Languages in Tashkent

<sup>3</sup>2nd course students, Karshi Engineering-Economic institute

**Introduction.**

In the "Concept of efficient use of land and water resources in agriculture", approved by the decree of the President of the Republic of Uzbekistan dated June 17, 2019 No pf-5742 "On measures for the efficient use of land and water resources in agriculture" tasks in increasing agro-technical, land reclamation, introduction of advanced farming systems and high, intensive agro-technologies for agricultural crops as well as enhancing the efficiency of lands and water and hydraulic structures in order to achieve maximum productivity potential of agricultural lands, the volume of production, restoring soil fertility by integration of science and practice. There is a need to maintain and increase the fertility of lands and pastures in the Republic of Uzbekistan until 2030, analysis of the current state of soil fertility in the country, pressure of natural and anthropogenic factors, including global climate change on soils, various soil degradation processes and food security are an integral part of socio-economic processes.

**Rainfed areas.** The rainfed lands of the republic are more than 800 thousand hectares, the main part of which falls on the territory of Kashkadarya (252.0 thousand hectares), Jizzakh (220.9 thousand hectares), Samarkand (175.5 thousand hectares) regions. 99.8 thousand ha of these lands are sufficient for precipitation, 553.7 thousand ha are semi-arid and 89.5 thousand ha are underdeveloped [1]. Most of rainfed lands is distributed in the Kashkadarya region. In order to get high harvest, it is necessary to improve soil fertility.

Rainfed agriculture is prevalent in areas where the average annual rainfall is above 200 mm. It is possible to meet the food needs of the population through the introduction of modern innovative technologies for the efficient use of these lands. To improve the soil and ecological condition of lands, and increase productivity of the soil requires the development of crop rotation and drip irrigation, improvement of its agrophysical and water-physical properties, optimization of biological activity and erosion protection, agro-technical treatment of soil, determination of the level of contamination with heavy metals, reducing the amount of toxic substances in the soil, reducing their impact on the soil environment, ecological and agrochemical status, and developing technologies to improve soil self-renewal and agro ecological condition. This will be achieved through using of geo-information technologies and remote sensing, the creation of thematic maps that reflect the properties of soils, the creation of a digital geographic information bank, the development of special systems of biotechnology. Also, as a result of the implementation of agro-technologies in accordance with the soil and climatic conditions of the region, concerns the principles of "green economy"(green agricultural), "clear farming"(precision agriculture) and "carbon conservation" (carbon agriculture), effective systems in rainfed agriculture that will be developed economically.

**The importance of rainfed lands in economy of the country.** Rainfed agriculture is also of great economic importance as it allows the use of lands which is unreachable of irrigation system. Furthermore, measures such as accumulation and storage of natural moisture in the soil, fertilization, weed control, prevention of soil erosion are more focused. With the creation of irrigation, lands are a great reserve for the expansion of irrigated agriculture. Large areas of Kashkadarya region will be transformed into irrigated agricultural areas if irrigation and drip irrigation are introduced on these lands.

It will be possible to introduce optimal schemes of crop rotation of grain - cereals - oilseeds - clean and busy plowing – lucerne, taking into account their soil and weather conditions, land area on farms engaged in rainfed land, to grow high-quality crops from these areas on the basis

of selection of high-yielding varieties, resistant to local adverse weather conditions, diseases and pests, the use of resource-saving agro-technologies.

**Features of agriculture products.** In the food industry oilseeds such as safflower, flax, sesame, sunflower, sorghum is used as products which are in need of great amount of population. Although legumes such as peas, peas, and lentils are used as high-protein foods, they also act as biologically pure nitrogen accumulators in maintaining and increasing soil fertility, and are also used as side rate fertilizers. Millet from cereals ensures biological removal of toxic substances from the soil by repeated sowing.

Waste from various sources around the world negatively influences atmosphere, water and soil. The trophic chain in the circulating motion of these toxicants is as follows that, waste from the source → atmosphere → water → soil - these are the main accumulating factors that accumulate in the human body of all kinds → plants → animals → birds → and finally lead to incurable infectious and deadly diseases[2].

According to the above considerations, agro biotechnology improves the agro-ecological condition of soils in the dry lands distributed around the industrial enterprises of Kashkadarya region, that reduces the amount of toxic substances in the soil, impact on the soil environment, ecological and agro-chemical condition and increase capacity of the soil. Besides, this removes toxic elements from the soil.

It was found that the distribution of the lead element in the soils of these regions is around 13.7-17.8 mg / kg in the driving layer, and around 19.5-11.0 mg / kg in the subsoil, indicating a slight increase in the amount of lead along the profile. This situation proves the scientific data that the maximum allowable amount of lead in soils (rem 10 mg / kg) is 2.1 times higher [3,4]. Application of agro biotechnology envisaged in the practical project will reduce the amount of lead in the soil.

After soil rehabilitation, i.e. with 3 repeated plantings, the lead element is reduced by 1,846 kg per hectare in the driving layer.

Chromium element was observed to decrease to 40 mg, 36.4, 32.0 mg / kg along the soil profile at 66 mg / kg in the driving layer of soils [3,4]. A reduction in this amount is achieved.

Humus content is expected to increase to 0.034%, nitrogen 0.032%, phosphorus 0.027% and potassium 0.843% in a short period of time after rehabilitation works in the soil. Mobile forms of nutrients are increased by 10.0 mg / kg, 36.0 mg / kg, 296.3 mg / kg. The CN ratio in the drive layer of soils is 7.35–10.7. Resulting in increased productivity.

**Research methods.** We carried out of physical, chemical, physicochemical, mineralogical, microbiological and other types of complex genetic researches on dry lands of Kashkadarya foothills and low mountains, steppes, deserts provides morphological basis of eroded soils, biological factors, surface and underground masses of plants, and agrochemical, agrophysical, water-physical properties of soils. Besides, we made analysis on the issues of microelement composition, determination of humus status, dynamics of soil microflora and specificity of enzymatic activity.

**Expected results.** The goals and objectives of the practical project, efficient rainfed agriculture will be developed to restore, increase the fertility of degraded soils and ensure the purification of the environment. Agro-technology is used to reduce toxicants in excess of the permissible levels of heavy metals in the dry soils of the region.

The project is a technology that helps to get rid of the stress of nutrients under the influence of toxic elements, without recouping the degraded productivity, deteriorating productivity.

After the application of manure + hay remnants + earthworms + microorganism strains in the soil, the amount of toxic heavy metals and pesticides accumulated in the soil. As a result of accumulation, the amount of toxic elements is reduced from the allowable amount (rem) set for each element and the agrochemical condition of the soil will be improved, and next year the yield will improved too.

Along with the use of geo information technologies and remote sensing, thematic elite maps reflecting the properties of soils will be created, a digital geographic information bank will be created, special systems of agro biotechnology and GAT technologies will be developed.

Also, the results of the study will be applied to various sectors of the economy (agriculture, ecology and environmental protection, higher education).

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