Procedia of Theoretical and Applied Sciences
Volume 11 | Sep 2023
ISSN: 2795-5621 Available: http://procedia.online/index.php/applied/index

CURRENT STATE OF SOILS IN RICE AGRICULTURAL LANDSCAPES

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Abstract*:* The article presents the main properties of soils used in the cultivation of rice, presents the prospects for the use of rice today, the importance of rice, the fertility of irrigated meadow soils. Also, the soils used in the cultivation of rice are mainly meadow, meadow-marsh, and it has been studied that their fertility depends on the amount of nutrients entering the soil and the type of re-cultivation.

Key words: meadow soil, meadow-marsh soils, humus, soil fertility, rice growing, hydromorphic soils.

INTRODUCTION

Nowadays soil quality is deteriorating from year to year. Mankind uses the land to get the products he or she needs. The problems of growing agricultural crops are solved by different tillage of the soil. Unfortunately, mechanical treatment of the soil leads to the loss of its biota, a decrease in the amount of organic matter, the deterioration of the soil composition and erosion. As a result, the soil loses its "health" and becomes low-yielding (www.sgp.uz Earth energy biodiversity).

One of the main tasks of modern agriculture is to increase food production and comprehensively improve soil fertility on the basis of a science-based farming system.

However, in recent years, due to lack of financial resources agricultural producers have been unable to increase yields using traditional methods of crop rotation. At present, the basic law of agriculture - the law of return - is not observed, according to which all substances in the soil released with the crop must be returned to the soil in excess, which leads to an intensification of the mineralization process. Humus is the basis of soil fertility. This is especially evident in the farms where the structure of arable land is constantly occupied with corn and sunflower. The solution of this scientific problem, which is of great practical importance, is relevant today.

In the irrigated agriculture zone of Uzbekistan, about 50% of the total irrigated area is meadows. Irrigated meadow soils contain 1-2% humus, about 0.08-0.15% nitrogen, a sufficient amount of gross and mobile potassium.In meadoe soils, phosphorus rapidly combines with iron and aluminum oxides

ISSN: 2795-5621 Available: http://procedia.online/index.php/applied/index

to ensure the effectiveness of phosphorus fertilizers. Meadow soils in the high mountain and gray soil regions are generally non-saline, while those in the desert zone are saline to varying degrees.

In orderto prevent degradation processes in irrigated meadow-swamp soils used in rice cultivation, it is necessary to find the cheapest sources of soil replenishment with organic matter. For this, it is important to plant perennial legumes, use straw from cereals for fertilizer, green manuring, as well as combine them with other factors of intensification.

Rice is the most common food crop on our planet. It feeds more than 3 billion people on Earth and provides more than 30% of calories. Rice agricultural cenosis is a complex agroecological multi-component system. Soils that are constantly occupied by water differ from dry soils in the heterogeneity and complexity of the physical, chemical and biochemical processes that take place in them.

The specific redox regime of soils disrupts the natural balance of conditions formed in other hydrological environments, affects the intensity of migration along the profile of chemical compounds and individual elements, the synthesis and decomposition of minerals and organic matter. Also, the substances, the speed of microbiological and biochemical processes in soils, which in many respects determines the level of their productivity and fertility.

The impact of anthropogenic factors on the soil is most pronounced during rice planting. This is accompanied by the construction of irrigation systems, terracing of the natural relief, the conversion of its slopes into many horizontally planned and stepped rice fields.

LITERATURE REVIEW

Hydromorphic soils of the gray soil zone have a specific water regime. In the zone of gray soils, alluvial meadows, reed meadows, alluvial swamps, reed swamps, and other soil types are common. These soils are also common on the lower terraces of rivers or riverine, on the edges of floodplains, in the lowlands between floodplains, and in the lower parts of foothills.Hydromorphic soils in the gray soil zone are characterized by a number of features, including a stable wetting regime in relation to such soils in the desert zone. Here the groundwater level does not change dramatically during the season, so the soil moisture regime also changes less.The level of mineralization of groundwater is low, the hydromorphic soils of the light gray soils near the desert zone are more saline, and in the typical and dark gray soilareas is less saline [2,5,9,10,11].

Irrigated agriculture is well developed on hydromorphic soils of these areas. Hydromorphic soils in the gray soil zone are also formed under alluvial and more swampy regime wetting conditions[1]. In order to get high yields from agricultural crops, it is very important to use mineral fertilizers correctly and on a large scale, and to set the right amount of fertilizers. For example, in major rice-growing countries (China, India, Japan, etc.) rice has been grown continuously on the same area for 1,000 years.There are even lands in China's Huanghe Valley that have been used only for rice cultivation for four thousand years, where the soil is constantly enriched with nutrients, organic and mineral fertilizers needed to maintain high soil fertility [8, 15].

There has been almost no scientific research on soils used in rice cultivation. However, the Resolution of the President of the Republic of Uzbekistan No. PP-4973 from February 2, 2021 "On measures to further develop rice cultivation" sets up tasks to develop a program of crop rotation in rice cultivation in accordance with the soil and climatic conditions of the regions, to keep recordingof arable lands for rice growing and to establish a system of crop rotation in seed farms.At the same time, the introduction

[1] https://od-press.uz/xabarlar/5911

of a science-based rotation system was emphasized to prevent the cultivation of rice in one field for more than 2 years [1].

The difference in terracing, i.e.in height between the plains of rice fields, the unsatisfactory state of their hydro-ameliorative depending on the level of soil and groundwater depth, the significant diversity of soil fertility will certainly lead to a decrease in rice yield. The reduction in yield due to different terraces averages 0,63 t / ha in non-saline soils and 2,30 t / ha in saline soils [7].

With the advent of green revolution, use of HYV and increased use of fertilizers in rice has boosted up rice production without much concern to the long-term sustainability of the system and soil health. Stagnation of productivity levels and decline in soil productivity are emerging out as major problems in this system. The long-term experiments conducted in Asia demonstrated decline in yield and depletion in soil nutrient status with intensified monocropping of rice for years [4].

The present knowledge justify that the use of locally available organic sources like FYM, crop residues and green manures are highly potential to improve the soil properties and sustain the level of crop productivity [14].

Short term benefits of applied fertilizers are very well documented in many cropping systems. However, studies on the long-term effects of chemical fertilization integrated nutrient management practices on soil fertility under intensive cropping with sustained crop production are essential. It takes several years to bring about changes in soil fertility. Long-term experiments provide an insight in to the changes in soil properties and processes over time and help to identify suitable nutrient management practices for sustainability of agricultural systems and also to formulate future strategies for maintaining soil health [13].

Along-term experiment in rice–rice cropping system with twelve treatments chemical fertilizers alone and in conjunction with FYM, paddy straw and gliricidia at 50% and 25% N substitution during and with 100% and 50% RDF in was established at the College Farm of PJTSAU, Hyderabad, during 1988-89 After 25 years of experimentation, the changes in the bulk density were significant only in the upper 30 cm soil layers and ranged from 1.31 to 1.48 Mg m in the surface layer (0-15 cm), from 1.58 to 1.82 Mg m in the subsequent 15-30 cm layer and in lower layers (30-60 cm) the differences in BD were insignificant. A significant improvement in organic carbon was evidenced by the integrated nutrient supply through 50 or 25 per cent substitution of N fertilizer in the season with FYM or paddy straw. Application of recommended dose of NPK through fertilizers significantly increased the availability of nutrients compared to control. The trend of available nitrogen over years imply that the fertility of the soil can be better sustained by substituting 25 or 50% N fertilizer with FYM or twigs in the season than only through chemical fertilizers. Considerable build up in the available phosphorus ranging from 37.1 to 43.2 kg ha was recorded with all the INM practices and was at par with 100% NPK. On an average the potassium status at the end of 25 years of rice-rice sequence was in the range of 156-195 kg ha and irrespective of the treatments there was depletion in the available potassium compared to initial status.Available copper and iron contents depleted in all the treatments when compared to the initial status. Manganese depletion was also seen with all other treatments except with 50% NPK+50% N substituted treatment, where in a slight build up was noticed. All the substituted treatments could maintain the zinc to its initial status and 50% NPK + 50% N substituted treatment showed a buildup. Highest dehydrogenase activity was recorded under 25% N substitution through while acid and alkaline phophatases activity was higher under 50% N substitution through FYM [12].

RESEARCH METHODOLOGY

Agrochemical analyzes of the soil were carried out on the basis of the "Methodology for agrochemical analyzes of soils and plants of Central Asia" by Arinushkina (1970).

Procedia of Theoretical and Applied Sciences
Volume 11 | Sep 2023
ISSN: 2795-5621 Available: http://procedia.online/index.php/applied/index

ANALYSIS AND RESULTS

Our research is also aimed at increasing the fertility and seed quality indicators of meadow soils used in rice cultivation. Our research is a comprehensive study of the properties of hydromorphic soils in Tashkent region, microbiological processes and physical, agrochemical, microbiological and reclamation properties of soils, depending on the lithological and geomorphological condition of soils, aimed at restoring and increasing soil fertility, increasing crop yields.

Urtachirchik district of Tashkent region belongs to the subtropical foothills of the Central Asian province due to climatic conditions.

This zone is characterized by specific features of the climate: continentalism, uneven distribution of atmospheric precipitation, high temperatures of soil and air in summer, short snow cover period. Climate indicators in the territory of Urtachirchik district are described on the basis of data from the Tashkent meteorological station. The average annual temperature is 12,4-14,2^0. In our country, there are lands with a high salinity, in which crops are not grown except for rice,here the groundwater is near the surface. There are also swamps which are not used for the intended purpose, in some cases they are not used at all, the yield from such lands with partial rice cultivation does not exceed 25-30 centners per hectare. A sharp decline in productivity is observed due to the negative change in the composition of the soils in which rice is grown continuously and the quality of seeds. Under such conditions, the soil density varied from1,30 g/$cm^3$to 1,55 cm^3, the seeds of weeds such as early barnyardgrass and cyperus were 65-70% higher, and the plant residue was up to 50% higher than the fields where the crop rotation system was used.

Research on continuous rice cultivation has been carried out at the Rice Research Institute for 46 years. At the beginning of the study, the humus content in the soil was 2,2-2,5%, but after 45 years this figure dropped to 1,9-2,3%. Yields fell from 45-50 c to 31-34 c/h, and seed germination ranges from 45-50 percent to 38-42 percent. Due to the application of various agro-technical measures, the yield was maintained at 50-55c. The soil of the experimental farm of the Institute is not saline, the reaction is neutral (PH-7.08 - 7.39), the mechanical composition is heavy sand.

There are no mineral salts due to the fact that the experimental area is partly sloping, the lower layer of soil consists of sand and small stones, and groundwater flows from the north-east to the south-west. Studies have shown the effect of alfalfa + soy bean + rice crop rotation on soil fertility, changes in the biological activity of soils in the region under the influence of hydromorphic regimes.

When the soil samples taken from the areas under scientific research were analyzed, the results on the status of total humus, mobile nitrogen, phosphorus, potassium in the soil samples in the drive layer of the area under continuous rice cultivation in 2020 are given in Table 1.

In the first variant of the experimental field, humus was 1.92%, nitrogen 20.7 mg / kg, phosphorus 17.6 mg / kg, potassium 108 mg / kg, salinity type was chloride-sulfate and low salinity was observed. The soil medium was pH 7.08. In variant 2, humus was 2.32%, nitrogen was 22.9 mg / kg, phosphorus 14.4 mg / kg, potassium 106 mg / kg, salinity type was sulfated and the soil level was not saline, pH was 7.19. In variant 3, humus was 2.35%, nitrogen 21.6 mg / kg, phosphorus 9.6 mg / kg, potassium 106 mg / kg, salinity type was chloride-sulfate and low salinity was noted, pH was 7.30. In variant 4, humus was 2.12%, nitrogen was 20.4 mg / kg, phosphorus 7.04 mg / kg, potassium 115 mg / kg, salinity type was sulfated and the level was not saline, pH was 7.39. In variant 5, humus was found to be 2.16%, nitrogen 25.6 mg / kg, phosphorus 11.2 mg / kg, potassium 96 mg / kg, salinity type was sulfated and soil level was not saline, pH was 7.22.

ISSN: 2795-5621 Available: http://procedia.online/index.php/applied/index

Table-1 Determination of total humus and mobile nitrogen, phosphorus, potassium and amount of water-soluble salts in soil samples, in 2020.

Card-13 check- 3								Ph
variants	depth	humus, %	phosphorus P_2O_5 mg/kg	potassium K_2O mg/kg	nitrogen N-NO_2 mg/kg	Salinity		
						type	level	
1	0-30	1,92	17,6	108	20,7	chloride-sulfate	Low saline	7,08
2	0-30	2,32	14,4	106	22,9	sulfated	Non-saline	7,19
3	0-30	2,35	9,6	106	21,6	chloride-sulfate	Low saline	7,30
4	0-30	2,12	7,04	115	20,4	sulfated	Non-saline	7,39
5	0-30	2,16	11,2	96	25,6	sulfated	Non-saline	7,22
Card-15 check- 4								
1	0-30	2,53	14,4	120	15,6	chloride-sulfate	Low saline	7,35

Moreover, the samples taken from the experimental field conducted in 3 directions of the project were as follows:

Humus was 2.53%, nitrogen was 15.6 mg / kg, phosphorus 14.4 mg / kg, potassium 120 mg / kg, salinity type was chloride-sulfate and low salinity was observed. pH was 7.35.

There are no mineral salts due to the fact that the experimental area is partly sloping, the lower layer of soil consists of sand and small stones, and groundwater flows from the north-east to the south-west.

According to B. I. Niyazaliev, in addition to crop rotation, the shortage of organic fertilizers can be filled with organic and mineral compost prepared by mixing animal manure, municipal waste, silkworm waste and pupa, old leaves and crop residues with old wall cuttings, clay of ditches, or the soils of non-arable lands [6].

CONCLUSION

The soils used in rice cultivation are mainly meadow, meadow-swamp soils, and their fertility depends on the amount of nutrients supplied to the soil and the type of repeated crop. That is, the agrochemical, agrophysical and biological activity and the germination rate of seeds is 3-5 percent of the soil increased when rice was planted in the soybean + alfalfa crop rotation system. Also, the experiments of B.A. Pleshkov (2007) show that the timely and quality implementation of agro-technical measures in the cultivation of rice on irrigated lands is of particular importance. First of all, it is necessary to study the soil-climatic properties and characteristics, and then apply appropriate agro-technical measures.

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Procedia of Theoretical and Applied Sciences
Volume 11 | Sep 2023
ISSN: 2795-5621 Available: http://procedia.online/index.php/applied/index

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