SHORT COMMUNICATION

Ecological condition of walnut forests during the development of green economy

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ABSTRACT

Walnut-fruit forests represent a rich and important source of genetic biodiversity and are one of the sources of income for the people living in this region, especially through the collection of fruits, nuts and other non-timber forest products, food productsas well as a base for wild animals. It has been shown that under the influence of anthropogenic factors, unsystematic grazing of cattle, felling of trees, collection of nuts and fruits, as well as other types of anthropogenic impact lead to deterioration of the physical and chemical properties of the soil, soil erosion.This article is aimed at the development of forestry in the territory of the republic in accordance with the directions of implementation of the state policy in the field of forest horticulture development, mitigation of the effects of climate change and its development, obtaining environmentally friendly products, realizing the advantages of the "green economy".

Keywords: Anthropogenic factor, biodiversity, climate change, ecological system, walnut forest,

The nut-fruit forests of Kyrgyzstan are the largest and only natural massif of nut-fruit trees in the world, and it is noted that they have a unique gene pool and landscape in terms of size, value and beauty of the territory they occupy.The walnut-fruit forests of Arstanbap, Kara-Alma, Kyzyl-Unkur and Dashman are among the most beautiful places in the South of Kyrgyzstan. These forests are of great importance for the overall ecology. It maintains the climate balance and prevents the land from turning into a desert. In addition, the walnut forests in the South of Kyrgyzstan are also of great importance for the local population.In recent years, some areas of walnut-fruit forests have been allocated to local residents as land plots, but not all locals are concerned about preserving the future of the forest. Currently, 60% of forests in southern Kyrgyzstan are on the verge of disappearing. If the current neglect by the public continues, then within fifty years there is a risk of losing walnut and fruit forests. Scientists have proven that the origin of walnuts is millions of years old. Walnut is the longest-living tree. With good care and no damage from humans or nature, it can grow for 1000 years. The reason why walnut forests do not recover naturally is because they are neglected. It is alarming that the number of forests in Kyrgyzstan is decreasing.

According to the Forest Code of the Kyrgyz Republic, forests, flora and fauna are

the exclusive property of the Kyrgyz Republic, are used to maintain a unified ecological system as the basis for the life of the people of the Kyrgyz Republic and are under special protection of the state (Forest Codeof KP, 1999). The area of forests in the Kyrgyz Republic is 1,123,045.2 hectares, or 5.61% of the total area of the country (forest vegetation). Among the forest areas of Kyrgyzstan, the rare nut and berry forests located in the Jalal-Abad and Osh regions are of particular value.Under the influence of anthropogenic factors that have a long-term impact on mountain forest biogeocenoses, unsystematic and disorderly grazing, tree felling, collection of nuts and fruits, collection of medicinal herbs, as well as other types of anthropogenic impact lead to deterioration of the physical and chemical properties of the soil and its erosion (Gryza*et.al*., 2008).

Studying the soil cover and clarifying the relationships between soils and forests allows us to identify the changes that occur in forest landscapes due to human activity: deforestation, grazing, haymaking, fruit harvesting, etc. Ultimately, this will allow us to make fuller use of the fertility of mountain soils and ensure rational forest management.

The study was conducted in the Kara-Alma walnut-fruit forest (elevation – 1801m., latitude -41°12´54.66"N, longitude -73°23´00.05"E) of the Jalal-Abad region of Kyrgyzstan.Theresearch work wascarried out in 2020-2024at the Jalal-Abad State University named after B. Osmonov.To study the fertility of walnut-fruit forests, soil samples were taken from genetic horizons. At the same time, soil sections were described based on the morphological characteristics of the genetic horizons of the soil profile. Laboratory analyzes were done according to generally accepted methods adopted in the Kyrgyz Republic, in the Republican laboratory of soil-agrochemical station of Kyrgyzstan (Arinushkina, 1963).The humic and fulvic acids were analyzed in the laboratory of the Institute of Soil Science and Plant Nutrition of the Federal Center for Agricultural Research in Germany (Faithfull, 2002).

In walnut-fruit forests, there are mountain-forest black-brown soils with very high fertility. They are characterized by high fertility and are distinguished by a high content of humus, mineral substances and digestibility (Roychenko, 1960). Table 1 shows the state of humus in mountain-forest black-brown soils.

The composition of humus reflects such an important aspect of the soil structure as the nature of the processes of accumulation and decomposition of organic matter (Kononova, 1963, Sakbaeva *etal*.,2012). The most important characteristics of the soil are the composition of humus and the thickness of the humus horizon. Soil fertility, the formation of its structure and microbial activity depend on the humus content (Sakbaeva *etal*.,2013). The humus state of the mountain-forest black-brown soils of the walnut-fruit forests of the Kara-Alma forestry enterprise is characterized by very high fertility, the amount of humus in them is up to 11.3-12.0%, and the humus-accumulative horizon contains 8.3-9.3% humus, and its volume decreases sharply along the soil profile.

The soil under nut-fruit forests has the highest water permeability. However, due to the increase in cattle grazing, deforestation, and the collection of nuts and fruits, the landscape changes dramatically, which leads to a sharp deterioration in the water-regulating and anti-erosion properties of forests. Plants are often trampled by roads that cross hillsides from all sides. Therefore, it is known that slopes covered with vegetation are more susceptible to erosion. On these slopes, 50-60% of the soil is washed away, and in some places even more. First, the upper humus horizon is washed away, then the lower one, as a result of which the entire territory becomes unsuitable for use.

Leaching of mountain forest black-brown soils of walnut-fruit forests is closely and

directly dependent, first of all, on the water resistance of the structural elements of the soil, which, in turn, largely depends on the vegetation cover (Sakbaeva *etal.*,2022).As can be seen from Table 2, as a result of leaching, the chemical and physical properties of soils change significantly. The bulk density of unwashed soils in the upper horizon is 0.78-0.82 g / cm3, and washed - 1.20-1.24 g / cm^3. The physical properties of soils are of great ecological importance, since they largely determine the exchange processes between the soil and other components of the biogeocenosis (Sakbaeva *etal.*,2022).In mountainous conditions, the physical properties of soils are of primary importance, since the resistance of the soil to erosion largely depends on them.

Measures to mitigate the effects of climate change should include measures aimed at maximum protection, restoration and reforestation of forest areas. In connection with the above, it is necessary to carry out reforestation and afforestation in the territories of the Kara-Alma forestry, where anthropogenic pressure is observed.

In conclusion, it should be noted that the goal is to improve (reconstruct) growing trees of nut crops, create walnut plantations aimed at obtaining a bountiful harvest, meeting the needs of the local market, processing nuts and exporting competitive, environmentally friendly products, promoting food security, and raising the standard of living of the country's population. Improving the quality and productivity of nut crops can be achieved through the introduction of modern agricultural technologies for growing planting material, widespread introduction of valuable forms and varieties of nut crops into production, creating highly productive plantings using advanced domestic and foreign experience, including modern grafting methods.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1:Humus state of mountain-forest brown and black-brown soils of the walnut-fruit forest of the Kara-Alma forestry

Land and soil	Depth, cm	Humus, %	Carbon %	Total nitrogen,%	C:N
Walnut-fruit forest of Kara-Alma (mountain-forest brown soil)	0-2	11,33	6,58	0,95	6,9
	2-14	8,30	4,82	0,55	8,76
	14-52	2,70	1,56	0,20	7,84
	52-105	0,88	0,51	0,09	5,68
	105-165	0,68	0,39	0,05	7,9
Walnut-fruit forest of Kara-Alma (mountain-forest black-brown soil)	0-4	12,0	6,9	0,98	7,04
	4-18	9,30	5,4	0,64	8,43
	18-57	3,80	2,20	0,30	7,30
	57-91	2,65	1,54	0,14	11,0
	91-130	1,09	0,63	0,10	6,3
	130-185	0,88	0,51	0,06	8,5

Table-2:Density of unwashed and washed mountain-forest brown and black-brown soils of walnut-fruit forests, g/cm^3

Depth, cm	Soil			
	P.61 Mountain-forest black-brown, unwashed	P.62 Mountain-forest black-brown, unwashed	P.63 Mountain- forest black brown, washed	P.64 Mountain-forest black- brown, unwashed
0-5	0.82	0.78	1.24	1.20
5-10	1.01	0.96	1.27	1.25
10-20	1.06	1.00	1.38	1.36
20-30	1.15	1.07	1.39	1.35
30-40	1.24	1.28	1.41	1.38
40-50	1.36	1.35	1.45	1.39