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Characteristics of Carbon Deposition of *Salix alba* L. Forest Plantations in Irtysh-Karagada Channel Tract in Pavlodar State Institution

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Abstract: Since forests contain more than 70% of the Earth's total phytomass, any significant changes in its reserves can affect the global carbon cycle, CO_2 content in the atmosphere and climate. Currently, the likelihood of environmental crises and the danger of a further increase in CO_2 content in the atmosphere has increased significantly. Forests plantations along the Irtysh-Karaganda Channel of Pavlodar and Karaganda regions have great socio-economic and cultural-ecological significance. However, their research has still been carried out mainly from the point of view of the raw material properties of wood and almost did not affect the ability of regional forests to absorb carbon, which increases the practical value of the research.

Keywords: Carbon, Carbon deposition, biomass, forest plantation.

1. INTRODUCTION

The main reservoir where carbon accumulates is the phytomass of forest plantations (the trees themselves), as well as undergrowth, forest litter, dry wood and soil cover. When plants respire, up to 40% of the carbon absorbed from the atmosphere returns back to the atmosphere, but while the forest is young and continues to grow, it accumulates this carbon within itself every year, thereby ensuring climate balance on the planet. As soon as the planting has reached the age of maturity, the accumulation (collection) of carbon almost stops, the reservoir is full - it cannot accommodate more, therefore it is vitally necessary to make every effort to create favorable conditions for the emergence of the young generation of the forest, both naturally and by creating forest crops (Isaev et al., 2001).

The processes taking place in the world after the signing of the Kyoto Protocol are recognized by many countries and are acquiring specific numerical characteristics and economic outlines. For example, after setting the limit values for carbon dioxide emissions into the atmosphere at the level of its actual volumes in 1990, countries around the world came to the need to trade its surplus. There is a practice of selling and buying carbon dioxide, which indicates the presence of demand for it and internationally recognized prices (Baranov & Boranbai, 2012). Therefore, if it is necessary to compensate for anthropogenic CO_2 emissions, in principle, each ton of carbon deposited by forest vegetation can receive a cost estimate.

Since 2012, specialists of State Institution KazNIILHA have been working on assessing the carbon deposition potential of Kazakhstan's forests. For this purpose, the calculated phytomass data were analyzed in connection with the age and stand volume of tree stands as the main determining indicators included in the forest background, and a database was compiled that characterizes the stock and deposition of organic carbon in forest plantations of Northern, Central, Eastern and Southern Kazakhstan (Baranov & Boranbai, 2013; Boranbai & Baranov, 2015).

2. MATERIALS AND METHODS

According to the State accounting of the forest fund on 01.01.2013, forest plantations of the total area of the "Irtysh-Karaganda Channel tract" is 1755 hectares, of which tree willow (*Salix alba* L.) occupies 23.7% or 415.94 hectares. The distribution of areas and reserves of forested land by age classes in plantations of tree species is heterogeneous. They were used to determine carbon stocks and their annual deposition models describing the dependence of phytomass on age (A, years) and stock (M, m^3/ha) plantations by species, set forth in methodological provisions (Usoltsev & Zalesov, 2005).

In general, the data model calculates the stock phytomass in absolutely dry conditions states for all forest-forming species are as follows:

lnPi or ln(Pi/M) = f [lnA, (lnA)2, lnM, ln(PB/M), ln(PF/M)] (1)

Path of tabulation of models for storage of stem wood (M, m^3/ha) in growth of plantations (A, years) is determined by the total forest stands of phytomass stems, and ot phytomass stem using a series of constants and independent variables (Usoltsev, 2007). The calculated phytomass of branches, needles (leaves), roots and the lower layer (understory, undergrowth, ground cover).

Further, the reserve phytomass of each fraction is calculated according to the translation coefficient phytomass: carbon (K = 0.5 for woody part and K = 0.45 for leaves and lower tier).

3. RESULTS AND DISCUSSION

Calculations made based on the data of the distribution of areas and reserves by predominant species established that the total reserves of organic carbon of forests amount to 10.319 thousand tons. Carbon pool for young stands - 20.519 thousand t, middle-aged - 11.359 thousand t, ripening - 19.631 thousand and ripe stand and overmature - 27.926 thousand tons. The average carbon stock in phytomass plantations of 1 ha of forest cover is 14.932 tons (Table 1).

Table 1. Sequestration of organic carbon in the tract, thousand tons.

***Salix alba* L.**	**Age classes of forest stands**					
	Saplings		**Middle-aged (20-30 years)**	**Ripening (30-50 years)**	**Ripe and overmature (50-70 years)**	**Total, tons**
	1 age class (0-10 years)	**2 age class (10-20 years)**				
Organic carbon stocks	0.055	1.025	3.771	4.378	1.09	10.319
Average carbon reserve in phytomass t/ha	9.262	11.257	11.359	19.631	27.926	14.932
Annual deposition of carbon (thousand tones)	0.007	0.079	0.549	0.296	0.051	0.982
Average carbon reserve in phytomass t/ha	1.162	0.872	1.654	1.326	1.317	1.422

It was calculated that the total annual flow of atmospheric carbon in the phytomass plantations of the nature reserve is 22,638 thousand t or 1,299 t/ha and distributed according to the size of the forested area and stocks of stem wood

As can be seen from the data, young trees (i.e., plantations of the 1st and 2nd age classes) are inferior to mature and dormant plantations in terms of annual carbon deposition.

And as it was said above, in order to strengthen the carbon-depositing properties of plantations, it is necessary to increase the area of young trees by gradually replacing dormant plantations (reconstruction of plantations) and creating artificial plantations on uncovered forest lands (reforestation and reforestation).

Forests plantations along the Irtysh-Karaganda Channel of Pavlodar and Karaganda regions have great socio-economic and cultural-ecological significance. However, their research has still been carried out mainly from the point of view of the raw material properties of wood and almost did not affect the ability of regional forests to absorb carbon, which increases the practical value of the research.

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