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THE IMPACT OF CLIMATE CHANGE ON THE CONDITIONS OF GROWING VEGETABLE CROPS IN THE STEPPE ZONE OF UKRAINE

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At the present time, the warming of the climate is no longer in doubt. According to scientists, this warming will continue until 2100. Warming causes a significant change in the agro-climatic conditions of growth, development and the formation of crop yields. Taking in the account the inertial nature of agricultural production and the dependence of its efficiency on weather conditions, it is already necessary to make timely and adequate decisions to solve the complex problems arising from climate change. Warming causes a change in the radiation and moisture-temperature regimes of crops growing, increasing the heat supply of the growing season, reducing soil moisture, decreasing its fertility and increasing its degradation. In addition, the main feature of warming is the unevenness of precipitation in certain periods of the year. Future climate changes are calculated using climate models. In this case, climatic models of different degrees of complexity are used. With the help of models, future climate change is calculated based on a number of scenarios of changes in anthropogenic factors [1].

In the presented study a set of scenarios was used for climatic calculations, namely-Representative Concentration Pathways (RCP). They represent four scenarios, including the time series of emissions and concentrations of the entire set of greenhouse gases, aerosols and reactive gases. Two scenarios were used, as the most commonly used-RCP 4,5 and RCP 8,5.

As a theoretical basis for performing calculations and comparing the results obtained, Polevoi's A.N. models of the production process of agricultural crops were used [2].

The calculations were carried out on the basis of long-term observations of vegetations of vegetables and meteorological elements for the period from 1986 to 2010 year (base period) on the territory of the steppe zone of Ukraine. Calculations of changes in agroclimatic resources, with possible climate changes, were carried out from 2021 to 2050 year. At the same time, agroclimatic indicators were investigated: the average ten-day air temperature (T_c), the amount of precipitation (P), the deficit of air saturation (Das) (t.1), the total evaporation (E_f), the evaporation (E_o), the evaporation deficit (E_o-E_f),the hydrothermal coefficient of Selyaninov G.T. (GTK) (t.2).

The analysis of the calculations made it possible to conclude that the warming of the climate will favor the improvement of the heat supply of heat-loving vegetable crops.

Table 1. Comparison of average long-term agro-climatic indicators with those calculated according to the scenario RCP 4,5 and RCP 8,5

Indicator	Months and decades of the growing season										
	V	VI			VII			VIII			IX
	3	1	2	3	1	2	3	1	2	3	1
Tc	16,1	17,7	19,0	20,3	21,5	22,6	23,1	22,9	22,3	20,8	18,7
T4,5	16,4	17,2	18,8	21,4	23,1	24,4	24,1	23,4	22,1	22,3	18,4
T8,5	17,0	18,2	20,4	20,5	22,3	24,3	23,6	24,7	24,5	21,3	19,2
∑Pc	13	16	18	19	19	16	14	13	13	13	12
∑P4,5	15	23	21	13	5	1	6	7	9	2	8
∑P8,5	25	13	14	18	7	8	3	2	3	9	15
Дс	6,8	7,7	8,7	9,6	10,7	12,2	13,3	13,4	12,2	10,9	9,6
Д4,5	6,6	6,5	7,1	10,5	14,0	17,2	16,1	15,4	12,7	15,4	10,5
Д8,5	6,2	7,2	9,6	9,7	13,1	16,2	17,0	18,9	18,4	12,2	10,4

Table 2. Comparison of average long-term moisture indicators for the growing season with the calculated indicators for scenarios RCP4.5 and RCP8.5

Period	Precipitation amount (mm, %)	Total evaporation (Eф, mm)	Evaporativity (E_o, mm)	Volatility Relationship ($E_ф/E_o$)	Evaporation deficit, mm	Hydro-thermal coefficient of Selyaninov
1980-2010pp.	377	420,2	556,2	0,76	136,0	0,86
RCP 4.5	293	365	516	0,71	151,3	0,80
Difference	-84	-55,2	-40,2	-0,05	15,3	-0,06
RCP 8.5	290	367,1	543	0,68	173,0	0,79
Difference	-87,0	-53,1	-13,2	-0,08	37,0	-0,07

However, under both scenarios, a decrease in precipitation and an increase in aridity are expected, which will adversely affect the productivity of moisture-loving vegetable crops.

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