ASSESSMENT OF CLIMATE RISK OF SUNFLOWER SEED YIELD LOSS IN UKRAINE FOR 2021–2050

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The climate has already become more arid throughout the entire territory of Ukraine. The rapid increase in thermal resources. combined with an almost unchanged amount of precipitation – both annual and during the spring-summer period – leads to a higher frequency of droughts and their expansion into the western and northern regions. In recent years. droughts have been observed in areas where they had not occurred before. The calculated climate aridity indices over the past decade indicate a significant expansion of areas with insufficient natural moisture. Therefore. the issue of assessing the vulnerability of territories and the climate risk of crop yield losses in Ukraine is now more relevant than ever (Adamenko, 2019; Stepanenko et al., 2018).

According to the results of sunflower productivity modeling under future climate change conditions. carried out using the RCP4.5 and RCP8.5 climate change scenarios. during the period from 2021 to 2050. certain years are expected when weather conditions will favor achieving sunflower seed yields of up to 4-5 t/ha. Conversely. very unfavorable conditions are also possible. which will lead to a significant reduction in sunflower crop productivity. resulting in yields dropping to as low as 0.5-1.0 t/ha.

According to calculations based on the RCP4.5 climate change scenario. low risks (2-4%) are expected in the Western and Eastern Forest-Steppe regions (Table 1). In the central part of the Forest-Steppe. the Northern Steppe. and the western part of the Donetsk region. moderate risks of yield shortfall are projected. specifically: Kyiv region – 6.1%. Cherkasy and Kirovohrad regions – 8.5%. Kharkiv and Donetsk regions – 10.6%. and Dnipropetrovsk region – 12.8%. High risks of up to 17.2% are expected in the southwestern part of the Steppe and the eastern part of the Donetsk region. In the central part of the Southern Steppe. significantly high risks of yield loss are anticipated (26%).

In the case of the RCP8.5 scenario. extremely high risks of yield loss are not expected. However. throughout the Southern Steppe zone. high risks of yield loss (15.5-18.0%) are projected.

In the central and eastern parts of both the Steppe and Forest-Steppe zones. moderate risks of yield loss are expected. including 7.5% in Cherkasy region. 10.3% in Poltava and Kirovohrad regions. 13.2% in Kharkiv region. and 12.6% in Dnipropetrovsk region.

Table 1. Projected risks of sunflower seed yield loss in 2025–2050 under RCP4.5 and RCP8.5 climate change scenarios

№	Districts	Scenario					
		RCP4.5			RCP8.5		
		Risks of yield reduction		Average annual HTC, relative units	Risks of yield reduction		Average annual HTC, relative units
		%	assessment		%	assessment	
1	Sumy	4.0	low	1.0	1.8	low	1.1
2	Kyiv	6.1	medium	0.9	4.2	low	1.0
3	Cherkasy	8.5	medium	0.8	7.5	medium	0.9
4	Poltava	2.2	low	1.1	10.3	medium	0.8
5	Vinnytsia	2.2	low	1.1	0.2	low	1.2
6	Kirovohrad	8.5	medium	0.8	10.3	medium	0.8
7	Zaporizhzhia	26.0	very high	0.5	18.0	high	0.5
8	Odesa	17.2	high	0.6	15.5	high	0.6
9	Mykolaiv	26.0	very high	0.5	15.5	high	0.6
10	Kherson	26.0	very high	0.5	18.0	high	0.5
11	AR of Crimea	26.0	very high	0.5	18.0	high	0.5
12	Kharkiv	10.6	medium	0.7	13.2	medium	0.7
13	Dnipropetrivsk	12.8	medium	0.7	12.6	medium	0.7
14	Luhansk	17.2	high	0.6	18.0	high	0.5
15	Donetsk	10.6	medium	0.7	18.0	high	0.5

Note: (0-5% – low. 6-15% – medium. 16-25% – high. >25% – very high)

It should be noted that under the RCP4.5 climate change scenario. the risk of yield shortfall in Poltava region is expected to be 7% lower. Low risks of yield shortfall can be expected in the Western Forest-Steppe (0.2%) and in the northern part of the Eastern Forest-Steppe (1.8%).

In Kyiv region compared to the risks projected under the RCP4.5 climate change scenario (6.1%). the expected risks under this scenario will be lower – 4.2%.

REFERENCES

1. Adamenko, T., 2019: Climate change and agriculture in Ukraine: what should farmers know? German-Ukrainian Agricultural policy dialogue. 36 p. URL: https://mepr.gov.ua/wp-content/uploads/2023/07/5_Zminaklimatu-ta-silske-gospodarstvo-v-Ukrayini.pdf

2. Stepanenko, S.M., Polovyi, A.M. (Eds.), 2018: Climate Risks of Economic Sectors in Ukraine under Climate Change: Monograph. p. 259-497.