

Influence of Global Climate Changes on Cereal Crops Yield in Rainfall Lands in Uzbekistan

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Abstract. The consequences of the global warming of the world's climate are felt in the rainfed regions of the republic. Climate change will have a negative impact on the food security of the population living in dry regions.

As a result of global warming, the frequency of droughts has accelerated, until 2010, severe droughts occurred every 8-10 years. In recent years, it has been observed that during the period of grain filling and ripening of grain crops, drought occurs along with strong anomalous heat.

Key Words. bread wheat, barley, rainfed lands, rainfall, vegetation period, heading, spike, spikelets, drought, heat, heat and drought tolerant, unfavorable factor, valuable traits, yield, variety, samples.

Introduction. The total land area of the Land Fund of the Republic of Uzbekistan for agriculture is 20761,6 thousand hectares (46,25%), of which irrigated land is 4210,1 thousand hectares (9,38%).

The total area of agricultural crops in our republic is 3998,5 thousand hectares, of which 3238,8 thousand hectares are irrigated and 759,7 thousand hectares are arable rainfed lands.

All arable lands of rainfed areas in the country are divided into 4 zones according to altitude, soil and weather conditions:

1. Plain flat region. This region is not provided with precipitation, and the annual rainfall is 250-300 mm. Strong weather and soil drought occur in the region in spring and summer.
2. The hill step regions. Annual precipitation in this area is 300-350 mm.
3. Foothill region. The annual rainfall in this region is 400-450 mm.
4. Mountainous region. Annual precipitation in this region of dry land is 450-500 mm and more.

Out of a total of 759,700 hectares of dry land, 91,100 hectares belong to plain flat regions, 564,000 hectares to hill step regions, and 104,600 hectares to foothill and mountainous regions.

Low temperature in winter, heat during flowering of wheat and barley, and warm winds strongly damage the growth and development of grain crops in the rainfed region of Uzbekistan. The yield of crops grown on dry land is completely dependent on weather conditions. In particular, the lack of moisture in the soil is one of the main factors that lead to decrease in yield.

Measures aimed at increasing the stability of dry farming and its intensification are important. The yield of grain crops depends only on the total moisture reserve accumulated in the soil during the winter-spring period and the amount of moisture in the most fertile layer where the main root system of the plant is located (R.Katkova, 1971).

High precipitation during the formation of the above-ground part of the plant has a positive effect on the yield. The yield of bread wheat in dry lands depends on the amount of precipitation, the average yield in dry years is 0,3-0,5 t/ha, in dry years 0,8-1,0 t/ha (G.Lavronov 1972, M.Amanov 1978).

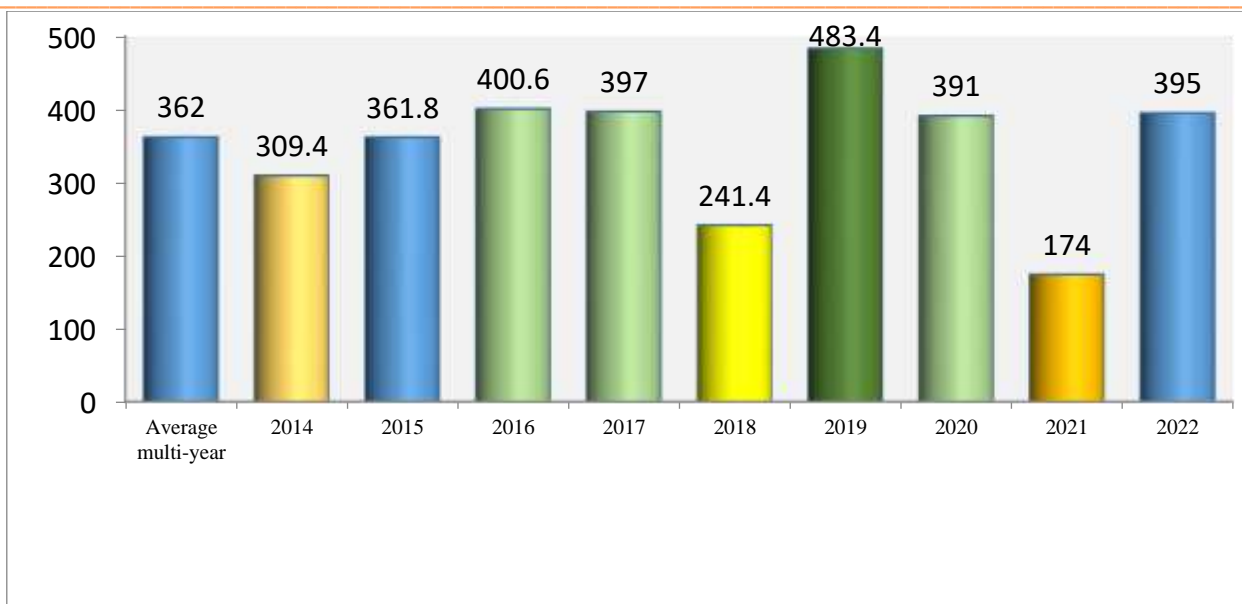


Figure 1. Changes in the amount of precipitation (mm) over the years, (Gallaaral meteorological station, 2014-2022).

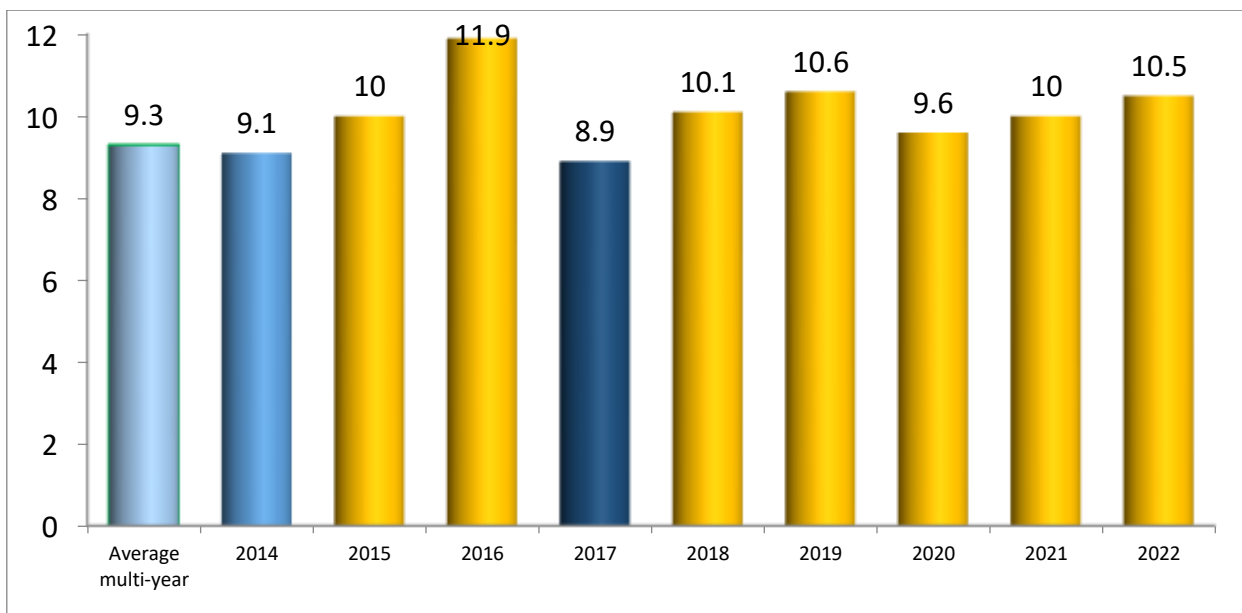


Figure 2. Changes in air temperature (°C) over the years, (Gallaaral meteorological station, 2014-2022).

Barley (*Hordeum vulgare*) is one of the grain crops, and it ranks fourth among cereal crops in world agriculture. In world agriculture, barley grain is used for livestock and poultry feed, human food and barley malt.

In 2019, 200,000 hectares of barley were planted and 240,000 tons were harvested in the Republic of Uzbekistan.

Barley grain is used for food and fodder, straw and blue pulp for fodder. In recent times, as a result of the global climate change, the negative impact on the productivity of grain crops, including barley, grown in the arid lands of our Republic is felt. It will be possible to meet the demand for barley grain by creating new varieties of barley suitable for dry areas, intended for food and fodder, and resistant to the adverse effects of the external environment, which have been observed frequently in recent years.

Main Part. For planting in dry areas of the republic, selection of samples of soft wheat varieties that economically use the natural fertility of the soil, organic and mineral fertilizers, and in the process of selection,

to create varieties with high yield and high grain quality that are resistant to adverse conditions of the external environment. It provides an increase to 0,8-1,0 t/ha, and also allows to increase the protein content of grain by 2-3%, gluten and other quality indicators by 5-10%.

As a result of scientific research, it has been found that wheat and barley varieties with valuable agricultural characteristics lose their characteristics and characteristics over the years under the influence of climatic changes, adverse environmental conditions and diseases.

Continuing the work of creating new varieties of grain crops for arid lands, gradually renewing the variety replacement over the years will ensure high productivity.

Results And Discussions. In the next ten years, it was observed that the yield of soft wheat varieties in dry areas decreased by an average of 0,3-0,5 t/ha due to the increase in the frequency of drought.

During the years of research conducted at the Lalmikor Agricultural Scientific Research Institute on the creation of new varieties of bread wheat, it was found that the grain yield of the "Tezpishar" variety changed under the influence of weather conditions.

As mentioned above, in the process of climate change, the increase in air temperature and the decrease in the amount of precipitation have led to a decrease in productivity. In dry conditions, the lack of precipitation during the spike-ripening phase of grain crops or the increase in air temperature during this period affected the grain yield.

According to the data, the weather in 2020 was favorable, with sufficient rainfall in April-May (total 391 mm) and normal air temperature, high yields of wheat and barley varieties were obtained, and the effects of drought in 2021 (rainfall 174 mm) in cereal crops it can be seen that the grain yield is low (Fig. 3-5).

However, despite the rainfall in 2022 being higher than the average long-term amount (395 mm), the grain yield of wheat and barley varieties was low compared to other years with favorable weather conditions. This is explained by the insufficient amount of precipitation in April-May 2022 during the heading-ripening phase of grain crops.

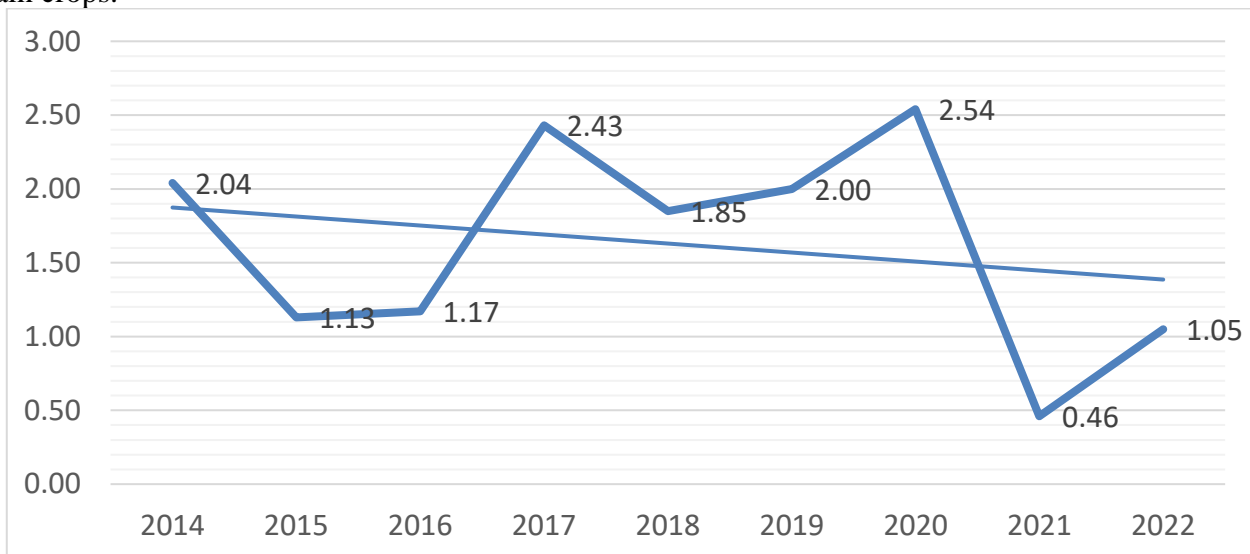


Figure 3. Yielding indicators of Tezpishar variety of bread wheat by years,t/ha, Gallaaral, 2014-2022.

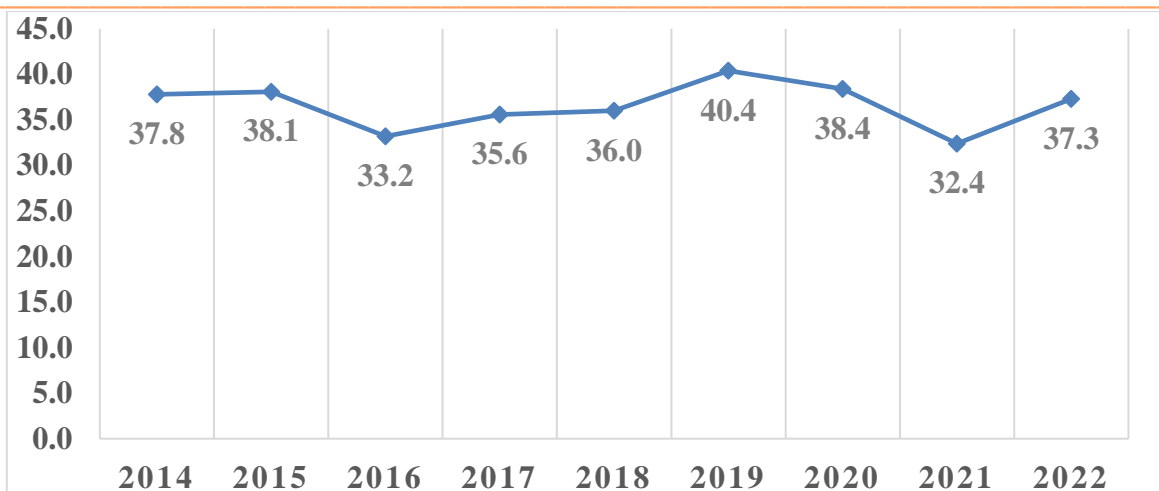


Figure 4. Indicators of 1000 kernel weight of Tezpishar variety of bread wheat by years, gram, Gallaaral, 2014-2022.

The yield variability of barley is influenced by the amount of precipitation, the distribution of precipitation by month, temperature, soil conditions, diseases and other unfavorable factors. Under the influence of adverse factors of the external environment, the productivity of barley varied by year in dry areas.

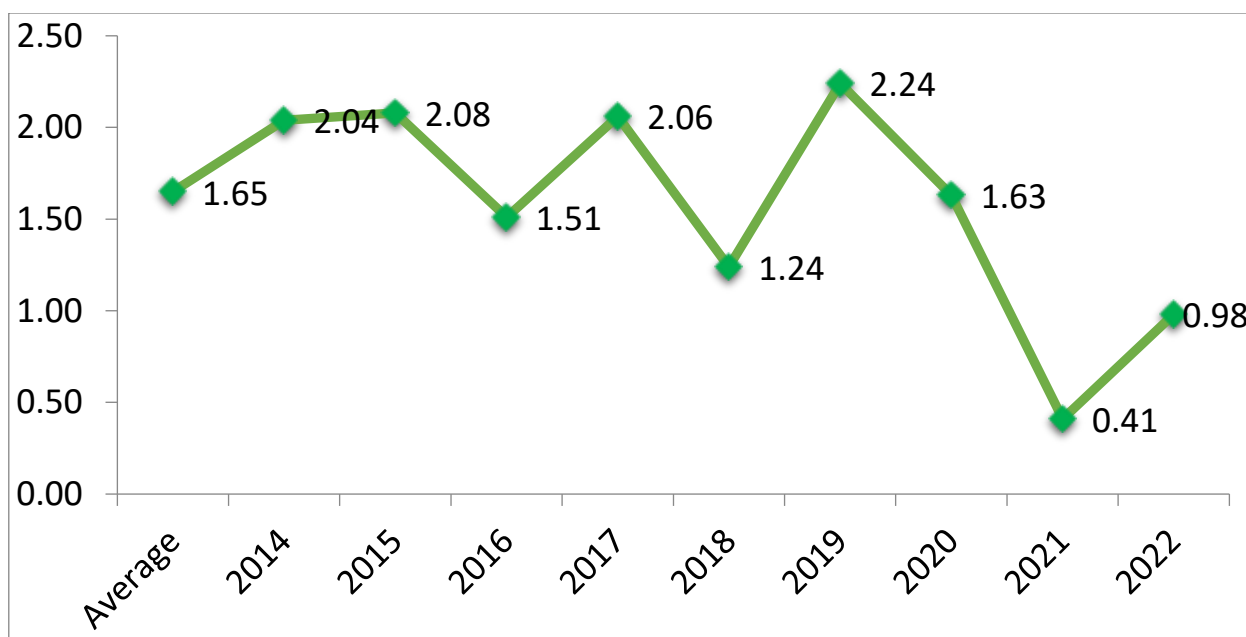


Figure 5. Yield indicators of the Lalmikor variety of barley by years, t/ha, Gallaaral, 2014-2022.

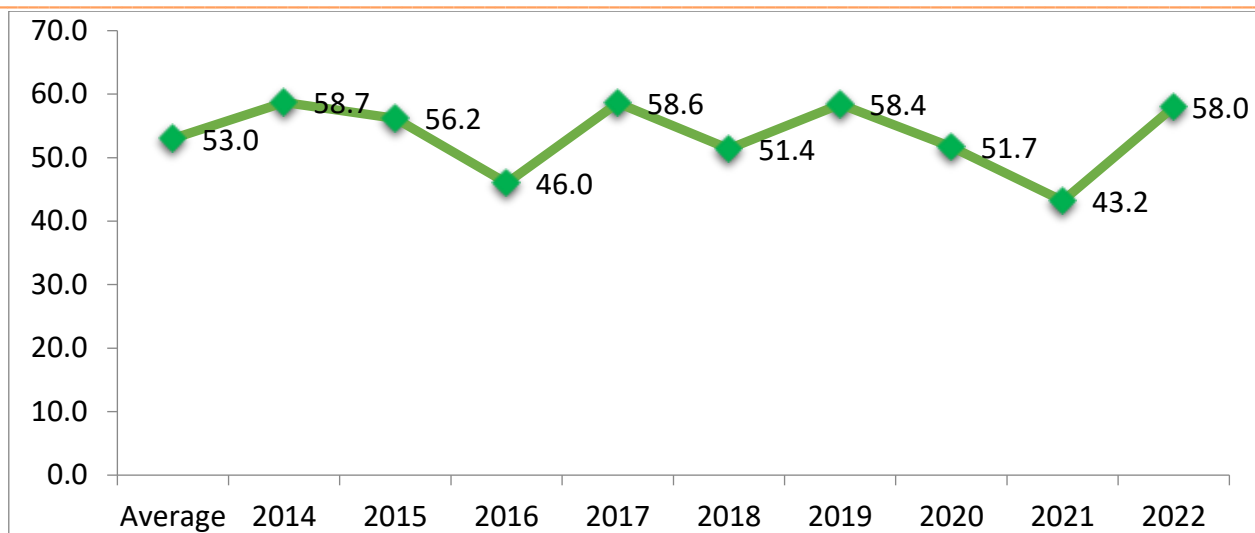


Figure 6. Indicators of the weight of 1000 grains of the Lalmikor variety of barley by year, gram, Gallaaral, 2014-2020.

Conclusions. In recent years, global climate changes require the creation of new varieties of wheat and barley cultivated in dry lands of Uzbekistan. The creation of new varieties of grain crops that are suitable for expected climate changes will ensure their abundant harvest.

In recent years, by studying the adaptability of wheat and barley varieties to adverse conditions in dryland areas, it is possible to select new genotypes and use them in selection, and to apply new grain varieties adapted to the changing conditions of the external environment to obtain a stable harvest.

References

1. Katkova R.O. Some results of research on hybridization and selection of wheat on the rainfed land of Uzbekistan. Autoref. dis. candidate agriculture science - Tashkent, 1971.-25.
2. Lavronov G.A. Wheat of Uzbekistan. Tashkent, Uzbekistan Publishing House, 1972. - 350 p
3. Amanov M.A. Wheat resistance to unfavorable environmental factors in Uzbekistan.. - Tashkent: Science, 1978. -91 p.
4. Otaboev G', Korobov V., Oleynik P., Baigulov D. Agrotechnics of arable crops. Tashkent, "Uzbekistan", 1972. - 248 p.
5. Juraev M. A. Evaluation on developing of new varieties and lines of bread wheat tolerant to drought and heat on the rainfed areas of Uzbekistan //ACADEMICIA: An International Multidisciplinary Research Journal. – 2021. – Т. 11. – №. 10. – С. 1553-1560.
6. Juraev M. et al. Results of the research for developing ultra-early ripening varieties of bread wheat on rainfed lands in the process of global climate change. – 2022.
7. Juraev M. A., Gaybullaev S. The results of studying new bread wheat varieties and lines for rainfed conditions in uzbekistan //Фундаментальные и прикладные научные исследования: актуальные вопросы, достижения и инновации. – 2019. – С. 72-74.
8. Холдоров А.А., Покровская М.Н., Хусанов О. Засухостойкости и теплоустойчивости пивоваренного ячменя в условиях сухой земли узбекистана // Путь науки. – 2014. – С. 56.
9. Холдоров А. А. Лалмикор майдонларда арпанинг рақобат нав синовида ўрганилган нав ва намуналарида маҳсулдорлик кўрсаткичлари бўйича олинган натижалари //O'zbekistonda fanlararo innovatsiyalar va ilmiy tadqiqotlar jurnali. – 2022. – Т. 1. – №. 10. – С. 42-47.
10. Каршибоев Х. Х., Сиддиков Р. Э., Покровская М. Н. Устойчивость содержания общей воды в листьях и температуры коагуляции белков листьев сортов твердой пшеницы в богарных условиях //Аграрная наука. – 2018. – №. 11-12. – С. 54-55.
11. Xolbazarovich K. K., Nikolaevna P. M. The Valuable Traits of Varieties and Lines for Breeding Durum Wheat //Texas Journal of Agriculture and Biological Sciences. – 2022. – Т. 8. – С. 132-137.