

# Agriculture and Drought

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**Abstract—One of the most important problems in the world on a global scale is the danger of drought. Drought can be defined as a natural climatic event that occurs with the decrease of the average precipitation over many years. This situation affects every period of our lives such as physical and natural environment, urban life, economy, development, technological life, agriculture and food, clean water and health. Drought develops differently from other natural disasters that have economic, social and environmental effects. Although the effect is slow from time to time, it can last for many years. The effects of drought usually first manifest themselves in the agricultural sector. After that, it begins to spread to sectors dependent on agriculture and water. It is not possible to predict the effect, duration and time of the drought. It can be said that one of the most important reasons for this formation is the human factor.**

For a sustainable agricultural production, soil, seeds, people and climate are the most necessary factors. While other factors other than climate can generally be controlled and improved, the climate elements and especially the precipitation factor, which has the greatest effect on production, show great temporal and spatial changes.

In order to reduce the negative effects of drought in agriculture, a correct planning should be made with the measures to be taken. Although it is not possible to increase the water supply by ensuring the continuity of precipitation, it is possible to reduce the negative effects caused by drought. In this study, it has been tried to convey the factors that cause drought and preventive measures and ways of protection to reduce this effect.

**Keywords— drought; natural disaster; global warming; agriculture.**

## I. INTRODUCTION

According to many researchers, drought is one of the most important natural disasters. It occurs as a result of the variability of arid climates and lack of moisture in the regions. Drought, which is a hidden danger of nature, occurs with the decrease of precipitation. Other variables such as high temperature, strong wind and low humidity are natural events that have an impact on drought in many

regions. Due to people's dependence on water, it causes serious environmental, economic and social problems on society. There are three types of drought as meteorological drought, agricultural drought and hydrological drought.[1]

1-Meteorological drought: It is a significant decrease in normal precipitation over a long period of time. It may differ between regions due to the decrease in humidity.

2-Agricultural drought: Agricultural drought, which is defined as the lack of water in the soil to meet the needs of the plant, occurs when moisture loss and water resources occur. As a result of insufficient development and growth of the product, it will cause low yield. It will cause danger not only to plants, but also to animals.

3-Hydrological drought: It is related to the effect of underground water resources, surface waters or precipitation periods. If the meteorological drought lasts for a long time, it is said to be hydrological drought. The long-term lack of precipitation is manifested in components of the hydrological system such as source levels, runoff, and soil moisture. It causes a sudden drop in the level of groundwater, rivers and lakes. It poses a great danger to human, plant and animal life.

## II. SITUATION IN TURKEY

Although the annual precipitation average in Turkey is around 640 mm, water shortage and drought are experienced in many regions due to the irregularity of precipitation distribution rates. In response to this average precipitation, an average of 501 billion m<sup>3</sup> of water falls on Turkey annually. Of this water, 274 billion m<sup>3</sup> is returned to the atmosphere by evaporation, 41 billion m<sup>3</sup> feeds groundwater storages by infiltration, and 186 billion m<sup>3</sup> flows. Taking into account that the rivers coming from our borders and originating from neighboring countries and 7 billion m<sup>3</sup> of water per year are included in our country's water potential, our total renewable water potential is 234 billion m<sup>3</sup> in gross [2].

In middle belt countries like Turkey, there are two different periods during the year: rainy winter and dry summer periods. Turkey receives 35% of its annual total precipitation during the winter months. [1],[2]. This is followed by the spring and autumn

seasons, and this rate drops to 11% in the summer months. Since the annual total precipitation is less than 500 mm in approximately 82% of the total cultivated land in Turkey, dry farming is practiced [3].

Causes of drought in Turkey, only 0.3% of 35 million km<sup>3</sup> of fresh water in the world consists of ecosystems and fresh water resources suitable for human consumption. In Turkey, on the other hand, 9% of the total surface water of 95 billion m<sup>3</sup> is utilized. It is predicted that the amount of water that Turkey will need will be 3 times the current water consumption in the next 25 years.

The meaning of drought in agriculture is more meaningful than other sectors [4]. Because the water in the root zone of the plant during the growth periods is more important than the total precipitation during the year for the plants. Therefore, the fact that the water needed by the plants during the emergence and development period cannot be found in the soil is called agricultural drought.

It is certain that there will be an increase in the amount of moisture circulating in the atmosphere due to the increase in temperature in our world and it will fall to the ground somehow. The critical issue here is that this precipitation is not evenly distributed in terms of time and space. Sometimes rains fall in some places at unusual times, while on the other hand, there is no precipitation in some places.[5] It will be useful to examine the changes in precipitation and to conduct regional or basin-based studies, especially in countries with climate diversity in this geography.

Reasons such as metropolitan cities with rapidly increasing population density and current growth rate and water consumption habits are already putting a significant pressure on water resources. Considering the increasing need for water and climate change, it is certain that the problems will increase gradually if necessary, precautions are not taken. For this reason, it is necessary to focus on the protection of water resources, the economical use of water and the reuse of rain water and especially treated wastewater.

There are many reasons for the increase in droughts in Turkey, which has a semi-arid climate. The foremost of these is that, together with climate change, the places where there is precipitation and the places where water is needed are developing very different and far from each other. In addition, the quality of drinking, utility and irrigation water is decreasing day by day as a result of increasing industry and other environmental pollution factors. Therefore, water storage areas and water basins cannot be protected and are destroyed.

Drought is one of the most important risk sources in terms of agricultural production and income. A major drought can reduce crop yields. It can narrow the farmer's cultivated land or harvested land, and

reduce livestock productivity. It can increase the costs of production inputs such as feed and irrigation water [6],[7].

Climate change may occur as a result of changes in the composition of the atmosphere or land use due to human-induced activities [8]. With the effect of climate change, there are changes in the water cycle, and accordingly, increases in the frequency and severity of natural disasters such as drought and flood are expected. To summarize the causes of drought;

Pollution of groundwater and drying up of springs.

Unconscious waste of clean water resources.

Cutting down trees, destroying forest areas.

Failure to recycle waste water.

People's continuous use of natural water resources.

Disposal of industrial wastes and pollution of the environment.

Destroying rain-draining vegetation.

Lack of recycling system in industrial facilities or not giving enough importance.

Improper use of fertile land.

Construction on agricultural lands.

Continuous emission of toxic gases into the atmosphere due to car exhausts and industrial factories and affecting the precipitation patterns.

The acceleration of global warming, especially due to the damage caused by humans to nature.

### III. CONCLUSION

The fact that Turkey is surrounded by seas on three sides, the length of the mountains and the diversity of landforms have led to the formation of different climate types. In the climate analyzes made, it is seen that the dry and wet periods follow each other in the annual average total precipitation of Turkey, with great differences between seasons and regions. Turkey is a country with a wide area of semi-arid and arid regions according to its climate structure.

In order to reduce the negative effects of agricultural drought on environmental, economic and social life and to ensure sustainability, in the settlements and rural areas in line with the decisions and practices taken by the local and national management; programming of water management and irrigation investments, dissemination of new irrigation

techniques that save water, providing good-organic-conservative agricultural practices, developing and disseminating new drought-tolerant varieties, integrated struggle with diseases and pests, regulation of pasture grazing plans, creation of economic and organizing social life support, training on climate change, carrying out project studies, directing agricultural supports, water use restrictions and taking all kinds of measures for the implementation of the emergency action plan [1],[6].

More efforts should be made to eliminate the failures in the policies and action plans being implemented to reduce the effects of agricultural drought, in communicating possible policy and project proposals to practitioners in the field, farmers and all stakeholders.

Awareness and awareness of “more water does not mean more product” should be spread among farmers. Irrigation water should be given in a controlled manner, in the amount needed by the plant, and on time. In order to prevent the use of water more than needed, trainings should be given and preventive legal regulations should be applied when necessary.

To minimize the effects of drought caused by climate change on agricultural production and its pressure on water reserves, to increase the capacity of the sector to adapt to climate change, and to ensure the sustainability of the environment and natural resources. It is essential to ensure adaptation to climate change and to raise awareness in societies.

To bring the agriculture sector to a structure that is least affected by drought. It is necessary to ensure the dissemination of drought-resistant species and varieties, to spread climate-friendly agricultural techniques together with climate change, and to minimize the effects of drought by implementing an effective combat program in today's conditions where the effects of climate change are increasing.

It will be very useful in the long term to include drought and water management issues among the topics of priority interested parties, and to address individuals more frequently in agricultural education and farmer education at young ages.

In order to minimize the effects of drought, studies are carried out and policies are developed in Turkey as well as in the world. The important suggestions of these policies, which are regulatory, supervisory and supportive, should be emphasized with sensitivity. In irrigation, modern methods should be used instead of traditional methods. Employees in the agricultural sector should be taught the characteristics of the agricultural lands they plant, and the most economical agricultural plants should be selected, and the sector should be informed about modern irrigation methods and encouraged to apply these methods.

## REFERENCES

[1]. Erol Kapluhan 2013 Drought and Drought in Turkey Effect of Agriculture). Marmara Coğrafya Dergisi Sayı: 27, Ocak - 2013, S. 487-510

[2]. DSİ (2007), “Soil and Water Resources”, <http://www.dsi.gov.tr/topraksu.htm>, (Access date: 16 November 2021).

[3]. İşler, N. ve Kılınç, M., (2016). Tarla Tarımı, Mustafa Kemal Üniversitesi Ziraat Fakültesi Yayınları, Hatay, 184s.

[4]. Soy, H., Dilay, Y., & Koçer, S. (2017). A LoRa-based Low Power Wide Area Network Application for Agricultural Weather Monitoring. International Journal of Science and Engineering Investigations, 6(71).

[5]. Flannery Tim (2005), İklimin Efendileri, Klan Yayınları, İstanbul

[6] T.C.Gıda, Tarım ve Hayvancılık Bakanlığı Türkiye Tarımsal Kuraklıkla Mücadele Stratejisi ve Eylem Planı (2013-2017) Ankara .2013 – [https://www.tarimorman.gov.tr/TRGM/Belgeler/Duyurular/2013\\_2017\\_Kuraklik\\_Eylem\\_Plani.pdf](https://www.tarimorman.gov.tr/TRGM/Belgeler/Duyurular/2013_2017_Kuraklik_Eylem_Plani.pdf) (Access date: 12 December 2021).

[7]. Wallander, S., Marshal, E. ve Aillery, M., (2017). “Farmers Employ Strategies to Reduce Risk of Drought Damages”, Unites States Department of Agriculture, Economic Research Service. [https://ageconsearch.umn.edu/record/264878/files/http\\_s\\_\\_www\\_ers\\_usda\\_gov\\_amberwaves\\_2017\\_june\\_farmers-employ-strategies-to-reduce-risk-of-drought-damages\\_\\_WgnFJk4\\_OAx8\\_pdfmyurl.pdf](https://ageconsearch.umn.edu/record/264878/files/http_s__www_ers_usda_gov_amberwaves_2017_june_farmers-employ-strategies-to-reduce-risk-of-drought-damages__WgnFJk4_OAx8_pdfmyurl.pdf) (Access date: 26 November 2021).

[8]. Soy, H., Dilay, Y., Aydın, C., & Bayrak, M. (2013). Reducing Agricultural Water Consumption in Konya Plain with the Help of Wireless Sensor and Actuator Networks.