

The Importance of Water use under Climate Change effects in Semi-Arid Agricultural Areas

Ayşe Güneş

Harran University, Agriculture Faculty, Field Crops Department.63000.Şanlıurfa, Turkey

Abstract— Irresponsible use of water resources, hunger, drought, extinction of species, vegetation and soil destruction, pollution, global warming and climate change, the thinning of the ozone layer, the negative effects of greenhouse gases was the beginning of the process of global warming. Almost 90 percent of the irrigated agricultural production in our country is carried out by so-called wild irrigation flood irrigation method. To obtain abundant and high-quality forage from pastures, irrigation of this area is to solve the drainage problems, fertilization, weed the war and the various maintenance jobs are dependent on properly. With surface irrigation practices, fertile agricultural land becomes barren in the Southeastern Anatolian region. These lands are becoming agricultural production cannot be done in the future. Therefore, soil and agricultural production to continue in a healthy manner and informed water management practices must be done to protect the soil. The use of wastewater for this purpose irrigation, directing the arid areas of runoff, evaluating and storing rainwater farmers to promote modern irrigation methods, practices that save water and farmer training with consideration should be given to applications involving studies as to ensure its dissemination. We have to use irrigation water in our region with low rainfall. We must look for ways to benefit from rainwater.

In this study, in order to ensure sustainable water management in our country under the influence of climate change on agricultural production, land and water use and it has consciously explored in agriculture.

Keywords— Drought, climate change, water management, irrigation, water conservation.

I. INTRODUCTION

In order to ensure sustainability in agricultural production, water resources must be well protected and used rationally. Turkey is not a water-rich country, a country faced with water. All our regions have been affected by the agricultural drought that has been experienced with global warming. It is inevitable that the agricultural drought is the result of low agricultural productivity, economic losses, deterioration of ecological balance and social life. As a result of global warming Turkey influenced by ecological degradation and

desertification linked to them in terms of the potential impact of global warming, and water resources decreases, forest fires, droughts, thus has been among the risk group of countries. According to the climate change scenarios and the expectations expressed by these scenarios, the amount of water available in the world, such as warming in the atmosphere, increasing evaporation, decreasing snowfall, degradation of existing distribution in the rainfall season, and changes affecting agricultural production negatively. The amount of rainfall has decreased in our country under the influence of climate change. It is necessary to evaluate the small amount of rainfall in situ and use it in agricultural production. (Kuzucu 2017), informed that rainwater harvesting studies could supply the water needed in arid regions and pointed out that rainwater harvesting practices are an easy and economical method to gain water to the soil. For this reason, drought and flood should be considered together and evaluated, based on these climate events. Water, which is gradually decreasing due to global warming and climate change, is an indispensable necessity of living life. Drinkable water resources in the world; irregular urbanization, excessive population growth, increase in greenhouse gases and excessive industrialization. In this context, methods for reducing water consumption rates need to be defined and water conservation models for sustainable water and wastewater management should be developed (Anonymous, 2014). Researchers worked on water management in the process of climate change (Kılıç, 2008) and the solution of a global problem of water scarcity (Sahin, 2016). According to these studies, "conservation of water resources" should be one of the priority targets. (Monirul 2003) and (Huang 2014), it is important to note that the adaptation of the two varieties to agricultural activities is important. (Kuzucu 2017) reports that organic fertilizers in the production of pistachio conserved soil and water at dry conditions and increase yields at the same time. Water-conscious techniques involving the collection and storage of surface runoff and rainwater, and water-saving practices to promote farmers to modern irrigation methods such as drip and drip irrigation, should be given importance in order to achieve conscious water consumption in agriculture in agricultural irrigation. In countries affected

by climate change, FAO also conducts various surveys and emphasizes that all measures necessary for food safety and agricultural sustainability are taken according to the studies (Anonymous, 2016).

Global warming and climate change effects in Turkey.

Drought, which is the result of global warming and climate change, is a climate event that occurs when precipitation occurs less than the average for many years. The effects of the drought, the duration and the time and the difficulty of predicting it are also closely related to human activities. With the increase in the amount of greenhouse-influencing gases released to the atmosphere after the industrial revolution, the world entered an artificial climate change process. Globally, the average temperature of earth and water bodies has increased since 1861. This increase was at 0.8 ° C during the 20th century. Diminishing the amount of water in some lakes in Turkey visualized (Figure 1).

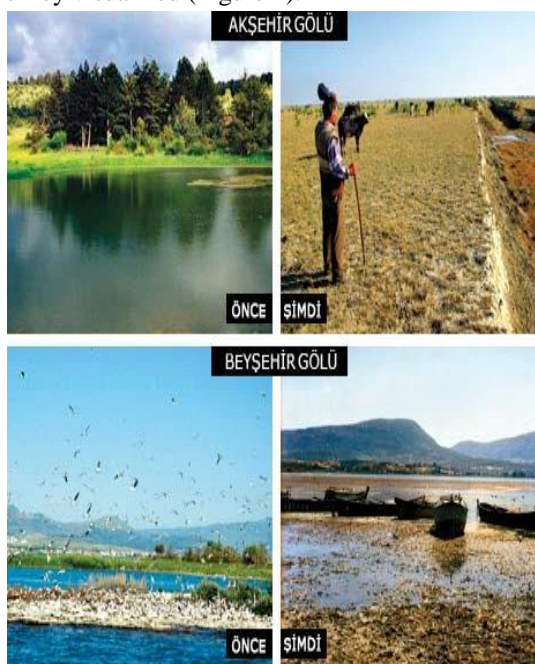


Fig.1: Effects of global warming in some lakes in Turkey

Market share is given that affect global warming in Turkey in Figure 2. Global warming the most affects was the energy sector with 26%. This is followed by industrial forestry and agriculture sectors respectively. Impact of the agricultural sector on global warming was set at 14%.



Fig.2: Sector share in global warming in Turkey.

Population increasing, especially farmers in agricultural areas in Turkey, increased industrialization and prosperity that took place in the cities also increases the need for water. Turkey, especially the increase in the major cities in the amount of water used for industrial and residential, which means a reduction in the amount of water used in agriculture and growing population with the greater number of waste water and has led to more water pollution. For this reason, the water used in agricultural areas has to be used more effectively (Anonymus, 2005). The effect of global warming is to extract the water from the small farm ponds used in agriculture and to damage the area as shown in Figure 3.



Fig.3: Evaporation and water withdrawn from agricultural land under dry condition in Turkey.

In the 2070 general of Turkey 6 0C temperature will rise until thoroughly rainfall will decrease in other areas outside the Black Sea region and ecosystem changed, it is also expected to be faced with extinction of many species. Especially in our country where our global warming has started to be felt, our fields are driven by wrong edition techniques. The biggest mistake is a very deep field version. Very deep field crops cause drought and soil cracking and plant capillary roots to be destroyed by temperature effect. As is known, the humus layer of the soil is a layer thickness of 3-5 cm on the surface. This 3-5 cm humus layer in the uppermost layer is pushed deeply

and is exposed to the surface of the layer which is in the deep and the amount of humus and organic matter is extremely weak. The deep part is not pushed into the humus wherein the deep drilling down to the groundwater. From this point of view, the deep driving of the fields is wrong. Climate change and the scarcity of rainfall caused limited agricultural production in Turkey. Particularly, in the southeastern region of Anatolia, agricultural production has been hampered by the droughts in 2008 and 2010. The average of 30 years rainfall was 344.1 mm in this semi-arid region. Between 1982 and 2011, the lowest rainfall measured was 227.3 mm in 2008, while the highest rainfall measured was 573.1 mm in 1996. Agricultural production's products are very difficult circumstances under rain-fed conditions (Kuzucu et al. 2016).



Fig.4: Water harvesting practices for collecting rainwater in arid areas.

Some of our farmers are tillage their fields for inclination because this application is easier. In this case, the humus layer disappears of the soil with rain and wind erosion. In this respect, the sloping fields must be driven perpendicular to the slope. Though it is difficult in this regard, sloping land should be driven upright. Water shortage is one of the main problems in agricultural production for Southeast Anatolia Region. The organic fertilizers used in this study increased the amount of organic matter in the soil and thus the water absorption capacity, thereby preventing the stress conditions of the plant in the arid summer season. It is also supplied with the applied water harvest and the winter rainfall of the water needed by the plant (Fig 4.). The best plant water consumption was obtained by application of farm grab with water harvesting of soil with an average of 380mm. water harvesting and organic fertilization are recommended for plant growth and yield enhancement in dry farming areas (Kuzucu et al. 2013). In the last years when global warming has occupied our agenda and drought is felt more every day, 30% - 70% of irrigation water is evaporating with daytime field irrigation. In addition, the water droplets remaining on the leaves in

daytime irrigation show a lens effect, burning 12 times as much as their own area. This means that the area of photosynthesis of the plant is shrinking. The plant has to constantly defeat this situation, which leads to a decrease in fruit yield of the plant. Another drawback of daytime watering is the formation of miniature ponds in the pit areas of the fields. These ponds cause the plant roots in this part to decay. Irrigation should be done whatever method is absolutely night soil cold (Çakmak et al., 2005).

II. RESULTS AND DISCUSSION

In-situ development work such as leveling, consolidation and drainage should be built in conjunction with irrigation systems to ensure sustainable water management in agriculture. It should not be forgotten that the success of irrigation projects depends on the arrangement of soil-water-human relations in the physical infrastructure project area. Agricultural water user sector is in first place as the most water-use sectors in Turkey. For this reason, the use of tools and techniques that provide effective water use in agriculture should be among the priority targets of our country. With advanced irrigation technologies it is possible to produce the same amount or more of products with less irrigation water and work power without harming the environment. The selection and projecting of the most appropriate irrigation method for the vegetation pattern to be selected according to the characteristics of the land in our country and application of a suitable irrigation program will ensure that our natural resources are transferred to the next generation in the best way. The application of pressure irrigation systems will reduce water losses and minimize the harmful effects of excessive watering. Under the pressure of the Agricultural Drought, the decrease in agricultural production becomes more effective with the future population increases, and the increase of the food need makes the struggle with the agricultural drought even more important. Completion of surface storage facilities and completion of work to ensure that groundwater reservoirs are kept at the highest levels with maximum nutrition, application of appropriate water harvesting methods according to land use types and effective methods of water use should be improved. Rainfall should be stored in soil or other area in rainfall-less areas. Farmers should benefit from this water during the arid periods. It is necessary to prevent excessive watering in flat land and to spread the application of drip irrigation. Priority should be given to informing and educating farmers in order to improve performance and ensure effective water use in the irrigation system.

REFERENCES

- [1] Anonim (2004). 1995-2004 50.Yılında DSİ. Enerji ve Tabii Kaynaklar Bakanlığı DSİ Genel Müdürlüğü, DSİ İdarive Mali İşler Daire Başkanlığı, Basım ve Fotofilm Şb.Md.84s. Ankara.
- [2] Anonim (2005). 2004 yılı DSİ'ce İşletilen ve Devredilen Sulama Tesisleri Değerlendirme Raporu. DSİ Genel Müdürlüğü, İşletme ve Bakım Dairesi Başkanlığı, Ankara.
- [3] Anonim (2016). <http://www.fao.org/climate-change> (Erişim: 25/10/2016, FAO 2016)
- [4] Çakmak B, Kendirli B, Yıldırım M (2005). Türkiye'de Sulama Uygulamaları ve Basınçlı Sulama Uygulama Olanakları. II. Ulusal Sulama Sistemleri Sempozyumu 9-11 Kasım 2005, DSİ Gn.Md., s.25-37, Ankara.
- [5] Huang Ji-Kum (2014). Climate Change and Agriculture: Impact and Adaptation. *Journal of Integrative Agriculture (Elsevier)*, 13 (4): 657-659.
- [6] Kılıç S (2008). Küresel İklim Değişikliği Sürecinde Su Yönetimi. İ.Ü., Siyasal Bilgiler Fakültesi Dergisi, No:39 (Ekim 2008), s. 161-186, İstanbul.
- [7] Koçak M, Zayıf YA (2005). Yüzeysel Basınçlı Sulama Sistemlerinin Karşılaştırılması ve İşletme Hizmetleri Yönünden Değerlendirilmesi. II. Ulusal Sulama Sistemleri Sempozyumu 9-11 Kasım 2005, DSİ Gn.Md., s.193-207, Ankara.
- [8] Kuzucu, M., Gözel H., Şahan A. 2013. Effects of Water Harvesting Practices and Organic Fertilization on Growth, Yield and Quality in Pistachio Orchards. *Soil and Water Journal* ISSN: 2146-7072 Special Issue for AGRICASIA' 2013. Vol.2 Number 2 (1) page 381-386.
- [9] Kuzucu, M., Dökmen, F., Güneş A. 2016. Effects of Climate Change on Agriculture Production Under Rain-Fed Condition. *International Journal Of Electronics, Mechanical And Mechatronics Engineering* Vol.6 Num.1 - 2016 (1057-1065).
- [10] Kuzucu, M. (2017). The Economic Evaluation Of Water Harvesting Techniques In Dry Agricultural Areas. *Journal of Multidisciplinary Engineering Science and Technology*. ISSN: 2458-9403 Vol. 4 Issue 9, p.8267-8270. September – 2017.
- [11] Kuzucu, M. (2017). Effects Of Water Harvesting Techniques And Using Humic Acid On Soil Moisture, Plant Evaporation, Growth And Yield In Pistachio Orchards In Southeastern Of Turkey. *Fresenius Environmental Bulletin*. Volume 26 – No. 12/2017 pages 7521-7528.
- [12] Monirul M, Mirza Q (2003). Climate Change and Extreme Weather Events: can Developing Countries Adapt. *Climate Policy (Elsevier)* 3(2003), 233-248.
- [13] Şahin B (2016). Küresel Bir Sorun: Su Kıtlığı ve Sanal Su Ticareti. T.C. Hitit Üniversitesi, Sosyal Bilimler Enstitüsü, İktisat Ana Bilim Dalı, Yüksek Lisans Tezi, 2016, Çorum.
- [14] Öztürk A (2004). Tuzluluk ve Sodyumluluğun Oluşumu, Bitki ve Toprağa Etkileri, Sulanan Alanlarda Tuzluluk Yönetimi Sempozyumu Bildirileri, s.1-16, 20-21 Mayıs 2004, Ankara.