



THE IMPACT OF AGRICULTURAL ACTIVITIES ON WETLAND ECOLOGY AND THE PRESERVATION OF SUSTAINABILITY

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Abstract: This study was conducted to assess the current status of the Seyfe basin and to identify sustainable agricultural opportunities. It draws on previous research on the Seyfe basin. The Seyfe basin holds both ecological and socioeconomic value in Türkiye, especially in Central Anatolia. Lake Seyfe faces a significant ecological threat from recent environmental pressures. The balance between conservation and economic use has been disrupted, which has reduced the lake's surface area. The basin's closed structure and unsustainable groundwater exploitation have caused a decline in the lake's water level. This has led to a reduction in its total water reservoir. In addition, climate change has accelerated this decline. Salinity has increased significantly in the region, worsening the impact of pollutants at the lake bottom. This process irreversibly threatens the natural, holistic ecosystem of the Seyfe basin. To ensure a sustainable life, the factors that trigger lake desiccation must be addressed. This will prevent the lake's surface area from falling below critical levels. Public awareness and a revision of agricultural production and product diversity should be implemented. These can support a transition to dryland farming. These measures are necessary for Lake Seyfe to be revitalised and to maintain its international wetland status.

Keywords: Seyfe basin, Climate change, Sustainable management, Drought and salinity, Ecological balance

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Received: October 13, 2025

Accepted: November 13, 2025

Published: November 15, 2025

Cite as: Güngör A. 2025. The impact of agricultural activities on wetland ecology and the preservation of sustainability. BSJ Agri, 8(6): 903-908.

1. Introduction

Wetlands are defined as "transition zones between terrestrial and aquatic ecosystems"; in these areas, the water table is generally at or near the surface or covered by shallow water (Mitsch and Gosselink, 1986; Prasad et al., 2002). The global importance of wetlands is increasing due to their multifaceted contributions to a healthy environment. These ecosystems act as water reservoirs by maintaining a relatively high water table during droughts and reducing the impact of excessive flows and floods during flood periods. They also function as natural filters, retaining pollutants and nutrients from the water. As a result of this filtration, streams flowing through wetlands to lakes carry much cleaner and less nutrient-rich water than those flowing directly into lakes. However, the destruction of wetlands through activities such as urbanisation, unsustainable agricultural practices, actions that disrupt the ecological balance, and ecosystem degradation often leads to a decline in lake water quality. Wetlands are also critical for wildlife, serving as feeding and breeding grounds, as well as safe havens and shelters for waterfowl. Consequently, with controlled management, these areas are considered complex and indispensable ecological assets that provide the basis for agricultural infrastructure and support species diversity. Wetlands are among the most threatened habitats. For much of modern history, wetlands have been dangerously

drained, filled, dammed, flooded, and converted to other land uses (Davidson 2014; Spieles 2022). In addition to anthropogenic threats in many parts of the world, these areas are also significantly affected by global climate change in some regions. Over the past centuries, competition for space due to urban expansion and increased agricultural land has negatively impacted the area and ecology of wetlands. For example, approximately 21% of global freshwater wetlands (a vast area of 3.4 million km²) have been lost between 1700 and 2020 due to wetland drainage and land use changes (Fluet-Chouinard et al., 2023; Schuster et al., 2024). In other words, human activities, especially indiscriminate agricultural practices, have accelerated the loss of wetlands, some of the world's most valuable ecosystems. Wetlands in arid and semi-arid climates are notable for their unique and vital characteristics compared to those in humid regions. As they are generally located in closed basins, reservoir recharge comes primarily from precipitation, surface runoff, and aquifers. There is no outflow in closed basins. Water losses are mainly due to evaporation, deep infiltration, and drainage channels. Water levels fluctuate throughout the year due to irregular rainfall and temperature variations. Levels rise with winter precipitation and are lowest in summer. This results in the formation of salt lakes and salt marshes. The presence of wetlands creates a humid microclimate in arid



regions. They contribute to various factors, including the diversity of surrounding vegetation, the significance of migratory routes, agricultural productivity, and tourism development. Due to this characteristic, wetlands in arid and semi-arid regions are negatively affected by environmental pressures and are highly sensitive to surrounding agricultural activities, particularly errors in water management. When all agricultural activities are carried out using sustainable methods, they can make significant contributions, primarily to nature and natural resources, as well as to local communities and future generations. In other words, environmentally sound technical management promotes the restoration of ecological balance and ensures the long-term well-being of wetlands. Thanks to restoration techniques and engineering solutions implemented in wetlands, positive improvements have been observed in the area covered and the ecological balance of these areas (Beck and Beck, 2009). It has been reported that these restored wetlands provide a wide range of ecosystem services, from biodiversity conservation to hydrological regulation of the water cycle, including food production, cultural benefits, and recreational opportunities. However, despite these benefits, wetlands still face serious threats from agricultural land pressure, overuse of water resources, pollution, and climate change (Cammerino et al., 2024; He et al., 2025). Lake Seyfe, classified as a wetland in Türkiye under the Ramsar Convention, provides significant diversity for the region. The people living in and around Lake Seyfe benefit from the Seyfe spring for irrigation and drinking water in agriculture, as well as for daily life and socio-economic development. The lake is a vital natural resource, providing essential inputs for the development of the local community. Furthermore, Lake Seyfe offers scientific, cultural, and historical richness in terms of biodiversity and habitat for waterfowl (Kiyamaz, 2009). Accordingly, this study aims to provide definitive solutions for achieving sustainable development goals by protecting biodiversity and restoring agricultural and ecological balance in the region.

2. Review

Lake Seyfe, a Ramsar site of international importance, is the only wetland in the province of Kırşehir that represents Türkiye's natural heritage and reflects its biodiversity. It is a shallow, tectonic lake located 35 km east of Kırşehir, in the central Kızılırmak region of Central Anatolia, between latitude 39° 12' 55" N and longitude 34° 23' 24" E (Figure 1).



Figure 1. Lake Seyfe basin.

The lake, at 1,110 metres above sea level, is approximately 10 km long and 5 km wide. Lake Seyfe, situated in the Seyfe Basin, a sub-basin of the Kızılırmak Basin, has a drainage area of 1,471,692 km², and its maximum surface area is about 69 km². While the lake area has decreased annually, it was found to cover 20.98, 11.82, 18.17, and 1.86 km², respectively, for each of the five years between 2005 and 2020. The lake's depth varies between 0.5 and 4.0 metres. In August, the deepest point of the lake was measured at 1.95 metres in the northern part of the area. The deepest point is reached approximately 2.5 km from the shoreline in the south of the lake and 1.5 km in the west (Yurteri and Kurttaş, 2021). Lake Seyfe's water level decreases significantly in summer but rises with rainfall in winter. Due to the lake's closed basin nature, salinity increases and the surrounding soil becomes barren. Fourteen Ramsar Sites have been designated in Türkiye according to the Ramsar Convention criteria, and the Lake Seyfe Wetland is one of them. Many of these sites are of international importance for the waterfowl and fish species they support. This makes them a stopping point for migratory birds.

This study examines the current situation in the Lake Seyfe Basin. It assesses how the region's agricultural production process and continued agricultural management will accelerate basin-level degradation in the future. Furthermore, it addresses strategies for sustainable agricultural management across the basin and for achieving agricultural and social benefits that support regional prosperity and contribute to the ecological cycle.

3. Discussion

Climate change directly affects agricultural production and poses a significant threat to agricultural sustainability worldwide. Agriculture is a vital component of the gross domestic product in developing countries. The observation of both direct and indirect effects of climate change on agricultural activities creates a more complex structure in production opportunities. The primary problem at Lake Seyfe is the poor management of wetland

strategies. Located in Kırşehir, a semi-arid region, Lake Seyfe, with its closed basin characteristics, forms an important ecosystem. However, the consequences of global climate change, combined with irresponsible agricultural activities, have caused serious problems in the lake and its surroundings. In recent years, increased demand for water, withdrawals exceeding permitted levels, non-compliance with water quotas, and the use of illegal structures have put the recharge of Lake Seyfe at risk. Additionally, the drainage system throughout the basin prevents water returning from agriculture from feeding the lake. Research has shown that climate change threatens people by causing water and food scarcity, floods, extreme heat, diseases, and economic losses, and that climate change has been recognised by the World Health Organization (WHO) as the greatest threat to global health in the twenty-first century (Thota et al., 2018; Amiri et al., 2024). Rural communities, particularly small-scale farmers, are among the most vulnerable to climate-induced water stress due to their dependence on agriculture and natural resources for their livelihoods (Alibaygi and Karamidehkordi, 2009; Karamidehkordi et al., 2023; Karimi et al., 2024; Naderi et al., 2024). Furthermore, farmers whose socio-economic situation is highly sensitive to climatic extremes are easily affected by risk factors such as rising air temperatures, unpredictable severe droughts, and plant diseases. It has been reported that the use of illegal wells has increased in some villages in the Seyfe basin (Kan and Akalin, 2025). Some farmers who rely on agriculture for their income, particularly due to economic concerns, have sought solutions to their problems by turning to illegal wells and tending to flood their agricultural lands. This not only negatively affects the lake surface but also leads to salinisation and barrenness of surrounding wetlands and agricultural lands. The challenges of climate change require the rapid adoption of sustainable agricultural practices, particularly diversification and integrated soil management. In addition to the effects of drought, the attitudes of local people also contribute to the barrenness of soils in the Seyfe basin. A study conducted in the Seyfe basin found that chemical fertilisers are predominantly used to provide plant nutrients, and that people rely on their own experience as a source of information on this issue (Doğan and Karaaslan, 2022). The irresponsible use of agricultural inputs leads to extreme values in soil and water resource quality. The pH value of the water collected from the lake and its surroundings was reported as neutral to basic, ranging from 7.15 to 8.65. Furthermore, the electrical conductivity (EC) of the waters in the area ranged from 0.37 to 30.5 dS/m, while it reached 36 to 74 dS/m in the lake and its surroundings (Yurteri, 2020). In addition, in the regions towards the northeast of the lake, NO₃ values were above 50 µg/L, SO₄ values were above 500 µg/L, and F values were above 2.0 µg/L (Başbüyük et al., 2020). Managing agricultural activities around the lake using sustainable practices will prevent these problems and allow soil quality to return to

its normal state in the medium term. However, innovative policies and publication efforts are needed to overcome the socio-economic barriers encountered during the implementation of these practices. Given the current human-related problems, the inadequacy of public awareness-raising and publication efforts in the villages of the Seyfe basin, particularly regarding global climate change and wetland management, is notable. To increase agricultural resilience, investing in innovative and developing technologies, as well as incorporating new foods and healthy diets that consume fewer resources per capita, is crucial (Yang et al., 2024). The main sources of income for people around the lake are arable farming and animal husbandry. Ninety per cent of the population earns their living through these means. Dryland farming is practised in 91.7% of the basin, while irrigated farming is practised in 8.3%. The main crops cultivated are barley, sunflower, wheat, beans, lentils, chickpeas, sugar beet, and oats. In recent years, forage crop farming has gained significant importance. Fruit and vineyard farming is also practised, albeit to a lesser extent (Ciftci, et al., 2021). Crop pattern selection, particularly in wetlands within closed basins, should be determined by the availability of agricultural inputs. According to the crop water consumption guide for irrigated crops in Türkiye (Tarimorman, 2017), the average crop water consumption for the most commonly cultivated crops in Kırşehir and the Seyfe Lake basin is shown in Table 1.

Table 1. Plant water consumption amounts of some irrigated plants in Kırşehir province

Product	Plant Water Consumption (mm)	Product	Plant Water Consumption (mm)
Barley (Winter)	509	Corn (Grain)	675
Safflower	680	Corn (Silage)	617
Sunflower	662	Chickpeas (Summer)	540
Wheat (Winter)	581	Potatoes	694
Grassage, Pasture (Annual)	1008	Sugar Beet	893
Bean	633	Oats (Winter)	594
Vetch (Common)	425	Oats (Summer)	558
Lentil	492	Alfalfa	880

However, according to the basin crop pattern guide for 2025–2027 crop production planning covering the region (Tarimorman, 2024), the basin crop pattern table (Table 2) for the Kırşehir region, which is the subject of the planning, shows that throughout Kırşehir, crops with high water requirements relative to regional conditions are included. Agricultural management strategies that include

crops with high water consumption will also increase the need for agricultural irrigation. This will result in greater water consumption for each product produced per unit area.

Table 2. 2025-2027 Crop production planning

Basin Name	Basin Product Pattern Subject to Planning
Kırşehir/Akçakent	Barley, Sunflower (Oil), Wheat, Lentil, Chickpea, Forage Crops
Kırşehir/Akpınar	Barley, Sunflower (Oil), Wheat, Chickpeas, Forage Crops
Kırşehir/Boztepe*	Barley, Sunflower (Oil), Wheat, Lentil, Chickpea, Forage Crops
Kırşehir/Çiçekdağı	Barley, Sunflower (Oil), Wheat, Lentil, Chickpea, Forage Crops
Kırşehir/Kaman	Barley, Sunflower (Oil), Wheat, Lentil, Corn (Grain), Chickpea, Potato, Forage Crops
Kırşehir/Merkez	Barley, Sunflower (Oil), Wheat, Lentil, Chickpea, Potato, Fodder Crops
Kırşehir/Mucur*	Barley, Safflower, Sunflower (Oil), Wheat, Lentil, Chickpea, Potato, Forage Crops

*Drip irrigation is required for corn (grain) production in districts with water restrictions.

In future production planning, a crop pattern should be created by considering the availability and status of water in the region. When determining the crop pattern for the region, at least for the service area of Lake Seyfe in the Mucur district of Kırşehir, selecting a crop pattern that takes into account the presence of scarce resources will contribute to the solution. In addition, it is considered that in short-term planning, dryland farming should be encouraged more in the region and any crop production plan with high water requirements, even if it is within pressurised irrigation, should be avoided. Otherwise, farmers' search for water will increase, and both their tendency to exceed the quotas of licensed wells and their search for illegal water will continue. Studies show that more than a quarter of humanity's total water footprint (27%) is used in the production of animal products (Bhagat et al., 2020). In other words, the water footprint of animal product production accounts for approximately 27% of the burden on water resources. Therefore, water management is important not only in crop agriculture but also in animal production. According to studies, the largest share of the water footprint in animal product production is attributed to beef cattle (33%). Dairy cattle account for 19%, pigs 19%, laying hens and broilers 11%, and sheep 3%. The water footprint for animal product production includes not only the water animals drink directly, but also the water used in producing edible feed and processing the product (Demir, 2023; Kaya and Mazlum, 2025). The feed production stage constitutes the largest share of the total water footprint of animal products. Globally, the

main components of the total water footprint of animal feed are pasture (38%), maize (17%), forage crops (8%), soybean meal (7%), wheat (6%), barley (6%), and oats (3%) (Besd-Bir, 2021; Kaya, and Mazlum, 2025). The fact that beef cattle have the highest water footprint in animal production indicates that beef cattle farming may be risky for Kırşehir province, especially in short-term planning. The region should limit the number of cattle by introducing quotas for beef farms and reorganising them. It would be more prudent to focus on forage crops such as barley, wheat, vetch, and sainfoin, as well as oxtail and damson, which have lower water requirements depending on the region. Alternative solutions to forage crops, such as shrub species, herbaceous species, appropriate crop rotation, and the use of fallow land as drought-tolerant forage sources, were also presented in the workshop's final report (Tarimorman, 2022). With the increasing impact of global warming, protecting natural wetlands and restoring damaged areas—considered natural climate solutions—have become increasingly popular methods for mitigating climate change (Bossio et al., 2020). Beyond their role in climate change, freshwater wetlands provide additional benefits, such as habitat for various species, improved water quality and security, and protection against floods (Thorslund et al., 2017; Chausson et al., 2020). Therefore, freshwater wetlands offer a holistic, nature-based solution to mitigate the impacts of climate change (Schuster et al., 2024). Protecting wetlands, which are unique elements of our future, cannot be achieved through public policy alone. Local communities who interact with these areas have primary responsibility for their protection and sustainability (Kan and Akalin, 2025). To this end, adopting a management system that involves organised action by local communities in collaboration with both official institutions and private organisations will be the most effective approach to wetland reconstruction.

4. Conclusion

Official records of agricultural wells in the Seyfe basin should be considered to ensure that water withdrawals remain within quotas. Re-drilling of wells should be halted in the short to medium term, and illegal wells should be identified and managed. Areas where the lake basin is receding are highly susceptible to soil erosion. Plant growth in these areas will be difficult, and wind-driven dust transport will be inevitable. Screening and lakeside vegetation should be established in these areas. Infrastructure investments are essential for building resilience to the impacts of climate change. To achieve this, farmers and local communities, especially livestock farms in the region, should contribute to adaptation measures by constructing water harvesting and storage structures to meet their needs in agricultural activities. Agricultural extension workers should provide education and training to increase farmers' awareness of climate change.

Author Contributions

The percentages of the author' contributions are presented below. The author reviewed and approved the final version of the manuscript.

	A.G.
C	100
D	100
S	100
DCP	100
DAI	100
L	100
W	100
CR	100
SR	100

C= concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision.

Conflict of Interest

The author declared that there is no conflict of interest.

References

Alibaygi A, Karamidehkordi E. 2009. Iranian rural youths' intention to migrate to urban areas. *Asian Pacific Migration J*, 18(2): 303-314.

Amiri Z, Heidari A, Navimipour N. J. 2024. Comprehensive survey of artificial intelligence techniques and strategies for climate change mitigation. *Energy*, 308: 132827.

Başıbüyük Z, Ekinçioğlu G, Yavaşlı, D. D. 2020. Determination of groundwater quality in the Lake Seyfe (Kırşehir) area using geographic information systems (GIS). *Aksaray Univ J Sci Eng*, 4(1): 77-89.

Beck CW, Beck RE. 2009. Trade-offs among life-history traits; a comment on Wang et al.(2009). *J Zool*, 279(4): 319-320.

Besd-Bir. 2021. Water footprint in white meat production. URL: <https://besd-bir.org/tr/evresel-etkiler> (accessed date: September 26, 2025)

Bhagat S, Santra A. K, Mishra S, Khune V. N, Bobade M. D, Dubey A, Yadav A, Soni A, Banjare S, Yadav G. 2020. The water footprint of livestock production system and livestock products: A dark area: A review. *Int J Fauna Biol Stud*, 7(1): 83-88.

Bossio DA, Cook-Patton, SC, Ellis PW, Fargione J, Sanderman J, Smith P, Griscom BW. 2020. The role of soil carbon in natural climate solutions. *Nat Sustain*, 3(5): 391-398.

Cammerino ARB, Ingaramo M, Monteleone M. 2024. Complementary approaches to planning a restored coastal wetland and assessing the role of agriculture and biodiversity: An applied case study in southern Italy. *Water*, 16(1): 153.

Chausson A, Turner B, Seddon D, Chabaneix N, Girardin CA, Kapos V, Seddon N. 2020. Mapping the effectiveness of nature-based solutions for climate change adaptation. *Glob Change Biol*, 26(11): 6134-6155.

Ciftci E, Günek H, Nazik L. 2021. Natural Environment Characteristics in Seyfe Lake Basin (Kırşehir). *Black Sea J Public Soc Sci*, 4(2): 42-53.

Davidson NC. 2014. How much wetland has the world lost? Long-term and recent trends in global wetland area. *Mar Freshw Res*, 65(10): 934-941.

Demir Y. 2023. Water footprint status in beef production. *Aydın Gastronomy*, 7(1): 161-171.

Doğan HG, Karaaslan H. 2022. Investigation of producers receiving support within the scope of policies to prevent environmental destruction caused by the agricultural sector in Türkiye (The example of cereal producers in the lake Seyfe Region). *Turk J Agric Food Sci Technol*, 10(11): 2213-2223.

Fluet-Chouinard E, Stocker BD, Zhang Z, Malhotra A, Melton JR, Poulter B, McIntyre PB. 2023. Extensive global wetland loss over the past three centuries. *Nature*, 614(7947): 281-286.

He H, Li X, Li T. 2025. The sustainable development of wetlands and agriculture: A literature review. *Agronomy*, 15(3): 746.

Kan M, Akalin A. 2025. Environmental attitudes of producers for conservation and sustainability of wetlands; Seyfe Lake Wetland-Turkiye. *Glob Nest J*, 27(5): 07051.

Karamidehkordi E, Sadati SAH, Tajvar Y, Mirmousavi SH. 2023. Climate change vulnerability and resilience strategies for citrus farmers. *Environ Sustain Indic*, 20: 100317.

Karimi M, Tabiee M, Karami S, Karimi V, Karamidehkordi E. 2024. Climate change and water scarcity impacts on sustainability in semi-arid areas: Lessons from the South of Iran. *Groundw Sustain Dev*, 24: 101075.

Kaya H, Mazlum H. 2025. Assessment of water footprint in animal food production. *Osmaniye Korkut Ata Univ J Inst Sci Technol*, 8(2): 970-984.

Kiyamaz S. 2009. Problems and solutions related to the management of lake Seyfe wetland and water resources. *Ecol Life Sci*, 5(2): 174-185.

Mitsch WJ, Gosselink JG. 1986. *Wetlands Van Nostrand Reinhold Company Inc.* New York, NY, USA.

Naderi L, Karamidehkordi E, Badsar M, Moghadas M. 2024. Impact of climate change on water crisis and conflicts: Farmers' perceptions at the ZayandehRud Basin in Iran. *J Hydrol Reg Stud*, 54: 101878.

Prasad SN, Ramachandra TV, Ahalya N, Sengupta T, Kumar A, Tiwari AK, Vijayan L. 2002. Conservation of wetlands of India- a review. *Trop Ecol*, 43(1): 173-186.

Schuster L, Taillardat P, Macreadie PI, Malerba ME. 2024. Freshwater wetland restoration and conservation are long-term natural climate solutions. *Sci Total Environ*, 922: 171218.

Spieles DJ. 2022. Wetland construction, restoration, and integration: A comparative review. *Land*, 11(4): 554.

Tarimorman. 2017. *Plant Water Consumption guide for irrigated plants in Türkiye.* URL: <https://www.tarimorman.gov.tr/Tagem/Belgeler/yayin/Tu%CC%88rkiyede%20Sulanan%20Bitkilerin%20Bitki%20Su%20Tu%CC%88ketimleri.pdf> (access date: September 28, 2025).

Tarimorman. 2022. Forage crops production, current situation, and assessment of measures to be taken within the context of climate change, Workshop Final Report. URL: [https://www.tarimorman.gov.tr/Tagem/Belgeler/C%CC%A7MYB%20C%CC%A7al%4%B1s%CC%A7tay%20Raporu%20\(1\).pdf](https://www.tarimorman.gov.tr/Tagem/Belgeler/C%CC%A7MYB%20C%CC%A7al%4%B1s%CC%A7tay%20Raporu%20(1).pdf) (access date: September 30, 2025).

Tarimorman. 2024. *Plant production planning 2025 - 2027 Basin Crop Pattern List i.* URL: <https://www.tarimorman.gov.tr/Bugem/Belgeler/Tar%4%B1m%20Havzalar%4%B1/2025-2027%20Tar%4%B1msal%20C3%9Cretimin%20Plannin g%4%B1na%20Topic%20C3%9Cr%20C3%BCn%20Pattern%20Listesi.pdf> (access date: September 28, 2025).

Thorslund J, Jarsjo J, Jaramillo F, Jawitz JW, Manzoni S, Basu NB, Destouni G. 2017. Wetlands as large-scale nature-based solutions: Status and challenges for research, engineering and management. *Ecol Eng*, 108: 489-497.

Thota A, Tilak P, Ahluwalia S, Lohia N. 2018. Fake news detection: a deep learning approach. *SMU Data Sci Rev*, 1(3):

10.
Yang Y, Tilman D, Jin Z, Smith P, Barrett CB, Zhu YG, Zhuang M. 2024. Climate change exacerbates the environmental impacts of agriculture. *Science*, 385(6713), eadn3747.
- Yurteri C. 2020. Hydrogeological and hydrochemical assessment of water resources in the lake Seyfe (Mucur-Kırşehir) wetland Basin. *Dokuz Eyl Univ Fac Eng J Sci Eng*, 22(65): 581-597.
- Yurteri C, Kurttaş T. 2021. Analysis of the temporal change in the surface area of Lake Seyfe (Kırşehir) using remote sensing and GIS techniques. *Gümüşhane Univ J Sci*, 11(4): 1115-1128.