FROM WELLS TO WARNINGS: WATER CONSUMPTION AND AGRICULTURAL DECLINE IN KONYA & SOUTHEASTERN ANATOLIA, TURKEY

Tuana Tantur

Georgetown University CAS' 28

Dr. Marcus King

August 2025

GEORGETOWN UNIVERSITY
Center for Research & Fellowships

Abstract

Turkey is running dry, literally and economically. As one of the most agriculturally productive countries in its region, it is increasingly struggling with a growing water scarcity that not only threatens its farms but also the livelihoods and economies that depend on them. This study examines the impact of water scarcity, caused mainly by unsustainable water irrigation in Turkey's most water-stressed watersheds, on agricultural production and regional GDP. Based on empirical evidence from the Konya Closed Basin and the Southeastern Anatolia Project region, the paper investigates the unequal economic effects of groundwater loss and climate-induced drought. Using a Difference-in-Differences approach, the analysis finds that wheat yields in Konya have significantly underperformed relative to similar provinces that share comparable climate conditions, wheat cultivation patterns, and baseline yield trends before 2014, indicating the early-stage consequences of long-term groundwater depletion. Nevertheless, agricultural GDP has not declined in tandem, suggesting that short-term economic effects may be buffered by rising prices, subsidies, or shifts in production. This disconnect between declining physical output and economic indicators reveals a deeper structural vulnerability.

Introduction

Water scarcity is one of the major problems the world is facing in 2025. Water consumption continues to increase at more than twice the rate of the world population increase, and water scarcity already affects more than 40% of the global population. In Turkey, this issue takes on particular urgency. Agriculture-dependent areas of the nation are at the forefront of a growing environmental and economic shift as freshwater supplies diminish and climatic variability rises. This situation is becoming increasingly pressing in a country where renewable freshwater resources per capita have dropped below 1,313 m^3, placing it on the verge of water scarcity according to the Falkenmark Water Stress Index.[1]

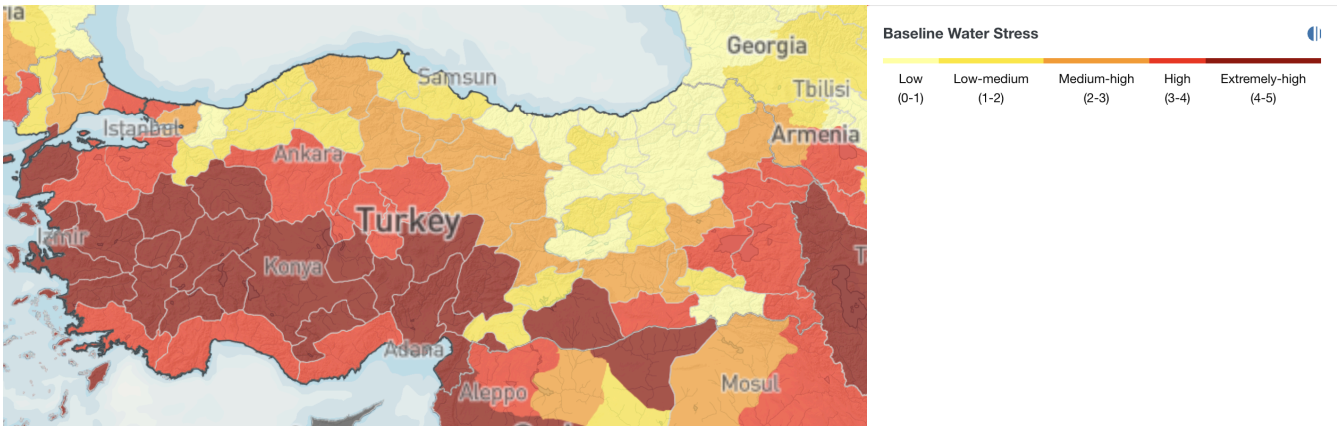

Figure 1. *Turkey's Baseline Water Stress Map. Aqueduct - World Resources Institute.* https://www.wri.org/applications/aqueduct/country-rankings/?country=TUR.

The problem extends beyond environmental concerns, though. It also affects the country's economy. Turkey is the world's 9th largest agricultural producer and a leader in products like wheat, poultry, cotton, hazelnuts, tomatoes, apricots, and other fruits and vegetables. As the largest employer, the agricultural sector employs nearly 20% of the workforce and accounts for 6% of the economy, underscoring its continued importance to the Turkish economy, particularly in terms of regional employment, income, and food security. Moreover, agricultural output forms the backbone of local GDP in some regions.[2] However, many farmers continue to engage in inefficient irrigation techniques despite these risks. They prefer techniques such as flood or basin irrigation, often due to a lack of access to infrastructure, policy misalignment, or the absence of important economic incentives for water-saving alternatives.[3]

---

[1] Republic Of Türkiye Ministry Of Agriculture And Forestry, *Water Efficiency Strategy Document And Action Plan In The Framework Of Adaptation To The Changing Climate* (Ankara, 2023), 19. https://suverimliligi.gov.tr/wp-content/uploads/2023/10/su-vermliligi-eylem-plani-en.pdf.
[2] Republic of Turkey Ministry of Agriculture and Forestry. *İl Tarım ve Orman Raporu – Konya* (June 2024).
[3] FAO and DSİ. *Türkiye Sulama Sistemleri Değerlendirme Raporu*. 2021.

This research aims to answer the underexplored question: How does water scarcity, driven by unsustainable agricultural irrigation practices, affect agricultural output and regional GDP in Turkey? This paper argues that unsustainable irrigation is both an ecological issue and a structural economic limitation.

I use a mixed-methods approach to investigate this: first, it reviews national datasets and empirical studies on water usage and economic output; second, it conducts case studies of basins with limited water supply (Konya and Southeastern Anatolia) to understand the practical effects of water inefficiencies.

Ultimately, I argue that solving Turkey's water crisis requires more than environmental awareness, as it requires a clear economic rationale for change. The project provides a means for policymakers to see irrigation as a future-proof investment rather than a sunk cost by presenting water sustainability as a prerequisite for economic development. By identifying where physical productivity declines are already occurring and showing how they may precede economic loss, the study contributes to early-warning efforts for long-term economic growth.

Empirical & Analytical Context

Water scarcity in Turkey has become a primary focus of environmental development and research, particularly as the country transitions toward a water-stressed status under the combined pressures of climate change, population growth, and increasing sectoral water demand. Multiple studies have shown that the increasing frequency of droughts and the decline in per capita freshwater availability, with projections showing a worsening trend by mid-century.[4] Moreover, climate models suggest that Turkey's Mediterranean and Southeastern Anatolia regions are especially vulnerable, given their already arid climates and dependence on surface water for irrigation (Ozturk et al.).[5]

An emerging theme in the literature is the disproportionate share of freshwater used by agriculture, accounting for approximately 77% of Turkey's total water consumption.[6] Turkey stands out for the inefficiency of its irrigation systems, with an estimated 85% of irrigated land still relying on traditional methods of irrigation, such as furrow or flood surface irrigation.[7] These methods result in considerable water loss through runoff and evaporation, exacerbating an already limited supply. Previous studies by Kibaroglu and Baskan and FAO show that inefficient water management practices are not only environmentally unsustainable but also economically wasteful, especially in the context of climate-induced water stress.[8]

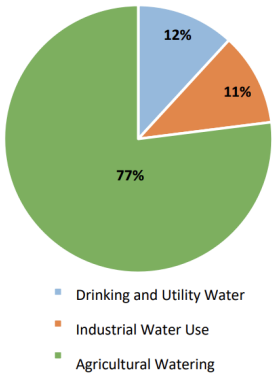

Figure 2. *Sectoral Water Uses in Turkey. Republic of Türkiye Ministry of Agriculture and Forestry, Water Efficiency Strategy Document and Action Plan In The Framework of Adaptation To The Changing Climate*. https://suverimliligi.gov.tr/wp-content/uploads/2023/10/su-vermliligi-eylem-plani-en.pdf.

[4] UN Water, *World Water Development Report* (Geneva: United Nations, 2023), https://www.unwater.org/publications/un-world-water-development-report-2023.
[5] Tuğba Öztürk, Zeynep Ceber, Murat Türkeş, and Levent Kurnaz, "Projections of Climate Change in the Mediterranean Basin by Using Downscaled Global Climate Model Outputs," *International Journal of Climatology* 35, no. 14 (2015): 4276–4292, https://doi.org/10.1002/joc.4285.
[6] Republic of Turkey Ministry of Agriculture and Forestry, İl Tarım ve Orman Raporu – Konya (June 2024).
[7] OECD, *Innovation, Agricultural Productivity and Sustainability in Turkey*.
[8] Kibaroglu, Ayşegül, and Argun Baskan. "Turkey's Water Policy Framework." In *Turkey's Water Policy: National Frameworks and International Cooperation*, edited by Kibaroglu et al.; FAO, *Turkey: Country Water Overview*, AQUASTAT (Rome: FAO, 2022).

Past reports have highlighted that inefficient irrigation practices, especially in regions like the Konya Basin, contribute not only to overextraction of groundwater but also to declining crop yields and reduced productivity. These impacts are severe when it comes to areas where traditional surface irrigation still dominates, leaving farmers vulnerable to seasonal drought and soil degradation. Furthermore, many of these regions are also characterized by limited investment in irrigation modernization, which creates a feedback loop of water waste and economic underperformance. Turkey's Water Action Plan (2023) acknowledges the economic potential of modern irrigation systems, yet emphasizes that current implementation remains fragmented and underutilized, limiting the full economic benefits of water-saving technologies.[9]

A smaller but growing body of research links water infrastructure investment to economic growth. For example, Koç et al. (2022) model the long-term benefits of drip irrigation and show positive returns on investment through both yield increases and water savings.[10] Likewise, case studies in Spain and Israel have demonstrated the macroeconomic advantages of investing early in efficient water systems, yet similar analyses are very few in Turkey.[11]

This study addresses both gaps by combining a causal analysis of yield impacts with an exploratory examination of agricultural GDP outcomes, providing new insight into where early physical losses may be hidden behind short-term economic stability.

Turkey's agriculture is exposed to water stress unevenly, both in terms of natural water availability and water infrastructure. Two areas in particular illustrate contrasting trajectories of agricultural dependence, water stress, and development outcome: the Konya Closed Basin and the Southeastern Anatolia Project (GAP) region. These regions are not only environmentally distinct but also serve as valuable empirical contrasts in evaluating the economic effects of water scarcity.

When these two regions are compared, different but related stories emerge. Konya highlights the long-term risk of relying on unregulated groundwater under technological constraints, while GAP shows the potential and limitations of extensive infrastructure to boost agricultural productivity. Both are experiencing growing water stress, which is producing concrete agricultural effects and is indicated by declining aquifer levels, increased evaporation, and fluctuations in rainfall and river flow. These cases form the empirical backbone of the study, allowing for both comparative analysis and broader conclusions about the economic sustainability of Turkey's agricultural water use.

---

[9] Republic of Turkey Ministry of Agriculture and Forestry, *Water Action Plan 2023–2027*, 31–35.
[10] Koç, Deniz Levent, Burçak Kapur, Mustafa Ünlü, ve Rıza Kanber. "The Situation of Water Resources and Agricultural Irrigation in Turkey". *Çukurova Tarım Ve Gıda Bilimleri Dergisi* 37, vol 2 (Dec 2022): 112-22. https://doi.org/10.36846/CJAFS.2022.80.
[11] OECD, *Financing a Water Secure Future* (Paris: OECD Publishing, 2022), 42–45. https://www.oecd.org/content/dam/oecd/en/publications/reports/2022/03/financing-a-water-secure-future_27cd3a4c/a2ecb261-en.pdf.

Case Studies

Konya Closed Basin:

The Konya Closed Basin (Konya Kapalı Havzası) is one of Turkey's most critical agricultural regions and, at the same time, one of its most water-stressed. This basin is located in the semi-arid land of Central Anatolia and spans over 4.9 million hectares, covering parts of nine provinces, with Konya alone accounting for more than half of the basin's area.[12] Despite its status as Turkey's "grain silo," the basin faces increasing challenges from groundwater depletion, inefficient irrigation, and erratic rainfall patterns, which threaten both environmental stability and regional economic performance.

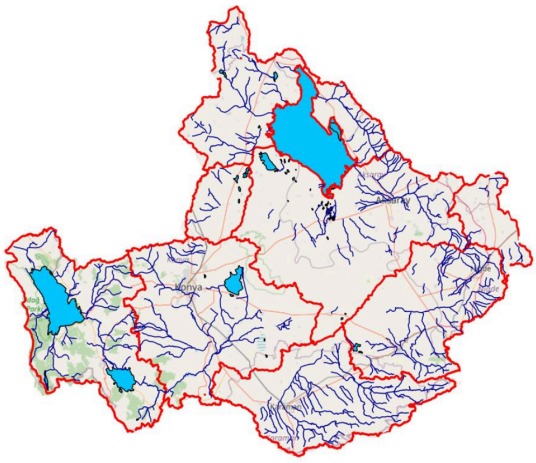

Figure 3. *Map of the Konya Closed Basin. Republic of Turkey Ministry of Agriculture and Forestry. Konya Kapalı Havzası Kuraklık Yönetim Planı: Stratejik Çevresel Değerlendirme (SÇD) Raporu [Konya Closed Basin Drought Management Plan: Strategic Environmental Assessment Report]. General Directorate of Water Management, 2023.*
https://webdosya.csb.gov.tr/db/scd/icerikler/konya-havzasi-kyp-n-ha--scd-raporu-20231006134839.pdf.

Approximately 1.88 million hectares of land in Konya province are dedicated to agriculture, with important crops like wheat, barley, sugar beet, and maize.[13] However, over 78% of this land is rainfed, and of the irrigated portion, much still relies on traditional irrigation methods. As the 2023 Drought Management Plan writes, evapotranspiration rates have consistently outpaced

[12] Republic of Turkey Ministry of Agriculture and Forestry. *Konya Havzası Tanıtım Raporu* [Konya Basin Introductory Report]. General Directorate of Agricultural Reform, 2023. https://www.tarimorman.gov.tr/SYGM/Belgeler/havza%20tan%C4%B1t%C4%B1m%2023.03.2023/t%C3%BCrk%C3%A7e/Konya%20Havzas%C4%B1%20Tan%C4%B1t%C4%B1m.pdf.

[13] Konya Provincial Directorate of Agriculture and Forestry. *İl Tarım ve Orman Raporu – Haziran 2024* [Provincial Agriculture and Forestry Report – June 2024]. Republic of Turkey Ministry of Agriculture and Forestry, 2024. https://konya.tarimorman.gov.tr/Belgeler/kitap/%C4%B0l_Tar%C4%B1m_ve_Orman_haziran_24_v3_2024.pdf.

water replenishment, which led to persistent over-extraction of groundwater, especially in sub-basins like Konya-Çumra-Karapınar.[14]

The Konya Basin is an example of the water-agriculture paradox in Turkey: it produces a significant share of national agricultural output (accounting for over 10% wheat and 30% of sugar beet), but its long-term viability is compromised by unsustainable water use. The 2024 provincial agricultural report indicates that the basin's annual agricultural water demand exceeds 4.1 billion cubic meters, while the available renewable surface and groundwater supply is only about 3.8 billion cubic meters.[15] This deficit results in groundwater mining and land subsidence, as well as a growing dependency on well-based irrigation systems with diminishing yields. This study's DiD analysis supports that trend: since 2014, wheat yields in Konya have fallen behind those in similar provinces, suggesting an early economic cost of prolonged water stress.

Konya ranks first among Turkish provinces in total agricultural production value; however, this output is increasingly dependent on water-intensive crops and irrigation systems that are not resilient to drought. For instance, the Konya 2023 report shows that maize (both silage and grain) and sugar beet–two of the most water-demanding crops–are grown on hundreds of thousands of hectares, regardless of repeated recommendations from the Ministry of Agriculture to shift toward more drought-resistant crops.[16] Despite the physical yield decline, regional agricultural GDP has so far remained relatively stable, highlighting the potential disconnect between production volumes and short-term economic indicators.

The updated 2023 Konya Basin Drought Management Plan calls for an integrated strategy centered around three key notes: modernizing irrigation infrastructure (including promoting drip and sprinkler irrigation), reconfiguring crop patterns based on water availability, and enforcing stricter groundwater usage monitoring.[17] In particular, the plan estimates that full implementation of water-saving technologies and crop pattern adjustments could reduce agricultural water demand by up to 30%, a shift that would help realign the region's water budget and protect its agricultural economy. Konya thus serves as a warning: early declines in yield may precede more visible economic downturns unless mitigated.

---

[14]Republic of Turkey Ministry of Agriculture and Forestry. *Konya Kapalı Havzası Kuraklık Yönetim Planı: Stratejik Çevresel Değerlendirme (SÇD) Raporu* [Konya Closed Basin Drought Management Plan: Strategic Environmental Assessment Report]. General Directorate of Water Management, 2023. https://webdosya.csb.gov.tr/db/scd/icerikler/konya-havzasi-kyp-n-ha--scd-raporu-20231006134839.pdf.
[15]Konya Provincial Directorate of Agriculture and Forestry. *İl Tarım ve Orman Raporu – Haziran 2024*
[16]Konya Provincial Directorate of Agriculture and Forestry. *İl Tarım ve Orman Raporu – Haziran 2024*
[17]Republic of Turkey Ministry of Agriculture and Forestry. *Konya Kapalı Havzası Kuraklık Yönetim Planı: Stratejik Çevresel Değerlendirme (SÇD) Raporu*

Southeastern Anatolia Project (GAP):

The Southeastern Anatolia Project (GAP) is one of Turkey's most ambitious and established regional development projects. Initially, thought in the 1970s as a water infrastructure project centered on the Euphrates and Tigris rivers, GAP has since evolved into a multi-sectoral development program, encompassing approximately 10% of Turkey's population and territory, covering nine cities: Adıyaman, Batman, Diyarbakır, Gaziantep, Kilis, Mardin, Siirt, Şanlıurfa, and Şırnak.[18] The project aimed to irrigate 1.8 million hectares and produce 27 billion kWh of hydroelectric energy, while also promoting economic diversification, employment, and improved quality of life across the region.

Figure 4. *Map of the Southeastern Anatolia Project (GAP)*. n.d. *Republic of Türkiye, GAP Regional Development Administration, Southeastern Anatolia Project Action Plan 2024–2028*.
https://www.gap.gov.tr/Yayin/Dosya/www.gap.gov.tr_396_RS8W35HD_gap-eylem-plani-2024-2028.pdf.

What is special about the GAP region is that it stands out as both agriculturally productive and socioeconomically underdeveloped. While it possesses 20% of Turkey's irrigable land and nearly 28% of its freshwater resources, its average per capita GDP in 2023 (₺162,556) remains only 52% percent of the national average.[19] The economic profile of the region is uneven, too. For instance, Gaziantep, with its powerful industrial and export base, has a GDP per capita of ₺232,100, while Şanlıurfa, despite its agricultural potential, falls behind significantly ₺116,767. Agriculture contributes 14% to the region's Gross Value Added (GVA), double the national average of 7%, showing its importance to the local economy.[20]

[18]Arda Bilgen, "Waiting for the Southeastern Anatolia Project: An Exploration of the Factors That Stall the Project's Progress," *Hacettepe University Journal of Economics and Administrative Sciences* 37, no. 2 (2019): 241–270, https://doi.org/10.17065/huniibf.375707.
[19] Republic of Türkiye, GAP Regional Development Administration, *Southeastern Anatolia Project Action Plan 2024–2028* (Şanlıurfa: GAP Regional Development Administration, 2024).
[20] GAP Regional Development Administration, *Southeastern Anatolia Project Action Plan 2024–2028*

To this date, only about 30.4% of GAP's targeted irrigation systems have been completed, despite over four decades of planning and investment.[21] This shortfall reflects both technical and political challenges, including bureaucratic inefficiency, funding constraints, and local governance gaps. The 2024-2028 GAP Action Plan sets out renewed priorities, including a "Precision Agriculture Transformation Program" and a new generation of "smart irrigation" systems, which aim to reduce water waste while enhancing agricultural productivity and farmer incomes.[22]

From an economic perspective, GAP's partial implementation has generated uneven gains. Gaziantep's export-focused industrial development has boosted its GDP and employment, but most other provinces remain heavily reliant on agriculture and government transfers. While total regional exports reached $13.6 billion in 2023, 77% of that came from Gaziantep alone, emphasizing the concentration of growth in a single city.[23] Meanwhile, structural problems (such as low agricultural value-added per hectare, weak logistics infrastructure, and limited private-sector investment in agribusiness) continue to constrain broader economic development.

The 2024-2028 Action Plan proposes a total of 198 projects with an estimated budget of ₺496.2 billion to address these gaps. These include major public investment projects in water infrastructure, agricultural R&D, tourism, and labor-intensive manufacturing. As Bilgen (2019) emphasizes in his analysis of GAP's delayed implementation, only 74% of energy infrastructure and 30% of irrigation works have been completed, largely because of political instability, administrative problems, and changing policy priorities.[24] These delays have real economic costs: they limit agricultural productivity, constrain rural employment, and perpetuate income inequality both within the region and relative to the rest of Turkey.

[21]Arda Bilgen, "Waiting for the Southeastern Anatolia Project: An Exploration of the Factors That Stall the Project's Progress."
[22]GAP Regional Development Administration, *Southeastern Anatolia Project Action Plan 2024–2028*
[23]GAP Regional Development Administration, *Southeastern Anatolia Project Action Plan 2024–2028*
[24] Arda Bilgen, "Waiting for the Southeastern Anatolia Project: An Exploration of the Factors That Stall the Project's Progress."

Empirical Strategy and Results: A Difference-in-Differences Approach

To estimate the causal effect of water scarcity on agricultural productivity in the Konya Basin, I decided to use a Difference-in-Differences (DiD) approach. This method compares the change in wheat yields over time in Konya (Turkey's most water-stressed agricultural region) with that of similar control provinces that did not experience the same level of water depletion during the study period. The DiD framework isolates the treatment effect of water scarcity by controlling for time-variant regional differences and year-specific shocks through the inclusion of province and year fixed effects.

$$log(Yield_{it}) = \alpha + \beta_1(Treated_i \times Post_t) + \gamma_i + \delta_t + \varepsilon_{it}$$

Where:

- i indexes provinces and t years
- $Treated_i$ is a dummy equal to 1 for Konya
- $Post_t$ is a dummy equal to 1 for years 2014 and after, marking the onset of significant water scarcity
- γ_i and δ_t are province and year fixed effects
- The dependent variable is the natural logarithm of wheat yield, which allows coefficients to be interpreted as percentage changes

Control Group Selection:

The Control Group selection consists of provinces that are agro-climatically similar to Konya—primarily in terms of crop type (wheat), climate (semi-arid or continental), and baseline productivity—but that did not experience comparable levels of water stress during the period of analysis. To improve comparability and reduce noise, several provinces (such as Uşak, Yozgat, and Karaman) were excluded from the final sample because their wheat yields declined significantly after 2014 due to unrelated factors. The final control group includes Aksaray, Niğde, Afyon, Çorum, Manisa, Eskişehir, and Kırşehir—provinces that exhibited stable or increasing wheat yields post-2014 and did not suffer from acute groundwater depletion.

Results:

The coefficient on the interaction term, Treated × Post, captures the causal impact of water scarcity on wheat yields in Konya relative to the control provinces.

- The estimated coefficient is -0.0418, suggesting that, after 2014, wheat yields in Konya declined by approximately 4.2% more than in the control provinces.
- This effect is marginally statistically significant at the 10% level ($p = 0.088$), supporting the hypothesis that long-term water stress has negatively affected productivity.

GDP Analysis

To assess whether the physical decline in wheat yields translated into broader economic consequences, I estimate a second Difference-in-Differences model using log agricultural GDP as the dependent variable. This allows for an interpretation of the treatment effect in percentage terms, capturing relative changes in the economic output of the agricultural sector.

The model includes province and year fixed effects, and standard errors are clustered at the province level to account for serial correlation.

- The coefficient on the interaction term treat_post is 0.125, suggesting that, after 2014, agricultural GDP in Konya grew approximately 12.5% more than in the control provinces. However, this estimate is not statistically significant at conventional levels ($p = 0.128$).

This finding implies that, despite measurable declines in wheat yield, agricultural GDP in Konya did not fall, and may have even increased relative to comparable provinces.

Several factors could explain this apparent disconnect between yield and GDP:

- Higher crop prices may have offset lower output volumes
- Policy subsidies or support measures could have buffered revenue losses
- Crop switching to higher-value agricultural products may have increased overall value despite reduced staple grain production

These results suggest that while physical productivity has declined, the economic consequences have been partially mitigated or delayed, at least in the short term.

An agricultural engineer from the State Hydraulic Works of Turkey interviewed for this study emphasized that the apparent disconnect between falling wheat yields and stable regional GDP can be partly attributed to recent market dynamics and farmer behavior.[25] Before the COVID-19 pandemic, agricultural prices had remained relatively stable, but during the pandemic, commodity prices rose sharply. “Farmers reported earning more during this period, primarily because the prices of their products increased,” noted the engineer.

[25] Tantur, Tuana, and Habib Küçük. Interview About the Konya Closed Basin. Personal, August 29, 2025.

The interview also highlighted that groundwater is being extracted at unsustainable rates, with well levels falling by 4 to 5 meters in some areas, and that wastewater irrigation is common. In recent years, there has been a marked increase in maize cultivation, as maize commands a higher market price but also requires significantly more water. Farmers often choose maize over wheat not because of agronomic necessity, but due to market incentives: “If I’m going to pay for irrigation water, I might as well grow maize and earn more,” is a common sentiment.

Policy Solutions and Economic Benefits

Turkey's current water trajectory indicates not just an environmental threat but a structural economic vulnerability. This paper's findings, namely, that wheat yields in the Konya Basin have declined relative to comparable regions while GDP remains stable, suggest that agricultural losses may be hidden behind short-term economic inertia. To prevent future downturns, Turkey needs a transition from reactive crisis management to proactive investment in water-smart infrastructure.

One key area is improving irrigation efficiency. Although state plans acknowledge the need for modernization, implementation has lagged. Pressurized systems such as drip and sprinkler systems should be prioritized through targeted subsidies and enforcement programs that phase out high-consumption surface irrigation. The Konya Basin Drought Management Plan already estimates that a full transition could reduce agricultural water demand by 30%.

Another opportunity lies in crop planning. Water-intensive crops like maize and sugar beet in dry regions are economically and environmentally inefficient. Encouraging a shift toward less water-dependent, climate-appropriate crops would support both sustainability and farmer incomes.

The GAP region demonstrates how expanding irrigation without energy planning can drive unsustainable outcomes. As farmers rely more on electrically pumped groundwater, energy costs rise and water tables fall. Smart metering, off-grid solar support, and water-energy pricing coordination would help internalize resource costs and prevent overuse.

More broadly, the economic logic behind these interventions is straightforward: preventing agricultural loss is cheaper than offsetting it through disaster relief, subsidies, or lost GDP. International experience shows that irrigation modernization pays for itself in 5-10 years through yield increases and avoided losses.

Conclusion

I evaluated how water scarcity–exacerbated by unsustainable irrigation practices–affects agricultural output and regional economic performance in Turkey. Using a difference-in-differences model, the analysis finds that wheat yields in the Konya Basin have declined relative to comparable provinces since 2014, a period marked by intensified water stress. However, this drop in productivity has not yet translated into a statistically significant decline in regional GDP, suggesting delayed economic effects or compensating mechanisms.

These findings reflect a critical insight: early-stage environmental degradation may not immediately show up in headline economic indicators. However, this does not mean it can be ignored. The persistent yield decline in Konya, coupled with mounting water deficits and unmodernized irrigation, signals future risks to regional growth and fiscal stability. By contrast, the Southeastern Anatolia Project demonstrates both the potential and the limits of large-scale water infrastructure. While the region has seen yield gains and diversification, these benefits remain uneven, energy-intensive, and vulnerable to climate shocks.

Without early investment in efficient irrigation, crop diversification aligned with water availability, and stronger local water governance, short-term resilience could give way to long-term economic losses. Water sustainability, therefore, must be regarded as a core component of economic infrastructure.

Acknowledgments

I would like to express my sincere gratitude to the Laidlaw Foundation for generously supporting this research. I am especially thankful to my research advisor, Dr. Marcus King, for their invaluable guidance, insight, and encouragement throughout the course of this project. I am also grateful to the Georgetown University Laidlaw Scholars Programme for providing the opportunity and resources to pursue independent research as part of this experience.

Bibliography

"Agricultural Policy Monitoring and Evaluation 2023
Adapting Agriculture to Climate Change - Türkiye." OECD.,
https://www.oecd.org/en/publications/agricultural-policy-monitoring-and-evaluation-2023_b14de474-en/full-report/turkiye_65650dde.html.

OECD Innovation, Agricultural Productivity and Sustainability in Turkey b.Anonymous .

Regional Impact of the Climate Change- a Cge Analysis for Turkey c.Anonymous .

REPUBLIC OF TÜRKİYE MINISTRY OF AGRICULTURE AND FORESTRY -GENERAL DIRECTORATE OF WATER MANAGEMENT d.Anonymous .

Türkiye Irrigation Modernization, e.
https://projects.worldbank.org/en/projects-operations/project-detail/P158418.

Türkiye's Climate-Smart Future, f.
https://www.worldbank.org/en/news/immersive-story/2024/03/12/turkiye-climate-smart-future?utm_source=chatgpt.com.

Water Along the Food Chain g.Anonymous .

wceip_environmental_and_social_management_framework_january_2023 h.Anonymous .

The World Bank ADDITIONAL FINANCING TÜRKİYE IRRIGATION MODERNIZATION IRRIGATION PROJECT (P181624) i.Anonymous .

Acar, Bilal, Ramazan Topak, and Mithat Direk. , 2018. "Impacts of Pressurized Irrigation Technologies on Efficient Water Resources Uses in Semi-Arid Climate of Konya Basin of Turkey," *International Journal of Sustainable Water and Environmental Systems* 1 (1): 1. doi:10.5383/swes.0101.001.

Bagherzadeh, Morvarid and Makiko Shigemitsu. *Resilience of Turkey's Agricultural Sector to Droughts Oecd Food, Agriculture and Fisheries Paper*Anonymous .

Giulio, ©fao /. *March 2021 -Issue #1 FAO's Irrigation Project in Konya and Karaman Achieved More than 23 Percent Savings on Water and Electricity use Viorel Gutu -Subregional Coordinator for Central Asia and FAO Representative in Turkey this First Issue of FAOTURN Represents a New Approach in our Communication Activities. This*Anonymous .

Köken[1], Emre, Mustafa Berk Duygu[2], Bilal Kirmencioğlu[2], and Maruf Aras[2]. *Essential Tools to Establish A Comprehensive Drought Management Plan: Konya Closed Basin as a Case Study*Anonymous .

Tanchum, Michaël. , 2023. "Climate Change Threatens Turkey’s Role as a Food Supplier to Europe and the Middle East," .
https://www.turkeyanalyst.org/publications/turkey-analyst-articles/item/710-climate-change-threatens-turkey%E2%80%99s-role-as-a-food-supplier-to-europe-and-the-middle-east.html.

Yazici, Burcu and Hatice Taner. , 2023. "Water Reuse in Agriculture: A Case Study in Konya Closed Basin," *Water Supply* 23 (3): 1106. doi:10.2166/ws.2023.039.

Zizawar, Win Naing and March. *Groundwater Fluxes in Konya Closed Basin, Turkey*Anonymous .