WATER CONSUMPTION FOR IRRIGATION OF AGRICULTURAL CROPS

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Annotation: *Water consumption for irrigation of agricultural crops is a critical aspect of global food production, impacting both the environment and food security. Irrigation accounts for a significant portion of global water usage, and the efficiency of water management practices directly affects crop yields, water availability, and environmental sustainability. Understanding the factors influencing water consumption in agriculture, such as crop type, climate, soil type, irrigation techniques, and water management strategies, is essential for optimizing water use efficiency and mitigating water-related challenges, including water scarcity, depletion of aquifers, and ecological degradation. This annotation explores the key considerations surrounding water consumption for agricultural irrigation, highlighting the importance of sustainable water management practices in ensuring long-term agricultural productivity and environmental resilience.*

Keywords: *Water consumption, irrigation, agricultural crops, water management, water efficiency, crop yield, water scarcity, sustainable agriculture, environmental sustainability, irrigation techniques, water availability, soil type, climate, water use efficiency, water-related challenges, aquifer depletion, ecological degradation.*

Different crops have varying water requirements depending on factors such as climate, soil type, stage of growth, and crop variety. Crop water requirements are often expressed in terms of evapotranspiration (ET), which is the sum of water lost through evaporation from the soil surface and transpiration from the plant.

Water use efficiency (WUE) is a measure of how efficiently crops use water to produce biomass or yield. Improving WUE is crucial for sustainable agriculture, especially in regions where water resources are limited.

Various irrigation systems are used in agriculture, including surface irrigation (e.g., flood, furrow), sprinkler irrigation, and drip irrigation. The choice of irrigation system depends on factors such as crop type, soil characteristics, water availability, and economic considerations. Drip irrigation, which delivers water directly to the root zone of plants, is known for its high efficiency in water use and is particularly suitable for water-stressed regions.

Efficient water management practices, such as scheduling irrigation based on crop water requirements, soil moisture monitoring, and using technologies like soil moisture sensors and weather forecasts, can help optimize water use in agriculture. Implementing strategies such as mulching and conservation tillage can also help reduce water loss through evaporation and improve soil water retention.

The water footprint of agricultural crops refers to the total volume of water consumed, both directly (through irrigation) and indirectly (through rainfall), during their production. Assessing the water footprint of crops is essential for understanding the environmental impact of agricultural practices and informing water resource management decisions.

Climate change poses challenges to agricultural water management, with shifts in precipitation patterns, increased temperatures, and more frequent extreme weather events affecting water availability and crop water requirements. Adaptation strategies, such as developing drought-tolerant crop varieties, improving irrigation efficiency, and enhancing water storage infrastructure, are essential for mitigating the impacts of climate change on agricultural water use. Effective water governance frameworks and policies are necessary to ensure sustainable water use in agriculture.

This includes measures such as water pricing mechanisms, regulations on water use, incentives for water-efficient practices, and investments in water infrastructure.

By integrating scientific knowledge with practical applications and policy interventions, it is possible to enhance water productivity in agriculture while ensuring the sustainability of water resources for future generations.

The consumption of water for irrigation of agricultural crops is determined by the consumption of water evaporated from the leaves, trunks and soil surface of crops. This total evaporation is called water consumption or evapotranspiration.

The water needs of plants depend on climatic and natural conditions, biological characteristics and variety of crops, age, duration of the growing season, the amount of harvest and the level of agro technics.

The amount of water consumption of crops depends on weather conditions, the amount of heat energy coming to the soil surface, soil moisture, the type of crop being grown and its productivity.

The amount of water that the calculated soil layer can hold after irrigation is called the marginal field moisture capacity of the field. This value is the upper limit of moisture in irrigation.

Seasonal irrigation rate is the amount of water supplied to 1 hectare of irrigation area during the growing season to obtain the planned harvest in the current year, and it is measured in units of m3/ha.

The amount of the seasonal irrigation norm depends on the type of crop and the area of cultivation:

- 5000-9000 m3/ha for cotton crop;
- 2000-10000 m3/ha for perennial grass crops;
- 1000-5000 m3/ha for grain;
- 2000-8000 m3/ha for polys;
- It is set as 1500-7000 m3/ha for orchards and vineyards.

Seasonal irrigation rate is given in the form of irrigation rate for agricultural crops.

Irrigation rate is the volume of water supplied to 1 irrigated area for one-time irrigation of agricultural crops, it is measured in the unit of m3/ha.

Irrigation rate is the main component of total water consumption or total moisture evaporation in irrigated areas. In addition to the irrigation rate, the total water consumption includes:

- Moisture reserves in the soil as a result of precipitation or washing of soil salt and reserve moisture collecting irrigation;

- Precipitation and groundwater consumption during the vegetation period.

It is also necessary to take into account the consumption of underground water, because 60% of the irrigated area in the cotton fields of Central Asia is located on hydromorphic soils with shallow groundwater levels (1-2 meters and 2-3 meters). Groundwater consumption depends on the biological properties of cotton and other crop rotations - potential evaporation and location of the root system.

Generalized data from special experiments conducted under field conditions, the contribution of groundwater to the total water consumption in the cotton field - depending on the mechanical composition and structure of the soil: 25 to 65 when the groundwater table is 1-2 meters deep. %, and when it is 2-3 m, it shows that it is from 5 to 45%.

The nature of the development of the plant root system also affects the water needs of plants. For example, since cotton is a perennial plant by nature, its growth and crop formation during the growing season are not limited. These processes occur simultaneously and are interdependent.

The duration of the cotton growing season depends on its variety and climatic conditions. It lasts from 100 to 150 days. When planted early, the duration of the vegetation period is longer, when planted late, this period is shortened.

External environmental conditions have a decisive influence on the growth and development of cotton. In order for the seed to germinate well, the pre-sowing moisture of the soil, that is, the marginal moisture capacity of the field under field conditions, should be equal to 70-80%. Moisture characteristic of mature soil is moderate moisture.

Water consumption for irrigation of agricultural crops is a multifaceted issue with significant implications for global food production, water resources, and environmental sustainability. Our analysis underscores the complexity of factors influencing water use in agriculture, including crop selection, climate variability, soil characteristics, and irrigation techniques. While irrigation plays a crucial role in enhancing crop yields and ensuring food security, unsustainable water practices can exacerbate water scarcity, degrade ecosystems, and compromise long-term agricultural viability.

Moving forward, prioritizing sustainable water management practices is imperative to address the challenges posed by increasing water demand and dwindling freshwater resources. Implementing efficient irrigation technologies, such as drip irrigation and precision farming, alongside improved water conservation strategies, can enhance water use efficiency and minimize agricultural water wastage. Additionally, promoting crop diversification, selecting drought-resistant cultivars, and adopting agro ecological approaches can help mitigate the impacts of water stress on agricultural systems.

Furthermore, interdisciplinary collaborations involving scientists, policymakers, farmers, and stakeholders are essential to develop holistic solutions that balance agricultural productivity with environmental conservation. Investing in research and innovation to better understand the dynamic interactions between water, crops, and ecosystems will be pivotal in shaping sustainable irrigation practices tailored to diverse agricultural landscapes and socio-economic contexts.

In conclusion, addressing water consumption for irrigation in agriculture requires concerted efforts to integrate technological advancements, policy interventions, and behavioral changes to achieve water security, food sovereignty, and environmental resilience on a global scale.

LIST OF REFERENCES:

1. Xamidova, S. M., Juraev, U. A., & Sadullayev, A. N. (2022). THE EFFECT OF PHYTOMELIORANT CROPS ON THE ACCUMULATION OF SALT IN THE SOIL, NORMS FOR WASHING SOIL BRINE. Spectrum Journal of Innovation, Reforms and Development, 5, 78-82.

2. Xamidova, S. M., Juraev, U. A., & Sadullaev, A. N. (2022). The effectiveness of phytomeliorative measures in conditions of saline soils. Academicia Globe: Inderscience Research, 3(7), 1-5.

3. Juraev, U. A., & Nafiddinovich, S. A. (2022). APPLICATION OF RESOURCE-EFFICIENT IRRIGATION TECHNOLOGIES IN BUKHARA OASIS. In INTERNATIONAL CONFERENCE: PROBLEMS AND SCIENTIFIC SOLUTIONS (Vol. 1, No. 2, pp. 176-185).

4. Sadullaev, A. N. (2023). IT IS A WATER-SAVING TECHNOLOGY CREATED WITH THE POWERFUL SWELLING "HYDROGEL". Educational Research in Universal Sciences, 2(18), 207-210.

5. Sadullaev, A. N. (2022). EFFECTS OF IRRIGATED AGRICULTURE ON THE GROUNDWATER REGIME IN THE FOOTHILLS. Educational Research in Universal Sciences, 1(2), 124-128.

6. Sadullaev, A. N. (2022). MEASURES OF EFFECTIVE USE OF WATER IN FARMS OF BUKHARA REGION. RESEARCH AND EDUCATION, 1(4), 72-78.

7. Sadullaev, A. N. (2022). INTERPRETATION OF PSYCHOLOGICAL KNOWLEDGE IN THE TEACHINGS OF OUR GREAT ANCESTORS. Educational Research in Universal Sciences, 1(2), 117-123.

8. SCIENTIFIC JUSTIFICATION OF SOIL DENSITY AND MOISTURE CAPACITY: AN INTEGRATED APPROACH FOR SUSTAINABLE AGRICULTURE. GOLDEN BRAIN, 2 (1), 414–417

9. Sadullaev, A. N. (2024). PECULIARITIES OF THE WATER PERMEABILITY PROPERTIES OF THE SOIL. Educational Research in Universal Sciences, 3(1), 4-6.

10. Sadullaev, A. N. (2022, July). BUKHARA REGIONAL IRRIGATION AND MELIORATION SYSTEM. In INTERNATIONAL CONFERENCES (Vol. 1, No. 12, pp. 18-27).

11. Саъдуллаев, А. Н., & Чорикулов, Ш. (2020). ДУККАКЛИ ЭКИНЛАР ТУПРОҚ УНУМДОРЛИГИНИ ОШИРАДИ. ЖУРНАЛ АГРО ПРОЦЕССИНГ, (SPECIAL ISSUE).

12. Зарипович, Қ. З., Саъдуллаев, А. Н., & Зариповна, Қ. Р. (2020). G'OZANI SUG'ORISHDA SUV TEJAMKOR SUG'ORISH TEXNOLOGIYALARNING SAMARADORLIGINI ILMIY ASOSLASH. ЖУРНАЛ АГРО ПРОЦЕССИНГ, (SPECIAL ISSUE).

13. Амонова, З. У., & Саъдуллаев, А. Н. (2020). КУЧЛИ ШИШУВЧАН "ГИДРОГЕЛЬ" НИ ҚЎЛЛАБ ЯРАТИЛГАН СУВ ТЕЖАМКОР ТЕХНОЛОГИЯСИ. ЖУРНАЛ АГРО ПРОЦЕССИНГ, (SPECIAL ISSUE).

14. Холматовна, С. Ҳ., Саъдуллаев, А. Н., & Джўраев, Ш. Б. (2020). ҚИШЛОҚ ХЎЖАЛИГИ ЭКИНЛАРИНИ СУҒОРИШДА СУВ ТЕЖАМКОР УСУЛЛАРДАН ФОЙДАЛАНИШ. ЖУРНАЛ АГРО ПРОЦЕССИНГ, (SPECIAL ISSUE).

15. Аманова, З. У., & Саъдуллаев, А. Н. (2020). WATER-SAVING TECHNOLOGY DEVELOPED BY "GIDROGEL" FOR IRRIGATION OF WINTER CEREALS. ЖУРНАЛ АГРО ПРОЦЕССИНГ, (SPECIAL ISSUE).

16. Sadullaev, A. N., & qizi Jo'rayeva, S. I. (2024). THE SCIENTIFIC RATIONALE FOR PLOUGHING TO INCREASE SOIL POROSITY. Educational Research in Universal Sciences, 3(2), 433-436.

17. Sadullaev, A. N., & o'g'li Rajabov, O. R. (2024). UNEARTHING CONNECTIONS: EXPLORING THE DIRECT IMPACT OF TILLAGE REQUIREMENTS ON CROP YIELD. Educational Research in Universal Sciences, 3(2), 440-443.

18. Sadullaev, A. N., & Azimova, G. Z. A. (2024). SCIENTIFIC JUSTIFICATION OF SOIL DENSITY AND MOISTURE CAPACITY: AN INTEGRATED APPROACH FOR SUSTAINABLE AGRICULTURE. GOLDEN BRAIN, 2(1), 414-417.

19. Toshevna, T. H., Nafiddinovich, S. A., & Adizovna, A. G. (2024). SCIENTIFIC APPROACHES AND TECHNIQUES FOR ESTABLISHING FOUNDATIONS AND QUANTIFYING SOIL MOISTURE LEVELS. JOURNAL OF AGRICULTURE AND LIFE SCIENCES, 7(1), 1-5.

20. Akramova, P. A. Ecological situation and its impact on the level of health of the younger generation.". O 'zbekistonda fanlararo innovatsiyalar va ilmiy tadqiqotlar" jurnali. Materiallari to 'plami, 98-102.

21. Aminovna, A. P., & Zaripovna, S. Z. (2023). ENVIRONMENTAL EDUCATION IS AN URGENT TASK OF OUR TIME. Finland International Scientific Journal of Education, Social Science & Humanities, 11(2), 471-477.

22. Akramova, P. A., kizi Berdiyeva, Z. F., & kizi Makhamadzhonova, M. M. (2024). ECOLOGICAL FUNDAMENTALS OF NATURE MANAGEMENT IN THE MODERN WORLD. GOLDEN BRAIN, 2(2), 24-28.

23. Акрамова, П. А., & угли Шамуратов, О. К. (2023). ЭКОЛОГИЧЕСКИЕ ПРОБЛЕМЫ УГРОЗА БЕЗОПАСНОСТИ. Educational Research in Universal Sciences, 2(16), 35-38.

24. Акрамова, П. А., & кизи Махамаджонова, М. М. (2023). АТМОСФЕРНЫЙ ВОЗДУХ НАМАНГАНСКОЙ ОБЛАСТИ И ПУТИ СТАБИЛИЗАЦИИ ЭКОЛОГИЧЕСКОГО БАЛАНСА. Educational Research in Universal Sciences, 2(15), 140-142.

25. Акрамова, П. А., & Ражабова, Н. Я. (2023). ИСПОЛЬЗОВАНИЕ ЗЕМЕЛЬНЫХ РЕСУРСОВ И ОЦЕНКА В СОВРЕМЕННОМ МИРЕ. Educational Research in Universal Sciences, 2(14), 394-400.

26. Акрамова, П. А., & угли Турдалиев, Ж. О. (2023). НАУЧНЫЕ ЭКОЛОГИЧЕСКИЕ ОСНОВЫ ПРИРОДОПОЛЬЗОВАНИЯ. Educational Research in Universal Sciences, 2(13), 259-262.

27. Amankulova, K., Farmonov, N., Akramova, P., Tursunov, I., & Mucsi, L. (2023). Comparison of PlanetScope, Sentinel-2, and landsat 8 data in soybean yield estimation within-field variability with random forest regression. Heliyon.

28. Акрамова, П. А. (2023). ДИНАМИКА ЗАГРЯЗНЕНИЯ АТМОСФЕРНОГО ВОЗДУХА ПРИРОДНОЙ СРЕДЫ ГОРОДА БУХАРЫ. Scientific Impulse, 1(8), 1099-1106.

29. Aminovna, A. P. (2023). THE PRACTICE OF ENVIRONMENTAL PROTECTION FROM THE NEGATIVE IMPACT OF THE TECHNOSPHERE. Finland International Scientific Journal of Education, Social Science & Humanities, 11(3), 362-365.

30. Aminovna, A. P. (2023). THE STATE OF WATER RESOURCES UNDER PRESENT GLOBAL CLIMATE CHANGE. Finland International Scientific Journal of Education, Social Science & Humanities, 11(2), 879-884.

31. Aminovna, A. P., & Khurshidovich, U. S. (2023). MAIN SOURCES ATMOSPHERIC AIR POLLUTION (ON THE EXAMPLE OF THE CITY OF BUKHARA). Finland International Scientific Journal of Education, Social Science & Humanities, 11(2), 379-385.

32. Акрамова, П. А., Улмасов, С. Х., & Азимова, Г. А. (2023). СОСТОЯНИЕ ВОДНЫХ РЕСУРСОВ ПРИ СОВРЕМЕННОМ ГЛОБАЛЬНОМ ИЗМЕНЕНИИ КЛИМАТА. O'ZBEKISTONDA FANLARARO INNOVATSIYALAR VA ILMIY TADQIQOTLAR JURNALI, 2(15), 878-883.

33. Tuymuradovna, A. H., & Komilovich, K. E. UDC: 631.481 MAPPING ON THE SCIENTIFIC BASIS OF SOIL SALINE OF BUKHARA DISTRICT, BUKHARA REGION. ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING IN THE REGION, 55.

34. Sadullaev, A. N. (2024). THEORETICAL ASPECTS OF IRRIGATION OF AGRICULTURAL CROPS. Educational Research in Universal Sciences, 3(3), 190-193.

35. Rajabova, M. M., & Azimova, G. Z. A. (2024). SPECIFIC ASPECTS OF PLOWING PERIODS AND PLOWING DEPTH. Educational Research in Universal Sciences, 3(2), 418-421.

36. Rajabova, M. M., Jo'raqulov, F. F., & Eshpo'latov, J. R. (2024). PARTICULAR ASPECTS OF SOIL POROSITY AND CAPILLARITY IN PRACTICE. Educational Research in Universal Sciences, 3(2), 425-428.

37. Раджабова, М. М., Эргашев, М., & Раджабов, О. (2023). ВЛИЯНИЕ НАПОРНЫХ ИНФИЛЬТРАЦИОННЫХ ВОД НА МЕЛИОРАЦИЮ ОРОШАЕМЫХ ТЕРРИТОРИЙ. Journal of new century innovations, 37(1), 204-209.

38. Maxmudovna, R. M., Mirsharif, E., & Oxunjon, R. (2023). SUG’ORILADIGAN MAYDONLARDA SUV RESURSLARIDAN (YER OSTI SUVLARIDAN) SAMARALI FOYDALANISHNI ILMIY ASOSLASH (BUXORO VILOYATI MISOLIDA) SUG ‘ORILADIGAN MAYDONLARNING MELIORATIV HOLATIGA BOSIMLI SIZOT SUVLARINING TA’SIRI. Journal of new century innovations, 37(1), 199-203.

39. Ikrom No‘mon o‘g, T., Mahmudovna, R. M., & O’g, E. M. G. A. (2023). VEGETATSIYA DAVRIDA YER OSTI SUVLARIDAN QISHLOQ XO ‘JALIGI EKINLAR (KUNGABOQAR) NI YETISHTIRISHDA BO ‘LADIGAN TA’SIRNI ANIQLASH. Journal of new century innovations, 37(2), 3-9.

40. Раджабова, М. М., Ниязов, Х. Х., Улмасов, С., & Зулфиев, А. (2023). СИСТЕМА ПЕДАГОГИЧЕСКОЙ ПОДГОТОВКИ ОБЕСПЕЧЕНИЯ БЕЗОПАСНОСТИ РАБОТНИКОВ ПРИ ПРОИЗВОДСТВЕННОМ ПРОЦЕССЕ. Scientific Impulse, 1(8), 245-249.

41. Radjabova, M. M., Davitov, N. R., Zulfiyev, A. A., & Shodiyev, S. (2023). ANTHROPOGENIC LANDSCAPES AND PROSPECTS OF ECOTOURISM IN THE AREA OF THE BURGUNDY RESERVOIR. Finland International Scientific Journal of Education, Social Science & Humanities, 11(3), 366-371.

42. Раджабова, М. М., Улмасов, С., & Зулфиев, А. (2023). ТРАДИЦИОННЫЕ И ВОДОСБЕРЕГАЮЩИЕ ТЕХНОЛОГИИ ПОЛИВА НА ПРИМЕРЕ БУХАРСКОГО ОАЗИСА. Finland International Scientific Journal of Education, Social Science & Humanities, 11(3), 372-375.

43. Mahliyo, R., & Go’zal, A. (2023). SUG’ORILADIGAN MAYDONLARDA SUV RESURSLARIDAN (YER OSTI SUVLARIDAN) SAMARALI FOYDALANISHNI ILMIY ASOSLASH (BUXORO VILOYATI). In Uz-Conferences (Vol. 1, No. 1, pp. 492-497).

44. Xabiba, T., Mahliyo, R., Ravshan, C., & Mirsharif, E. (2023). QISHLOQ XO’JALIGIDA YER OSTI SUVLARIDAN SAMARALI FOYDALANISHNING ILMIY ASOSI (BUXORO VILOYATI MISOLIDA). In Uz-Conferences (Vol. 1, No. 1, pp. 465-470).

45. Jaxongir, D. S., Mahliyo, R., Ravshan, C., & Nazokat, R. (2023). BUXORO VILOYATI YER USTI VA YER OSTI SUV RESURSLARI. In Uz-Conferences (Vol. 1, No. 1, pp. 474-475).

46. Раджабова, М. М., Зулфиев, А., & Эргашев, М. (2023). ЗАПАСЫ ПОДЗЕМНЫХ ВОД БУХАРСКОЙ ОБЛАСТИ И ИХ ЭФФЕКТИВНОЕ ИСПОЛЬЗОВАНИЕ. In СОВРЕМЕННАЯ НАУКА И ОБРАЗОВАНИЕ: АКТУАЛЬНЫЕ ВОПРОСЫ ТЕОРИИ И ПРАКТИКИ (pp. 25-28).