

Sustainable Water Research Funding and Water Quality Challenges in Agricultural Practices: An Economic Analysis in Egypt

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ABSTRACT

This study sheds light on the significance of enhancing sustainable funding for water research and addressing water quality challenges in agricultural practices through economic analysis in Egypt. The study employed a survey questionnaire targeting researchers from various disciplines. The results revealed a gender distribution of approximately 44.7% female and 55.3% male participants. The study also disclosed university participation percentages, with the University of Alexandria having the highest at 43.5%, followed by Beni Suef University at 19.4%, Zagazig University at 17.6%, and Aswan University at 11.8%. The results further indicated the diversity of researchers' specializations. Regarding funding sources, the study found that around 30% of researchers obtained external funding for their research projects. Funding sources included international donors (46.2%), governmental grants (30.8%), and the private sector (23.1%). The results also highlighted challenges faced by researchers in obtaining funding, and affirmed that 75% of projects made progress due to funding, while 25% were concluded upon achieving financial objectives. A field study was conducted in the Moghra and Wadi Natron regions to measure the impact of salinity (water quality) on agricultural productivity. The outcomes underscored the urgent need for water research funding, as it indirectly affects the increase in agricultural productivity.

Keywords: Water Research , Water Quality, Agricultural Practices, Funding.

INTRODUCTION

Water research, particularly in relation to its quality, takes on paramount significance. Water, as a finite and vital resource, faces escalating challenges due to scarcity and contamination, these challenges reverberate globally and are especially pronounced in countries like Egypt, where agriculture plays a pivotal role in the economy and livelihoods. The urgency to understand, manage, and sustain water resources becomes not only a scientific endeavor but a necessity for societal well-being. Globally, water quality issues are accentuated by the World Health Organization's (WHO) estimate that by 2025, nearly half of the world's population will be living in water-stressed areas. In Egypt, per capita water availability has dwindled to around 570 cubic meters

per year, signifying a severe scarcity situation (World Bank, 2021). As water quality declines, its impact ripples through ecosystems and economies. In this context, comprehensive water research becomes indispensable to grasp the intricacies of these challenges and devise effective solutions. However, the pursuit of water research is intrinsically tied to funding availability. Researchers across disciplines, including water quality, grapple with a significant obstacle: securing funding for their studies. In Egypt, the agricultural sector accounts for over 80% of water consumption, underscoring its pivotal role in water resource management (Ministry of Water Resources and Irrigation of Egypt, 2020). This study embarks on a comprehensive exploration of the interplay between water research funding, water quality challenges, and their profound implications for Egyptian agricultural productivity. By examining distinct regions, such as Wadi El Natron and El Moghra, Study aim to provide insights that contribute to informed decision-making, policy formulation, and sustainable practices. In an era where the intersections of water, agriculture, and funding are pivotal to national development, this research aspires to make a meaningful contribution.

Research Problem

In Egypt, the agricultural sector's reliance on water resources becomes a central concern. As the world faces escalating water scarcity and quality challenges, this sector's sustenance is at risk (General Authority for Industrial Development, 2023). Despite the evident need for comprehensive water research to address these challenges, researchers encounter a significant hurdle in securing funding for their studies. This funding gap inhibits the development of innovative solutions and hampers efforts to enhance water quality, resource efficiency, and agricultural productivity. The shortage of financial support hampers advancements in water research, impacting Egypt's ability to achieve sustainable water management and safeguard agricultural livelihoods.

Research Objectives

This study aims to comprehensively examine the interplay between funding availability for water

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research and water quality challenges in the regions of El Moghra and Wadi El Natron in Egypt, the objectives include:

- 1- Investigate and categorize the main funding sources that support water research in Egypt.
- 2- Identify the primary challenges faced by water researchers in obtaining funding for their studies, and how funding constraints influence the scope and direction of water research.
- 2- Examine the connection between funding sources and the research topics prioritized in water research projects.
- 3- Evaluate and compare essential water quality indicators, including salinity, across different locations in El Moghra and Wadi El Natron.
- 4- Analyze how funding availability shapes the research outcomes and contributions to addressing water quality challenges.
- 5- Develop a dynamic model that simulates the interactions between different funding sources, research outcomes, and water quality improvements over time.

Research Methodology and Data Resources

This study employs a comprehensive methodology to explore the interplay between funding availability for water research and water quality challenges in the El Moghra and Wadi El Natron regions. The methodology encompasses the following components:

Survey of Researchers: A questionnaire was distributed to 114 researchers representing various Egyptian universities, the survey aimed to identify key challenges faced by researchers and their perspectives on funding-related issues, **Water Sampling and Analysis:** Water samples were collected from the El Moghra and Wadi El Natron regions, these samples underwent rigorous laboratory analysis to assess salinity

levels. And **Interviews with Decision-Makers:** Interviews were conducted with decision-makers from agricultural reclamation companies operating within the El Moghra and Wadi El Natron regions, these interviews provided insights into funding mechanisms, water quality concerns, and their relevance to the research context. The study employs both qualitative and quantitative data analysis techniques to gain comprehensive insights into the research problem: **Descriptive Analysis:** Survey responses undergo descriptive analysis to highlight prevailing challenges among researchers, **Inferential Analysis:** Water quality data are statistically analyzed to identify patterns, trends, and potential correlations, Interview transcripts are thematically analyzed to extract valuable insights related to funding and water quality dynamics.

RESULTS AND DISCUSSION

1) **Sources of financing** ongoing national water projects: Table (1) shows projects and their funding sources, sheds light on a diverse array of endeavors aimed at enhancing and managing water resources and sanitation in Egypt. The presented table compiles and quantifies a range of water projects in Egypt along with their associated funding sources. It showcases a diverse set of projects initiated across different time frames, funded by various entities through loans and grants. This statistical representation underscores the significant financial commitments made toward water-related endeavors, reflecting the collective efforts to address water resource challenges and enhance environmental sustainability in Egypt. The inclusion of funding values and sources adds a quantitative dimension, emphasizing the substantial investment in these vital projects for the betterment of Egypt's water landscape.

Table 1. Cohort of Water Projects in Egypt: Funding Sources and Environmental Implications

Project Title	Start Date	End Date	Funding Source	Funding Amount	Funding Type	Responsible Entity	Advisory Body
New Dairut Canal Network Project	2015	2025	Japan International Cooperation Agency (JICA)	5,854 million Japanese yen	Loan	General Authority for Tanks and Canals Sector	SANYO Corporation, Japan
National Sanitation Program (Phase 3)	2016	2023	African Development Bank (AfDB)	50.20 million euros	Loan	Egyptian General Authority for Sanitation Projects	N/A-
National Sanitation Program (Phase 3)	2016	2023	African Development Bank (AfDB)	560,000 euros	Grant	Egyptian General Authority for Sanitation Projects	-N/A
Climate Adaptation in Northern Coast & Delta	2018	2025	Green Climate Fund through UNDP	31.48 million dollars	Grant	Egyptian General Authority for Coastal Protection	National Water Research Center
Sanitary Network Rehabilitation (257,000 feddans)	2019	2023	German Development Bank (KfW)	84.5 million euros	Loan & Grant	Egyptian General Authority for Sanitation Projects	Euro consult Mott Macdonald bv
Red Sea Effluent System Project	2020	2027	Arab Fund for Economic and Social Development & Kuwait Fund for Arab Economic Development	27 million Kuwaiti dinars	Loan	General Authority for Sanitation Projects - Mechanical & Electrical	Central Administration for Canal Cities and Sinai (Sanitation) - Monitoring and Loans Unit (Mechanical)
Qalyoub Irrigation Improvement Project	2021	2023	European Bank for Reconstruction and Development & European Union	69 million euros	Loan & Grant	Egyptian General Authority for Sanitation Projects - Irrigation Development Sector	Mott MacDonald

Source: Compiled and calculated from: Ministry of Water Resources and Irrigation website. <https://www.mwri.gov.eg>

2) Analysis of Water Researchers' Questionnaire:

A) The examination of gender distribution among the respondents reveals an interesting trend. Approximately 44.7% of the participants are female, while 55.3% are male (Fig.1). This breakdown reflects a relatively balanced representation of

genders within the surveyed water research community. Such parity can be considered encouraging, indicating a growing inclusivity and diversity in the field. This balance suggests a departure from historical gender imbalances that have been observed in certain scientific disciplines.

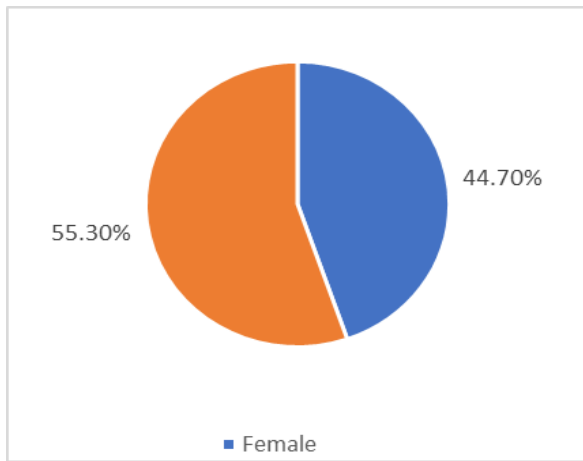


Fig.1.Distribution of Gender in the sample

Source: Sample Analysis

B)The distribution of respondents across various universities provides valuable insights into the landscape of water research in Egypt. The results indicate a notable concentration of participants from Alexandria University, accounting for around 43.5% of the total. Following Alexandria University, Beni Suef University emerges with approximately 19.4% representation, showcasing its engagement in water-related studies. Additionally, universities like Zagazig and Aswan are also represented, accounting for 17.6% and 11.8% of respondents respectively. This diverse participation underscores the wide geographic and institutional spread of water researchers, contributing to a comprehensive understanding of water-related challenges across different regions and settings. Furthermore, the presence of respondents from other universities, research centers, and institutions (7.7%) emphasizes the broad involvement of the Egyptian academic and research community in water studies (Fig. 2). This distributed representation highlights the collaborative and multidisciplinary nature of water research efforts across various educational and research institutions.

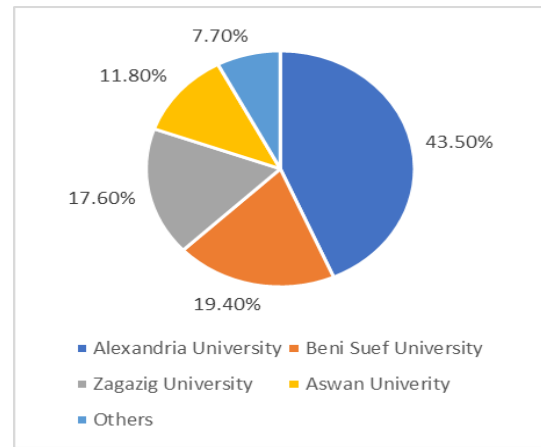


Fig. 2. The distribution of respondents across various universities

Source: Sample Analysis

C)The array of diverse academic disciplines represented among the respondents underscores the multidisciplinary nature of water research in Egypt. The survey findings demonstrate that water research attracts scholars from a wide range of fields, each contributing their expertise to address the multifaceted challenges related to water resources. Disciplines such as Water Engineering, Geology, Environmental Chemistry, Environmental Sciences, and many others are all woven into the fabric of water research endeavors. This interdisciplinary approach allows for a holistic exploration of water-related issues, spanning from engineering solutions to geological assessments, and from chemical analyses to environmental impact evaluations. The varied participation of researchers from these disciplines not only enriches the pool of knowledge but also signifies the collaborative spirit required to comprehensively tackle the complex water challenges facing Egypt. The majority of participants primarily consisted of university faculty members and graduate students. Their predominant involvement in scientific research and academic pursuits is closely tied to water-related themes. The distribution of research pursuits among the respondents was as follows: 34.2% were engaged in pursuing scientific theses (Masters and PhD levels), 32.5% were involved in conducting scientific research, and 26.3% were dedicated to research projects (Fig. 3). This distribution illustrates the comprehensive engagement of researchers in various academic capacities with water-related subjects. The distribution also reflects a balanced emphasis on both advanced academic studies and empirical research, which collectively contribute to the expansion of knowledge and practical applications in the realm of water resources.

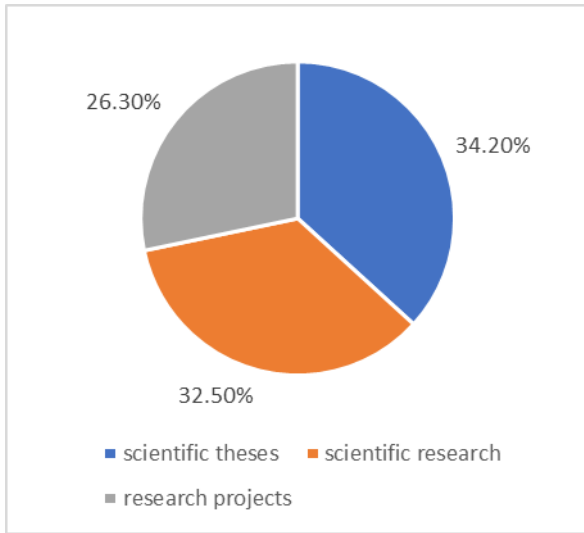


Fig. 3. Water Research Nature distribution

Source: Sample Analysis

D) The findings revealed that a minority of researchers, comprising less than 30% (28.9%), were successful in securing external funding for their research endeavors. In contrast, the majority (71.1%) self-funded their research initiatives. The most prominent funding sources for the researchers who managed to secure external funding were as follows: 22.5% from the European Union, 20.5% from the American University, 18.5% from STDF & ICARDA, and 15.7% from COE. Notably, when combining the contributions from COE and the American University, the cumulative percentage becomes 46.2%, with USAID being a significant contributor. Other funding sources included government funding and various ministries, accounting for 31.3% (Fig. 4). This funding was derived from both domestic and foreign-sponsored major projects, as elaborated in Table (1). These findings underscore the diverse array of funding channels, ranging from international collaborations to domestic governmental support, that researchers draw upon to sustain their research initiatives.

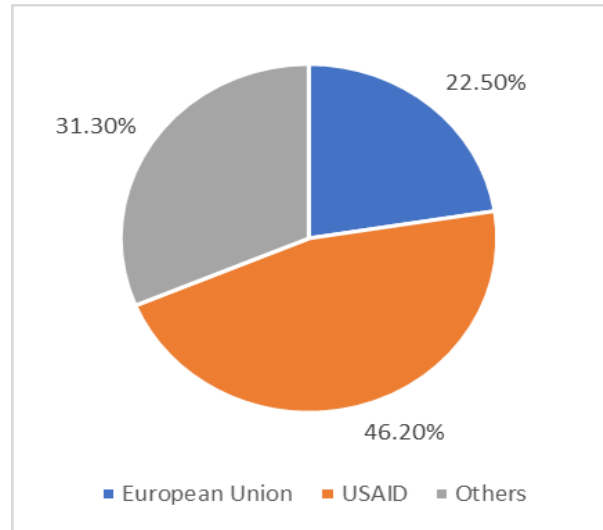


Fig.4 Funding Resource for sample

Source: Sample Analysis

E) Regarding the research focus and its relation to water, respondents provided the following breakdown (Fig. 5): 31.6% for studying water quality and efficiency, 23.7% for water consumption and conservation, and 21.1% for water economics. Additionally, 10.5% focused on non-conventional water sources such as seawater desalination. The remaining 13.2% of responses encompassed other research areas not covered in the questionnaire. These findings highlight the diversity of research interests within the water domain and emphasize the multifaceted aspects of water-related studies, these responses underscore the multidisciplinary nature of water research, encompassing various aspects ranging from environmental quality to economic considerations. The prevalence of research on water quality and efficiency is indicative of the growing concerns regarding sustainable water management. The substantial focus on water economics highlights the significance of addressing economic implications associated with water resource management. The attention to non-conventional water sources reflects the importance of innovative solutions to meet water demands in water-scarce regions. The inclusion of 'other' research areas indicates the dynamic and evolving nature of water research, embracing emerging challenges and opportunities in this critical field.

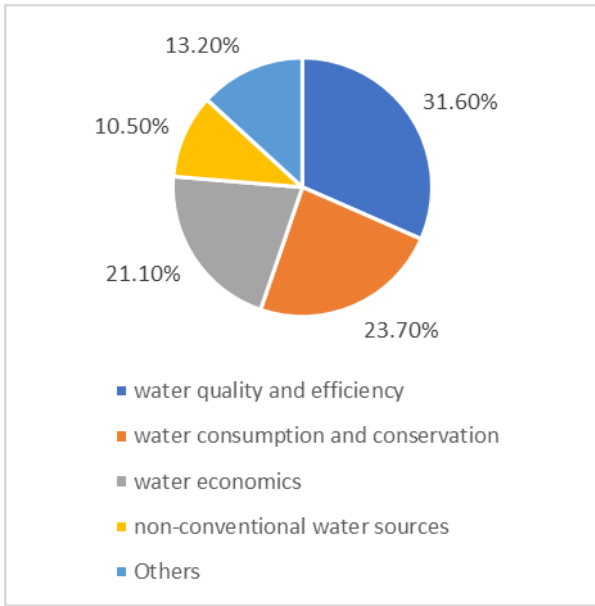


Fig.5. Water Research areas

Source: Sample Analysis

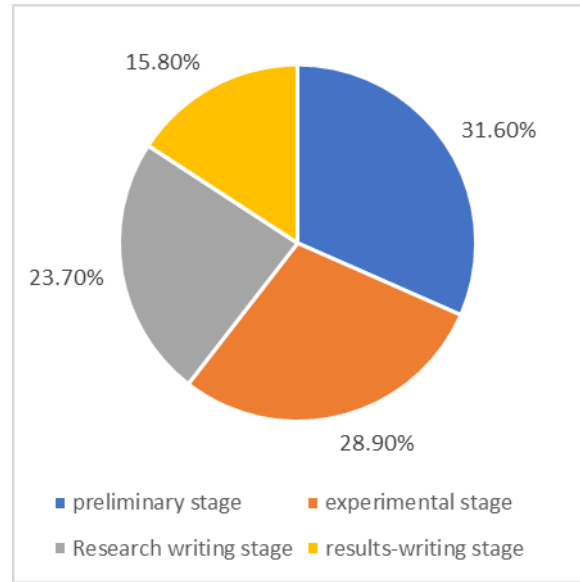


Fig.6. Water research progress stages

Source: Sample Analysis

F)The distribution of the respondents' research progress stages up to the point of questionnaire completion is as follows (Fig. 6): 31.6% were in the preliminary stage, 28.9% were in the experimental stage, 23.7% were in the writing stage of their research, and 15.8% were in the results-writing stage. These findings provide insights into the diverse phases of research development, shedding light on the significant portions of researchers engaged in different stages of their studies. This distribution presents a dynamic view of the progression and priorities among researchers, indicating the varied levels of advancement in their projects. The distribution also underscores the significance of understanding the funding landscape at different research phases and its potential influence on research outcomes and directions. This insight contributes to a comprehensive understanding of the dynamics within the water research community and the need for targeted support and resources aligned with researchers' specific needs at each stage of their endeavors.

G)The results reveal critical challenges encountered by researchers in executing their studies, particularly in the preliminary, research preparation, and experimental stages. Notably, approximately 50% of respondents faced funding-related issues, which can significantly hinder the progress and quality of research. This finding underscores the urgent need for improved funding mechanisms to support water research projects. Additionally, 34.2% of respondents encountered difficulties in accessing relevant data, a fundamental aspect of research. This underscores the importance of enhancing data accessibility and sharing mechanisms within the water research community to foster collaborative efforts and knowledge exchange. Around 10.5% of participants reported encountering technical challenges, such as inadequate laboratory infrastructure, which can compromise the accuracy and reliability of research outcomes. This indicates the necessity for investing in advanced research facilities and technology to ensure the validity of research findings. Moreover, 15.8% of respondents indicated facing other unspecified challenges not covered in the questionnaire. Further investigation into these unanticipated issues could provide insights into emerging research obstacles. Remarkably, only 7.9% of researchers claimed to encounter no challenges in their studies (Fig. 7). Addressing these challenges comprehensively could lead to improved research outcomes, greater knowledge dissemination.

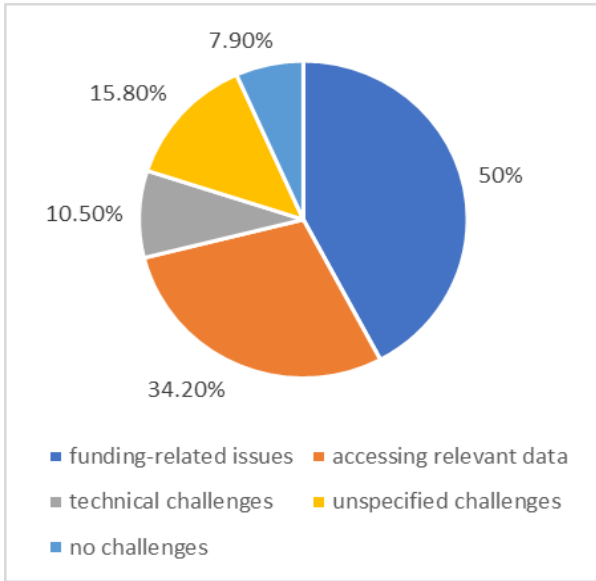


Fig.7. Challenges faced water researchers

Source: Sample Analysis

H) The research findings underscore the significant reliance on external funding sources among water researchers, with only a third of respondents having non-self-funded water research projects. Notably, 46.2% of funded projects receive support from international donor organizations, indicating the substantial interest and engagement of global entities in water research initiatives. Furthermore, 30.8% of funded projects receive support from governmental entities, including academic institutions such as the Academy of Scientific Research and Technology. Approximately 23.1% of funding comes from private sector entities affiliated with the water industry, these results suggest that international donors play a prominent role in driving water research efforts, followed by government-based funding bodies (Fig. 8). The private sector's involvement in funding water research is noteworthy, indicating the potential for increased collaboration between research institutions and private enterprises. Encouraging private sector contributions to water research funding could lead to mutually beneficial outcomes, wherein research findings directly address industry challenges and contribute to innovation and sustainable development in the water sector, analyzing these findings from both an academic and statistical perspective highlights the necessity of fostering strategic partnerships between various sectors to support water research financially. Strengthening these collaborations can accelerate research progress, enable more comprehensive investigations,

and ultimately enhance the impact of water research on addressing pressing environmental and societal challenges.

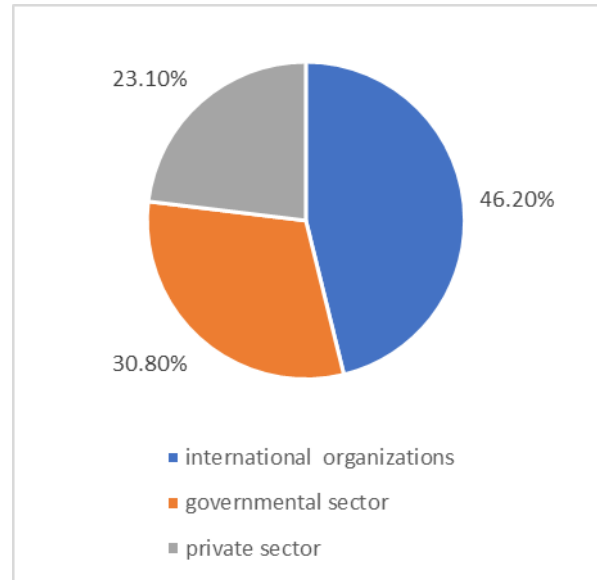


Fig.8. Foreign Fund Distribution for water research

Source: Sample Analysis

I) The analysis of funding types reveals interesting insights into the nature of financial support for water research projects (Fig. 9). Approximately 42.1% of the identified funding is associated with sponsored research projects, highlighting the significance of collaborative efforts between research institutions and funding entities to address water-related challenges. Moreover, 21.2% of the funding is attributed to non-repayable grants, reflecting the interest of grantors in supporting critical water research endeavors without the expectation of financial returns. Interestingly, the proportion of funding acquired through loans with specified repayment deadlines is relatively low, accounting for only 5.3%. This suggests that researchers and institutions tend to seek alternative funding sources that do not necessitate financial obligations within strict timelines. In about 31.6% of the cases, the funding type was not specified, indicating a need for increased transparency and clarity in communicating the terms of funding arrangements. These findings underline the diversity of funding mechanisms available for water research, ranging from research project sponsorships to non-repayable grants. The preference for non-repayable grants and the relatively limited utilization of loans with repayment obligations suggest a cautious approach by researchers and institutions to financial commitments. From a practical perspective, these insights emphasize the importance of well-defined

and flexible funding options that align with the unique characteristics of water research projects and cater to the diverse needs of researchers and institutions.

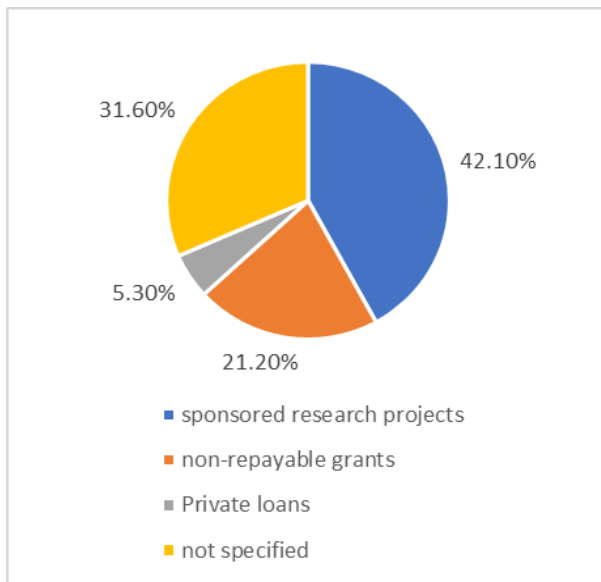


Fig.9. funding types

Source: Sample Analysis

J)The results indicate that a significant proportion of the surveyed researchers, approximately 68.4%, lack sufficient awareness regarding the entities that fund water research projects. This lack of familiarity with funding sources is noteworthy, especially when compared to the proportion (approximately 31.6%) of researchers who possess prior knowledge of such funding entities. Interestingly, this distribution mirrors the proportion of researchers who have successfully secured funding for their research projects, this alignment between researchers' awareness and their actual funding attainment suggests a potential correlation between knowledge of funding sources and successful application for funding, this is consistent with Pearson correlation coefficient (**0.782**) that indicates a strong positive correlation between variables. and the high correlation coefficient value strengthens the confidence in the observed relationship between the variables, emphasizing the robustness of the association, it highlights the importance of enhancing researchers' understanding of available funding opportunities, potentially leading to increased success in obtaining financial support for water research endeavors. From a scientific standpoint, these findings underscore the need for greater efforts to disseminate information about various funding entities that support water research projects. Raising awareness among researchers

about potential funding sources can foster a more informed and proactive approach to seeking financial support. This emphasis on knowledge dissemination may contribute to bridging the gap between those who secure funding and those who do not, ultimately promoting the advancement of water-related research initiatives.

K)The survey initiated the investigation into whether respondents, who were already aware of funding entities, had established communications with these funding organizations. The results revealed that approximately 62.5% of researchers had indeed engaged in communication with these funding entities, while around 37.5% had not attempted to establish contact with them. This aspect is of paramount importance as it reflects the proactive engagement of researchers with potential funding sources, Further inquiries were directed towards those who had communicated with funding entities but did not secure funding. The aim was to uncover the primary reasons for the lack of successful funding outcomes. The findings unveiled that around 58.3% of respondents found it difficult to establish effective communication with donor organizations. This significant proportion highlights the importance of considering the challenge posed by inadequate publicity of these institution, Meanwhile, approximately 25% of respondents who communicated with these entities did not follow up on communication methods or faced personal circumstances hindering their pursuit of funding. Additionally, 8.3% of researchers cited challenges in navigating the bureaucratic procedures required for obtaining funding. Notably, a similar percentage (8.3%) indicated that funding entities imposed formidable conditions that hindered their ability to secure funding easily (Fig. 10). These findings offer valuable insights into the obstacles faced by researchers in accessing funding from different perspectives: communication difficulties, administrative complexities, and demanding conditions set by funding entities. It is noteworthy that these challenges often align with the results previously discussed, such as the correlation between funding awareness and successful funding attainment. Addressing these challenges holistically could potentially enhance researchers' effectiveness in seeking and obtaining funding for water-related research projects.

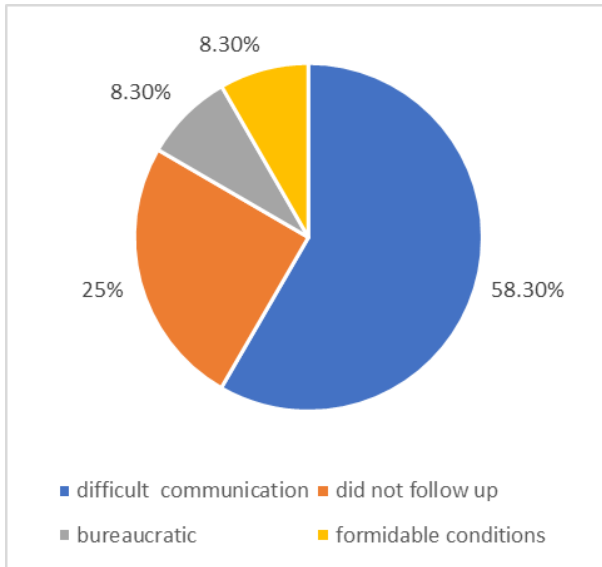


Fig.10. primary reasons for the lack of successful funding outcomes

Source: Sample Analysis

L) Regarding respondents who had successfully obtained funding for their water-related research projects, they were questioned about the stages at which their funded research stood. The responses were as follows (Fig. 11): 75% of researchers indicated that their research was ongoing due to the sustained funding, while 25% reported that their research concluded as the purpose of the funding was fulfilled. Notably, there were no responses regarding the cessation of funding for any reasons, this pattern underscores the positive facilitation provided by funding entities to researchers, allowing for the continuation and completion of research objectives. It is evident that funding organizations are offering effective mechanisms to harness the value of research and ensure that the research outcomes align with the intended purposes of the funding. Further exploration into the challenges encountered during the funding acquisition process revealed that 45.5% of respondents identified delays in funding disbursement from the funding organizations after approval as a significant issue. Additionally, approximately 9.1% of researchers faced obstacles imposed by the funding entities due to the requirements of the funding. Furthermore, 45.5% attributed funding challenges to other unspecified reasons. These findings shed light on the operational aspects of funding allocation and management. Delays in funding disbursement post-approval can hinder the timely progression of research activities. The existence of unspecified challenges underscores the need for transparency and effective communication between funding

organizations and researchers. Consequently, enhancing the efficiency of the funding process by addressing these challenges could contribute to the smoother execution and successful outcomes of water-related research projects.

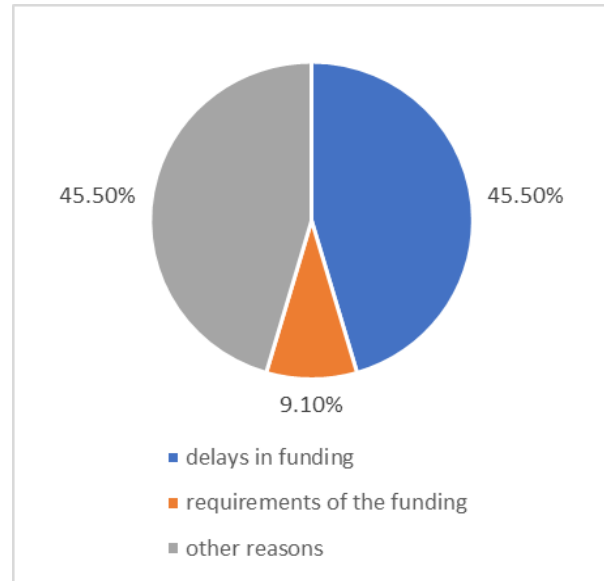


Fig.11. challenges encountered during the funding acquisition process

Source: Sample Analysis

3) Suggested Model for Enhancing Funding for Water Research and Reducing Water Losses:

The advancement of sustainable water management practices and the mitigation of water-related challenges are critical for global environmental preservation and socio-economic development (El Mahy, 2019). To address these pressing issues, a comprehensive model is suggested to bolster funding for water research while concurrently diminishing water losses (Table 2). This model involves a collaboration of various stakeholders, including water research institutions, governmental bodies, international organizations, private sector entities, NGOs, and foundations. By harnessing a diverse range of funding mechanisms and strategies, the proposed model aims to catalyze innovation and drive impactful research outcomes:

A) Stakeholders:

Water Research Institutions: Academic institutions, research centers, and think tanks focused on water-related studies.

Government Agencies: Ministries of Water Resources, Environmental Protection, and **Finance**, responsible for policy, regulation, and funding allocation.

International Donors and Organizations: Entities like the European Union, USAID, and UNDP, supporting water research through grants and loans.

Private Sector: Companies with an interest in water efficiency and sustainable practices, offering grants or partnerships.

NGOs and Foundations: Organizations advocating for environmental preservation and sustainable water management.

B)Funding Mechanisms:

Grant Programs: Develop targeted grant programs to support water research in areas like water quality, efficiency, and conservation.

Public-Private Partnerships (PPPs): Facilitate collaborations between private companies and research institutions to jointly fund projects.

Research Competitions: Organize competitions to encourage innovative research ideas with attractive prizes.

Research Fellowships: Establish fellowships for researchers to conduct focused studies on water-related challenges.

Matching Funds: Encourage governments to match private sector investments in water research.

International Collaboration: Foster partnerships with international donors to co-finance research projects.

C)Attracting More Funding:

Awareness Campaigns: Raise awareness about the importance of water research and its impact on sustainable development.

Networking Events: Organize conferences, workshops, and seminars to connect researchers, policymakers, and potential funders.

Showcasing Success Stories: Highlight successful water research projects and their positive outcomes to attract more attention and funding.

Research Alignment: Align research topics with pressing water-related issues, such as water scarcity, pollution, and infrastructure.

Policy Advocacy: Collaborate with government agencies to influence policies that prioritize water research and conservation.

Leverage Technology: Use digital platforms and social media to engage a wider audience and attract potential funders.

Impact Measurement:

D)Monitoring and Evaluation: Establish metrics to track the impact of funded research on water conservation and reduction of losses.

Reporting: Regularly share progress reports and success stories with funders to demonstrate the positive outcomes of their support.

Knowledge Dissemination: Publish research findings in journals and reports to contribute to the global body of knowledge and showcase expertise.

Table 2. Dynamic Economic Model for Enhancing Funding for Water Research and Reducing Losses

Variables	Equations
G(t) = Grant Programs	$G(t) = \alpha_1 * W(t)$
P(t) = Public-Private Partnerships (PPPs)	$P(t) = \alpha_2 * W(t)$
R(t) = Research Competitions	$R(t) = \alpha_3 * W(t)$
F(t) = Research Fellowships	$F(t) = \alpha_4 * W(t)$
M(t) = Matching Funds	$M(t) = \alpha_5 * W(t)$
I(t) = International Collaboration	$I(t) = \alpha_6 * W(t)$
A(t) = Awareness Campaigns	$A(t) = \beta_1 * Y(t-1)$
N(t) = Networking Events	$N(t) = \beta_2 * Y(t-1)$
S(t) = Showcasing Success Stories	$S(t) = \beta_3 * Y(t-1)$
Y(t) = Attracting More Funding	$Y(t) = G(t) + P(t) + R(t) + F(t) + M(t) + I(t) + A(t) + N(t) + S(t)$
W(t) = Water Research Funding	$Y(t) = G(t) + P(t) + R(t) + F(t) + M(t) + I(t) + A(t) + N(t) + S(t)$

Source: Study Sample.

Table 3. Groundwater characteristics for El Moghra Area and Wadi El-Natron area

Location	Water Sample	Ec	TDS	pH	Turbidity	Nitrate	Ammonia	Sulfate	Iron	Notes
		$\mu\text{S/cm}$	mg/l		NTU	mg/l	mg/l	mg/l	mg/l	
El Moghra oasis	Sample A	9510	4740	7.1	29.81	24.4	0.89	950	0.69	Groundwater
	Sample B	12290	6160	7.6	5.3	3.4	0.02	1375	0.07	Groundwater
	Sample C (effluent)	890	442	7.1	0.07	0.0	0.0	23	0.0	Desalinated water
Wadi El-Natron	Sample D	4380	2183	7.9	1.76	6.1	0.03	375	0.06	Groundwater

Source: Water Sample Analysis.

4) **Water quality:** The Western Desert in Egypt, covering approximately 68% of the nation's land with an arid climate prevailing, groundwater has emerged as a pivotal water source. Within this context, projects such as "One and Half Million Feddan" are instrumental in reclaiming land for agriculture (El Mahy, 2016), with the Moghra area being a focal point. This study part aims to compare agricultural productivity and water quality in the Moghra area to address challenges associated with water salinity, and to achieve this, groundwater samples (A, B, C, and D) were collected from wells in the Moghra area and Wadi El-Natron area, including a desalination water treatment plant. Analysis in a laboratory encompassed key parameters, such as electrical conductivity (EC) and total dissolved solids (TDS) to evaluate water salinity. The results indicate that groundwater in the Moghra area is characterized by high salinity (TDS > 4000 mg/l), while in Wadi El-Natron, it is moderately saline (TDS > 2000 mg/l). This divergence in water quality has significant implications for agricultural productivity and necessitates targeted interventions.

The observed disparity in groundwater salinity between the Moghra area and Wadi El-Natron underscores the profound influence of water quality on agricultural viability. High salinity levels can detrimentally impact crop growth, requiring careful consideration of suitable crops and cultivation practices. The interaction between water quality and crop yield is a multifaceted challenge that demands an interdisciplinary approach (Abbas, 2008). The survey's outcomes align with the broader understanding that water research plays a pivotal role in identifying optimal crops for cultivation and discerning ancillary benefits that can enhance agricultural outcomes. By studying the

relationship between water quality and crop productivity, researchers contribute to informed decision-making processes that can mitigate the impact of challenging conditions and optimize agricultural potential (Seada *et al.*, 2016), Table (3) shows the groundwater characteristics for El Moghra area and Wadi El-Natron area. Table (3) shows the water classification by salinity. As shown in table 1, for El-Moghra area the salinity of groundwater is highly TDS and the classification of water is considered as a high salinity water (TDS is more than 4000 mg/l). whereas, for Wadi Natron area the salinity of groundwater is medium TDS and the classification of water is considered as a salinity water (TDS is more than 2000 mg/l) (Appendix. 1).

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Appendix. 1.

Water classification	EC dS/m	TDS mg/litre
Non-saline water	< 0.7	< 500
Saline water	0.7–42	500–30 000
Slightly saline	0.7–3.0	500–2 000
Medium saline	3.0–6.0	2 000–4 000
Highly saline	> 6.0	> 4 000
Very saline	> 14.0	> 9 000
Brine	> 42	> 30 000

الملخص العربي

التمويل المستدام لأبحاث المياه وتحديات جودة المياه في الممارسات الزراعية: تحليل اقتصادي في مصر

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لمشاريع بحثهم. وتوزعت مصادر التمويل بين المتبرعين الدوليين (٤٦,٢٪)، والمنح الحكومية (٣٠,٨٪)، والقطاع الخاص (٢٣,١٪). وكشفت النتائج أيضاً عن التحديات التي تواجه الباحثين في الحصول على التمويل، مع تأكيد أن ٧٥٪ من المشروعات تحقق تقدماً بفضل التمويل، في حين تم اختتام ٢٥٪ منها مع تحقيق الأهداف المالية. وقد تم عمل دراسة ميدانية في منطقتي المغرة ووادي النطرون لقياس تأثير الملوحة (جودة المياه) على الإنتاجية الزراعية، حيث أظهرت النتائج الحاجة الملحة لتمويل بحوث المياه، مما ينعكس ذلك بشكل غير مباشر على زيادة الإنتاجية الزراعية.

الكلمات المفتاحية: بحوث المياه، جودة المياه، الممارسات الزراعية، تمويل.

تلقي هذه الدراسة الضوء على أهمية تعزيز التمويل المستدام لأبحاث المياه ومواجهة تحديات جودة المياه في الممارسات الزراعية بالتحليل الاقتصادي في مصر. وقد استندت هذه الدراسة إلى استبيان استقصائي لباحثين من مجالات متعددة. تبين أن نسبة ٤٤,٧٪ من المشاركين من الإناث و٥٥,٣٪ من الذكور. كما أوضحت نتائج الدراسة عن توزيع مشاركي الجامعات، حيث بلغت نسبة المشاركة من جامعة الإسكندرية ٤٣,٥٪، وجامعة بني سويف ١٩,٤٪، وجامعة الزقازيق ١٧,٦٪، وجامعة أسوان ١١,٨٪. تشير النتائج أيضاً إلى تنوع تخصصات الباحثين.

وفيما يتعلق بمصادر التمويل، فقد توصلت الدراسة إلى أن حوالي ٣٠٪ من الباحثين قد حصلوا على تمويل خارجي