Building Coherence into Food, Land and Water Systems

Tackling institutional complexity and policy choices in Egypt

Fayrouz Eldabbagh, Alan Nicol, Juan Carlos Sanchez Ramirez, and Youssef Brouziyne

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Context

Egypt combines a rapidly-growing population, dwindling per capita resource availability and highly arid climate. Amid this context, the country is faced with additional climate pressures affecting all aspects of food, land, and water systems. Policymakers need to be able to respond effectively and in a timely manner to this situation to ensure the country can continue to achieve long-term socio-economic and environmental development goals.

In 2024 the country's population hit 105 million and is projected to climb further to 160 million by 2050 (CAPMAS, 2024a; The World Bank Group, 2021). This rapid growth is affecting per capita resource availability, including water, 93% of which comes from the Nile (CAPMAS, 2024). In 2018 Egypt's water availability was just above the absolute water scarcity threshold of 500 m^3 per person, amounting to 583 m^3, and is expected to fall below the threshold in 2025 (CAPMAS, 2022). Structurally, the country's water deficit, defined as available water resources minus current water demand, is in the order of 21 billion m^3, much of which is being supplemented by drainage and wastewater reuse (CAPMAS, 2024b; Ministry of Water Resources and Irrigation, 2021). At the same time, the country's food imports represent approximately 40 billion m^3 of 'virtual' or 'embedded' water (the water used to grow a kg of the crop wherever in the world) (CAPMAS, 2024b; Nikiel & Eltahir, 2021). Nevertheless, Egypt continues to seek to expand its cultivated area – growing from 5.8 to 9.6 million feddans[1] between 1974 and 2022 – primarily through the reclamation of desert lands (CAPMAS, 2024b); and existing systems are vulnerable. With heatwaves intensifying at a 20% faster rate in the Mediterranean compared to the global average and sea-level rise intruding into groundwater across the Northern Delta, existing crop systems are under immense pressure, including from salinity and heat stress (Abd-Elaty et al., 2024; Jeffries & Campogianni, 2021; The World Bank Group, 2021).

On the supply side, the Ministry of Water Resources and Irrigation (MWRI) creates and expands the use of non-conventional water resources by establishing and refurbishing drainage and wastewater treatment stations (e.g. Kitchener Drain Depollution and Rehabilitation, Sustainable Development of Abu Rawash Wastewater Treatment Plant, and others) (AFDB, 2017; EBRD, 2018). Supply management is also linked to trade policies juggling the balance between the export and import of embedded water to compensate for the growing water scarcity and addressing the trade value deficit where the value of exports doesn't cover the cost of importing agricultural commodities (Ghoneim, 2014; Tellioglu & Konandreas, 2017). On the demand side, the government has taken steps towards controlling the expansion of high water-consuming crops, i.e. rice and sugarcane, and enhancing irrigation efficiency and water productivity, defined as increased crop productivity and value per drop (Cai et al., 2019; FAO, 2022; Molden et al., 2010). Canal rehabilitation, including the lining of 8 thousands kilometers was pushed forward to decrease water seepage into groundwater and thus maintain water flow (Eldabbagh et al., 2024). MWRI has the objective of turning 3.5 million feddans into modern irrigation (Fig. 1) (Eldabbagh et al., 2024). Modern irrigation is an institutional and technical setup to govern and operate an irrigation system to use efficiently the available resources while meeting users' needs and anticipating future demand (Renault et al., 2007). The Ministry of Agriculture and Land Reclamation, in other ways, is researching ways of improving seed productivity to reduce water use and increase resistance to drought (FAO, n.d.).

Either way, Egypt continues to face a structural water deficit and in response has evolved a complex network of institutions and instruments across sectors and governance scales. Institutions range from governmental agencies, international development organizations, and financial institutions, to the private sector, civil society, and grassroots organizations. Policy instruments range from water management infrastructure (e.g. canal lining, installing PVC pipelines), crop consolidation, regulations on the use of fertilizers and pesticides, to technological advancements (e.g. installing volumetric metering, drip and sprinkler irrigation), capacity building (e.g. knowledge and expertise of stakeholders from public officials to farmers), applying digital remote sensing, and finally, ensuring equity in accessing water, land and food (Cai et al., 2019; FAO, 2022; Molden et al., 2010).

[1] 1 feddan = 0.42 ha

Figure 1: Irrigated fields in Egypt using Drip Irrigation. Source: Mohamed Samy of Waft Agency (2024)

Problem Statement

Making progress in one water productivity instrument can boost progress in others (achieving synergies) or make them more difficult to achieve (trade-offs) (Nilsson et al., 2012; Stead & Meijers, 2009). Limiting the plantation of rice, for example, came at the expense of addressing land salinization and the livelihoods of rice producers in the summer; and using drip irrigation will impact the quantity of drainage water that is used to compensate for the decrease in water flow further down the systems, or is used by other water users in the network such as aquaculture farmers. At the same time, the economic cost of agricultural water (surface or groundwater) is not considered in determining the economic value of agricultural commodities exported, and therefore potentially undervalues water used for cultivation (Eldabbagh et al., 2024).

Policy prioritization must therefore ensure optimal management of expected trade-offs and maximize overall benefits which entails political-administrative complexities including around how decisions are framed, legitimized, weakened, and/or are influenced by policy choices and delivery options (El Qausy et al., 2011).

These complex institutional arrangements emerge as water resources productivity intersects with the mandate of several governmental actors, notably the Ministry of Agriculture and Land Reclamation, Ministry of Water Resources and Irrigation, Ministry of Environment, Ministry of International Cooperation and Planning and Economic Development, and the Ministry of Trade and Industry. External actors from donors and development financing institutions also influence policy choices on water demand management. These institutional arrangements include non-state actors including international and national development organizations, private sector companies, research centers/universities, and community-based organizations (Eldabbagh et al., 2024).

The United Nations Department of Economic and Social Affairs (UN-DESA) has developed a readiness assessment on institutional arrangements for policy coherence. Building block 3 in the assessment focuses on systems thinking and policy linkages. It engages with the analysis of the mechanisms that a country has put in place to allow relevant public institutions to systematically assess the cross-sectoral linkages of different policies in planning and implementation practices and thus fosters integration across several sustainable development goals. Building block 4 on organizations, structures, and processes assesses whether the country has an institutional mechanism in place that periodically brings together relevant ministries and government entities to enhance coherence across sectoral policies (UNDESA, 2023). Policy coherence could be horizontal (across different policy fields or sectors), or could be vertical (across different levels of government, e.g. Arab League agreements, national, governorate, etc.) (Nilsson et al., 2012; OECD, 2018). See Fig. 2 for an illustration of possible institutional arrangements for policy coherence. The key question for Egypt is how to govern such institutional complexities involved in managing its structural water

deficit in order to produce optimal value from its agriculture whilst reducing negative externalities so that national development can remain on a sustainable and resilient pathway.

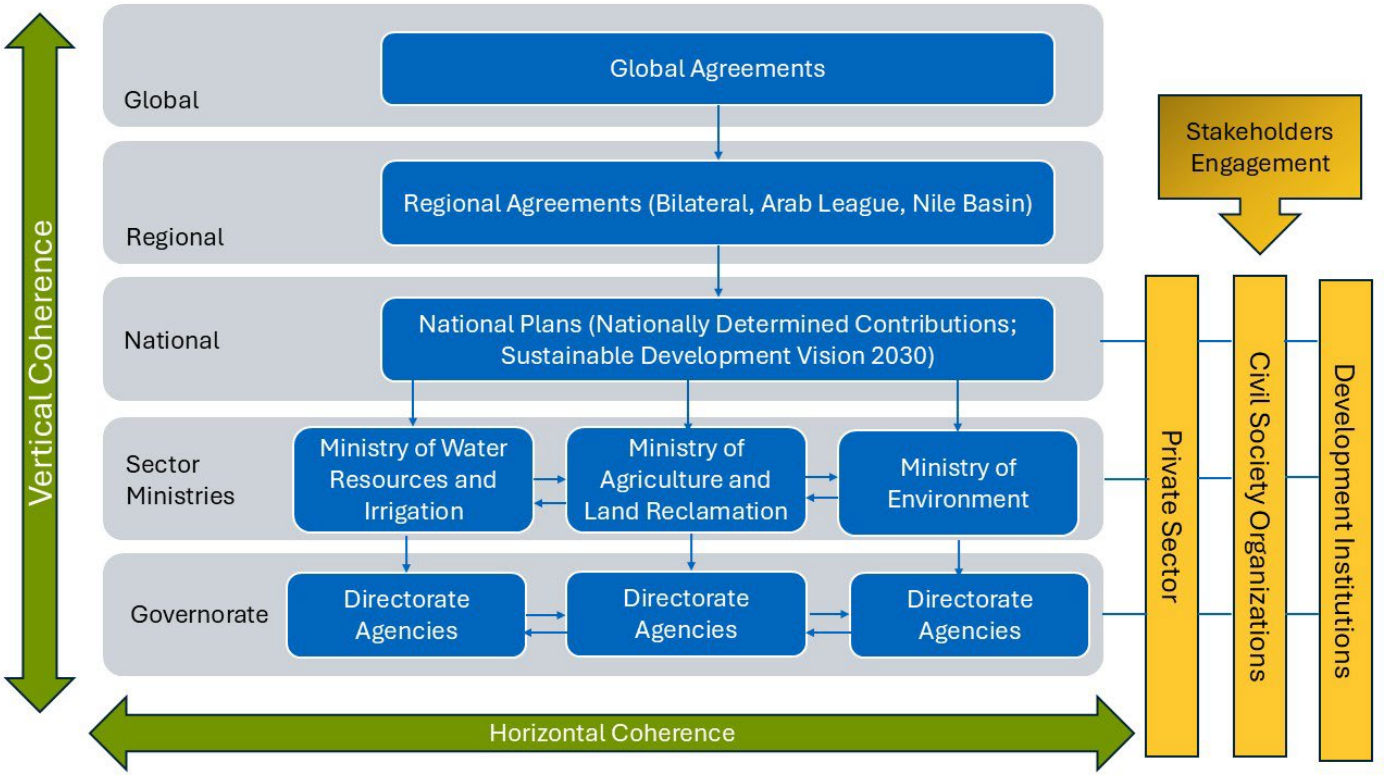

Figure 2: Vertical and Horizontal Coherence Illustration. Source: created by authors, adopted from (UNDESA, 2023, n.d.)

Pathways:

Based on research results from the flagship report on "*Framing policy coherence toward improving climate-adaptive water productivity in Egypt*", horizontal and vertical cross-coordination pathways have been identified to support Egypt's future food, land and water policy coherence.

1. Formalizing Inter-Ministerial Committee of Food, Land, and Water

Egypt has initiated horizontal and vertical coherence actions for water demand management. An interministerial steering committee between MALR and MWRI has been established to discuss highly water-consuming crops, including rice, wheat, sugar cane, and corn.

Capitalizing on this committee, their roles could encompass further developing sectoral strategies that explicitly address potential trade-offs and synergies with other policy areas, reviewing the work plans of each ministry, and identifying the listed mitigation and adaptation projects to ensure coordination of efforts made on the issue of climate change. The process of joint decision-making and co-implementing of policy actions is mandated by law. To increase national-based horizontal coherence, it is recommended to emphasize the role of the Ministry of Trade and Industry in the steering committee with MALR and MWRI. The MTI can boost progress toward balancing import and export value, fostering economic water productivity of crops by incorporating a water index for businesses and commercial farmers including analysis of water quality and standards, water usage efficiency and saving techniques, as well as social impact and climatic readiness.

2. Establish a Sub-Committee on Policy Coherence Data and Research

Establishing a sub-committee reporting to the high inter-ministerial committee would serve to mainstream policy coherence across national strategies and sectoral ministries. Its work areas would encompass creating centralized data repository on regular assessments of synergies, trade-offs, and gaps. Availability of accurate and disaggregated

data and integrated modelling tools are essential to measure and monitor policy coherence. Data includes overarching policy objectives transcending individual sectoral ministry agendas, which in the case of Egypt fall under enhancing climate adaptive water productivity (Eldabbagh et al., 2024). Data is collected on water productive innovations, water and land management, food standards, market and trade imports and exports value and quantity, targeted groups and beneficiaries. Data collection could encompass the water productive research innovations, such as genetically improved varieties that use less water and produce more yield. These data inputs would feed into modelling the natural resources nexus such as the Climate, Land-use, Energy, and Water Systems (CLEWS) model or the Q-nexus model providing a multi-sectoral quantitative analysis for researchers and statisticians to inform policy choices scenarios (Rasul & Neupane, 2021). Qualitative data could also be generated through regular policy assessments and impact assessments of implementing programs (Candel & Biesbroek, 2016; OECD, 2018). These assessments will identify and address outdated legislation or conflicting regulations that hinder policy coherence, while aligning sectoral policies. In Egypt, the Central Agency for Public Mobilization and Statistics plays a mediating role in collecting and coordinating statistics and data between governmental organizations and farmers (Eldabbagh et al., 2024).

3. Upscaling NWFE through permanent Interministerial sub-committee

The Nexus of Water, Food, and Energy "NWFE" program, also known as "fulfilling pledges" was launched in July 2022. This program aims to put into effect the Climate Change Strategy 2050 by upscaling adaptation and mitigation measures using different financial tools. Upscaling NWFE to other scopes and targets would serve the three pillars of an agrifood system: food, land, and water policy arenas. Through the established interministerial and joint committees between ministries, a sub-committee could be formed to identify and mange investment opportunities that benefit all work areas of ministries and align with current national macro--economic and social policies. This committee could be formed of international cooperation agents at each ministry. They have the role of aligning donors and development partners but also leveraging the capacities of national banks and social corporate responsibility towards implementing synergetic implementation based on the data and research repository.

4. Integrated advisory and extension systems across ministries

Creating integrated advisory and extension systems would support the effective management of food, land, and water systems by facilitating the exchange of skills, information, expertise, and technology. It is vital to ensure that the team responsible for integrated extension services receives a competitive financial package alongside relevant and thorough training. Equipped with this knowledge, the team can conduct targeted training sessions and share insights with civil society organizations, while also optimizing financial resources from donors and financial institutions. The key objective of these integrated extension services is to enhance the scalability of agricultural innovations. Since such innovations can be associated with risks and uncertainties, it is important to provide farmers with incentives to help overcome risk aversion. These could take the form of direct financial support or non-financial aid through initiatives like farmer field schools and the supply of agricultural inputs. Such measures would assist in maintaining the income of various extension department

5. Formalizing a collegial body of civil society organizations as part of the high-interministerial committee

Regulations and policies enforcement at local levels have been at odds with field-level practices. The recent legal limitations on cultivation of strategic crops, including rice, failed to consider the structure of rice producers' livelihoods across the country. As a result, one of the interviewees highlighted this vertical fragmentation by stating that there had in fact been an increase in total planted areas of rice (both formal and informal) to 1,800,00 feddans in 2022 compared to the 724,200 feddans authorized by the ministry (Eldabbagh et al., 2024).

Law 147 of 2021 legalized the structure of WUAs under Section IV of the law as part of establishing an institutional structure that fosters engagement and integration of local stakeholders affected by water scarcity and food production. Participatory approaches through water users' associations are important for the ministry because the intention is to let the corresponding WUA share distribution among themselves. Water quotas may vary from year to year according to water availability and water demand, and hence users will adapt their practices to optimize the return from available water. This aims to give the central authorities the flexibility to distribute water equally among different geographical regions. It will also allow local authorities to deal properly with the specific conditions in different areas.

Egypt could capitalize on participatory approaches through creating a process of community-led development plans gathering CSOs representatives to discuss recent innovations, current needs, and challenges encountered in managing water, food, and land systems. This plan could be put into effect under a local council supervised by each governor working with CSOs representatives to receive their feedback and eventually become an active policy consultation entity. This council and plan should help identify vertical policy incoherence and trade-offs existing in policies which will support the work of inter-ministerial committees.

Conclusion and Recommendations

While there is some progress in establishing horizontal coherence mechanisms to address institutional complexities, vertical coherence would allow Egypt to transition to more efficient and effective governance of current and future water and food demands. In particular, there is scope to capitalize on the power and influence of local research centers to coordinate cost-effective water-saving innovations with agrifood system extension services, civil society organizations, and farmers. This would also necessitate more cross-coordination between national governments and governorates.

One of the successful examples of partnerships between researchers and farmers is the Sakha rice research center located in Kafr Elsheikh. A network of farmers volunteered to try the new rice breeds on their plots of lands and, if successful in resisting disease, ecological conditions, and providing higher yields, would be distributed on a larger scale. This sort of partnership between farmers and researchers was informal with farmers freely and frequently entering the center to ask technical questions about their rice fields, whilst researchers maintained regular monitoring of crop growth (Lasheen, 2022).

"Bread" has always been a symbol of the basic food needs and demands of the Egyptian population. It is a potent symbol – and reminder – of some of Egypt's vulnerabilities, that most wheat is now imported from abroad. To mitigate further long-term vulnerability in managing the food production/water availability equation in the country national-level decision-makers need to further integrate both practices and resources (financial and technical) and at different levels. The formalization of cross-coordination mechanisms in the country with specific mandates and operational frameworks on irrigation, crops, and markets would be a major step in the right direction. A policy coherence data repository and investment sub-committees would constitute key parts of an operational framework central to which would be rational political-economic choices and compromises with transparency in the trade-offs involved and synergies achieved, especially at local community levels.

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Endnote

The policy analysis was carried out based on an extensive review of relevant policies (e.g. national strategies, laws, national programs, and initiatives), semi-structured interviews, and consultation sessions with government institutions from the Ministry of Water Resources and Irrigation, public research centers, and development organizations engaged in research or policy design and implementation on improving crop water productivity.

Authors

Fayrouz Eldabbagh, National Researcher-Political Scientist, IWMI, Cairo, Egypt, f.eldabbagh@cgiar.org

Alan Nicol, Principal Researcher, IWMI, Addis Ababa, Ethiopia, a.nicol@cgiar.org

Juan Carlos Sanchez Ramirez, Research Group Leader WGPE, IWMI, Addis Ababa, Ethiopia, J.SanchezRamirez@cgiar.org

Youssef Brouziyne, Country Representative – Egypt, IWMI, Cairo, Egypt youssef.brouziyne@cgiar.org

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