Institutional, Policy and Legal Evidence-Based Analysis of Agriculture Water Management (AWM)

Egypt

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EXECUTIVE SUMMARY

In Egypt, the governance structure for managing water for agriculture is characterized by several institutional, regulatory and policy frame works, plans and strategies. These areas cut across multiple sectors such as water, energy, agriculture and ecosystems.

Many institutions that have a responsibility of AWM in Egypt still lack adequate financial and technical capacities to carry out their various tasks efficiently. This problem is apparent within the different ministries including MALR, MWRI, EEAA as well as in the WUAs, BCWUAs and other institutions and organization.

Without sufficient capacities, these institutions cannot enforce laws effectively and several consequences are expected such as illegal abstraction of water, pollution of water sources, increasing water scarcity, decreasing law crop production.

This analysis proposes four solutions to tackle the aforementioned problems. At first, avoid the overlap of institutional roles that make either a direct or indirect contribution to AWM. The introduced policies and concepts have not been effectively coordinated or linked to each other, this may be due to the different nature of these programs as most are focusing on few issues and designed in a way that these policies cannot easily be interacted with each other. The establishment of committees, with members representing different entities, could coordinate and integrate activities in relation to agricultural water planning and management.

Secondly, AWM requires coordination of activities between all stakeholders to eliminate conflicts.

Thirdly, good AWM requires strong financial and technical capacities including defined government expenditures, enhanced financial autonomy of irrigation schemes, and stakeholder's awareness of the concept of AWM.

Lastly, implementing good AWM strategies requires updating laws which supports the legal framework. This will provide the water managers with guidelines and instruments for the planning of new irrigation improvement strategies, the allocation of water, the management of Operation & Maintenance (O&M) of irrigation and drainage systems, the management of water quality, and the financing of these activities.

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CONTEXT

OVERVIEW OF AGRICULTURE WATER MANAGEMENT IN EGYPT

Egypt faces significant food and water challenges over the next decades as the water has come below the water poverty threshold. An important factor in determining the country's level of food and water security will be consistent economic growth, together with gaining control of inflation. Ensuring the availability of sufficient and affordable food for the population will require sound economic policies that build resilience in the agricultural sector to trends in international food markets such as promote rural development.

One of the main challenge for AWM in Egypt is to increase local food production. Augmenting the nation's food storage capacity, particularly for wheat, will further assist food availability.

Expanding the production of food, however, is constrained by water supplies. Although agriculture is generally productive in Egypt, innovative technologies should be adopted to increase crop yields. Increasing water efficiency will provide a boost for total output. This is especially important as environmental degradation poses a threat to current production methods, meaning that conserving Egypt's existing agricultural land is imperative.

Generating new land through land reclamation projects will be vital in overcoming Egypt's production shortfall, though increasing the availability of agricultural land will place enormous pressure on the water supply. As Egypt is almost entirely dependent on the Nile for its fresh water, securing water supplies from the river is essential.

However, the new political dynamics within Egypt raise questions about its future water access, specifically in how it will engage with other Nile Basin countries. For example, domestic water demand is expected to increase 25 percent by 2025. Therefore, in addition to securing water supplies originating at the Nile, Egypt is currently implementing programs for a more efficient utilization of its available water.

An important part of this is to introduce more efficient irrigation systems in the agricultural sector. Better water management, modification of cropping patterns and growing crops that consume less water would all assist in ensuring Egypt's near future water security in addition to recycling water. Additional water resources originating from the Nile are essential for sustainable agriculture in Egypt.

The changing global climate poses another challenge to Egypt's food and water security. The United Nations Environment Program (UNEP) lists Egypt as highly vulnerable to its impending impacts. Egypt will experience coastal damage from rising sea levels, together with land deterioration and soil salinity. In addition, food production in Egypt is expected to decline by 30 percent by 2050, according to the World Food Program. There are several constraints that need to be addressed in order to achieve sustainable increases in land and water productivity and water-use efficiency at different scales in the Nile Delta. These include identifying and implementing appropriate and sustainable technical options for optimizing water use adapted to Egyptian farmers with small- to medium-sized holdings; as well as enabling policies to ensure positive economic and environmental impacts. The appropriate technical options will help reduce the gap between food production and consumption and, in turn, improve the country's food security level. Because agriculture in Egypt depends on irrigation, water policies were implemented in Egypt through a prolonged history.

METHODOLOGY

As already adopted in different project countries, the development of this tool encompassed the use of quantitative and qualitative methods. A stepwise approach was used to gather and organize the data as shown in Figure 1.

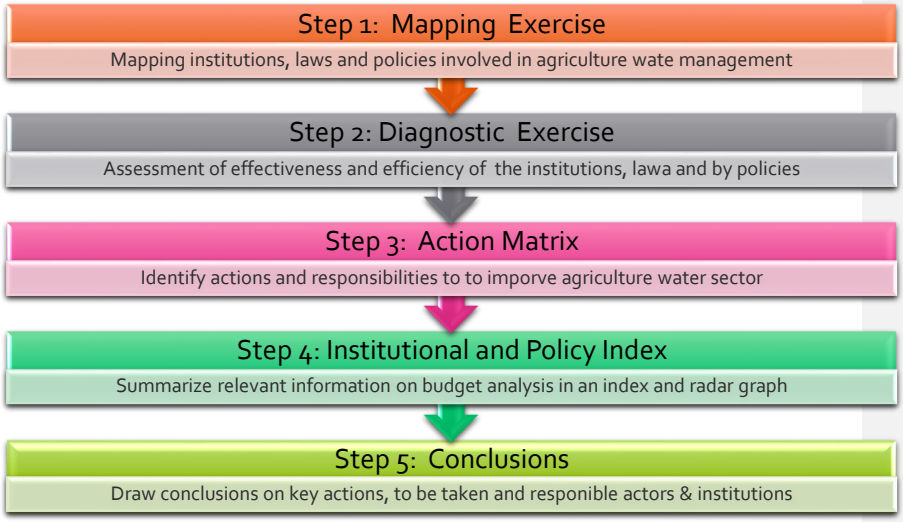

Figure 1. The tool for institutional and policy evidence-based analysis in five steps

STEP 1 – MAPPING OF INSTITUTIONS, LEGAL FRAMEWORKS & POLICIES

A mixed method approach was used to gather information on institutions (1.1), legal and regulatory frameworks (1.2), and policies (1.3). This information was organized to facilitate the analysis of governance dimensions/effectiveness/related capacity levels (step 2).

1.1. Institutions and actors

Within this context, institutions are organized entities, whether public or private, responsible for one or more aspects of agricultural water management at any level (national/local). The main actors in AWM in Egypt have been identified, and a description of their main goals and functions are presented (Table 1).

Results show several institutions which are involved in AWM in Egypt. The key institutions are: the Ministry of Water Resources and Irrigation (MWRI), Ministry of Agriculture and Land Reclamation (MALR), Water Users Associations (WUAs) at mesqa level, Branch Canal Water User Associations (BCWUAs), Agricultural Cooperatives, and some NGO's. Outside AWM, there are other institutions that have important influence on AWM and include the Ministry of Housing, Utilities and Urban Development

(MHUUD), Ministry of Electricity and Energy (MoEE), Ministry of State for Environmental Affairs (MoSEA), Ministry of Planning (MoP), Ministry of Trade and Industry (MoTI), Ministry of Health (MoH), Ministry of Transportation (MoT), and Ministry of interior (MoI).

Their mandates are diverse ranging from policy formulation, water resources regulations, and irrigation development to research and capacity. Some examples are: policy making, strategy development, policy and strategy implementation, water allocation, water delivery services, water resources protection and conservation, monitoring and evaluation, financing, infrastructure development, water resources management, mediation between stakeholders, approving & contracting services providers, licensing water service boards, and …etc. Table 1 summarizes the results of mapping of institutions and their associated functions/mandates.

Water management decisions in different sectors in Egypt are interconnected. In this section, analysis on this interaction is made through defining the scope, mandate and function of each sector.

This type of analysis is defined as a mapping of institutions. In Egypt, water management is characterized as centralized decision-making where water resources are mostly obtained from one source which is the River Nile. Central ministries serve for planning and scheduling of water allocation up to the local level and grass roots. The Ministry of Water Resources (MWRI), the oldest organization in Egypt, is the key player in water management and allocation. It is responsible for securing water to all sectors such as agriculture, urban water supply, industries, and navigation.

In the late 1970s, the MWRI realized the need for participatory water management through involvement of local entities and representatives at the grass-roots level. Pilot programs were implemented and evaluated that ended up with formulation of water user associations at Mesqa and Canal level. The rate of implementation of WUAs is still low and there is a need to speed up this process. Table 1 presents the analysis of institutions, governmental and non-governmental, related to AWM in Egypt.

Table 1: Step 1.1. Mapping of institutions primarily involved in Agricultural Water Management (Irrigation & Hydropower) in Egypt

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
Ministry of Water Resources and Irrigation (MWRI)	GL: National; N: Public, non-profit, formal	Secure and safeguard water to meet demands of all sectors in Egypt and to sustain the socioeconomic development in the country in the framework of a sound environment.	1. Development, distribution and management of water resources. 2. Construction, operation and maintenance of canal networks and water control structures. 3. Providing subsurface drainage to agricultural land to control salinity and water-logging. 4. Design, execution, operation, and maintenance of all the surface and subsurface drainage systems. 5. Construction, operation and maintenance of drainage network for collection and disposal of agricultural drainage water. 6. Construction, operation, and maintenance of irrigation and drainage pump stations and their mechanical and electrical parts. 7. Construction, operation and maintenance of groundwater well.s 8. Construction, operation and maintenance of water flash flood works. 9. Monitoring and assessment of various water sources water quality. 10. Protecting the coastal lakes and the shoreline. 11. Conducting land and aerial surveys and the use of satellites to draw different scale survey maps, in addition to the estimation of the country's agricultural area and determination of city/village borders. 12. Conducting research and studies in different fields that serve the integrated water management and the environment. 13. Coordination with Nile Basin Countries and represent the GoE in singing water agreements. 14. Develop and implement strategies for adaptation to climate change and disaster Risk reduction in coordination with related stakeholders. 15. Support and implement horizontal expansion plans and policies of the government through coordination with MALR. 16. Conduct public awareness campaign regarding water conservation and protection.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
Ministry of Agriculture and Land Reclamation (MALR)	GL: National; N: Public, non-profit, formal.	➢ Sustainable management of land-based resources including water. ➢ Improving agricultural activities and land reclamation, including water management at the on-farm level. ➢ To improve food security and increase national agricultural production through maximizing the net return per unit of water. ➢ Formulates laws, policies, strategies and plans that promote sustainable agriculture. ➢ Enforce laws, policies, strategies and plans for agricultural sector. ➢ Mobilizes funds and investment in agriculture water	1. Enforce the policy of liberalization and demand management. 2. Enhancing water-use efficiency in irrigated agriculture. 3. Sustainable expansion of reclaimed areas. 4. Sustainable development of land and water productivity. 5. Maximizing the sustainable returns of rain-fed agriculture. 6. Maintaining and protecting agricultural land. 7. Improving Agricultural Productivity. 8. Achieving Higher Rates of Food Security in Strategic Goods. 9. Improving Opportunities for Agricultural Investment. 10. Improving Livelihood of Rural Inhabitants. 11. Increasing farmers' participation in the management of irrigation systems.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
		management through project proposals, collaboration with development partners. ➢ Promotes and facilitates research in irrigation through endorsement of research institutions and collaborative initiatives.	
National Organization for Potable Water and Sanitary Drainage; (NOPWASD), Ministry of Housing, Utilities & Urban Development (MHUUD)	GL: National; N: Public, non-profit, formal.	➢ Sustainable water supply and sanitation services to the municipal and industrial subsectors. ➢ Implementing national programs to expand municipal water treatment capacity and provide adequate sanitation facilities. ➢ Provide sufficient drinking water of good quality to the population and to treat the municipal	1. Laying down plans at the national level in relation to drinking water and sanitary drainage works and preparing their concomitant execution programs as a prelude towards including them in the state general plan, and monitoring their implementation. 2. Coordinating among plans and projects of drinking water and sanitary drainage with a view to achieving their integration. 3. Carrying out studies and applied research works pertaining to potable water, household and public use of it. In addition, it performs studies and research regarding sewage and sanitary drainage affairs and takes part in making validity criteria and specifications for drinking water and disposal of wastewater. 4. Specifying conditions and standard specifications for sewage and sanitary drainage projects and potable water projects as well as household and public uses in productive firms and to observe them and operate in accordance with these specifications. 5. Rendering technical consultation and advice in the field of drinking water and sanitary drainage.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
		wastewater in such a way that the discharge of the effluent does not pose any health and environmental risk.	6. Establishing training centers for the purpose of enhancing efficiency of works related to design, execution, operation and maintenance of drinking water and sanitary drainage utilities. 7. Assisting governorates in the field of required research, preparing and making designs for large-scale projects or those of special nature and when requested supervising their implementation. This assistance is extended in return for fees to be fixed by the board of directors in a form of a by-law. 8. Helping governorates in preparing contracts pertaining to the above mentioned projects and in accordance with specifications and conditions prepared for them and already announced in bids, local and foreign negotiations, in addition to analyzing and examining offers (bids). NOPWASP is entitled to hire specialized local or foreign consulting firms for the purpose of implementing its duties and tasks.
Egyptian Environmental Affairs Agency (EEAA), Ministry of State for the Environment Affairs (MoSEA)	GL: National; N: Public, non-profit, formal.	Undertakes the responsibility of drawing general policies, preparing plans required for protection and development of environmental monitoring plans.	1. Coordinating governmental and non-governmental efforts in relation to protection and development of environment. 2. Providing financial resources for pilot projects for environment. 3. Monitoring implementation of laws and by-laws laid down for environment protection. 4. inspections regarding compliance with environmental and occupational health and safety regulations 5. Formulating bases of procedures in relation to assessment of environmental impact of the projects. 6. Prepare an action plan to reduce Nile water pollution from industrial effluents.
Ministry of Electricity and Energy (MoEE)	GL: National; N: Public, non-profit, formal.	Coordinates with MWRI regarding hydropower generation.	1. Responsible for the generation of hydropower at the High Aswan Dam and other hydropower stations. 2. Coordinate with MWRI to construct and operate hydropower generation plants.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
			3. Construct and operate thermal power plants that draw water from the Nile for cooling purposes and make sure that the return flows doesn't cause thermal pollution
Ministry of Planning (MoP)	GL: National; N: Public, non-profit, formal.	Prepare the annual and 5-year plans and put the priority of the allocation of investments.	1. Prepares the annual and 5-year plans in co-operation with the ministries and governmental authorities and monitors their implementation. 2. Involved in the prioritization of the allocation of investments.
General Department of Construction and Environment, Ministry of Trade and Industry (MoTI)	GL: National; N: Public, non-profit, formal.	➢ To ensure the availability and sustainability of water supply through the coordination with MWRI, NOPWASD and MOI and protect water resources from industrial pollution; and ➢ Review drawings of construction of new industrial units' requirements and conditions such as the availability of	1. Coordination between MWRI, NOPWASD and Mol to ensure the availability and sustainability of water supply. 2. Protect water resources from pollution through the implementation of cleaner technologies, recycling of process and cooling water and wastewater treatment prior to discharge. 3. Carrying out studies in relation to treatment of industrial wastewater. 4. Setting environmental indicators for polluting industries. 5. Surveying chemicals used in industries. 6. Carrying out preliminary studies on hazardous chemicals. 7. Upgrading the industrial environmental map. 8. Surveying those factories disposing of their wastewater at canals and drains.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
		wastewater treatment plants.	
The General Department of Environmental Health, Ministry of Health (MoH)	GL: National; N: Public, non-profit, Formal	Planning and suggests the general policy, from the technical point of view, to secure basic requirements needed to improve the environmental health in towns and villages.	1. Inspecting and controlling human and industrial wastewater to ensure that watercourses are not polluted with a view to protecting health of human beings, animals and fish. 2. Proposing development of laws and decrees and modification of health criteria for sanitary drainage and industrial wastewater in a manner that is consistent with continuous health development. 3. Planning, directing, supervising and monitoring all works related to human and industrial wastewater in governorates. 4. Periodically inspecting wastewater treatment processes to ascertain the degree of their efficiency and proposing suitable solutions to ensure that the final product of treatment conforms to health criteria as stipulated in the concerned laws. 5. Receiving monthly reports on sewer process and industrial wastewater drainage from directorates of health affairs in order to analyze their information and make technical opinions. 6. Finding solutions to health problem, and citizens' complaints regarding contamination of watercourses in governorates to avoid spread over of infectious diseases. 7. Training of technical personnel whose duties are of inspecting sanitary and industrial wastewater drainage. 8. Setting health criteria and plans required for reaching required health level of sanitary drainage and industrial wastewater treatment and disposal to avoid of environment pollution. 9. Making recommendations and directives to the concerned entities.
The River Transport Authority (RTA), Ministry of Transportation (MoT)	GL: National ; N: Public, non-profit, Formal	Manages navigation activities along the course of the Nile and main canals downstream Aswan	1. Dredging the navigational bottlenecks at the shallow sections of the Nile and the navigational canals. 2. Planning to raise the country's river transport capacity. 3. Provide licenses to companies and ships to engage in river transport.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
		Dam, in coordination with MWRI.	4. Issue regulations of the transport of goods and passengers and comply with the availability of water in the river and canals through coordination with MWRI.
The Inland Water Police, Ministry of Interior (MoI)	GL: National; N: Public, non-profit, Formal	Enforcing the water-related laws.	1. Assist and coordinate with MWRI to remove transgressions and encroachments on the water ways. 2. Protection of the Nile River from pollution. 3. Protection of canal network in Fayoum.
Water Users Associations (WUAs) at Mesqa level	GL: National ; N: Public, non-profit, Formal	Improve water management and allocation at farm level.	1. Participation in planning and construction of improved mesqas. 2. Operation, maintenance, and follow-up of improved mesqas. 3. Improvement of water use and distribution at the mesqa level. 4. Identifying the responsibilities and setting up rules to resolve conflicts. 5. Linkages for coordination with agriculture and irrigation concerned agencies. 6. Development of financial resources of the association to improve O&M.
Branch Canal Water Users Associations (BCWUAs)	GL: National ; N: Public, non-profit, Informal	Represent a collective association of cultivators on a branch canal, and liaise with the MWRI in all matters related to operation, maintenance and management of the branch canal.	1. Empower water users to better assess their needs and priorities. 2. Solve local water disputes and issues on their own, and partner with MWRI staff to solve larger-scale issues. 3. Contribute to better water management through engaging water users as active participants, not passive beneficiaries. 4. Provide an effective communication channel between water users and the MWRI. 5. Resolve conflicts among water users and coordinate their individual needs, concerns, priorities and activities.
Agriculture Cooperatives	GL: National; N: semi-public, autonomous, non-profit, formal.	Reducing poverty, generating employment, reduce migration of people and help them get jobs in rural areas, and contribute to	1. Amending law 122/1982 in light of market economy requirements and international agreements. 2. Provide a range of services to the members, particularly access to productive inputs, output markets, information and communication. 3. Reorient the role of administrative machinery to serve interests of its members.

Institution/actor	Geographical level (GL) Nature (N)	Mandate (AWM related)	Functions (AWM related)
		socio-economic development and food security.	4. Eliminating duplicity of cooperatives to consolidate financial and human resources, particularly at the village level. 5. Merging small cooperatives in one economically viable entity. 6. Training staff based on a professionally functional structure and a defined business plan. 7. Allowing cooperatives to establish different funds (for saving, financing, insurance, etc.). 8. Centers of disseminating modern technologies in their line of operation. 9. Increasing awareness and administrative functions for training programs and material for the cooperative elected members. 10. Allowing the cooperatives to establish and/or participate in agricultural banks and companies active in the field of agricultural development.
Al-Shams societies	GL: Middle & Upper Egypt; N: NGO.	Promoting agricultural development.	Pooling small farmers' efforts, on a voluntary basis, to provide technical, administrative and marketing expertise in the production, marketing and processing of non-traditional crops.

Conclusion

It can be concluded from table 1 that institutions concerned with water management in Egypt can be divided into three sectors.

At first, the MWRI is responsible for water management and allocation for the MALR. The MALR is concerned with the use of water of all sectors in consumptive ways or in non-consumptive ways. Agricultural sectors, Municipal and Industrial sectors are water consuming sectors where most of water allocated to them is non recoverable through evaporation.

Secondly, other sectors such as hydropower generation and river transport are non-consuming sectors. MWRI aims to match water requirements among consuming and non-consuming sectors to stimulate water efficiency.

The third sector is responsible for prevention of transgression or pollution in basin areas. This sector includes the Ministry of Interior and the Ministry of Environment. The governmental entities concerned with water management in Egypt are performing well. However, this performance can be enhanced through the implementation of a participatory approach through expanding water user associations.

1.2. Legal & regulatory frameworks

Legislation is a law passed by a legislative body such as a Parliament, while a regulation is a rule issued by a government agency (e.g. ministerial decree) that provides details on how primary legislation will be implemented.

A regulation may set specific minimum requirements for the public to meet if they are to be considered in compliance with a given legislation. There are several relevant existing primary legislations involved in AWM related activities in Egypt. The relevant laws in this respect are:

- Law 12/1982, concerning the issues of irrigation and drainage;
- Law 213/1994, concerning farmer's participation at the mesqa level for the improved irrigation systems;

- Law 48/1982 implemented by Decree 8/1982, concerning the protection of the River Nile and waterways from pollution;
- Law 4/1994, concerning environment;
- Many of these primary legislations have a mandate to conserve and manage water resources which form the basis of their specific objectives and associated targets which range from institutional reforms, development of water infrastructure, improved water use efficiency, regulating water quality and catchment protection to ensure adequate quantities. Table 2 outlines all the relevant primary legislations, specific targets and measures which are in place to achieve those targets.

In this section the main laws governing water management in Egypt are presented in Table 2. Two main laws govern water management; the irrigation and drainage laws No. 12 issued in 1984 and the Protection of River Nile and its waterways from pollution No. 48 issued in 1982. These laws are not new but they are deduced and reformed from previous laws and studies. Since the MWRI started implementing the participatory water management; a supplementary law No. 213 of Irrigation and Drainage was issued in 1994 to define the legal framework of farmers' involvement in the water management particularly at tertiary level.

Table 2: Step 1.2. Mapping of legislation and regulations for Agricultural Water Management (Irrigation and Hydropower) in Egypt

Legislation	Goal/Mission/Principle	Specific targets	Measures to attain targets
Law 102/1983	Delineates nature protection areas	➢ Forbids actions that lead to destruction of the natural environment, including marine and freshwater. ➢ Proscribes fines and penalties for violators.	1. Government pursues damage assessments for harms to the environment.
Law of irrigation and drainage (Law 12/1984)	Define the use and management of public and private irrigation and drainage system. It also provides legal direction for the maintenance of public and private canals, and specify arrangements for cost recovery in irrigation and drainage works. Law 12 regulates the use of groundwater and agricultural drainage water and legislates other factors such as protection against flooding, navigation and coastal protection. Penalties for violation of the Laws and by-Laws are also specified.	➢ Improve the water management and water use efficiency. ➢ Regulates the use of groundwater and agricultural drainage water. ➢ Protection against flash flooding. ➢ Legislates the inland navigation. ➢ Legislates coastal protection. ➢ Improve surface irrigation systems in the old lands. ➢ Define and determine penalties for the violations of the law and by-Laws concerning water resources.	1. Irrigation department of MWRI is fully responsible to control water distribution. Water permits and improved water management efficiency. 2. Irrigation department is also mandated to construct water control structures along the Nile and canals. 3. Irrigation Department is also responsible for setting regulation regarding groundwater use and drainage use. 4. Ministerial decrees and bylaws are issued to attain targets. 5. General authority for shore protection is responsible for protecting the Delta shore coast. 6. Egyptian authority for drainage projects is responsible for constructing drainage networks to control salinity and water logging in cultivated lands. The authority has established rules for cost recovery of farmer's subsurface drainage. 7. Coordination policy is set to coordinate with Ministry of Transport to organize the river transport and construction of navigation locks. 8. Coordination policy is set to coordinate with Ministry of Electricity to construct turbines in the New Barrages. 9. A special fund was established to maintain canal networks and removal of encroachment. 10. A ministerial decree is issued every year to determine the area of high-consuming crops (rice) in coordination with other related ministries and institutions. 11. National water resources plan have been prepared.

Supplementary Law for irrigation and drainage No. 213/1994	Provide the legal foundation for involving landowners, at the Mesqa (farm irrigation ditches) in irrigation system	➢ Improving the on-farm irrigation in the old lands, where Irrigation Improvement Projects (IIP) is implemented. ➢ Creation of a special fund to secure financing for developing and maintaining the improved Mesqas. ➢ Authorize Mesqa level WUAs to charge, collect and spend money on the operation, maintenance and administrative costs for their members. ➢ Increasing public awareness in the field of water use. ➢ Maintenance of Private Mesqas and Drains. ➢ WUAs formation WUAs in New Lands.	1. Applied modern irrigation technologies in the new lands such as drip and sprinkler irrigation is a must for water permits. 2. Specified the methodology of managing and maintenance of the improved irrigation systems. 3. Established more than 10000 WUAs at Mesqa level and 1200 BCWUAs at canal level to expand the participatory water management. 4. Established a special fund to secure financing for developing and maintaining the improved Mesqas (farm irrigation ditches). 5. Increased public awareness in the field of water use.
Law of Protection of the Nile River and its Waterways from Pollution No. 48/1982	Protection of the Nile River and Waterways from pollution. It governs the discharge of wastes and wastewater into the Nile and its waterways and sets standards for the quality of these discharge effluents. The law outlines the responsibilities of the MWRI and of other concerned ministries.	➢ Regulates the drainage of liquid waste, including effluents from public, commercial and industrial entities into water bodies. ➢ Classifies types of waterways and regulates the discharge of wastewater into these waterways. ➢ It prohibits discharges to the Nile, canals, drains, and groundwater without a license issued by the MWRI.	1. Introduced and confirmed the definitions of water bodies and effluents to define where the law must be implemented. 2. Monitoring of Compliance with Licensing Conditions. 3. Established Water quality standards and standards for treated liquid waste to be drained into Water Streams in the implementing decree for Law 48 (Decree 8/1983). 4. Perform periodic analysis for samples of the treated wastewater that discharges into waterways. 5. Roles of the relevant ministries with respect to licensing procedure, amend effluent discharge standards, are clearly defined. 6. Establishment of a monitoring program for water quality.

		➢ Define the responsibilities of stakeholders towards the water pollution control. ➢ Issue the Executive Regulation of the law after consultation with other concerned ministries. ➢ Monitor the pollution sources and take actions according to the law to stop pollution.	
Law 93/1962 Article 15:	Controls the reuse of wastewater in Agriculture ➢ Regarding the Amendment of Law93/1962 on the Drainage of Liquid Wastes.	➢ It is prohibited to harvest yields, which were irrigated with a treated wastewater until two weeks after stopping irrigation. ➢ It is prohibited to use treated wastewater, primary or secondary treatment, to irrigate cattle pasture. ➢ It is acceptable to reuse treated wastewater in agricultural purposes, only if it would be conform to conditions and criteria mentioned in Law 93 /1962. ➢ Initiates restricted irrigation for the safe use of wastewater on selected crops and distinguish the water quality requirements	1. Develop standards guidelines for the reuse of treated wastewater effluents and sludge. 2. Monitoring and evaluation of areas irrigated with wastewater effluents (production and qualities). 3. Enforce the conditions stated by the law. 4. Define specification of the irrigated lands -criteria for types of plants for each type of wastewater treatment. 5. Environmental and health precautions. 6. Decree 169/1997 to set Egyptian Code for wastewater treatment works. 7. Decree 603/2002 issued to prohibit the use of treated or untreated wastewater in irrigating traditional field crops (Reuse is limited to the cultivation of timber and ornamental trees considering the health of agriculture workers). 8. Decree 171/2005 to review the standards for the reuse of treated effluents and sludge in agriculture. 9. Decree 1038/2009 Prohibits use of wastewater, treated or untreated, for irrigating all food crops.

	➢ Specification of the irrigated lands -criteria for types of plants for each type of wastewater treatment - environmental and health precautions.	for unrestricted and restricted irrigation.	
The Environmental Law 4/1994	Provide the basis for environmental impact assessment (EIA), monitoring, record keeping, and periodic reporting. It also provides the basis for the licenses issued for new projects and establishments.	➢ EIA should be undertaken for new establishments/projects and for expansions/renovations of existing establishments before construction. The law considers the EIA as a main condition for licensing. ➢ Develop regulation of air pollution, hazardous waste management, and marine pollution. ➢ The EEAA is the authority concerned with preparing legislation and decrees to protect the environment. ➢ The agency has the tasks in standard and norm setting and to carry out compliance follow up. ➢ Participates in the preparation and implementation of the national program for environmental monitoring and utilization of data (including water quality).	1. Establishment of the High Committee for the Nile, chaired by the Minister of MWRI and represented by MOI, MALR, MHP, MIMW, MHNCPU and MOSEA, is responsible for protecting the quality and quantity of the entire Nile system. 2. The National Water Quality Conservation Unit (NWQCU), is the focal point on water quality information in Egypt and attempts to bridge between entities that generate data and users of information. 3. The National Water Quality Conservation Program Advisory Committee is instituted to guide the program of the NWQCU and has representatives from different government agencies. 4. The Central Directorate for Waterways Maintenance in the Irrigation Sector of MWRI, which has responsibility for issuing licenses (permits) for sources of municipal and industrial wastewater discharge under Law 48/1982, supervises irrigation and drainage to prevent inappropriate activities by other parties and carries out the necessary legal follow-up actions. 5. The Water Communication Unit attached to the MWRI has responsibilities for raising public awareness regarding water scarcity and the risks of polluted water resources. 6. EEAA oversees implementation of requirements under Law 4 for the conduct of Environmental Impact Assessments of projects with the potential to cause significant adverse environmental impacts, including the operation of industrial and wastewater treatment plants.

		➢ Establishes an "Environmental Protection Fund" which would also cover water quality monitoring. ➢ Authorizes use of incentives for managing the environment. This system is submitted to the Board of Directors of EEAA to decide on the kind of incentives.	7. A Quality Unit is being established under the Minister's Office in MWRI partly to address some of these coordination issues. 8. Establishment of the Supreme Council for Protection of River Nile and Waterways from Pollution.
Law No 142/1983	Fishing, aquatic life and the regulation of fish farms. It is the main body of legislation on fisheries.	➢ A license for establishment of fish-farm must be obtained from the Ministry of Agriculture, which is issued after obtaining authorization of the MWRIand Irrigation. ➢ The license must indicate the quantity of water permitted for water use, its source, inlet size and the method of drainage, as well as the authorization obtained from the MWRIand Irrigation, including the conditions. ➢ Only brackish and marine water, and infertile land that is not suitable for agriculture, can be used in aquaculture. ➢ Water supply should be restricted to water from lakes and drains, and the use of fresh (i.e. irrigation) water is prohibited. ➢ Prohibits to dispose any industrial wastes, insecticides,	1. The Act is administered by the General Authority for Fisheries Resources Development (GAFRD), established by Presidential Decree No 190/1983, falling under the Ministry of Agriculture. 2. The GAFRD, has the right to lease all lands within 200 m of shorelines for aquaculture and fisheries activity. In addition, it deals with the renting of land allocated for the establishment of fish culture and hatcheries. 3. A Committee of the Authority is responsible for defining areas suitable for fish farming and hatcheries, and for dividing them into economic units for leasing.

		and other poisonous and radioactive materials in the Egyptian waters.	
Law 122/1980 (amended in 1981)	Establishment of agricultural cooperatives	➢ Crediting the cooperative's member's with money according to the needs of land possessed. ➢ Providing the cooperative's member's with all agricultural requirements including seeds, fertilizers and agricultural mechanisms and facilities. ➢ Helping the cooperative's members to organize their lands through seed selection, crops classification and digging canals and drainage ditches. ➢ Marketing main crops for the cooperative's members. ➢ Performing all the required agricultural services for the cooperative's members as well as social services.	1. The ministry of agriculture supervises, directs and verifies the application of laws, bills and financial and administrative instructions of the cooperatives. 2. The State provides the technical and financial aids for the cooperative through the concerned administrative authority. 3. Following-up of cooperative activities for cooperative structural units, setting up cooperative policies and the implementation programs for these policies. 4. Providing services in the field of training, research, statistics and extension for affiliated units.
Law 96/1992	Amended the relation between landowners and tenants of agricultural land.	➢ Liberalization and improving the relation between landowners and tenants. ➢ Activation of land market considering the agricultural land as a commodity, and bringing the land market and farmers to interact with the free market mechanisms. ➢ Increase agricultural production efficiency.	Provide a five year as a transition period for implementing the law (1992-1997).

Conclusion

It can be concluded from table 2 that laws and regulations need to be assessed and modified to future challenges such as increasing water demand. Modification raised by MWRI include marginalize the use of water, and involvement of private sector and water users in water management aspects. Modification also included raising the fine against violations of water management regulations.

1.3. Policies & processes

There are several policies which govern the water and agriculture sectors at all levels. Examples include the Participatory Irrigation Management PIM (1984), Institutional Development and Organizational Strengthening (2000), strengthen water management to improve the efficiency of water use (1975), Horizontal Expansion Policy and Plan (1994), National Water Resources Plan (2005), Water Resources Supply Management Vision for 2050, 1980s Agriculture Development Strategy, 1990s Agriculture Development Strategy, Agricultural Development Strategy towards 2017, and Agriculture Development Strategy towards 2030.

Water policy in Egypt hinges on three major pillars; (i) water conservation and rationalization pillar, (ii) water supply augmentation and (iii) elimination the pollution of water resources.

The first pillar focuses on raising water use efficiency through rehabilitation of water structure and the canal networks, participatory water management and crop substitution. The second pillar focuses on increasing the water supply to Egypt through cooperation with Upper Nile countries. The third pillar targets the prevention of water pollution through integrated planning involving related stakeholders. Table 3 presents water policies grouped in different categories to meet the three pillars.

Table 3: Step 1.3 Mapping of policies and strategies involved in agricultural water management in Egypt

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
A) Irrigation Sectors: Participatory Irrigation Management, PIM, 1984	➢ Formation of WUAs at the mesqa level for operation and maintenance (O&M) of improved mesqas.	➢ Law 213 for year 1994 was issued to support this policy.
	➢ Formation of BCWUAs.	➢ The central directorate for water resources in each governorate was mandated to issue a decree for establishment and organization of BCWUAs. ➢ Development of guidelines for BCWUAs formation and operation.
	➢ Pilot study to transfer operation, maintenance and management of branch canals to the BCWUAs and/or the private sector.	➢ PIM implemented in 5 pilot canals.
Institutional Development and Organizational Strengthening, 2000	➢ Decentralizing water management and focusing on integrated district-level coordination and management. ➢ Enable the MWRI to make the most efficient use of water from all sources. ➢ Integrate all sources of water into district-level management decisions thereby increasing production per unit of Nile system water.	➢ Established more than 60 IWMDs.
	➢ Strengthen the participatory water management through strengthening the role of the governmental units concerning with irrigation advisory service.	➢ Transformation of the Irrigation Advisory Service (IAS) from an extension unit of IIP to a Central Directorate under the MWRI Irrigation Department.
	➢ Coordinate institutional reform at strategic and operational levels and support private sector participation initiatives.	➢ Established Institutional Reform Unit in the MWRI.
	➢ Revise existing water laws to take into account current Government of Egypt (GOE) policies and to improve the	➢ A draft revised law 12 is prepared for approval of parliament.

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
	ability of MWRI to mitigate the increasing water demand.	
	➢ Develop and implement a national policy for water quality management in cooperation with the other relevant institutions inside and outside the MWRI.	➢ Established the Central Water Quality Unit in the MWRI.
Strengthen water management,1975	➢ Substituting short-duration for long-duration rice varieties to save irrigation water.	➢ Short duration rice varieties have been introduced in all governorates that are permitted to grow rice. ➢ New irrigation rotations were developed and adapted for these varieties.
	➢ Increasing the reuse of water from intermediate drains to augment irrigation supplies.	➢ Irrigation sector is mandated to install and operate these drainage water reuse pumps.
	➢ Matching irrigation water deliveries with water demands by crop.	➢ MWRI establish a system to improve the exchange of real-time information with MALR with respect to irrigation demands and supplies.
	➢ Improve water monitoring systems.	➢ Established a real-time water monitoring systems uses telemetry technology on major sites on the canals and Nile River.
Horizontal Expansion Policy and Plan, 1994	➢ Reclaim and cultivate area of 1.43 million ha to 2017. ➢ Provide these new areas with industrial communities.	➢ Horizontal Expansion Sector of MWRI is mandated to implement this policy in coordination with MALR related institutions.
National Water Resources Plan (NWRP), 2005	➢ Develop the National Water Resources Plan (NWRP), that describes how Egypt will safeguard its water resources in the future, both with respect to quantity and quality, and how it will use these resources in the best way from a socio-economic and environmental point of view. The objectives are: ➢ Securing water for people (particularly for drinking). ➢ Securing water for food production. ➢ Secure water for industry, services and employment.	➢ Developed a national framework that defines the environment for the relevant stakeholders. ➢ Developed mitigation measures to be implemented by stakeholders. ➢ Developed a timetable of investments for all stakeholders. ➢ Set up an institution to follow up implementation of the plan.

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
	➢ Develop a strong institutional framework. ➢ Creating popular awareness and understanding. ➢ Protection and restoration of vital ecosystem. ➢ Cooperation with Nile Basin countries. ➢ Stimulating the political will to act.	
Water Resources Supply Management Vision for 2050	➢ Making the best agricultural, social and environmental use of the available water resources by means of irrigation improvement and changing crop patterns. ➢ Applying Integrated Water Resources Management approach through developing governmental and non-governmental institutions as well as enforcement of laws and legislations. ➢ Allocating different conventional and non-conventional water resources (agricultural drainage and wastewater reuse, sea water and brackish water desalination, rain harvesting, flash flood harvesting). ➢ Cooperation with the Nile Basin countries. ➢ Supporting and enhancing the private sector role in water management. ➢ Pollution abatement and preserving water resources.	A draft vision is being revised.
b) Agriculture sector: 1980s Agricultural Development Strategy "Liberalization of the agricultural sector".	➢ Developing the pricing policies as a means to reallocating resources and providing incentives to the farmers for raising their productivity. ➢ Reducing discrepancy between individual objectives and societal objectives. ➢ Liberalizing the agricultural from central decision-making. ➢ Finding solutions to short-term problems such as salinity and alkalinity. ➢ Developing irrigation systems particularly in the newly reclaimed areas.	➢ Establishment of pricing policies that ensures equity, economic, and financial objectives. Removal of government constraints on private sector practices in imports, exports and distribution of farm inputs to compete with Principal Bank for Development and Agricultural Credit (PBDAC). ➢ Removal of government constraints on private sector practices in importing and exporting agricultural commodities.

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
	➢ Institutional development. ➢ Development of human resources needed for the achievement of the targeted growth rates for the agricultural sector. ➢ Developing the agricultural extension services, research and credit systems.	➢ Gradual transformation of (PBDAC) into financial institution. ➢ Selling public ownership of the new reclaimed land to private enterprises, either individuals or companies.
1990s Agricultural Development Strategy "Completion of the economic reform program in the agricultural sector, increasing the value of agricultural exports to EGP50 billion, and raising the annual growth rate to 3%".	➢ Cotton liberalization (production/marketing/exportation). ➢ Promoting agricultural research. ➢ Increasing agricultural exports. ➢ Reviewing the policies and standards applied in selecting the beneficiaries for the distribution of the newly reclaimed lands. ➢ Facing the problem of building on agricultural lands. ➢ Maximizing the return of the water use and improving on-farm irrigation practices. ➢ Achieving complimentarily between field extension services and available technical expertise. ➢ Reducing the size of staff in the Ministry of Agriculture and Land Reclamation. ➢ Finalizing the arrangements for the non-interference of the Agricultural Development and Credit Bank in the procurement and distribution of agricultural inputs.	➢ Liberalization of the agricultural land market. ➢ Increased agricultural productivity and exports.
Agricultural Development Strategy towards 2017 "Achieving self-sufficiency in cereal crops and raising the annual growth rate to 4.1%, as well as continuing the land reclamation program at an annual rate of 150'000 feddans".	➢ Switching towards the functional decentralization of water management. ➢ Establishing mechanism for recovering part of the irrigation cost services and maintenance of facilities. ➢ Addressing the problem of encroachment on the agricultural lands. ➢ Achieving self-sufficiency in strategic crops. ➢ Regularization of water user associations and the delimitation of areas plated to rice and sugar cane.	➢ Investment in land and water resource management.

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
	➢ Developing the agricultural credit policy.	
Sustainable Agriculture Development Strategy towards 2030 (SADS) "Revision of development programs and their objectives, given special attention to the challenges facing agricultural development efforts, as well as execution modalities that would help achieve the greater part of its objectives, should there be a will to change and working potentialities and requirements".	➢ Rationalization of water resources use policy: ➢ Enhancing water-use efficiency in irrigated agriculture. In spite of water scarcity and the fact that Egypt's share in the Nile waters is predetermined, water-use efficiency is low, due to high water losses. Water conveyance efficiency is estimated at about 70 percent, and the mean efficiency of field irrigation systems is estimated at only 50 percent. Hence, one of the main components of the agricultural development strategy is to achieve a gradual improvement of the efficiency of irrigation systems to reach 80 percent in an area of 8 million feddan, and to reduce the areas planted to rice from 1.673 million feddan (2007) to 1.3 million feddan by 2030 in order to save an estimated 12.4 billion cubic meters of water.	➢ Raising the efficiency of field irrigation systems from around 50 percent to 80 percent by the year 2030; ➢ Saving the greatest possible quantities of water, through laser leveling, drought tolerant and short duration crop varieties, and modern irrigation systems, to be used in reclaiming and development of new areas. It is estimated that saved volume of water would be enough to add some 3.1 million feddans (1.3 million ha) by the year 2030; ➢ Raising water productivity in cultivating different crops; ➢ Reviewing tax policies related to agricultural land, with a view to amending them so that tax assessment should be based on the area under cultivation, the cropping pattern and the applied irrigation method; ➢ Introducing new concessional credit lines to encourage farmers to improve field irrigation systems; ➢ Improving the performance of government institutions responsible for the assessment and collection of agriculture taxes; and ➢ Granting tax exemption to farmers adopting improved irrigation systems and the proposed cropping pattern.

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
	➢ Sustainable expansion of reclaimed areas. Reclaiming areas is one of the main pillars of the strategy. This can be achieved by using the water saved through improving field irrigation conveyance systems in reclaiming additional new areas estimated at 1.25 million feddan by 2017 and about 3.1 million feddan by 2030.	➢ Land reclamation maps should include all necessary elements for the development and settlement of new communities; ➢ Small farmers in the newly-reclaimed areas should form voluntary institutions, with the state providing needed support to enable it to carry out their role. ➢ Preparing a framework for investment opportunities in agricultural projects and other related and complementary projects; and, if needed; ➢ Introducing new confessional credit lines for reclaiming and developing new areas.
	➢ Sustainable development of land and water productivity: Please.	➢ Designing and implementing extension campaigns to achieve this purpose; ➢ Providing support and credit facilities that would attract farmers to adopt modern irrigation systems and acquire the necessary equipment and requisites; ➢ Strengthening quality controls and supervision equipment used in modern pressurized irrigation and surface irrigation systems, as well as on their marketing and importation and encouraging investments for producing such equipment locally; ➢ Strengthening research in the field of planning and designing modern irrigation systems recommended for each crop and each environment; and ➢ Strengthening the legal and supervisory roles on the application of pressurized systems (sprinkler

Policies Goal/Mission/Principle	Specific objectives	Measures to attain targets
		and localized irrigation) in the new lands and in desert lands. ➢ Preparing national business plans for agricultural research by the ARDC to identify required research programs and projects, the necessary budgets and execution procedures; ➢ Reviewing the salary structures of researchers, ARDC and cooperating institutes and universities; ➢ Preparing cooperation protocols and agreements between the ARDC and the universities in executing the planned research projects. Such protocols and agreements should be periodically reviewed and evaluated; ➢ Exploring possible sources of finance for supporting research budgets including competitive grant funding; ➢ Preparing and executing intensive programs for the training of extension workers in the different specializations; ➢ Reviewing working procedures with a view to their development and for exercising coordination within the extension system, as well as with research; ➢ Strengthening the agricultural communication and information entity in the MALR through providing adequate human and financial resources; and ➢ Providing appropriate support to encourage cooperative organizations and promote the concept of integrated action.

CONCLUSIONS

I. Institutions responsible for water management, legislation, and policies related to water use in agriculture

I.1. Ministry of Water Resources and Irrigation (MWRI) and related institutions:

There are several institutions and actors involved in the water management process in Egypt. MWRI is the leading official government entity mandated to develop and manage the water sector. The water distribution system bifurcates from the Nile River down to main canals, secondary canals, tertiary canals (or so called "Mesqa"), and ending with the farm-level irrigation system. The jurisdiction/mandate of the MWRI extends from the Nile River down to the main- and secondary-canal levels, as water assets are publicly/state owned down to the secondary-canal level.

The MWRI is in charge of water resources research, development, and distribution. It undertakes the construction, operation, and maintenance of irrigation and drainage networks. It is also responsible for the specifications and permits for groundwater drilling.

I.2. Ministry of Agriculture and Land Reclamation (MALR) and related institutions:

The MALR is in charge of agricultural research and extension, land reclamation, fisheries, and animal wealth development.

Local Community Development Societies established under the Law 84/2002 regulating the establishment of non-governmental organizations and societies not related to the MALR.

I.3. other national institutions:

- Ministries of Finance, Electricity and Energy, Housing, Utilities and New Communities, Investment, and Ministry of Information;
- Egyptian universities in different regions, private sector bodies, the Public Authority for Geological Survey, Advisory and Consultancy entities, the National Investment Bank, and other National and Foreign Banks;
- Egyptian Syndicates;

- Academy of Science and Technology;
- National Research Center.

II. Laws and regulations concerning AWM

Water management is a critical element in Egypt's economic viability. In order to be effective and support the GoE, water policy and water management require a basic legal structure. This will provide all relevant agencies and stakeholders with guidelines and instruments for planning, new development interventions, water allocation and deliveries, and operational management and maintenance of the irrigation system.

Laws are regulatory formulae governing the relations among individuals or between the state and the citizenry. They define rights and obligations under the specific circumstances in which they were enacted and enforced. Therefore, these laws always require evaluation and rectification over time to keep abreast with change, to fill-in a loophole, or to cope with the changing nature of human beings.

III. Policies and strategies concerning AWM

The main goal of water policies are to improve water use efficiency to meet the increasing water demand. The more pressure added to water management result in deterioration of water quality. Therefore, water policies are formulated in an integrated manner.

STEP 2 – DIAGNOSTIC EXERCISE: ASSESSING PERFORMANCE OF INSTITUTIONS, LEGAL FRAMEWORKS & POLICIES

This section covers on governance issues and analyzes effectiveness and efficiency of legal, policy and institutional frameworks and processes of AWM in Egypt. In this analysis, a number of key issues are identified including actions and reforms needed to improve the performance of the agricultural water sector.

This analysis was guided by a set of questions based on both quantitative and qualitative indicators and is organized in in Tables 2a and 2b. This has led to the assessment of major capacity and effectiveness bottlenecks and opportunities for strengthening institutions, legal environment and policies, as well as readiness and resistance to change by the different institutions or actors.

The assessment also includes broad indications (effectiveness, capacity and governance dimensions) on the balance or relation between formal and informal aspects within the water sector; and on the internal and external power relations empowering such systems. Step 2 thus allows to identify inputs and outputs getting in or out of the sector and to assess whether these are adequate.

2.1 Institutions and actors

Assessing institutions' performance involves a careful appraisal of its ability to perform specific functions (as described in Table 1.1) as well as solve problems in the AWM sector. This requires the: (i) assessment of the effectiveness of institutions in complying with their mandate/functions/areas of responsibility, (ii) assessment of the human/financial/technical capacity of institutions and actors, and (iii) analysis of the governance and stakeholders relationships. Given the complexity of this task, an assessment was done on the most relevant institutions already outlined in Table 1.1 above.

Table 4: Step 2.1.a. Assessing the performance of institutions

Institution / Function	Effectiveness		Capacity			Governance dimensions		
	Quantitative	**Qualitative**	**Human**	**Financial**	**Technical**	**Institutions & stakeholders governance relationship**	**Dynamics of relations between different levels within institutions**	**External actors' influence**
Ministry of Water Resources and Irrigation (MWRI)	➢ Providing subsurface drainage to agricultural land for more than 5.2 million feddans ➢ Total canal length more than 33000 km ➢ Total drain length more than 18000 km ➢ total irrigated area is about 8.5 million feddans ➢ improved irrigation systems in more than	➢ Improved operation and maintenance programs ➢ Improved water monitoring systems ➢ established information center	Sufficient personnel	Insufficient	Technical capacities to perform mandates are available	Need to be strengthened	Good	Significant influence particularly ministry of housing, ministry of electricity

Institution / Function	Effectiveness		Capacity			Governance dimensions		
	Quantitative	**Qualitative**	**Human**	**Financial**	**Technical**	**Institutions & stakeholders governance relationship**	**Dynamics of relations between different levels within institutions**	**External actors' influence**
	0.5 million feddans ➢ More than 22000 water structures.							
National Organization for Potable Water and Sanitary Drainage; (NOPWASD)	➢ Coverage of potable water in Egypt is 100% ➢ Coverage of sanitation is 50%	➢ Installed holding companies for potable water and sanitation ➢ improved service ➢ installed complaint system and database	Sufficient personnel	Insufficient to expand the coverage of sanitation and treatment of sewage disposal	Technical capacities to perform mandates are available	Need to be strengthened	Good	Significant influence particularly from MWRI to rationalize the use of drinking water and to treat sewage disposal so that water quality can be improved
Egyptian Environmental Affairs Agency; (EEAA)	➢ 72 Factories have been stopped releasing disposal to the Nile (94% of factories) water	➢ increased Environmental awareness ➢ establishment of central and local laboratories to assess the pollution levels	Sufficient personnel	Insufficient to support the program of development of small enterprises to reduce pollution	Technical capacities to perform mandates are available	Need to be strengthened	Good	Significant influence particularly from urban and rural slums

Institution / Function	Effectiveness		Capacity			Governance dimensions		
	Quantitative	**Qualitative**	**Human**	**Financial**	**Technical**	**Institutions & stakeholders governance relationship**	**Dynamics of relations between different levels within institutions**	**External actors' influence**
	disposal along ➢ Construction of 8 factories to produce fertilizers and biogas from agricultural wastes	in water, air and soil ➢ preparation of National Strategy for Environment						
Ministry of Electricity and Energy; (MoEE)	➢ Established three hydropower station in barrages along the Nile over the period 1995-2015	➢ Conduct studies for installing minim hydropower that can work on low-head water flow to generate clean energy	Sufficient personnel	Lack of finance to expand the installation of Mini hydropower	Technical capacities to perform mandates are available	Need to be strengthened	Good	➢ Significant influence from MWRI to find suitable models of mini-hydropower that don't conflict with water allocation programs ➢ Operation of hydropower has conflict with operation for AWM
The River Transport	➢ Construction of 2 new	➢ Improved river transport	Sufficient personnel	Insufficient to remove	Technical capacities	Need to be strengthened	Good	Significant influence

Institution / Function	Effectiveness		Capacity			Governance dimensions		
	Quantitative	**Qualitative**	**Human**	**Financial**	**Technical**	**Institutions & stakeholders governance relationship**	**Dynamics of relations between different levels within institutions**	**External actors' influence**
Authority (RTA)	Navigation Locks	through removing the river bottlenecks along the Nile and Nobaria canal to increase the tonnage transported to/from Alex Port		bottle necks from the river and develop Nile transport	to perform mandates are available			particularly from MWRI to match with the available water in the Nile. MWRI doesn't release additional water for river transport.
WUAs at Mesqa level	About 10000 WUAs formed which still very low. It is less than 5%	Improve water management and allocation at farm level	sufficient for the board but no technical staff	Limited	limited	Need to be strengthened	Good	No external actor
(BCWUAs)	About 1200 BCWUAs formed	Improve water management and allocation at branch canal level	sufficient for the board but no technical staff	Limited	limited	Need to be strengthened	Good	No external actor

Table 5: Step 2.1.b. Assessing the performance of institutions (MALR)

Institution	Functions under performing	Problems associated with underperformance	Causes of the problem (Capacity, Governance, etc.)
Ministry of Agriculture and Land Reclamation	1. Optimize the policy of liberalization and demand management	➢ The economic liberalization era has led to noticeable shortcomings in market management and organization, leading to more market distortions that harmed producers and consumers while benefitting middlemen thus leading to unfair distribution of development returns. ➢ International and regional backgrounds have experienced many changes; most important was the international trend towards future liberalization of agricultural trade, at a time of increasing food prices and supply disruption.	➢ The institutional structure of agricultural sector is highly complex and characterized by duplicative, overlapping duties and responsibilities in some cases, and the absence of institutional structure in others. ➢ There are some institutional frameworks that lack the appropriate mechanisms for carrying out the assigned tasks, while some other entities carry out tasks incompatible with their structure and basic functions. ➢ Poor marketing information systems and the absence of an institution responsible for marketing issues.
	2. Enhancing water-use efficiency in irrigated agriculture	➢ Water resources available in Egypt fall short of requirements (water poverty), population and food requirements increases. ➢ Increasing agricultural areas through land reclamation and doubling the productivity of some basic crops. ➢ Achieving an appropriate of vertical agriculture development (Increasing productivity per unit area). ➢ Implementing a voluntary change in the cropping pattern. ➢ Water allocation problems and the illegal growing of rice crop and other high water consumption crops.	➢ High water losses through conveyance, distribution and field application systems. ➢ The use of developed irrigation systems is not expanded and adopted. ➢ Absence of combatable cropping pattern applied in each agriculture zone. ➢ Limited and weak coordination between the different agricultural research institutions. ➢ Weak linkages between research topics and practical field application. ➢ Reduce research budget. ➢ Lack of cooperation between research institutions. ➢ Absence of irrigation advisory services system at region and farm level.
	3. Sustainable expansion of land reclamation	➢ Reclaiming wide areas and land productivity has declined. ➢ Contradictions and shortcomings in land reclamation policies.	➢ Weak coordination among many agencies responsible for the allocation of reclaimed areas.

Institution	Functions under performing	Problems associated with underperformance	Causes of the problem (Capacity, Governance, etc.)
		➢ The distribution system failed in establishing viable communities capable of settling in the newly reclaimed lands. ➢ There is a pressing need for expanding agricultural land in order to address the problem of an increasing rural population density, and reduce the implications of the world food crisis on the economic and social conditions in Egypt.	➢ No attention was given to the provision of agricultural and social services necessary to establish settled agricultural communities. ➢ Expansion objectives of reclaimed areas have been identified without paying greater attention to water-use rationalization policies and producers. ➢ Allowing the use of groundwater in areas for which adequate studies have not been made for ensuring the sustainability of groundwater resources. ➢ The weakness of implementation and follow-up mechanisms. ➢ Lack of consistency between strategies and execution plan.
	4. Sustainable development of land and water productivity	➢ The cropping area increased. ➢ Agricultural sector liberalization. ➢ Addressing the problem of holding's fragmentation. ➢ Existence of many information-producing agencies and weak coordination between them. ➢ Databases are scarcely used in decision-making.	➢ Lack of coordination between the concerned institutions. ➢ Water supply is not flexible and the rate of water use efficiency is too low. ➢ Weak linkages between research and extension services. ➢ Weak performance, limited capabilities and continued erosion of agricultural extension system staff structure. ➢ Limited human resources.
	5. Maximizing the sustainable return of rain fed agriculture	➢ Low rates of rainfall and the effective rainfall is low due to evaporation. ➢ Lack of improved water harvesting techniques and the supplementary irrigation tools. ➢ Investments needed are not available and very limited. ➢ Weak performance and limited capabilities of the existing agricultural extension services. Absence of coordination and linkage between the concerned institutions and settlements.	➢ Land and water resources are very limited. ➢ Harsh climate conditions. ➢ Limited human resources and weak information infrastructure. ➢ Lake of infrastructure and facilities in rain fed areas. ➢ Lack of specialized environmental extension services and efforts in rain-fed areas.

Institution	Functions under performing	Problems associated with underperformance	Causes of the problem (Capacity, Governance, etc.)
	6. Maintaining and protecting agricultural land.	➢ Continued encroachment on agricultural land diverting it from agricultural to non-agricultural uses, and continued degradation of soil fertility in large agricultural areas. ➢ Land productivity has declined. ➢ Land fragmentation and scattering of agricultural holdings increased. ➢ Absence of continued restoration and maintenance of agricultural drainage system. ➢ Soil salinity increased.	➢ Addressing the problem of land fragmentation. ➢ Increase encroachment on agricultural land. ➢ Weak law enforcement for protecting the agricultural land. ➢ Continued degradation of soil fertility, in addition to rising groundwater level. ➢ Inefficient drainage system.
	7. Improving agricultural productivity.	➢ High pre- and post-harvest losses. ➢ Low level of agricultural industrialization. ➢ Inflexibility of the applied traditional marketing systems. ➢ Scarcity of contract farming. ➢ Quality deterioration. ➢ Impact of climate change on agricultural productivity. ➢ Soil salinity and water shortage as well as poor farm management systems.	➢ Limited agricultural investment and the inflexibility of credit policies. ➢ The probable rise in sea water level and its negative effects on agricultural land productivity. ➢ Institutional weakness and absence of coordination between the concerned institutions. ➢ Conventional seed and seedling production systems. ➢ Conventional financing systems.
	8. Achieving higher rates of food security in strategic goods.	➢ Population increase. ➢ Shortage of development programs, institutional reform, and the introduction of new policies. ➢ Increasing the pre- and post-harvest losses. ➢ Food quality and safety decreased (inefficient). ➢ Weak government role in regulating agricultural input and output markets and instability of agricultural products markets.	➢ Poor consumption patterns and poor nutritional standards and vital bodily functions. ➢ Lack of detailed policies and work programs to improve marketing efficiency. ➢ Absence of updating food standards of agricultural commodities and products as well as weak laws and control arrangements to enforce standards and improve consumer safety measures. ➢ The absence of an institution responsible for addressing marketing issues.

Institution	Functions under performing	Problems associated with underperformance	Causes of the problem (Capacity, Governance, etc.)
	9. Opportunities for agricultural investment.	➢ Some restrictions and problems are still prevailing which reduce the positive impact of the newly enacted laws. ➢ Absence of map for where to invest in agriculture, defining areas assigned to the different types of investments (especially in land and water). ➢ Reduced public investments in the agricultural sector, particularly in irrigation and drainage projects. ➢ Absence of physical foundations in areas intended for settlement and agricultural investment, including needed infrastructures and services.	➢ Absence of a single entity for the allocation of areas suitable for agricultural investments. ➢ The complexity of agricultural investment procedures, particularly in land reclamation, due to the multiplicity of government agencies and institutions handling agricultural investments and the weak coordination between them. ➢ Lack of coordination between horizontal expansion policies. ➢ The existence of many and contradictory laws regulating agricultural investments. ➢ Lack of the necessary means of electronic information databases.
	10. Improving livelihoods of rural inhabitants.	➢ Increasing encroachment on agricultural land. ➢ Conventional applications in most of production activities. ➢ Increasing poverty, illiteracy and poor standard of living in the rural areas. ➢ Lack of diversifying job opportunities and economic activities. ➢ Absence of developed small farmers' institutions linked to a market.	➢ Fragmented holdings of less than one feddan increased gradually. ➢ Challenges facing the marketing of agricultural products. ➢ High rate of unemployment prevailing in rural communities. ➢ Decreasing role of women and small farmers in the different rural development areas.
	11. Increasing farmers' participation in the management of irrigation systems.	➢ Excessive water losses from irrigation system. ➢ Crops diversity within areas served by one canal. ➢ Increasing in agricultural water demands. ➢ Water-use efficiency in agriculture worsened. ➢ Absence of farmer services (Water User Associations, irrigation advisory services, and agricultural extension services). ➢ Lack and shortages of farmer training.	➢ Absence of a mass media campaign to popularize modern field irrigation systems. ➢ Lack and shortage of extension campaigns to achieve this purpose. ➢ Lack of support and credit facilities. ➢ Lack of research, legal and supervisory roles. ➢ Fragmentation of holdings. ➢ Water user conflicts and poor water system management.

CONCLUSIONS

It can be concluded that institutions perform well. However, the conflict between different organizations on the use of water is evident. NOPWASD is the most relevant institution for water management.

Furthermore, the increase in water abstraction for drinking affects water availability for other sectors such as agriculture.

This problem becomes more serious when the disposed water from sewage reaches the drainage canals and therefore water in drainage canals cannot be reused due to pollution.

It can also be observed from the table that the institutions have sufficient human resources, sufficient capacity to do the job, and sufficient governance and relations capacities with stakeholders.

However, a lack of financial capacity is the critical factor that affects the performance of the institutions.

The institutional structure of the agricultural sector is highly complex and characterized by duplicative, overlapping duties and responsibilities in some cases and the absence of an institutional structure in others. In addition, there are some institutional frameworks that lack the appropriate mechanisms for facing out the assigned tasks, while some other entities carry out tasks incompatible with their structure and basic functions.

The institutional structure of the MALR comprises entities for planning, production, services and research functions. It is only natural that undertaking all these functions by the Ministry impedes the private sector and the civil society from carrying out some of these functions. For example, the Central Seed Department producers seed at the commercial level, a situation that limits the growth of this industry to the capacities of the ministry.

The mechanical cultivation units provide a negative effect on institutional structure at subsidized prices, the services of deep sub-soil ploughing, adding agricultural gypsum, laser leveling, and the use of drillers. This mechanical system has reduced the services of the private and cooperative sectors, and consequently restricted the level of mechanical cultivation.

Interference by the ministry, represented by the Central Department for Cooperation, in the functioning of the cooperatives, as well as the encroachment by the Principal Bank for Agricultural Development and Credit (PBADC), has reduced cooperatives to entities incapable of active participation in agricultural development.

The PBADC is a manifestation of incompatibility between the purpose for which the bank has been established (financing agricultural activities) and its actual activities in marketing production inputs and receiving some of the produce on behalf of the General Authority for Supply Commodities.

2.2. Legal and regulatory frameworks

Assessing the policies and processes means analyzing their ability to attain the specific targets described in Table 6, and to solve problems in the agricultural water sector.

This analysis includes: (i) assessment of the effectiveness of the current policy environment, and (ii) assessment of the governance dimensions of policies. The analysis looks into formal/informal aspects and readiness for reform/dialogue/compromises with respect to a specific policy. In addition, aspects of factors such as power, influence, trust, corruption, interest groups were also taken into consideration.

To simplify the analysis, the effectiveness of the policy framework was appraised by looking at major strengths and weaknesses of policies in relevant sectors (e.g. water, energy, agriculture, and land) and a well as plans and strategies (e.g. Agricultural Development Strategy and Water Master Plan).

Table 6: Step 2.2.a - Assessing the performance of legal & regulatory frameworks (MWRI)

Primary Legislation	Specific Targets	Effectiveness		Governance dimensions		
		Strengths	Weaknesses	Formal/Informal	Readiness to change	Resistance to change
Law 12/1984	➢ Improve the water management and water use efficiency ➢ Regulates the use of groundwater and agricultural drainage water ➢ Protection against flash flooding ➢ Legislates the inland navigation ➢ Legislates coastal protection ➢ Improve surface irrigation systems in the old lands ➢ Define and determine penalties for the violations of the law and by-Laws concerning water resources	➢ Full recovery of sub-surface drainage cost by farmers ➢ Improved water delivery and usage efficiency, and more efficient drainage performance ➢ Capability to better enforce laws related to water allocation, irrigation and drainage	➢ Legal Structural Issues are not enough and need to be redefined ➢ Process of permits is inadequate ➢ The law determining the relationship between landowner and tenant need to be defined in the law 12 ➢ Lack of definition of participatory water management ➢ Lack of definition of integrated water resources management ➢ The penalty fines are too small to compensate the negative impacts ➢ Lack of encouraging the establishment of private companies for the management, operation, and maintenance of irrigation and drainage networks	Roles and responsibilities in agricultural water management are well defined and implemented. But dealing with informal institutions is not addressed	Yes The law is being revised	No
supplementary Law 213/1994	➢ Improving the on-farm irrigation in the old	➢ Increased participation in water	➢ Slow rate of improving irrigation in the old lands	Formal roles and responsibilities for farmers are	Yes	No

	lands, where IIP is implemented ➢ Authorize mesqa-level WUAs to charge, collect and spend money on the operation, maintenance and administrative costs for their members ➢ Maintenance of Private Mesqas and Drains ➢ Formation of WUAs in the New Lands	management in new lands ➢ - Increased public awareness in the field of water use	➢ Less involvement of water users in O &M in old lands	legalized in agricultural water. Relation with governmental bodies was also determined.	The law is being Revised	
Law 48/1982	➢ Regulates the drainage of liquid waste, including effluents from public, commercial and industrial entities into water bodies ➢ Classifies types of waterways and regulates the discharge of waste water into these waterways ➢ It prohibits discharges to the Nile, canals, drains, and groundwater without a license issued by the MWRI ➢ Define the responsibilities of stakeholders towards the water pollution control	➢ The Executive Regulation of the law was Issued ➢ Developed water quality standards to be followed	➢ Promoting pollution prevention audits ➢ Foster cooperation among ministries with related missions	Roles and responsibilities in agricultural water management are well defined and implemented. But dealing with informal institutions is not addressed	Yes The law is being revised	No

	➢ Issue the Executive Regulation of the law after consultation with other concerned ministries ➢ Monitor the pollution sources and take actions according to the law to stop pollution					
Law No. 4/1994Amended by Law 9/2009	➢ EIA should be undertaken for new establishments/projects and for expansions/renovations of existing establishments before construction. The law considers the EIA as a main condition for licensing ➢ Develop regulation of air pollution, hazardous waste management, and marine pollution	EIA is considered in all water resources management project	The relation between law 48 and law 4 is not clear	Roles and responsibilities in agricultural water management are well defined and implemented	Yes	No

Table 7: Step 2.2.b - Assessing the performance of legal and regulatory frameworks (MALR)

Primary legislation	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
Low 93/1962 (controls the reuse of wastewater in agriculture)	1. It is prohibited to harvest yields, which were irrigated with a treated wastewater.	➢ Low agricultural yields. ➢ Contamination rates have reached unacceptable levels in some agricultural areas, and had negative effects on the ability of these areas to produce safe feed.	➢ (E): provisions were not introduced to farmers to improve quality of available water for agriculture. ➢ (G): water contamination levels are still high in some areas, particularly in the tail end of irrigation canals.
	2. It is prohibited to use treated wastewater, primary or secondary treated, to irrigate cattle pasture.	➢ Negative impacts on both quality and quantity of animal production (milk and meat), and on the health of agricultural workers.	➢ (E): the present regulations and there adaptations area weak. ➢ (G): strict enforcement of the present regulations.
	3. Specification of the irrigated lands-criteria for types of plants for each type of wastewater treatment - environment and health.	➢ Coordination between ministries and institutions involved in treatment and distribution of water and wastewater in insufficient. As a consequence, investments in treatment or reuse pump stations do not always lead to the optimal benefits. ➢ Implementation and enforcement of laws and regulations are ineffective, and generally more aimed at the letter of law than the purpose of the law. As a consequence, proposal of limited treatment have not given permits, continuing the situation of no treatment in some places. ➢ Increased reuse will bring more polluted water into the irrigation canal system.	➢ (E): information dissemination is insufficient. Data are rarely distributed outside the collected agencies. As a consequence, many ministries and institutions have to work without sufficient insight in the actual status of the system. ➢ (G): reduced flows in the Nile (due to increased demand in Toshka, Upper Egypt, and other horizontal expansion areas) and drains (due to increased efficiencies and reuse) will lead to less dilution of the loads and will thus lead to increased concentrations. ➢ (O): increased population and industrial production will increase the loads of pollutants to the system. In addition to increases in industrial and domestic loads are expected to grow as a result of

			increase agricultural area and intensification of agricultural production. ➢ (E): the lack of sufficient financial resources is limiting the implementation of measures. ➢ (G): problems with cost recovery limit possibilities of implementing BOT and other involvement of the private sector in financing measures.
Law 142/1983 (aquatic life and regulating fish farms)	1. Only brackish and marine, and infertile land that is not suitable for agriculture can be used in aquaculture. 2. Water supply should be restricted to water from lakes and drains, the use of fresh water (i.e. canal water) is prohibited. 3. Prohibits the disposal of any industrial wastes, insecticides, and other poisonous and radioactive materials in the waterways.	➢ The productivity is biologically poor, thus it is poor for fish stocks, due to the non-utilization of fisheries resources in the Exclusive Economic Zone, and fishing effort has been confined to limits of the continental shelf resulting in the decline of fish stocks. ➢ Illegal and unregulated fishing of fingerlings instead of relying on the production on nurseries. Less rates of fingerlings amount to more than 90% during fishing and handlings. ➢ Over-fishing is a problem affecting stocks availability. ➢ The relaxed application of fishing laws in addressing the illegal fishing methods and gear, in addition to unregulated, recreational and tourist fishing, unregulated sewage treatment and the lack of strict controls over the drainage of the tourist villages and the contamination resulting from oil wells and commercial vessels. ➢ Lakes are used for the disposal of agricultural and industrial drainage	**Effectiveness:** ➢ Weakness (lack) of supporting and developing the Aquatic Resources, Cooperative Association. ➢ Absence of laying down an integrated system for the compilation and dissemination of information. ➢ Absence of an effective coordination mechanism for the integrated management. ➢ Lack of the private sector role in production-market chain to streamline efficiency and decrease losses. **Governance:** ➢ The law 142/1983 is not amended and reviewed to introduce needed changes. ➢ The General Authority for Fisheries is not able (shortage) to carry out its responsibilities in monitoring law enforcement, developing and executing extension programs and projects. ➢ No serious efforts have been devoted to the promotion of aquaculture on investment. In addition to some contradictory aspects in aquaculture development policies have created several

		water carrying harmful pesticide residues and other contaminants. ➢ The spread of aquatic plants, particularly reed has reduced the water surface area of these lakes to about 40% of their total areas.	limitation that hider further investments in their fields. **Others:** ➢ Absence of signing fishing cooperation agreements with neighboring countries.
Law 122/1980, amended in 1981 (Establishment of agricultural cooperatives)	1. Providing the cooperative's members with all agricultural requirements and marketing facilities. 2. Performing all required agricultural services for cooperative's members as well as social services. 3. Crediting the cooperative's members according to the needs of land possessed.	➢ The multiplicity of cooperatives, in some cases more than one cooperative in the same village. ➢ Weak financial position of many cooperatives, and their inability to establish economically viable projects. ➢ Unavailability of suitable venues that would allow the staff to effectively carry out their duties, in addition to the unavailability of suitable stores. ➢ The low level of services rendered by cooperatives to their members, and their inability to provide their needs of production inputs and marketing outputs. ➢ Direct government interference in the management of cooperatives. ➢ Inputs provision services are not based on member's needs. ➢ Cooperatives are not engaged in value added services with higher returns. ➢ Cooperatives are not leveraging private sector partnerships. ➢ Services are not offered at the right level and scale.	**Effectiveness:** ➢ Excessive government intervention: ➢ Weak and inefficient structures. ➢ Lack of its own financial institutions. ➢ Lack of trained board members and staff. ➢ Lack of economic scales in marketing. ➢ Lack of women's and youth participation in cooperatives. ➢ Having government-driven mentalities. ➢ Cultural barriers of women's mobility. ➢ Harsh competitive market environment evolving due to fast economic and financial changes in rural areas. ➢ Migration (of youth) from rural to urban areas, and abroad due to lack of employment opportunities. ➢ Strengthened links established by local companies with national and international buyers to capture entire value chain system. **Governance:** ➢ Lack of clear cooperative development policy. ➢ Too many and outdated legislations. ➢ Lack of safety nets (insurance) in rural areas. ➢ Lack of needed-based professional cooperative management training.

			➢ Over Lack of "ownership" at government level. ➢ Insufficient government spending in agriculture. ➢ Continuation of bureaucratic and political interference. ➢ Increased competitive market environment. ➢ More support given to foreign investment and investor-driven companies.
Law 96/1992 (amended the relation between landowners and tenants of agricultural lands)	1. Liberalization the relation between landowners and tenants. 2. Activation of land market considering the agricultural land as a commodity and bringing the land market and farmers to interact with the free market mechanisms. 3. Increase agricultural production efficiency.	➢ Lack of confidence and cooperation between landowners and tenants, with resulting limited attention to land maintenance and increased land deterioration. ➢ A sever imbalance in land market. Rented land prices dwindled to half the price of unrented land. ➢ In collaboration with tenants, many landowners tended to leave their lands as fallow land and offer them for housing use, thus large areas of the best agricultural land have been switched to other non-agricultural uses. ➢ Dwindling investment flow, and consequently dwindling capital formation in the agricultural sector, a fact that has severely affected the potential of developing agricultural-related and complimentary projects.	**Effectiveness:** ➢ Gradual change in rental rates in order to reflect the real market value of land. ➢ Allowing a relatively long transition period for the adjustment of landowner-tenant relationship. ➢ Compensating affected land tenants by trading with land in reclaimed areas at concessional terms, while providing these areas with the infrastructure needs for settlement. ➢ Widening the scope of agricultural mechanization. ➢ The government had frozen the tax assessment on agricultural land, consequently its rental value for more than 40 years.

CONCLUSIONS

1- The main finding from this exercise is that the two main laws are law 12 and law 48. The first law deals with water quantity and water distributions. The second law deals with water quality. The modification of laws is needed to involve water users effectively.

2- Regarding the water legislations, it can be concluded that these legislations have achieved most of its targets. However, due to recent changes in water resources management, these laws need to be modified. Given the major changes in vision and policies, the increasing scarcity of water in Egypt, the anticipated diversion of the Nile water to new lands, and the increased importance of stakeholder participation, the law and its executive regulation need to be carefully reviewed and revised. The MWRI has formulated the proposed draft law in coordination with the governmental authorities concerned with water resources and irrigation affairs, especially, the Ministry of Agriculture and Land Reclamation, the Ministry of Reconstruction, and the local councils. Law 213 only provides for water user organizations above the mesqa level on new lands. Establishment of organizations on old lands above the mesqa level requires modification of the law.

3- In Egypt, water pollution controls were initiated under Law 48, enacted in 1982. Under this law, discharge limits are tied directly to stringent WQS, making full compliance very expensive. The existing low compliance rates are generally believed to relate to: (i) high compliance costs to meet stringent standards; (ii) constrained public and private resources for treatment; and (iii) limited institutional infrastructure devoted to compliance oversight. It is also generally recognized that plant closures for non-compliance, in the absence of some immediate and substantial risk to neighbors, are not an appropriate solution. Table 7 provides the summary of conclusions of assessing the performance of legal and regulatory frameworks.

4- There are 10 laws regulating the agricultural sector, 13 laws regulating agricultural land ownership, 7 laws regulating transaction of state land, in addition to irrigation and drainage laws. The array of these laws has created contradictory actions between different departments and administrations of the MALR, and between different ministries and institutions. This constitutes a burden on decision-makers and reduces the attractiveness of agricultural investment.

5- There are seven different laws for agriculture cooperatives:

   a. General Cooperative Union Law no, 28/1984.

   b. Agriculture Cooperation Law no. 122/1980.

c. Fishery Cooperative Law no. 123/1983.
d. Consumer Cooperation Law no. 109/1975.
e. Productive Cooperative Law no 110/1975.
f. Housing Cooperation Law no. 14/1981.
g. Educational Cooperation Law no. 1/1990.

6- Implementation and enforcement of laws and regulation are ineffective, and generally more aimed at the letter of the law rather than the purpose of the law.
7- It is generally acknowledged that the conditions imposed by law 48/1983 are too strict enforce, or expect compliance by industries at the short term. The introduction of compliance action plans has therefore been proposed. Although recent attempts to change law 48 were not successful, discussions between the stakeholders indicate that there is some scope for reconsideration. It is proposed to define the functions of the various water bodies in Egypt and to introduce water quality standards based on the function of receiving water.
8- The non-compatibility of fisheries law 142/1983 with changes that have taken place locally and internationally, requiring review and amendment of the law.
9- Lack of harmonized legislations.

2.3 Policies & processes

Assessing the policies & processes means analyzing their ability to attain the specific targets described in Table 7, and to solve problems in the water management sector. This analysis includes: (i) assessment of the effectiveness of the current policy environment, and (ii) assessment of the governance dimensions of policies. Results from this exercise are outlined in Table 8.

The analysis looked into formal/informal aspects and readiness for reform/dialogue/compromises with respect to a specific policy. In addition aspects of factors such as power, influence, trust, corruption, and interest groups were taken into consideration.

To simplify the analysis, the effectiveness of the policy framework was analyzed by looking at major strengths and weaknesses of policies in relevant sectors (e.g. water, energy, agriculture, land etc.) and a well as plans and strategies (e.g. Agricultural Development Strategy, Water Master Plan).

Table 8: Step 2.3 a. Assessing the performance of policies (MWRI)

Organization	Specific policy objective	Effectiveness		Governance dimensions	
		Strengths	**Weaknesses**	**Formal/Informal aspects**	**Readiness for reform/dialogue/compromises**
Participatory Irrigation Management (PIM)	➢ Formation of WUAs at the mesqa level for operation & maintenance (O&M) of improved mesqas ➢ Formation of branch canal water user associations (BCWUAs) ➢ Pilot study to transfer operation, maintenance and management of branch canals to the BCWUAs and/or the private sector	➢ 10000 WUAs formed ➢ Established 1200 BWCWUAs ➢ PIM implemented in 5 pilot canals	➢ Lack of involvement of water users in water allocation and distribution ➢ Slow rate of formation of WUAS and BCWUAs	**Formal aspects:** the law needs to be modified	
Institutional Development and Organizational Strengthening	➢ decentralizing water management and focusing on integrated district-level coordination and management ➢ Enable the MWRI to make efficient use of water sources. ➢ Integrate all sources of water into district-level management decisions thereby increasing production per unit of Nile water. ➢ Strengthen the participatory water management through strengthen the role of governmental units concerning IAS. ➢ Coordinate institutional reform at strategic and operational levels and support private sector participation initiatives.	➢ Established 54 IWMDs ➢ Transformation of the Irrigation Advisory Service (IAS) from an extension unit of IIP to a Central Directorate under the MWRI Irrigation Department ➢ Established Institutional Reform Unit in the MWRI ➢ A draft revised law 12 is prepared for	➢ Lack of delegation of authorities to local level ➢ Lack of participatory water management	**Formal aspects:** the law needs to be modified	Yes

	➢ Revise existing water laws to take into account current Government of Egypt (GOE) policies and to improve the ability of MWRI to mitigate increasing water demand. ➢ Develop and implement a national policy for water quality management in cooperation with the other relevant institutions inside and outside the MWRI.	approval of parliament ➢ Established the Central Water Quality Unit in the MWRI			
Strengthen water management	➢ Substituting short-duration for long-duration rice varieties to save irrigation water ➢ Increasing the reuse of water from intermediate drains to augment irrigation supplies ➢ Matching between irrigation water demand and supply ➢ Water monitoring systems	➢ Short duration rice varieties have been introduced in all governorates that are permitted to grow rice ➢ More than 250 pumps were installed	➢ The program of matching irrigation water deliveries with water demands was not completed	**Formal aspects:** Develop information network **Informal aspects:** lack of involvement of water users in the MISD	Yes
Horizontal Expansion Policy and Plan, 1994	➢ Reclaim and cultivate an area of 3.4 million feddans (1.43 million ha) till 2017	➢ Reclamation of about 1.8 million feddans	➢ Slow rate of reclamation	**Formal aspects:** increasing water resources needs	Yes
National Water Resources Plan (NWRP), 2005	➢ Develop the National Water Resources Plan (NWRP), that describes how Egypt will safeguard its water resources in the future, both with respect to quantity and quality, and how it will use these resources in the best way from a socio-economic and environmental point of view. The planning horizon is the year 2017	➢ Formulated and approved national plan	➢ Slow rate of implementation	**Formal aspects:** (1) needs for developing new water resources (2) lack of finances	Yes

Table 9: Step 2.3.b. Assessing the performance of policies (MALR)

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
1980s Agricultural Development Strategy "Liberalization of the agricultural sector, the liberalization of pricing policies and raising the annual growth rate of agricultural production to 3.4%".	1. Developing the pricing policies as a mean to reallocating resources and providing incentives to the farmers for raising their productivities.	1.1 The actual application of these policies has not been successful in many years. 1.2 Such contradictions led farmers to take wrong planting decisions. 1.3 Increased price distortions in the local market, for wheat flour and edible oils due to the high margins between subsidized prices and open market prices, leading to increased infiltration of subsidized goods to untargeted groups and purposes. 1.4 Food prices remained higher than their levels before "the World Food Crisis", with implications on Egyptian agriculture ad trade on the world market, as well as, on farmers' income.	➢ (E): The delay in declaring the guaranteed prices before the start of the growing season, or because such declared prices have been very low, which produced the opposite effects of these policies. ➢ (G): The absence of institutional arrangements related to pricing policies.
	2. Liberalization the agricultural sector from central decision-making.	2.1 Liberalization has led to noticeable shortcomings in market management and organization, thus leading to unfair distribution of development returns. 2.2 Absence of national campaigns to speed the transfer of new technologies. 2.3 Decrease returning to the agricultural crop rotation. 2.4 Obstacles of agricultural processing. 2.5 Decrease and lowest the services departments at MALR. 2.6 Inefficient expanding agriculture land reclamation based on the current water	2.1 (E): Improve the socio-economic conditions. 2.1 (G): Reallocate resources and provide incentives to the farmers to increase agricultural productivity. 2.2 (E): Raise the great need to find solutions to combat main soil problems, and develop improved irrigation systems and efficient water management practices. 2.2 (G): Formulating institutional and human resource development. 2.3 (E): To provide the basis needed to achieve the envisaged growth rates for the

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
		resources and irrigation development projects. 2.7 Less tight control and follow-up mechanisms for rationalizing the consumption of fertilizers and pesticides.	agricultural sector and developing the agricultural extension services, research and credit systems.
	3. Institutional development.	3.1 The weakness of small farmers' associations, as well as the weak agricultural marketing structure. 3.2 Institutional weakness lead to several problems in the following areas: control over agricultural inputs, control over market performance, agricultural education, information generation and dissemination, and the provision of agricultural extension system. 3.3 Contradiction and duality between the roles of the different institutions and entities. 3.4 Diversity of research, planning, follow-up and productive tasks performed by MALR institutions. 3.5 Developing policies and providing information, resulting in numerous administrative units at the central and governorate levels.	3.1 (E): There are some institutional frameworks that lack the appropriate mechanisms for carrying out the assigned tasks, while some other entities carry out tasks incompatible with their structure and basic functions. 3.1 (G): Merging institutional units with similar functions under one strong entity with defined terms of references. 3.2 (E): Reviewing the institutional structure of the different entities and units of MALR, and defining their strengths, weakness and relations with other entities, as well as defining the tasks compatible with their functions. 3.2 (G): There are several stand-alone general institutions with no defined horizontal or vertical linkages, such as PBADC, the General Authority of Land Reclamation,.. etc.
	4. Development of human resources needed for the achievement of the targeted growth rates for agricultural sector.	4.1 Skilled labors are scarce due to the lack of balance between human resource development policies, investments, and agricultural development policies. 4.2 Rural communities exhibit high rates of unemployment and underemployment.	4.1 (E): Emphasize human resource development to provide the needed skills for different development programs, particularly in research and extension activities.

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
		4.3 Rural population and rural inhabitants increased. 4.4 The pyramidal structure of human resources working in the field of agricultural research, extension and education lack of coordination. The percentage of older staff at the top of the pyramid is high, while the base is shrinking. 4.5 The weakness of implementation and follow-up mechanisms. 4.6 Lack of consistency between strategies and execution plans.	4.1 (G): Create job opportunities particularly for the younger generation in agriculture and related activities. 4.2 (E): Upgrading the scientific and technical skills of research, extension and technology transfer staff. 4.2 (G): Strengthening linkages between agricultural education programs and graduates, and the requirements of the labor market. 4.3 (E): Building the capacities of rural leaders and farmers.
	5. Developing the agricultural extension services, research and credit systems.	5.1 The utilization rate of extension services, research and credit systems is not reaching their potential due to reducing the annual budgets and the limited financial resources allocated to research development, such resources are grossly misused. 5.2 Lack of coordination between the roles played by the different research, extension and credit institutions due to the lack of national plans linking all agricultural institutions to collaborate and exchange experiences and establishes priorities. 5.3 Lack of the concerned activities in the field of agricultural production and environmental rural resources, in addition to lack in extension aids in support of agricultural extension.	5.1(E): Developing agricultural extension, research and credit modalities and approaches. 5.1 (G): Finding solutions to respond to the probable adverse effects of climate change on agricultural production. 5.2 (E): Evaluating agricultural development performance at the national level and in all sectors. 5.2 (G): Applying modern technology to the systems development. 5.3 (E): Improving value added activities to boost small farmers' income. 5.3 (G): Identifying and promoting investment opportunities. 5.4 (G): Lack of coordination between different agricultural related institutions.

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
1990s Agricultural Development Strategy "Completion of the economic reform program in the agricultural sector, increasing the value of agricultural exports to EGP50 billion, and raising the annual growth rate to 3%".	1. Increasing agricultural exports.	1. Weak participation by small farmers in the export system which relies on large producers and large export farms, as well as the weakness of complementary and adherence to contractual relations between producers and exporters. 2. The domestic marketing sector would not be able to support the export subsector. Each constitutes on almost independent chain from the other. 3. Marketing information and studies related to the export markets are limited. Monitoring, follow-up and analysis of market variables affecting Egyptian exports and imports are weak.	**Effectiveness (E):** 1. The very limited percentage of exported agricultural products compared to the great productive potential of those producers. 2. The contribution of non-traditional products which enjoy competitive export potential is limited (new crops, fruits and vegetables, medicinal and aromatic plants, organic agricultural products, cut-flowers and ornamental plants). **Governance (G):** In spite of Egypt's participation in several regional groupings and agreements, such arrangements were not fully exploited in promoting agricultural exports to the markets of the member countries of these groupings and agreements.
	2. Maximizing the return of water use and improving on-farm irrigation practices	2.1 Areas planted to rice increased greatly in spite of sharp deterioration of water resources per capita below the water poverty level. 2.2 In spite of water scarcity, water use efficiency is low due to water losses. 2.3 Weak cooperation between research centers and universities. 2.4 Lack of finance for supporting research budgets including competitive grant funding. 2.5 On-farm water use in Egypt is not efficient, and water use rationalization policies are still under discussion.	2.1 (E): Efforts exerted so far in the field of maximizing returns on water use are not enough to direct farmers towards applying water-saving measures and improved cropping pattern. 2.1 (G): In spite of limited water resources, applied policies have not led to establishing agricultural environment clearly leading to rationalizing water use. 2.2 (E): Absence of concessional credit lines to encourage farmers to improve field irrigation systems. 2.2 (G): Meeting the needs of land reclamation plans, and achieving an

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
		2.6 Water supplies are not flexible. Egypt is already suffering from water poverty (scarcity) at a rate that increases continuously. 2.7 Lack of quantitative assessment of water consumptive use on the basis of the assessed area cultivated.	appropriate rate of vertical agricultural development. 2.3 (E): Improving environmental conditions, farmers' income and public health in rural areas.
	3. Achieving complimentarily between field extension services and available technical expertise.	3.1 Inefficient agricultural extension system (structure). 3.2 Lack of executing intensive extension programs for training extension staff in the different specialization. 3.3 Insufficient working procedures with a view to their development and for exercising coordination within extension system. 3.4 Lack of transparent mechanism for monitoring and evaluating extension activities with participation of concerned stakeholders (technical experience). 3.5 Absence of integrating private sector participation in extension activities. 3.6 Lack of incentives to extension staff (should be based on their achievements).	3.1 (E): Developing agricultural extension modalities and approaches through technology transfer. 3.1 (G): Maximizing the sustainable levels of human resources and the productivity of both land and water. 3.2 (E): Evaluation the generated technology packages based on their economic benefits. 3.2 (G): Protecting the qualitative and quantitative characteristics of agricultural natural resources and promoting the productive efficiency. 3.3 (E): Responding to the probable adverse effects of climate change on agricultural production.
Agricultural Development Strategy towards 2017 "Achieving self-sufficiency in cereal crops and raising the annual growth rate to 4.1%, as well as	1. Achieving self-sufficiency in strategic crops.	1.1 The Egyptian national economy has experienced challenges some of which were due to international and regional changes, while others were the results of local interaction. 1.2 A global trend towards the use of food crops in the production of biofuel has wide implications on the food supply to the	1.1 (E): Resources and human experiences needed to achieve self-sufficiency in strategic crops are available. 1.1 (G): Several efforts have been exerted and identified for maximizing the sustainable returns of rain-fed agriculture (modern technical applications).

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
continuing the land reclamation program at an annual rate of 150’000 feddans".		world market, particularly in the developing countries. 1.3 Climate changes and its negative effects on agricultural production. 1.4 Little attention to the integrated farm management and improved cultural practices. 1.5 Lack of pre- and post-harvest practices. 1.6 Inefficient consumption patterns. 1.7 Insufficient appropriate agricultural investments, particularly in land and water management.	1.2 (E): There are several successful applications whose results can be replicated. Egypt has the basic legal and institutional requirements that would increase rates of self-sufficiency. 1.2 (G): Great potentialities to maintain and protect the agricultural lands. 1.3 (E): Improving the climate for agricultural investment, particularly in good agriculture practices. 1.3 (G): Existence of national programs and campaigns for the development of strategic crops production (quality and quantity).
	2. Developing the agricultural credit policy.	2.1 Exposure to external crises which negatively affected the agricultural productive capacity and farmer’s income. 2.2 Some restrictions and problems are still prevailing which reduce the positive impact of the newly enacted laws. 2.3 Absence of a single entity for the allocation of areas suitable for agricultural investments and a clear investing map in agriculture. 2.4 Weakness of PBDAC on its principal role in financing agriculture and banking activities. 2.5 Increased fragmentation and scattering of agricultural holdings. 2.6 Limiting available finance sources for agricultural activities approved by the government.	2.1 (E): Establishing an appropriate environment for strengthening the role of private sector and civil society organizations, and encouraging agricultural producers to establish their own organizations and associations to be able to work in accordance with market forces. 2.1 (G): The economic liberalization era has led to a noticeable shortcoming in marketing constraint and market distortion. 2.2 (E): Recognition or provision of priority areas for improving the standard of living of rural inhabitants. 2.2 (G): Supporting civil society organizations active in rural development. 2.3 (E): Increasing investment in land and water resource management to achieve food security of the main food commodities.

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
		2.7 Inflexibility of credit lines. Credit policies are limited to conventional types of credits, neglecting the introduction of new credit policies and lines compatible with the agricultural development & modernization.	2.3 (G): Strength and opportunities available to cooperatives.
Sustainable Agriculture Development Strategy towards 2030 (SADS**)** "Concerned with the revision of development programs and their objectives, given special attention to the challenges facing agricultural development efforts, as well as execution modalities that would help achieve the greater part of its objectives, should there be a will to change and working potentialities and requirements".	1. Rationalization of water resources use policy.	1.1 lack of scientific development and information technology and agriculture extension. 1.2 Effort exerted so far in this field are not enough to direct farmers towards applying water-saving measures and improved cropping pattern. Areas planted with rice have greatly increased. 1.3 Changing the relation between agricultural landowners and tenants. 1.4 The weakness of small farmers' associations and water user associations. 1.5 Global climate change and its adverse effects on water resources. 1.6 In spite of the limited water resources, the applied policies have not lead to establishing an agricultural environment clearly leading to rationalizing water use and water resources. 1.7 Expanding reclaimed areas.	1.1 (E): Applied policies have not succeeded in achieving the optimum utilization of Egypt's water resources. 1.1 (G): Lack of consistency between strategies and execution plans. In addition to the weakness of implementation and follow-up mechanisms. 1.2 (E): Developing economically viable technical packages. 1.2 (G): One of the main objectives of the current strategy is to expand reclaimed areas through the use of water quantities to be saved through the improvement of water conveyance and distribution and field irrigation systems. 1.3 (E): Weak linkages between research topics and practical field applications. 1.3 (G): Limited and weak coordination between the concerned institutions. As well as the absence of an effective advisory services and farmers' associations.
	2. Sustainable expansion of reclaimed areas.	2.1 The distribution system failed to establish viable communities capable of settling in the newly reclaimed areas.	2.1 (E): Lack of integrated soil and water management practices. 2.1 (G): Contradiction in land reclamation plans.

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
		2.2 The existence of many agencies responsible for the allocation of reclaimed areas, with weak coordination. 2.3 The concept of land reclamation has been restricted to the provision of infrastructure, irrigation facilities, roads and energy needs, without giving much attention to the provision of agriculture and social services necessary to establish settled communities. This has delayed or impeded the utilization of investments. 2.4 Expansion objectives of reclaimed areas have identified without paying great attention to water-use rationalization policies and procedures, to save irrigation water needed for areas to be reclaimed. 2.5 Allowing the use of groundwater in areas for which adequate studies have not been made for ensuring the sustainability of groundwater resources which may lead to high investment risks.	2.2 (E): Water scarcity and drought problems. 2.3 (E): Marginal agricultural areas would be negatively affected, and desertification rates will increase (climate change impact). 2.3 (G): Lack of coordination between the MALR and other agriculture-related ministries and institutions. 2.4 (G): Weakness in agricultural extension information and education systems, in addition to conventional agricultural financing systems. 2.5 (G): Improving the climate for agricultural investment, and facilitating the allocation of newly-reclaimed areas.
	3. Sustainable development of land and water productivity.	3.1 Insufficient scientific research and agricultural technology development plans. 3.2 Inefficient agricultural extension system development mechanisms. 3.3 Lack of possible sources of finance for supporting research budgets including competitive grand funding. 3.4 Weakness of the agricultural information system and development plans.	3.1 (E): Encroachment in agricultural lands. 3.1 (G): Reclamation and developing additional lands. 3.2 (E): Continued degradation of soil fertility in some areas. 3.2 (G): Adopting labor and capital intensive agricultural technologies and promoting. 3.3 (E): The limited land and water resources, and strong competition between the various water uses, it is necessary to

Policy	Specific targets not achieved	Associated problems	Reasons behind (Effectiveness, Governance, Others)
		3.5 Inefficient national programs and campaigns to optimize and upgrade the efficiency of water use in agriculture. 3.6 Insufficient national programs and campaigns to maintain and upgrade the productive capacity of agricultural land. 3.7 Insufficient national programs for capacity building of agricultural human resources (the scientific and technical skills of research, extension and technology transfer staff).	concentrate on maximizing land and water productivity. 3.3 (G): Raising the levels of self-reliance and self-sufficiency in strategic food commodities.

Conclusions of assessing the performance of policies

1- It can be concluded from water policies that there is significant implementation of these policies. However, the rate of implementation is still slow. Reasons behind this slow implementation are mainly lack of finance, the need for developing new water resources and modifications of laws and regulations.

2- The 1980s MALR strategy highlighted the need to find solutions to combat soil salinity and alkalinity, and to develop improved irrigation systems particularly in the newly reclaimed areas. The 1990s strategy continued to find solutions for loss of agricultural land, improving returns for water use, and improving on-farm irrigation practices.

3- The 1980s MALR strategy was the starting point to concentrate on formulating institutional and human resource development and water management aspects. To provide the basis needed to achieve the envisaged growth rates for the agricultural sector, the strategy concentrated on developing the agricultural extension services, research and credit systems. The 1990s strategy focused on fostering the complement between research and extension services activities by the PBDAC in procurement and distribution of agricultural inputs.

4- Regarding achievements gained, several objectives of the three aforementioned strategies have been realized, while others lagged. Since launching the 2017 strategy in 2003, the national economic situation in Egypt has experienced challenges, some of which were due to international and regional changes, while others were the results of local interactions.

5- It is worth mentioning that the SADS document is not only concerned with the revision of development programs and their objectives, but also with special attention to the challenges facing agricultural development efforts, as well as execution modalities that will help achieve the greater part of its objectives. The SADS vision focused primarily on improving livelihoods of the rural poor through efficient and sustainable use of natural resources. Its main mission is to increase agricultural productivity and enhance socioeconomic aspects of stakeholders. Regarding achievements gained, it is on-going and proposed activities, several objectives of SADS under considerations and assessments to be verified before implementing the action plans needed and designed. The SADS document towards 2030 has been prepared as an Egyptian document that reflects national objectives and orientation, in coordination with Agricultural Research and Development Council, the FAO, with inputs from the International Fund for Agricultural Development (IFAD) and the World Bank.

STEP 3 - ACTION MATRIX

The action matrix uses the results of the above analysis/assessment to define actions, policy reforms, and investment plans aimed at improving agricultural water management. It suggests what changes should occur to improve the agricultural water management sector in Egypt and identifies what different actors can do to improve inputs and outputs of the sector.

3.1. Institutions

For each of the functions underperformed by each institution a set of proposed actions to solve them are outlined together with the institutions/actors responsible to implement those actions. Table 10 provides an action matrix for key institutions in agricultural water management.

Table 10: Step 3.1 Action Matrix of Institutions

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
Ministry of Water Resources and Irrigation (MWRI)	Water Quality Degradation	**Governance:** ➢ Inter-ministerial coordination and cooperation ➢ Slow and long processes of policy reforms	Implement the NWRP measures that developed in 2005 and assigned tasks for each ministry to stop pollution Formulate and activate the role of the National Water Council formulate a plan for Groundwater quality management and protection Encouraging private sector participation	➢ The cabinet ➢ The Ministry of Water Resources and Irrigation (MWRI) ➢ EEAA
	Increased the gap between the available water resources and the water demands resulting (water scarcity).	**Others:** Delay in implementation of Upper Nile projects to increase water resources in Egypt and riparian countries **Governance:** less involvement of private sector in water management process	Bilateral cooperation with the River Riparian through joint agreements to develop The River-shared resources. Studies clarified that large amounts of Nile water is lost in Upper Nile swamps. Accordingly, there is a modest potential to decrease these losses through implementing joint projects with other countries in the Nile basin. Three projects had been identified, namely, Jongli Canal, Bahr El-Ghazal, and Mashar Marshes projects, which will add about 9 BCM/year to Egypt's share of Nile water Encouraging private sector participation	➢ The cabinet ➢ The Ministry of Water Resources and Irrigation (MWRI)

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Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
			Enforce using the water-saving technologies in irrigation particularly in newly reclaimed areas	
	water allocation among water users	**Capacity:** Data gaps and limited financial and technical capacity to collect and manage data **Governance:** less involvement of water users	Enhance water monitoring systems Introduce the updated technology in monitoring and water allocations Activate the Matching Irrigation Supplies and Demands (MISD) program between MALR and MWRI	➢ (MWRI) ➢ MALR ➢ WUAs
National Organization for Potable Water and Sanitary Drainage; (NOPWASD)	Conveyance water losses in the supply network	**Capacity:** Limited finances to rehabilitate the existing water supply network	Develop a long term plan for rehabilitation of water supply network	➢ NOPWASD ➢ (MWRI)
	low coverage of sewage collection and sewage treatment	**Capacity:** Limited finances to expand the sewage collection and treatment	Develop a long term plan to expand the sewage collection and treatment Develop a plan for using the treated sewage Develop and implement low cost technologies for domestic wastewater treatment	➢ NOPWASD ➢ (MWRI) ➢ MALR
	Increased water supply abstraction	**Governance:** lack of awareness	Conduct public awareness campaign Develop incentives for water saving	➢ NOPWASD
Egyptian Environmental Affairs Agency; (EEAA)	Water quality degradation by solid wastes	**Capacity:** Limited finances and technical capabilities to establish solid waste collection infrastructures **Capacity:** lack of training of youth to conduct solid waste management	Conduct public awareness campaign Establish solid waste collection and management projects	➢ EEAA ➢ MWRI ➢ MALR ➢ Local and governorate entities

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
				➢ Media
Ministry of Electricity and Energy; (MoEE)	Low energy production in some periods	Mis-match between water allocation and required water head for turbines	Improve the performance of turbines using new technology to work under low head Introduce the low-head turbines in new hydropower projects	MOEE Hydropower Generation Authority
General Department of Construction and Environment	Increased industrial wastes into water ways and water bodies that deteriorates the water quality and has negative impacts on crop growth and production as well as human health	**Governance:** need for law modification	Develop a plan for transferring the factories in the rural areas to be far from canal network Introduce the closed circuits for treatment of industrial wastes Rationalize water use in industries and encourage air-cooling systems Encourage use of brackish water Introduce incentives for low-water- use and less-polluting industries Exchange knowledge and experiences with comparable national and regional organizations to combat industrial pollution set standards for licensing industrial zones and factories	Ministry of Industry Ministry of Environment MWRI Ministry of Health

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
The River Transport Authority (RTA)	Low tonnage transported by the river	**Capacity:** finances and technical capacities to dredge the river bottle necks due to lack of enough water depth for navigation **Capacity:** lack of training for the boat operators **Capacity:** Lack of the existence of proper navigational aids and land marks **Capacity:** The navigational channel is not well defined and maintained on constant basis by dredging	Develop a master plan to benefit from the waterways in river transport with no additional water. i.e. match with the water released for irrigation proper planning, management and operation of a navigational channel throughout the Nile development of existing ports on the Nile Installation of navigation aids, control centers, navigation traffic system	MWRI RTA Ministry of Environment
	Water pollution	**Capacity:** Sunken, stranded ship or sunken cargo **Capacity:** leakage of shipped material and wastes **Governance:** Limited involvement of local institutions	increasing the number of waste dumpsites along the Nile banks, banning shipping of hazard material, and improving standards of ships develop a framework for cooperation and coordination among ministries and stakeholders to avoid any misalignment of functions	MWRI RTA Ministry of Environment Local/governorate entities
Water Users Associations (WUAs) at Mesqa level	Low water use efficiency	Ineffective participation of WUAs	Enact the proposed modified law 12 Conduct public awareness Conduct training for WUAs	MWRI

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
Branch Canal Water Users Associations (BCWUAs)	Low water use efficiency	Less involvement of water users in water allocation, planning and monitoring programs	Enact the proposed modified law 12 Raise public awareness Conduct training for WUAs	MWRI
Ministry of Agriculture and Land Reclamation (MALR)	1.1 The economic liberalization era has led to noticeable shortcomings in market management and organization, leading to more market distortions that harmed producers and consumers while benefitting middlemen thus leading to unfair distribution of development returns. 1.2 International and regional backgrounds have experienced many changes, most important of which the international trend towards future liberalization of agricultural trade, at a time of increases in food prices and supply disruption.	1.1 (**Governance**): The institutional structure of agriculture sector is highly complex and characterized by duplicative, overlapping duties and responsibilities in some cases, and the absence of institutional structure in others 1.2 (**Governance**): There are some institutional frameworks that lack the appropriate mechanisms for carrying out the assigned tasks, while some other entities carry out tasks incompatible with their structure and basic functions. 1.3 (**Governance**): Poor marketing information systems and the absence of an institution responsible for marketing issues.	➢ Establish an entity responsible for the economic liberalization affairs with clear cut assigned tasks and appropriate mechanisms. ➢ Support the institutional setup of marketing issues and improve the marketing information network systems. ➢ Allowing the private sector to actively participate in agriculture activities.	Economic Affair Sector and Agric. Economic Res. Institute (MALR)
	2.1 Water resources available in Egypt fall short of requirements (water poverty), population and food requirements increases.	2.1 (**Capacity**): High water losses through conveyance, distribution and field application systems.	➢ Increase the efficiency of water conveyance and distribution systems, as well as raising on-farm water use efficiency to 80%.	ARC's relevant institutes, agriculture extension sector

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
	2.2 Increasing agricultural areas through land reclamation and doubling the productivity of some basic crops. 2.3 Achieving an appropriate of vertical agriculture development. 2.4 Implementing a voluntary change in the cropping pattern. 2.5 Water allocation problems and the illegal growing of rice crop and other high water consumption crops.	2.2 (**Capacity**): The use of developed irrigation systems is not expanded and adopted. 2.3 (**Capacity**): Absence of combatable cropping pattern applied in each agriculture zone. 2.4 (**Governance**): Limited and weak coordination between the different agricultural research institutions. 2.5 (**Governance**): Weak linkages between research topics and practical field application. 2.6 (**Capacity**): Reduce research budget. 2.7 (**Governance**): Lack of cooperation between universities and research institutions. 2.8 (**Governance**): Absence of irrigation advisory services system at region and farm level.	➢ Expand the modern irrigation techniques in the newly reclaimed areas. ➢ Define the suitable cropping pattern applied in each agriculture zone. ➢ Enhance the coordination among the different concerned institutions on AWM issues (research institutions, extension services, and universities). ➢ Increasing the efficiency of utilizing rainfall, and reducing rainfall water losses. ➢ Maximizing the utilization of underground water in agricultural. ➢ Establishing a modern and integrated national network for monitoring climate change affecting agriculture. ➢ Establish an irrigation advisory system in agriculture extension sector.	(MALR), and universities
	3.1 Reclaiming wide areas and land productivity has declined. 3.2 Contradictions and shortcomings in land reclamation policies. 3.3 The distribution system failed in establishing viable communities capable of settling in the newly reclaimed lands.	3.1 (**Governance**): Weak coordination among many agencies responsible for the allocation of reclaimed areas. 3.2 (**Governance**): No attention was given to the provision of agricultural and social services necessary to establish settled agricultural communities. 3.3 (**Governance**): Expansion objectives of reclaimed areas have	➢ Merging the different entities responsible for implementation in one entity. ➢ Expand reclaimed areas through the use of water quantities to be saved through the improvement of water conveyance and distribution, as well as field irrigation systems. ➢ Preparing a technical and financial framework for investment opportunities in agricultural projects	Land Reclamation Sector (MALR)

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
	3.4 There is pressing need for expanding agricultural land in order to address the problem of increase rural population density, and reduce the implications of the world food crisis on the economic and social conditions in Egypt.	been identified without paying greater attention to water-use rationalization policies and producers. 3.4 (**Governance**): Allowing the use of groundwater in areas for which adequate studies have not been made for ensuring the sustainability of groundwater resources. 3.5 (**Governance**): The weakness of implementation and follow-up mechanisms. 3.6 (**Governance**): Lack of consistency between strategies and execution plan.	and other related and complementary projects, in order to draw farmers' and businessmen's attention to investing in such projects. ➢ Introducing new concessional credit lines for reclaiming and developing new areas. ➢ Securing conditions for establishing viable settled agricultural communities in the newly reclaimed areas. ➢ Encouraging small farmers in the newly-reclaimed areas to form voluntary institutions to defend their interests, regulate their production activities and help marketing their products in domestic and foreign markets, with the state providing all kinds of support to enable such institutions carry out their role.	
	4.1 The cropping area increased. 4.2 Agricultural sector liberalization. 4.3 Addressing the problem of holding's fragmentation. 4.4 Existence of many information-producing agencies and weak coordination between them. 4.5 Databases are scarcely used in decision taken.	4.1 (**Governance**): Lack of coordination between the concerned institutions. 4.2 (**Capacity**): Water supply is not flexible and the very low rate of water use efficiency. 4.3 (**Governance**): Weak linkages between research and extension services. 4.4 (**Capacity**): Weak performance, limited capabilities and continued	➢ Rationalizing water use efficiency through developing the irrigation systems. ➢ Increasing areas planted to high-value products, provided enough marketing capacity is available. ➢ Developing technological packages. ➢ Establishing close coordination between agricultural research institutions, under a national research plan defining research areas and budgets. Such coordination should be	ARC's relevant institutions, and agricultural extension services (MALR)

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
		erosion of agricultural extension system staff structure. 4.5 (**Capacity**): Limited human resources' skills and weak information infrastructure.	based on strong institutional relations that do not change with the change of the leaders of research institutions. ➢ Increasing research budgets in order to enable researchers to carry out their responsibilities, under a system of continued performance evaluation through evaluation modalities to be introduced for this purpose. ➢ Improving the income levels of researchers. ➢ Establishing the closest possible coordination and cooperation between universities and specialized research institutions. ➢ Enabling the younger generation of researchers to interact with their counterparts at international level, for improving their research capabilities.	
	5.1 Low rates of rainfall and the effective rainfall is low due to evaporation. 5.2 Lack of improved water harvesting techniques and the supplementary irrigation tools. 5.3 Investments needed are not available and very limited. 5.4 Weak performance and limited capabilities of the	5.1 (**Others**): Land and water resources are very limited. 5.2 (**Others**): Harsh climate conditions. 5.3 (**Capacity**): Limited human resources, resources, and weak information infrastructure. 5.4 (**Capacity**): Lake of infrastructure and facilities in rain-fed areas. 5.5 (**Capacity**): Lack of specialized environmental extension services and efforts in rain-fed areas.	➢ Cultivating some crops that do not need much water, such as barley. ➢ Applying modern technical applications, such as water harvesting and other suitable techniques. ➢ Paying greater attention to rain water harvesting projects and expending such projects in accordance with modern techniques.	ARC's relevant institutions, DRC, and agricultural extension services (MALR)

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
	existing agricultural extension services. 5.5 Absence of coordination and linkage between the concerned institutions and settlements.		➢ Applying supplementary irrigation systems, making use of the results of local and international research. ➢ Developing infrastructure and facilities in rain-fed areas. ➢ Developing a map of water basins, in order to raise their use efficiency in supplementary irrigation. ➢ Covering the inhabitants of rain-fed areas under development programs, social studies, extension and enlightening programs, and helping them diversify their activities, including herding, and environmental handicrafts, and introduce the growing of suitable perennial plants and shrubs.	
	6.1 Continued encroachment on agricultural land diverting it from agricultural to non-agricultural uses, and continued degradation of soil fertility in large agricultural areas. 6.2 Land productivity has declined. 6.3 Land fragmentation and scattering of agricultural holdings increased. 6.4 Absence of continued restoration and maintenance	6.1 (**Governance**): Addressing the problem of holdings' fragmentation**.** 6.2 (**Governance**): Increase encroachment on agricultural land. 6.3 (**Governance**): Weakness in law enforcement for protecting the agricultural lands. 6.4 (**Capacity**): Continued degradation of soil fertility, in addition to rising groundwater level. 6.5 (**Capacity**): Inefficient drainage system.	➢ Continued restoration and maintenance of agricultural drainage systems, as well as establishing drainage systems in the areas lacking such systems. - Maintenance of agricultural areas and developing their physical and economic productivity. ➢ Applying modern monitoring techniques and practices through the use of remote sensing and GIS. ➢ Expanding the cultivation of man-made forests and green belts. ➢ Using modern techniques in sand-dune fixation, and making use of the	MALR

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Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
	of agricultural drainage system. 6.5 Soil salinity increased.		experiences of other countries in this connection. ➢ Strengthening specialized environmental extension efforts in areas under risk of desertification.	
	7.1 High pre- and post-harvest losses. 7.2 Low level of agricultural industrialization. 7.3 Inflexibility of the applied traditional marketing systems. 7.4 Scarcity of contract farming. 7.5 Quality deterioration. 7.6 Impact of climate change on agricultural productivity. 7.7 Soil salinity and water shortage as well as poor farm management systems.	7.1 (**Governance**): Limited agricultural investment and the inflexibility of credit policies. 7.2 (**Climate Change**): The probable rise in sea water level and its negative effects on agricultural land productivity. 7.3 (**Governance**): Institutional weakness and absence of coordination between the concerned institutions. 7.4 (**Governance**): Conventional seed and seedling production systems. 7.5 (**Governance**): Conventional financing systems.	➢ Increasing land productivity, through development and breeding programs, while making use of genetic engineering techniques. ➢ Continuing present and proposed research programs for the development of tolerant varieties to unsuitable environmental conditions, such as temperature, soil salinity and water shortage, as well as early-maturing, high-yielding crop varieties, as it is the case with rice and wheat. ➢ Developing long-medium staple cotton varieties. ➢ Giving greater attention to horticultural crops with limited water consumption, particularly date palm, olive, fig, pomegranate and grapes, as well as developing commercial varieties with competitive marketing properties in the world market. ➢ Giving greater attention to integrated farm management practices, through introducing integrated technological packages, and ensuring the technical and extension staff capable of	MALR and its related sectors and research institutions.

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
			transferring technical recommendations to farmers, particularly small farmers. ➢ Developing policies for establishing integration between extension, credit and marketing services for both inputs and final products.	
	8.1 Population increase. 8.2 Shortage of development programs, institutional reform, and the introduction of new policies. 8.3 Increasing the pre- and post-harvest losses. 8.4 Food quality and safety decreased (inefficient). 8.5 Weak government role in regulating agricultural input and output markets and instability of agricultural products markets.	8.1 (**Capacity**): Poor consumption patterns and poor nutritional standards and vital bodily functions. 8.2 (**Governance**): Lack of detailed policies and work programs to improve marketing efficiency. 8.3 (**Governance**): Absence of updating food standards of agricultural commodities and products as well as weak laws and control arrangements to enforce standards and improve consumer safety measures. 8.4 (**Governance**): The absence of an institution responsible for addressing marketing issues.	➢ Promoting self-sufficiency in strategic food commodities through the development programs, institutional reform, and the introduction of new policies. In light of this, Egypt would be capable of achieving near-self-sufficiency in some food commodities imported at present, particularly wheat, maize, sugar and fish. ➢ Improving consumption patterns in order to improve nutritional standards and the vital bodily functions through improving nutritional standards and dietary patterns, the application of policies and programs for encouraging the consumption of local high-value food products, including meat, milk, eggs, fish, as well as protective foods such as vegetables and fruits, while achieving a positive development in per capita consumption of the main food items. ➢ Reducing post-harvest food losses through the initiations of detailed policies and work programs for	Agricultural policies sector (MALR)

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
			reducing post-harvest losses to half their present levels, through improving marketing policies and systems, as well as reviewing the presently applied policies of in-kind support and the introduction of other more effective support policies. ➢ Improving food quality and safety through establishing specific food standards for agricultural commodities and products, as well as enacting necessary laws and control arrangements for compelling all food dealers to abide with these standards. ➢ Improving social safety nets through reviewing food support policies in light of related international experiences and proposing policies for furthering food security.	
	9.1 Some restriction and problems which reduce the positive impact of the newly enacted laws are still prevailing. 9.2 Absence of clear-cut map for investing in agriculture, defining areas assigned to the different types of investments (especially in land and water).	9.1 Absence of a single entity for the allocation of areas suitable for agricultural investments. 9.2 The complexity of agricultural investment procedures, particularly in land reclamation, due to the multiplicity of government agencies and institutions handling agricultural investments and the weak coordination between them. 9.3 Lack of coordination between horizontal expansion policies.	➢ Facilitating the allocation of newly-reclaimed areas, through the establishment of a single administration comprising representatives from all concerned ministries with which investors and businessmen are in direct contact. ➢ Reviewing land allocation laws and procedures, in order to expedite the issuance of title deeds, or putting in place a new process to enable farmers and investors to whom the	The agricultural investment administration of the MALR

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
	9.3 Reduced public investments in the agricultural sector, particularly in irrigation and drainage projects. 9.4 Absence of physical foundations in areas intended for settlement and agricultural investment, including needed infrastructures and services.	9.4 The existence of many and contradictory laws regulating agricultural investments. 9.5 Lack of the necessary means of electronic information databases.	new areas have been allocated to use their holdings as bank collaterals for obtaining medium- and long-term credit. ➢ Reviewing credit and lending policies, in order to reduce lending terms and conditions, and facilitate lending procedures. This should be done in accordance with new credit lines that would increase investment flows in certain fields. ➢ Prepare a clear map for investing in agriculture defining the following elements and components: *Areas allocated to horizontal expansion provided with all facilities for agricultural settlement. ➢ Areas allocated to the establishment of marketing and post-harvest processes, such as sorting, grading and packaging stations, stores, drying medicinal and aromatic plants, and similar projects. ➢ Areas allocated to the establishment of agro-industries related to planted crops. ➢ Areas allocated to housing, as well as educational, health and social care facilities.	
	10.1 Increasing encroachment on agricultural land.	10.1 Fragmented holdings of less than one feddan increased gradually.	➢ Improving the living conditions of rural women and enabling them to	MALR

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
	10.2 Conventional applications in most of production activities. 10.3 Increasing poverty, illiteracy and poor standard of living in the rural areas. 10.4 Lack of diversifying job opportunities and economic activities. 10.5 Absence of developed small farmers' institutions related to market.	10.2 Challenges facing the marketing of agricultural products. 10.3 High rate of unemployment prevailing in rural communities. 10.4 Decreasing the role of women and small farmers in the different rural development areas.	participate positively and actively in the different activities. ➢ Diversifying income-generating rural agricultural activities and other related and complementary activities. ➢ Reviving rural industries and handicrafts and applying modern production systems. ➢ Creating an added-value in favor of small farmers, through the economic utilization of agricultural residues. ➢ Providing suitable job opportunities for the greatest number of the rural youth entering the working market, in direct agricultural activities or in the other productive and service complementary activities related to agriculture. ➢ Expanding the non-farm activities related to, and complementing agricultural activities in the fields of production of agricultural inputs, processing agricultural products and the various other service and support activities, while concentrating on small economic units managed by individuals in the rural areas. ➢ Adopting labor and capital intensive agricultural technologies in order to achieve better income for workers in the agricultural sector and the rural areas in general.	

Institutions	Problems associated with underperformance	Causes of the problems (Capacity; Governance; politics; Climate Change; Security)	Proposed actions	Responsible
			➢ Giving greater attention and support to agricultural human resources' development, including university and secondary education institutions, training, information and skill development centers, as well as other activities that make available enough numbers of skilled and specialized laborers to meet the requirements of modernized agricultural activities.	
	11.1 Excessive water losses from irrigation system. 11.2 Diversity of crops within areas served by one canal. 11.3 A continuous increase in agricultural water demands. 11.4 Water-use efficiency in agriculture decreased. 11.5 Absence of farmer services (Water User Associations, irrigation advisory services, and agricultural extension services). 11.6 Lack and shortages of farmer training.	11.1 Absence of a mass media campaign to popularize modern field irrigation systems. 11.2 Lack and shortage of extension campaigns to achieve this purpose. 11.3 Lack of support and credit facilities. 11.4 Lack of research, legal and supervisory roles. 11.5 Fragmentation of holdings. 11.6 Water user conflicts and poor water system management.	➢ Training programs for farmers and on-farm subject matter specialist in the field of AWM. ➢ Develop a field irrigation extension guide at village level. ➢ Improve linkages between agriculture extension and irrigation advisory services specialists. ➢ Enhance the role of agriculture cooperatives in on-farm irrigation improvement programs. ➢ Enhance women participation in on-farm water management activities. ➢ Continuation of irrigation improvement programs and projects.	Agriculture Extension Sector and Agric. Coop. Union (MALR) & Irrigation Improvement Sector and Irrigation Advisory Service Administration (MWRI)

3.2 Legal & regulatory frameworks

In this section, problems associated with existing laws and regulations are presented. Reasons of problems and actions needed to overcome these problems in addition to responsible organization are also presented in table 11.

Table 11- Step 3.2. Action matrix for legal and regulatory frameworks

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
Law of Irrigation and Drainage Law No. 12/1984	lack of definition of integrated water resources management	**E:** no clear guidelines on water monitoring **G:** it doesn't support the IWRM principle particularly the decentralized water management	Modified law was prepared and ready to be presented to the parliament	MWRI
	the penalty fines are too small to compensate the negative impacts	**E:** low fine	Modified law was prepared and ready to be presented to the parliament	MWRI
	lack of encouraging the establishment of private companies for the management, operation, and maintenance of irrigation and drainage networks	**Governance:** No clear provision of private sector involvement in water management process	Modified law was prepared and ready to be presented to the parliament	MWRI
	lack of definition of participatory water management	**Governance:** No clear provision of water users involvement in water management process	Modified law was prepared and ready to be presented to the parliament	MWRI
supplementary Law for Irrigation and Drainage No. 213/1994	Less involvement of water users in Old Lands	**Governance:** No clear provision of water user's involvement in water management process in old lands. The law was developed for new lands	The Modified law 12 was prepared and ready to be presented to the parliament	MWRI
Law of Protection of The Nile River and its	Conflict among related stakeholders in pollution control	**G:** the law need to be revised to remove the conflict	The law was revised and need to be presented to the parliament	MWRI

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
Waterways from Pollution No. 48/1982				
The Environmental Law No. 4/1994	Conflict with other related laws	**G:** The relation between law 48 and law 4 is not clear	The law 48 was revised to consider the conflicts with other laws and need to be presented to the parliament The relation between law 4 and other laws particularly the ministry of health laws need to be reviewed	MWRI MOE MOH
Low 93/1962 (controls the reuse of wastewater in agriculture)	➢ Low agricultural yields. ➢ Contamination rates have reached unacceptable levels in some agricultural areas, and had negative effects on the ability of these areas to produce safe feed. ➢ Negative impacts on both quality and quantity of animal production (milk and meat), and on the health of agricultural workers. ➢ Coordination between ministries and institutions involved in treatment and distribution of water and wastewater in insufficient.	➢ Provisions were not introduced to farmers to improve quality of available water for agriculture (**E**). ➢ Water contamination levels are still high in some areas, particularly in the tail end of irrigation canals (**G**). ➢ Weakness of the present regulations. ➢ Strict enforcement of the present regulations (**G**). ➢ Information dissemination is insufficient. Data are rarely distributed outside the collected agencies. As a consequence, many ministries and institutions have to work without sufficient insight in the	➢ Law needs to be modified, given major changes in vision and policies. ➢ The existing law compliance rates to meet stringent standards (Effluents compliance: MoHP). ➢ Monitoring of water quality. ➢ Raising awareness. ➢ Developing human resources. ➢ Sufficient mechanism and instruments to prevent or control pollution. ➢ Enhance law enforcement. ➢ Sufficient and effective awareness. ➢ Establish a central information system or data exchange. ➢ Establish a central water quality management unit.	MALR, Ministry of Housing, in cooperation with the sanitary drainage authorities, MWRI, and EEAA.

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
	As a consequence, investments in treatment or reuse pump stations do not always lead to the optimal benefits. ➢ Implementation and enforcement of laws and regulations are ineffective, and generally more aimed at the letter of law than the purpose of the law. As a consequence, proposal of limited treatment have not given permits, continuing the situation of no treatment in some places. ➢ Increased reuse will bring more polluted water into the irrigation canal system.	actual status of the system (**E**). ➢ Reduced flows in the Nile (due to increased demand in Toshka, Upper Egypt, and other horizontal expansion areas) and drains (due to increased efficiencies and reuse) will lead to less dilution of the loads and will thus lead to increased concentrations (**G**). ➢ Increased population and industrial production will increase the loads of pollutants to the system. In addition to increases in industrial and domestic loads are expected to grow as a result of increase agricultural area and intensification of agricultural production (**O**). ➢ The lack of sufficient financial resources is limiting the implementation of measures (**E**). ➢ Problems with cost recovery limit possibilities of implementing BOT and other involvement of private sector in financing measures (**G**).	➢ Awareness raising and advisory services. ➢ Policy development unit responsible for coordination and cooperation. ➢ Enhancing issued licenses service. ➢ Sufficient mechanisms and instruments. ➢ Close the gaps and deficiencies in legislation. ➢ Improve the enforcement of legislation.	

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
Law 142/1983 (aquatic life and regulating fish farms)	➢ Poor fish production. ➢ Illegal and unregulated fishing of fingerlings. ➢ Over-fishing ➢ The relaxed application of fishing laws in addressing the illegal fishing methods and gear, in addition to unregulated, recreational and tourist fishing, unregulated sewage treatment and the lack of strict controls over the drainage of the tourist villages and the contamination resulting from oil wells and commercial vessels. ➢ Lakes are used for the disposal of agricultural and industrial drainage water carrying harmful pesticide residues and other contaminants. ➢ The spread of aquatic plants, particularly reed has reduced the water surface area of these lakes to about 40% of their total areas.	**Effectiveness:** ➢ Weakness (lack) of supporting and developing the Aquatic Resources, Cooperative Association. ➢ Absence of laying down an integrated system for the compilation and dissemination of information. ➢ Absence of an effective coordination mechanism for the integrated management. ➢ Lack of the private sector role in production-market chain to streamline efficiency and decrease losses. **Governance:** ➢ The law 142/1983 is not amended and reviewed to introduce needed changes. ➢ The General Authority for Fisheries is not able (shortage) to carry out its responsibilities in monitoring law enforcement, developing and executing extension programs and projects. ➢ No serious efforts have been devoted to the promotion of aquaculture. Aquaculture development policies have	➢ Reviewing and amending Law 142/1983. ➢ Developing and restructuring the General Authority for Fisheries (GAFR). ➢ Supporting and developing the Aquatic Resources' Cooperative Association. ➢ Establish an Integrated system for the compilation and dissemination of information. ➢ Establishing an effective coordination mechanism for the integrated management of captured fisheries. ➢ Spending substantial investments and expanding sea fish culture.	MALR (GAFR)

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
		created several limitation that which limit further investments. **Others:** ➢ Absence of signing fishing cooperation agreements with neighboring countries.		
Law 122/1980, amended in 1981 (Establishment of agricultural cooperatives)	➢ The multiplicity of cooperatives, in some cases more than one cooperative in the same village. ➢ Weak financial position of many cooperatives, and their inability to establish economically viable projects. ➢ Unavailability of suitable venues that would allow the staff to effectively carry out their duties, in addition to the unavailability of suitable stores. ➢ The low level of services rendered by cooperatives to their members, and their inability to provide their needs of production	**Effectiveness:** ➢ Excessive government intervention. ➢ Weak and inefficient structures. ➢ Lack of financial institutions. ➢ Lack of trained board members and staff. ➢ Lack of economic scales in marketing. ➢ Lack of women's and youth participation in cooperatives. ➢ Having government-driven mentalities. ➢ Cultural barriers of women's mobility. ➢ Harsh competitive market environment evolving due to fast economic and financial changes in rural areas. ➢ Migration (of youth) from rural to urban areas, and abroad due to lack of employment opportunities.	➢ Amending Law 122/1980 articles that contradict with cooperative independence. ➢ An effective institutional framework for the development and maintenance of the irrigation system provided by the cooperative system. ➢ Allowing cooperatives to establish funds. ➢ Providing training and human resources' development. ➢ Cooperatives constitute the best institutional framework for providing marketing services to farmers. ➢ Enhance the relationship between cooperatives and agricultural research and extension centers to promote the use of modern techniques in agriculture.	MALR [Central Department of Agricultural Cooperatives (CDAC), and Agricultural Cooperatives' Directorates in the governorates (ACD)]

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
	inputs and marketing outputs. ➢ Direct government interference in the management of cooperatives. ➢ Inputs provision services are not based on member's needs. ➢ Cooperatives are not engaged in value added services with higher returns. ➢ Cooperatives are not leveraging private sector partnerships. ➢ Services are not offered at the right level and scale.	➢ Strengthened links established by local companies with national and international buyers to capture entire value chain system. **Governance:** ➢ Lack of clear cooperative development policy. ➢ Too many and outdated legislations. ➢ Lack of safety nets (insurance) in rural areas. ➢ Insufficient government spending in agriculture. ➢ Increased competitive market environment. ➢ More support given to foreign investment and investor-driven companies.	➢ Merging weak cooperatives and establishing economically viable ones. ➢ Considering cooperatives as centers for the dissemination of modern technology in the different fields of production. ➢ Redesigning the role of multi-purpose cooperatives at the administrative centers level. ➢ Substantial assets and investments owned by cooperatives.	
Law 96/1992 (amended the relation between landowners and tenants of agricultural lands)	➢ Lack of confidence and cooperation between landowners and tenants, with resulting limited attention to land maintenance and increased land deterioration. ➢ A sever imbalance in land market. Rented land prices dwindled to half	**Effectiveness:** ➢ Gradual change in rental rates in order to reflect the real market value of land. ➢ Allowing a relatively long transition period for the adjustment of landowner-tenant relationship. ➢ Compensating affected land tenants by trading with land in reclaimed areas at	➢ Review and amend of land owner-tenant relationship law. ➢ Enacting a new law with the purpose of activating market forces in determining land rental and market values. ➢ Improving the efficiency of land distribution among the various agricultural activities.	MALR and Ministry of Finance (MoF)

Legislation	Associated problems	Reasons behind (Effectiveness, Governance, capacity, others)	Proposed actions	Responsible
	the price of unrented land. ➢ In collaboration with tenants, many landowners tended to leave their lands as fallow land and offer them for housing use, thus large areas of the best agricultural land have been switched to other non-agricultural uses. ➢ Dwindling investment flow, and consequently dwindling capital formation in the agricultural sector, a fact that has severely affected the potential of developing agricultural-related and complimentary projects.	concessional terms, while providing these areas with the infrastructure needs for settlement. ➢ Widening the scope of agricultural mechanization. ➢ For more than 40 years, the government had frozen the tax assessment on agricultural land.	➢ Gradual change of rental rates to reflect the real market value of land.	

3.3 Policies & processes

For each of the problems (for each policy) listed in step 2.3, actions to solve them have been proposed together with the institutions/actors responsible to implement those actions as shown in Table 12.

Table 12: Step 3.3. Action matrix for policies and strategies

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
Horizontal Expansion Policy and Plan, 1994	Slow rate of reclamation	Insufficient finances Water shortages	Invest on developing more water resources through drainage recycling in an environmentally sound way. Invest in soil and water conservation activities.	MWRI MALR WUAs MOE
National Water Resources Plan (NWRP), 2005	Slow rate of implementation	**G:** ineffective participatory water management **G:** centralized water management **G:** the modified laws were not issued **G:** institutional reform was not implemented yet **G:** less participation of stakeholders **Others:** lack of information and databases **Others:** lack of monitoring systems **Others:** lack of finances **E:** lack of training for local staff	Formation of National Water Council to follow and promote the implementation of the plan	MWRI

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
1980s Agricultural Development Strategy	<u>Developing the pricing policies:</u> ➢ The actual application of these policies has not been successful in many years. ➢ Such contradictions led farmers to take wrong planting decisions. ➢ Increased price distortions in the local market, for wheat flour and edible oils due to the high margins between subsidized prices and open market prices, leading to increased infiltration of subsidized goods to untargeted groups and purposes. ➢ Food prices remained higher than their levels before "the World Food Crisis", with implications on Egyptian agriculture ad trade on the world market, as well as, on farmers' income.	➢ The delay in declaring the guaranteed prices before the start of the growing season, or because such declared prices have been very low, which produced the opposite effects of these policies (**E**). ➢ The absence of institutional arrangements related to pricing policies (**G**).	➢ Adjust the pricing policies and mechanisms to reallocate resources and provide incentives to the farmers to increase the productivity. ➢ Liberalizing the agricultural sector from the central decision-making process. ➢ Combat soil salinity and alkalinity. ➢ Develop improved irrigation systems, particularly in the newly reclaimed lands. ➢ Formulating institutional and human resources development based on soil and water management aspects. ➢ Developing the agricultural extension services, research and credit systems. ➢ Identifying and promoting investment opportunities. ➢ Enhance the coordination between	MALR and its sectors (ARC, extension, and socio-economic affairs)
	<u>Liberalization the agricultural sector:</u> ➢ Liberalization has led to noticeable shortcomings in market management and organization, thus leading	➢ Lack of efforts to improve the socio-economic conditions (**E**). ➢ Incentives to the farmers to increase agricultural		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	to unfair distribution of development returns. ➢ Absence of national campaigns to speed the transfer of new technologies. ➢ Decrease returning to the agricultural crop rotation. ➢ Obstacles of agricultural processing. ➢ Decrease and lowest the services departments at MALR. ➢ Inefficient expanding agriculture land reclamation based on the current water resources and irrigation development projects. ➢ Less tight control and follow-up mechanisms for rationalizing the consumption of fertilizers and pesticides.	productivity are not provided and additional resources to help farmers were not reallocated (**G**). ➢ Solutions to combat main soil problems, and develop improved irrigation systems and efficient water management practices are not raised (**E**). ➢ Institutional and human resource development are not formulated (**G**). ➢ The basis needed to achieve the envisaged growth rates for the agricultural sector and developing the agricultural extension services, research and credit systems are not provided (**E**).	the different agricultural related institutions.	
	<u>Institutional development:</u> ➢ The weakness of small farmers' associations, as well as the weak agricultural marketing structure.	➢ There are some institutional frameworks that lack the appropriate mechanisms for carrying out the assigned tasks, while some other entities carry out tasks incompatible with their		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	➢ Institutional weakness lead to several problems in the following areas: control over agricultural inputs, control over market performance, agricultural education, information generation and dissemination, and the provision of agricultural extension system. ➢ Contradiction and duality between the roles of the different institutions and entities. ➢ Diversity of research, planning, follow-up and productive tasks performed by MALR institutions. ➢ Developing policies and providing information, resulting in numerous administrative units at the central and governorate levels.	structure and basic functions (**E**). ➢ Institutional units with similar functions under one strong entity with defined terms of references are not merged (**G**). ➢ Institutional structure of the different entities and units of MALR, their strengths, weakness and relations with other entities, as well as tasks compatible with their functions are not frequently reviewed and assessed (**E**). ➢ There are several stand-alone general institutions with no defined horizontal or vertical linkages, such as PBADC, the General Authority of Land Reclamation, etc. (**G**).		
	<u>Development of human resources:</u> ➢ Skilled labors are scarce due to the lack of balance between human resource development policies,	➢ Human resource development to provide the needed skills for different development programs, particularly in research and		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	investments, and agricultural development policies. ➢ Rural communities exhibit high rates of unemployment and underemployment. ➢ Rural population and rural inhabitants increased. ➢ The pyramidal structure of human resources working in the field of agricultural research, extension and education lack of coordination. The percentage of older staff at the top of the pyramid is high, while the base is shrinking. ➢ The weakness of implementation and follow-up mechanisms. ➢ Lack of consistency between strategies and execution plans.	extension activities are not well recognized (**E**). ➢ Job opportunities particularly for the younger generation in agriculture and related activities are not created (**G**). ➢ The scientific and technical skills of research, extension and technology transfer staff are not upgraded (**E**). ➢ Linkages between agricultural education programs and graduates, and the requirements of the labor market are not strengthened (**G**). ➢ The capacities of rural leaders and farmers are not built (**E**).		
	<u>Developing the agricultural extension services, research and credit systems:</u> ➢ The utilization rate of extension services, research and credit	➢ Agricultural extension, research and credit modalities and approaches are not developed (**E**). ➢ Solutions to respond to the probable adverse effects of climate change on		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	systems is not reaching their potential due to reducing the annual budgets and the limited financial resources allocated to research development, such resources are grossly misused. ➢ Lack of coordination between the roles played by the different research, extension and credit institutions due to the lack of national plans linking all agricultural institutions to collaborate and exchange experiences and establishes priorities. ➢ Lack of the concerned activities in the field of agricultural production and environmental rural resources, in addition to lack in extension aids in support of agricultural extension.	agricultural production are not proposed (**G**). ➢ Agricultural development performance at the national level and in all sectors are not frequently evaluated (**E**). ➢ Modern technology to the systems development are not applied (**G**). ➢ Value added activities to boost small farmers' income are not improved (**E**). ➢ Investment opportunities are not identified or promoted (**G**). ➢ Coordination between different agricultural related institutions are not well linked (**G**).		
1990s Agricultural Development Strategy	**<u>Increasing agricultural exports:</u>** ➢ Weak participation by small farmers in the export system which relies on	➢ The very limited percentage of exported agricultural products compared to the great productive potential of those producers (**E**).	➢ Reviewing the policies and standards used in selecting the beneficiaries for	MALR and its related sectors in addition to the PBDAC

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	large producers and large export farms, as well as the weakness of complementary and adherence to contractual relations between producers and exporters. ➢ The domestic marketing sector would not be able to support the export subsector. Each constitutes on almost independent chain from the other. ➢ Marketing information and studies related to the export markets are limited. Monitoring, follow-up and analysis of market variables affecting Egyptian exports and imports are also weak.	➢ The contribution of non-traditional products which enjoy competitive export potential is limited (new crops of fruits and vegetables, medicinal and aromatic plants, organic agricultural products, cut-flowers and ornamental plants) have export potential (**E**). ➢ In spite of Egypt's participation in several regional groupings and agreements, such arrangements were not fully exploited in promoting agricultural exports to the markets of the member countries of these groupings and agreements (**G**).	distributing newly reclaimed land. ➢ Promoting agricultural research, production, marketing and export. ➢ Improving on-farm irrigation practices and returns for water use. ➢ Control and combat the loss of agricultural lands. ➢ Fostering the complementarily between research and extension services. ➢ Rationalizing the activities by the PBDAC in procurement and distribution of agricultural inputs. ➢ Establishment of concessional credit lines to encourage farmers to improve field irrigation systems.	
	<u>Maximizing the return of water use:</u> ➢ Even though the sharp deterioration of water resources and the per capita is below the water poverty level, the areas planted to rice increased greatly.	➢ Efforts exerted so far in the field of maximizing returns on water use are not enough to direct farmers towards applying water-saving measures and improved cropping pattern (**E**). ➢ In spite of limited water resources, applied policies		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	➢ In spite of water scarcity, water use efficiency is low due to high water losses. ➢ Weak cooperation between agricultural research centers and universities. ➢ Lack of finance for supporting research budgets including competitive grant funding. ➢ On-farm water use in Egypt is not efficient, and water use rationalization policies are still under discussion. ➢ Water supplies are not flexible. Egypt is already suffering from water poverty (scarcity) at a rate that increases continuously. ➢ Lack of quantitative assessment of water consumptive use on the basis of the assessed water consumptive use and the area cultivated.	have not led to establishing agricultural environment clearly leading to rationalizing water use (**G**). ➢ Absence of concessional credit lines to encourage farmers to improve field irrigation systems (**E**). ➢ Meeting the needs of land reclamation plans, and achieving an appropriate rate of vertical agricultural development (**G**). ➢ Improving environmental conditions, farmers' income and public health in rural areas (**E**).		
	<u>Achieving complimentarily between field extension services</u>	➢ Developing agricultural extension modalities and approaches through technology transfer (**E**).		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	and available technical expertise: ➢ Inefficient agricultural extension system (structure). ➢ Lack of executing intensive extension programs for training extension staff in the different specialization. ➢ Insufficient working procedures with a view to their development and for exercising coordination within the extension system. ➢ Lack of transparent mechanism for monitoring and evaluating extension activities with the participation of concerned stakeholders (available technical experience). ➢ Absence of integrating private sector participation in extension activities. ➢ Lack of incentives to extension staff (should be based on their achievements).	➢ Maximizing the sustainable levels of human resources and the productivity of both land and water (**G**). ➢ Evaluation the generated technology packages based on their economic benefits (**E**). ➢ Protecting the qualitative and quantitative characteristics of agricultural natural resources and promoting the productive efficiency (**G**). ➢ Responding to the probable adverse effects of climate change on agricultural production (**E**).		
	Achieving self-sufficiency in strategic crops:			

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
Agricultural Development Strategy towards 2017	➢ The Egyptian national economy has experienced challenges some of which were due to international and regional changes, while others were the results of local interaction. ➢ A global trend towards the use of food crops in the production of biofuel has wide implications on the food supply to the world market, particularly in the developing countries. ➢ Climate changes and its negative effects on agricultural production. ➢ Little attention to the integrated farm management and improved cultural practices. ➢ Lack of pre- and post-harvest practices. ➢ Inefficient consumption patterns. ➢ Insufficient appropriate agricultural investments. Particularly in land and water management.	➢ Resources and human experiences needed to achieve self-sufficiency in strategic crops are available (**E**). ➢ Several efforts have been exerted and identified for maximizing the sustainable returns of rain-fed agriculture (modern technical applications) (**G**). ➢ There are several successful applications whose results can be replicated. Egypt has the basic legal and institutional requirements that would increase rates of self-sufficiency (**E**). ➢ Great potentialities to maintain and protect the agricultural lands (**G**). ➢ Improving the climate for agricultural investment, particularly in good agriculture practices (**E**). ➢ Existence of national programs and campaigns for the development of strategic crops production (quality and quantity) (**G**).	➢ Decentralization of water management and continue the irrigation improvement activities. ➢ Encourage the establishment of WUA at the marwa and mesqa levels and decrease areas planted with rice and sugar cane. ➢ Establish a mechanism to recover part of the cost of irrigation services and maintenance of irrigation facilities (a cost recovery system). ➢ Create penalties to maintain and protect the agricultural land. ➢ Increase the investment in land and water resources' management to achieve food security. ➢ Support and strengthen the agricultural cooperative.	MALR and its sectors (ARC, extension, and socio-economic affairs), and MWRI
	Developing the agricultural credit policy:	➢		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	➢ Exposure to external crises which negatively affected the agricultural productive capacity and farmer's income. ➢ Some restrictions & problems are still prevailing which reduce the positive impact of newly enacted laws. ➢ Absence of a single entity for the allocation of areas suitable for agricultural investments and a clear investing map in agriculture. ➢ Weakness of PBDAC on its principal role in financing agriculture and banking activities. ➢ Increased fragmentation and scattering of agricultural holdings. ➢ Limiting available finance sources for agricultural activities approved by the government. ➢ Inflexibility of credit lines. Credit policies are limited to conventional types of credits, neglecting the introduction of new credit	➢ Establishing an appropriate environment for strengthening the role of private sector and civil society organizations, and encouraging agricultural producers to establish their own organizations and associations to be able to work in accordance with market forces (**E**). ➢ The economic liberalization era has led to a noticeable shortcoming in marketing constraint and market distortion (**G**). ➢ Recognition or provision of priority areas for improving the standard of living of rural inhabitants (**E**). ➢ Supporting civil society organizations active in rural development (**G**). ➢ Insufficient investment in land and water resource management to achieve food security of the main food commodities (**E**). ➢ Strength and opportunities available to cooperatives (**G**).		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	policies and lines compatible with the agricultural development and modernization.			
Sustainable Agriculture Development Strategy towards 2030 (SADS) "Concerned with the revision of development programs and their objectives, given special attention to the challenges facing agricultural development efforts, as well as execution modalities that would help achieve the greater part of its objectives, should there be a will to change and working potentialities and requirements".	**<u>Rationalization of water resources use policy:</u>** ➢ Lack of scientific development and information technology and agriculture extension. ➢ Effort exerted so far in this field are not enough to direct farmers towards applying water-saving measures and improved cropping pattern. Areas planted with rice have greatly increased. ➢ Changing the relation between agricultural landowners and tenants. ➢ The weakness of small farmers' associations and water user associations. ➢ Global climate change and its adverse effects on water resources. ➢ In spite of the limited water resources, the applied policies have not lead to establishing an agricultural environment	➢ Applied policies have not succeeded in achieving the optimum utilization of Egypt's water resources (**E**). ➢ Lack of consistency between strategies and execution plans. In addition to the weakness of implementation and follow-up mechanisms (**G**). ➢ Developing economically viable technical packages (**E**). ➢ One of the main objectives of the current strategy is to expand reclaimed areas through the use of water quantities to be saved through the improvement of water conveyance and distribution and field irrigation systems (**G**). ➢ Weak linkages between research topics and practical field applications (**E**). ➢ Limited and weak coordination between the concerned institutions. As	➢ National program to rationalize and upgrade the efficiency of water use in agriculture. ➢ National program to maintain and upgrade the productive capacity of agricultural land. ➢ National program to develop field and horticultural crops. ➢ National program for the socio-economic development of rural areas. ➢ National program to develop and modernize marketing and agro-industries. ➢ National program for agricultural research, extension, and technology transfer. ➢ National program for settlement and encouraging investments in agriculture and	MALR and its sectors (ARC, extension, and socio-economic affairs)

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	clearly leading to rationalizing water use and water resources. ➢ Expanding reclaimed areas.	well as the absence of an effective advisory services and farmers' federations (associations) (**G**).	agricultural-related activities. ➢ National program to increase the competitiveness of the Egyptian agricultural products in local and foreign markets. ➢ National program for capacity building of agricultural human resources. ➢ National program to promote the role of communications and information technology in agricultural development.	
	<u>Sustainable expansion of reclaimed areas:</u> ➢ The distribution system failed to establish viable communities capable of settling in the newly reclaimed areas. ➢ The existence of many agencies responsible for the allocation of reclaimed areas, with weak coordination. ➢ The concept of land reclamation has been restricted to the provision of infrastructure, irrigation facilities, roads and energy needs, without giving much attention to the provision of agriculture and social services necessary to establish settled communities. This has delayed or impeded the utilization of investments.	➢ Lack of integrated soil and water management practices (**E)**. ➢ Contradiction in land reclamation plans (**G**). ➢ Water scarcity and drought problems (**E**). ➢ Marginal agricultural areas would be negatively affected, and desertification rates will increase (climate change impact) (**E**). ➢ Lack of coordination between the MALR and other agriculture-related ministries and institutions (**G**). ➢ Weakness in agricultural extension information and education systems, in addition to conventional agricultural financing systems (**G**). ➢ Improving the climate for agricultural investment, and		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	➢ Expansion objectives of reclaimed areas have identified without paying great attention to water-use rationalization policies and procedures, to save irrigation water needed for areas to be reclaimed. ➢ Allowing the use of groundwater in areas for which adequate studies have not been made for ensuring the sustainability of groundwater resources which may lead to high investment risks.	facilitating the allocation of newly-reclaimed areas (**G**).		
	<u>Sustainable development of land and water productivity:</u> ➢ Insufficient scientific research and agricultural technology development plans. ➢ Inefficient agricultural extension system development mechanisms. ➢ Lack of possible sources of finance for supporting research budgets including competitive grand funding. ➢ Weakness of the agricultural information	➢ Encroachment in agricultural lands (**E**). ➢ Reclamation and developing additional lands (**G**). ➢ Continued degradation of soil fertility in some areas (**E**). ➢ Adopting labor and capital intensive agricultural technologies and promoting them (**G**). ➢ The limited land and water resources, and strong competition between the various water uses, it is necessary to concentrate on		

Legislation Goal/Mission/Principle	Associated problems	Reason behind (Governance, effectiveness, other)	Proposed actions	Responsible
	system and development plans. ➢ Inefficient national programs and campaigns to optimize and upgrade the efficiency of water use in agriculture. ➢ Insufficient national programs and campaigns to maintain and upgrade the productive capacity of agricultural land. ➢ Insufficient national programs for capacity building of agricultural human resources (the scientific and technical skills of research, extension and technology transfer staff).	maximizing land and water productivity (**E**). ➢ Raising the levels of self-reliance and self-sufficiency in strategic food commodities (**G**).		

Step 4 – Institutional and policy indicators

An integral part of the tool is the public and programs introduced in a country in terms of implementation of political commitments towards objectives and targets. The analysis focuses on two key dimensions of budget analysis, for which different indicators were developed (See table below). These dimensions are:

Strategic priorities and political commitment of Government and donors

This dimension illustrates the investment priorities and political commitments assigned by governments and donors to irrigation and hydropower investment. The indicators are used to show the public and donor investment priorities and commitment to water management for agriculture.

Efficiency of the public spending in the irrigation and hydropower sectors

Although water allocation planning is a centralized process in Egypt, budget spending in irrigation projects is directed to local entities; governorates and districts. Implementation of irrigation activities and projects is supervised by central level. To study these two dimensions, it worth to present here the process of Egypt's budget allocation. Like many countries in the world, Egypt developed the basics for effective budget analysis and allocation. These basics include the laws that govern the budget, the process the government follows to develop and implement the budget, and the formats including the "classifications" used to present budgets, the location of budget documents where members can of the public get copies of budget documents. The government's budget process of developing, implementing (or executing), and evaluating the budget has four phases .

i. Formulation Phase

In this phase, the government (the Ministry of Finance and the Ministry of Planning, together with the Central Bank) identifies its macroeconomic assumptions for the country in the coming year. On the basis of these assumptions it develops an estimate of anticipated total revenue and expenditure, normally about six months before the start of

the fiscal year. While this is happening, all ministries, departments, and agencies develop their budgets. They send the budgets to the relevant sector ministries, which in turn integrate them into the sector ministry's budget and forward the results to the Ministry of Finance. After receiving and compiling these various budgets, the Ministry of Finance discusses them with the cabinet, which reaches a consensus on a budget proposal. The cabinet submits its proposal to the President who forwards it to the parliament for discussion and approval ("enactment"). The proposal, which is considered the most important budget document as it lays out the government's plans for raising and spending public funds, is called the Executive's Budget Proposal.

ii. The Enactment Phase

This phase starts when the President presents the Executive's Budget Proposal to the parliament to examine, amend and approve the budget. Then an Enacted Budget (a key budget document) is issued before the start of the fiscal year. Another document that is issued along with the Enacted Budget is a Citizens Budget. A Citizens Budget is a simplified, nontechnical presentation of the enacted budget document, one that ordinary people can understand.

iii. Implementation ("Execution") Phase

Once the budget has been enacted into law, the executive can start implementing it. That is, collecting and spending funds according to the functions, line items, and ceilings specified in the budget. The ministries report monthly to the Ministry of Finance on their revenue and expenditures. The Ministry of Finance integrates the information and issues cumulative, aggregate Monthly In-Year Reports throughout the fiscal year. These reflect the actual funds collected and spent to date by the entire government.

Midway through the year, the executive should review revenue and expenditures for the first six months and analyze economic and political developments (local and international) that may have had, or will likely have, a significant impact on the budget. On the basis of this analysis the government re-examines the assumptions related to macroeconomic indicators that it had used in initially formulating the budget. Following the end of the fiscal year, in other words in July, ministries and other administrative units begin to

compile their actual revenue and expenditure figures, forwarding their reports to the Ministry of Finance to prepare and issue the Final Accounts Report.

iv. Audit Phase

The Final Accounts Report (Year-End Report) is sent to the Central Audit Agency to be audited for accuracy in accounting as well as compliance with laws and administrative regulations. Audit Report is submitted to the Ministry of Finance and to the parliament, whereas its recommendations and suggestions for corrective actions are discussed with the executive. The executive's Final Accounts Report is then approved by the House of Representatives and passed through a law signed by the President. This Final Accounts Law is then published on the Ministry of Finance website. It can be noted from the process of the budget development that the local entities in Egypt has the key role in planning and proposing the budget allocation. Their proposals are sent to central level (to their line ministries) to be integrated in the country budget. For effective and efficient budget spending, a monthly and mid-year evaluation is made through the fiscal year**.**

The timely utilization of this budget and the share of actual versus planned public spending is 100% due to the process of regular evaluation of the budget.

STEP 5 – CONCLUSIONS

Since the agricultural sector uses more than 80 percent of available water supplies, it is the most relevant sector in order to improve water efficiency to reduce water scarcity. There is a need for innovative solutions to make agriculture in Egypt more water efficient, and to increase yields and food security by measures leading to "more crop per drop".

The challenges facing the water sector in Egypt indicate the need for strengthening the role of all stakeholders involved in water resources management. Through this paper, an institutional mapping and analysis was conducted to determine the role and mandate of each institution, current legislations, and current policies.

Most of the proposed actions are already set by the MWRI through the National Water Resources Plan (NWRP) developed in 2005. Measures of the NWRP are based on three main pillars. The first is the water supply augmentation which is considered the most

critical pillar since Egypt's Nile water share is fixed since 1959 agreement even though the population has doubled. The second pillar is water quality protection and pollution control which is the responsibility of most stakeholders such as NOPWASD, the Ministry of Industry and the Ministry of Environment. The third pillar considers the increase of water use efficiency in order to meet the growing water demands and to increase water productivity.

Analysis of laws and legislation showed that some existing water laws require revision to reflect present day conditions and the need of private sector involvement. An example of this is the introduction of market-based instruments as policy tools which deserves careful attention in legislative reforms. There is no legislation that allows any stakeholder to collect fees for the provision of irrigation services. Despite progress on the ground with pilot activities, there is no clear legislation covering participation of the private sector in water management and services. In addition to the modification of laws, capacity building of governmental officials is essential in order to foster private sector involvement and the farmer's participation.

Law 12 and its executive regulation were issued to provide a legal basis for irrigation and drainage issues based on the vision of the 1980s. Given the major changes in vision and policies, the increasing scarcity of water, and the increased importance of stakeholder's participation, the law needs to be carefully reviewed and modified by the MWRI.

Training is also required for farmers' organizations to manage water allocation and maintain water facilities. One of the most important topics in farmers' training is crop selection and irrigation scheduling. The MWRI established the irrigation advisory body to provide technical assistance to farmers. Although great efforts have been done by the MWRI in the field of participatory water management, there is still a need for expansion of this approach and formation of water user associations to cover the whole irrigation system.

Another key action proposed is pollution control. The problem identified is the high cost of pollution control such as wastewater treatment. NOPWASD has some initiatives to introduce low cost treatment plants that can be provided to villages and hence improve water quality for irrigation. The Ministry of Environment has a major role in solid waste

management that leads to maintaining water quality. Solid waste management can be considered as micro projects for youth and hence solving the unemployment problem in addition to sustaining the environment. Key actions required for improving and sustaining AWM in Egypt is presented in the following matrix.

Primary legislations such as law 12/1984, law 213/1994, law 48/1982, Law 4/1994 share a common mandate which is to promote sustainable socio–economic growth and protection of the environment. In accordance with these frameworks, water use should be regulated in order to achieve good quality and adequate quantities. Some of the key strategies for ensuring such targets include use of permit to regulate use, catchment protection, capacity building and multi – stakeholder participations.

Water management is fragmented among several ministries and authorities, each making either a direct or indirect contribution to water resources management. Although the Ministry of Water Resources and Irrigation (MWRI) is responsible for water resources planning and management, linkage and coordination with other stakeholders are not strong enough to eliminate conflicts. These stakeholders include governmental agencies and authorities, the private sector, non-governmental organizations, and individuals. Some of these stakeholders affect the quantity of water supplies, while others are more involved in the quality of water supplies.

For AWM interventions to achieve its goals (e.g. efficient water use), farmers need to participate fully in order to achieve sustainable agricultural practices (IIP, IIIMP, etc.). For example, in developing the irrigation improvement projects, local farmers need to be engaged right at the beginning of infrastructure development so that they can build a sense of ownership. Successful engagement with farmers can also ensure that they can participate in the operations and maintenance of irrigation improvement project over a longer period of time. The main reason is slow implementation of IIP, lack of involvement of WUAs, slow rate of formation of WUAs and BCWUAs and lack of participatory in water management.

When farmers are not involved from the start of a project, the potential consequence is mismanagement of irrigation projects, underutilization of the infrastructure and in some cases permanent closure of operations.

External financial support from development partners (e.g. W.B., USAID, CIDA, IFAD, FAO, JICA and GIZ) plays a vital and important role in AWM in Egypt. However, this is not sustainable, meaning that many interventions that are fully dependent on donor funding tend to stop once the support ceases. It is therefore important to mobilize funding within the country (at national, country and local levels) in order to sustain AWM projects over a longer period of time.

Systematic research and monitoring can generate important information about water productivity in agriculture. This analysis demonstrated the limited and weak coordination between the different agricultural research institutions; weak performance and limited capabilities of the existing agricultural extension services and the irrigation advisory services; weak linkage between research topics and practical field application; reduced research budgets; the lack of a national research plan indicating application problems that need to be given priority; and lack of cooperation that led to reducing the capabilities of scientific developments and achievements.

The Agricultural Research Center (ARC, MALR) and the National Water Research Center (NWRC, MWRI) are legally mandated to monitor water productivity in agriculture sector.

The main institution for water management in Egypt is MWRI. Its mandate is to develop and provide water for all sectors in Egypt. The MALR performs effectively through existing legislation and regulations. However, for future development, both mandate and legislations need to be revised. The relation with related institutions may need more strengthening. The need for additional water has a great influence on the performance of the MWRI.

The present analysis has also revealed that the importance of the institutional reform of the MALR and their institutions, cooperative sector, and civil society organizations support in playing an effective role in AWM.

Regarding MALR legislations, it can be concluded that implementation and enforcement of laws and regulations are ineffective and there is a lack of harmonization of legislations. However, the presented laws need to be enacted to reflect the latest developments, concepts, visions, and inputs related to water resources management. Given the major

changes in vision and policies, the increasing scarcity of water in Egypt, the anticipated diversion of the Nile water to new lands, and the increased importance of stakeholder participation, the law and its executive regulations need to be carefully reviewed and revised.

The MWRI has formulated the proposed draft law in coordination with the governmental authorities concerned with water resources and irrigation affairs, especially, the MALR, the Ministry of Reconstruction, and the local council. It can be concluded that there is significant implementation of water policies. However, the rate of implementation is still slow. Reasons behind this slow implementation are mainly lack of finance, the need for developing new water resources and modifications of laws and regulations.

Regarding MALR policy achievements gained, several objectives of these policies have been realized, while others lagged. Underlying causes are the national economic situation in Egypt that has experienced challenges. Taking into account all these challenges, the analysis has identified four key actions that should be taken in account order to achieve successful AWM.

Stakeholders include governmental agencies and authorities, the private sector, non-governmental organizations and individuals. To cope with that, several policies have been launched to better utilize the limited water resources and increase the efficiency of water use within all sectors. It also considers the integration of socio-economic and environmental aspects in water management and the involvement of all stakeholders in the various management activities. Also, encourage effective stakeholders' participation and strengthen the role of NGOs in protecting the environment, specifically in the areas of rationalizing water consumption, avoiding solid waste and industrial wastewater disposal in the River Nile, and acquiring safe and clean energy through the use of organic subsurface material from animal and agriculture waste.

FINAL KEY ACTION MATRIX

Table 14 summarizes the proposed main actions recommended (MWRI and MALR) for AWM in Egypt to improve and strengthen the AWM in Egypt based on the analysis made

in previous sections of this report. The previously proposed actions are merged and screened to set the most urgent and effective actions.

Table 14 – Step 5.1. Final action matrix for AWM in Egypt

Responsible	Proposed actions
Ministry of Water Resources and Irrigation (MWRI)	➢ Implement the NWRP measures that were developed in 2005 and assigned tasks for each ministry ➢ Formulate and activate the role of the National Water Council ➢ formulate a plan for Groundwater quality management and protection ➢ Encourage private sector participation ➢ Strengthen and expand the participatory water management ➢ Establish and conduct training program for WUAs and BCWUAs ➢ Strengthen the bilateral cooperation with the River Riparian countries to develop the water resources ➢ Enforce using the water-saving technologies in irrigation particularly in newly reclaimed areas ➢ Enhance water monitoring systems and introduce the updated technology in monitoring and water allocations
National Organization for Potable Water and Sanitary Drainage; (NOPWASD)	➢ Develop a long-term plan for rehabilitation of water supply network ➢ Develop a long-term plan to expand the sewage collection and treatment ➢ Develop a plan for using the treated sewage ➢ Develop and implement low cost technologies for domestic wastewater and industrial treatment ➢ Conduct public awareness campaign ➢ Develop incentives for water saving
Egyptian Environmental Affairs Agency; (EEAA)	➢ Conduct public awareness campaign ➢ Establish solid waste collection and management projects that may be added to the micro-project national program ➢ Develop modernized monitoring systems to maintain the quality of water resources and monitor the point and non-point pollution
The River Transport Authority (RTA)	➢ Develop a master plan for national navigation by using the canals and the river ➢ Proper planning, management and operation of a navigational channel throughout the Nile ➢ development of existing ports on the Nile ➢ Installation of navigation aids, control centers, navigation traffic system ➢ Increasing the number of waste dumpsites along the Nile banks, banning on shipping of hazard material, and improving standards of ships
Economic Affair Sector and Agriculture Economic	➢ Establish an entity responsible for the economic liberalization affairs with clear cut assigned tasks and appropriate mechanisms ➢ Support the institutional set up of marketing issues and improve the marketing information network system

Responsible	Proposed actions
Research Institute (MALR)	➢ Allowing the private sector to actively participate in agriculture activities, especially in irrigation and drainage
ARC relevant institutes, agriculture extension sector (MALR)	➢ Increase the efficiency of water conveyance and distribution systems, as well as raising on – farm water use efficiency to XX% ➢ Expand the modern irrigation techniques in the newly reclaimed area (Sandy soil) ➢ Define the suitable cropping pattern applied in each agriculture zone. ➢ Enhance the coordination among the different concerned institutions on AWM issues (research institutions) ➢ Increasing the efficiency of utilizing the rainfall water losses (water harvesting and supplementary irrigation techniques) ➢ Maximizing the utilization of groundwater in agriculture ➢ Establishing a modern and integrated national network for monitoring climate change effecting agriculture ➢ Establish an irrigation advisory system in agriculture extension sector ➢ Developing technological and awareness packages (proper agriculture water management practices and techniques) ➢ Increasing the research budgets and enabling the younger researchers to interact with their counterparts at the international level
Agriculture Extension Sector and Agricultural Cooperative Union (MALR) & Irrigation Improvement Sector and irrigation advisory administration (MALR)	➢ Training programs for farmers and on farm subject matter specialists in the field of AWM. ➢ Develop a field irrigation extension guide at village level. ➢ Improve linkages between agriculture extension and irrigation advisory services specialists. ➢ Enhance the role of agriculture cooperatives in on-farm irrigation improvement programs. ➢ Enhance women participation in on-farm water management activities. ➢ Continuation of irrigation improvement programs and projects.
Ministry of Agriculture and Land Reclamation (MALR)	➢ The Egyptian MALR has adopted a strategic planning approach to identify ways and means to continue fostering development of the agriculture sector (four agricultural development strategies were proposed and issued. ➢ Issue laws and regulation to manage and monitoring the agricultural activities in different field of interests (mainly in AWM). ➢ Enhancing water use efficiency in irrigated and rain fed agriculture. ➢ Guarantee sustainable expansion of reclaimed areas. ➢ To foster sustainable development of land and water. ➢ Maximizing the sustainable returns of rain fed agriculture. ➢ Maintaining and protecting agricultural land. ➢ Human resources development and creation of job opportunities. ➢ Improving agriculture productivity. ➢ Increasing competitiveness of the agricultural products in local and foreign markets. ➢ Achieving higher rates of food security in strategic goods. ➢ Improving opportunities for agricultural investment. ➢ Improving livelihood of rural inhabitants' reform.

Responsible	Proposed actions
	➢ Preparing investments needed achieve the strategy objectives. ➢ The agricultural sector institutional reform. ➢ Reforming and supporting civil society organization active in the field of agricultural water management. ➢ Reviewing and developing different agricultural policies. ➢ Formulation of monitoring and evaluation mechanisms for AWM and others.

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