

Regional Initiative on Water Scarcity in the Near East

Preliminary Regional Review and Gap Analysis - DRAFT

FAO RNE, May 2013

1. INTRODUCTION

1.1 Food Security and Water in the Near/Middle East and North Africa (NENA/MENA) region

The MENA region is the most food import-dependent region in the world, and net food imports are projected to rise even further in the future. Net food imports have accounted for 25–50 percent of national consumption (IFPRI, 2012), and this high reliance on imported food can be attributed to both demand- and supply-side factors. Demand-side factors include rising population and changing consumption patterns due to higher income. The MENA population tripled from 100 million in 1960 to more than 300 million people in 2006 and is projected to continue to grow at an annual rate of 1.7 percent. Shifting demand patterns from staples to higher-value food products, combined with limited potential for land expansion, will further increase the region's food trade deficit. Supply-side factors include limited natural resources such as land and water.

Poverty and food security are particularly closely linked in Arab countries due to high vulnerability to food-related “external shocks.” Arab countries are exposed to global food price volatility, natural disasters, increasing water scarcity, and conflicts, all of which have direct and indirect impacts on people's well-being and nutritional status. The food and oil price spikes of 2007–2009 were a stark reminder of the potential fragility of the region's food security situation. Food security has a macro and a micro dimension. The macro-level dimension comprises the key elements of macroeconomic stability, economic growth, and governance (IFPRI, 2012).

“At the macroeconomic level, there is broad and growing consensus that food security goes beyond the simple notion of food self-sufficiency ... Particularly in the Arab world, with its high food-import dependency and limited agricultural potential, a country's trade and budget balances play major roles in food security. The general idea behind this “trade-based” view is countries that generate sufficient foreign exchange earnings from their exports (of goods and services), and thus have sufficient access to food imports from world markets, have no food security problem.”

The micro-level dimension includes household access to food and assets and services necessary for an individual to be healthy, which are typically constrained by poverty in food-insecure households. As described by IFAD (2007), poverty in the Near East and North Africa (NENA) is concentrated in rural areas. Some 60 to 70 per cent of the region's poor people live in rural areas, and on average about 40 per cent of the rural population is considered poor. Latest estimates indicate that about 95 million rural people in the region live on less than US\$2 a day and about 65 million of them live in absolute poverty, without the minimum requirements for basic survival. Recent analyses reported by IFAD show that the NENA region is lagging behind other developing regions in poverty reduction, economic growth, trade reform, private-sector development, governance and democratization, and gender equity. One of the most pressing challenges in the region is the high rate of unemployment, particularly among young people. Average official unemployment rates in the region are about 13 per cent, and in some countries jobless rates among young people are twice as high.

Four broad pathways for food security have been identified by IFPRI, including

- i) domestic production (including for local markets, both urban and rural, and including some self-consumption of own production)
- ii) commercial imports (financed by earned foreign exchange revenues, themselves partly generated by export-oriented agriculture), including both inter-continental and intra-regional imports

iii) food aid and

iv) (more recently) the directly sourcing of food requirements from overseas (including by the leveraging of hydrocarbon resources with reciprocal food security agreements and diversifying overseas investments)

Each of these pathways implicate water demand and supply within food security in different ways, at different scales in different countries, among different farmer groups and in different locations, both inside and outside the region:

Domestic production: including production (of crops, fish and livestock and forest products) under improved water control and rain-fed for self-consumption by farmers or for sale on local markets

Commercial imports: requiring of foreign exchange earnings, with production of high-value export crops, often under irrigation. Water consumption and management (and profitability) in exporting countries, which may be within the MENA/NENA region.

Food aid: Water consumption and management (including profitability) in exporting countries.

Direct sourcing of food requirements from overseas: Water consumption and management (including profitability) in exporting countries.

The MENA region is the most water scarce region in the world. Worldwide, the average water availability per person is close to 7,000 m³/person/year, whereas in the MENA region, only around 1,200 m³/person/year is available. One half of MENA's population lives under conditions of water stress. Moreover, with the population expected to grow from around 300 million today to around 500 million in 2025, per capita availability of water is expected to halve by 2050 (World Bank, 2010).

FAO has anticipated (SOLAW – TR01) that the global expansion of irrigation would be strongest (in absolute terms) in the land-scarce regions that are hard-pressed to raise crop production by intensive cultivation practices, including in Near East/North Africa (+ 6 million ha); although in the this region further expansion will become increasingly difficult as water scarcity increases and competition for water from households and industry continues to reduce the share available to agriculture.

So, the nexus of food security and water is clearly a vital one in the region. However, food security (at national or household scales) is not the sole driver of water policy and management in the region. Economic and social drivers for jobs, employment, income and export earnings, inter alia, are all also influential upon water use and reform processes, not just among the rural agricultural population but also among the urban-based non-agricultural populations. Major gains have been made in drinking water coverages, but more remains to be done, especially in relation to those without access, and on sanitation and hygiene.

The overall goal for countries in the region is to secure sustained agricultural growth, reduce poverty and improve food security, as agreed at the Arab Economic Summit in Kuwait in 2009. This overall goal places diverse drivers onto water. A water/food security strategy cannot be pursued in isolation of drivers of other outcomes that will similarly depend on water, and clearly agriculture is not about food security alone, but also jobs, employment, income and export earnings from agriculture.

Indeed, it has been concluded that water shortage in the MENA region will be enormous in the next decades. 80% of that shortage will be attributable to a steep increase in demand owing to strong

population growth and fast economic development (including the rising demand of a wealthier middle-class, with different dietary habits), and about 20% may be attributed to climate change.

IFPRI view that the managing of future food security at the national level must include strategic choices about securing access to food through a mix of domestic investments (agriculture and food stocks) and international market arrangements (trade agreements and hedging) or potential innovative mechanisms (such as virtual reserves).

Within these contexts, some central and overarching lessons learned from the body of experience from agricultural water in NENA are that

- “Potential solutions to the region’s water problems are well known but have often not been implemented because of constraints in the broader political economy”¹
- “Non-water policies in particular create incentives for inefficient water use”²
- “Water is not an isolated sector but an integral part of a wider economic system. Any agenda for reform of water policy must respond to the realities of the political economy.” ... “Actions outside the sector will be important. No matter what changes are made within water ministries, service providers and interest groups, if forces outside the sector encourage inefficient water use, unsustainable water will prevail”. “Countries (outside MENA) that have introduced or accelerated water reforms have often done so as part of broader economic and structural changes”³
- “An increased reliance on a trade-based food security strategy has implications for future resource allocation in the MENA region. Within the agricultural sector, international organisations are advocating a shift away from domestic cereal, dairy and meat production towards production of tree crops, vegetables, fruit and semi-arid crops, which make more efficient use of water and which can be partly destined for export markets. This is based on the need to save scarce water and maximise the returns to water use. Hence, within agriculture the policy advice is to shift away from water intensive food crops towards more water efficient agricultural exports, with the foreign exchange earned from such exports helping to fund a higher level of food imports. ... However, due to price distortions in water scarce countries such as trade protection, price supports, and subsidized credit, energy and water, all of which encourage excess water use for irrigation, water scarcity currently plays only a small role in determining global trade patterns.”⁴

These lessons, alongside other key lessons learned within the sector within the MENA region, point to a way forward that evolves from more traditional perspectives on water management, even beyond the IWRM agenda of the past ten years. It is an agenda that needs to be forged more closely within the moulds of the different strategies for achieving food security (that each depend upon water and farmers in significantly different ways) and of the political economy around water.

1.2 FAO’s Strategic Objectives

FAO’s Strategic Objectives which will be influential upon its Medium Term Programme (MTP) 2014-17 and its Programme of Work and Budget. Recently, FAO has reduced its overall number of Strategic Objectives to five, namely to

1. Eradicate hunger, food insecurity and malnutrition

¹ OECD (2010) ‘Progress in Public Management in the Middle East and North Africa – Case Studies on Policy Reform’ p.298

² World Bank (2010) MENA Water Sector Brief, p.1

³ World Bank (2007) ‘Making the most of scarcity - Accountability for Better Water Management Results in the Middle East and North Africa’. p.136

⁴ AfDB (2012) ‘The political economy of food security in North Africa’ p.16-17

2. Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner
3. Reduce rural poverty
4. Enable more inclusive and efficient agricultural and food systems at local, national and international levels
5. Increase the resilience of livelihoods to threats and crises

In preparation for the next Biennium 2014-2015, and is MTP 2014-2017, FAO is piloting each of the five Strategic Objectives in line with particular regional priorities, with Strategic Objective 2 undergoing two pilots, namely:

Strategic Objective 1: "Hunger free Latin America and Caribbean"

Strategic Objective 2: "Rice-based production systems in Asia", "Regional Initiative on Water scarcity in the Near East"

Strategic Objective 3: "Rural poverty in Africa"

Strategic Objective 4: "Agrarian structures in Europe and Central Asia"

Strategic Objective 5: "Resilience in the Sahel and the Horn of Africa."

The lessons learned from the six pilots conducted during 2013 are intended to be instrumental upon FAO refining new ways of working for the implementation of the Programme of Work and Budget, including in the next biennium (2014-15). It is understood that lessons learned from 'ground-testing' new ways of working for the organisation will be in respect of

- Strengthened alignment of programmes with the Strategic Framework
- FAO's recent decentralisation model
- Multi-disciplinary (cross-house) working
- Partnerships

1.3 FAO's 'Regional Initiative on Water Scarcity in Middle East and North Africa'

The 'Regional Initiative on Water Scarcity in Middle East and North Africa' is a pilot initiative of FAO's new Strategic Objective #2 aiming to 'Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner'. The principal focus of the MENA study, as one of two pilots during 2013, is the improvement of food security through water.

The 'logic' (Figure 1) of the overall pilot is aimed ultimately at achieving impact at scale in increased food production and availability in the region. Opportunities are seen to lie in raising yields, increasing cropping intensity, expanding cultivated areas, reducing food losses, fish, livestock and watershed management.

The delivery of that impact is to be through a Regional Initiative, founded on a Regional Strategy to be prepared by the end of 2013 and through Partnerships.

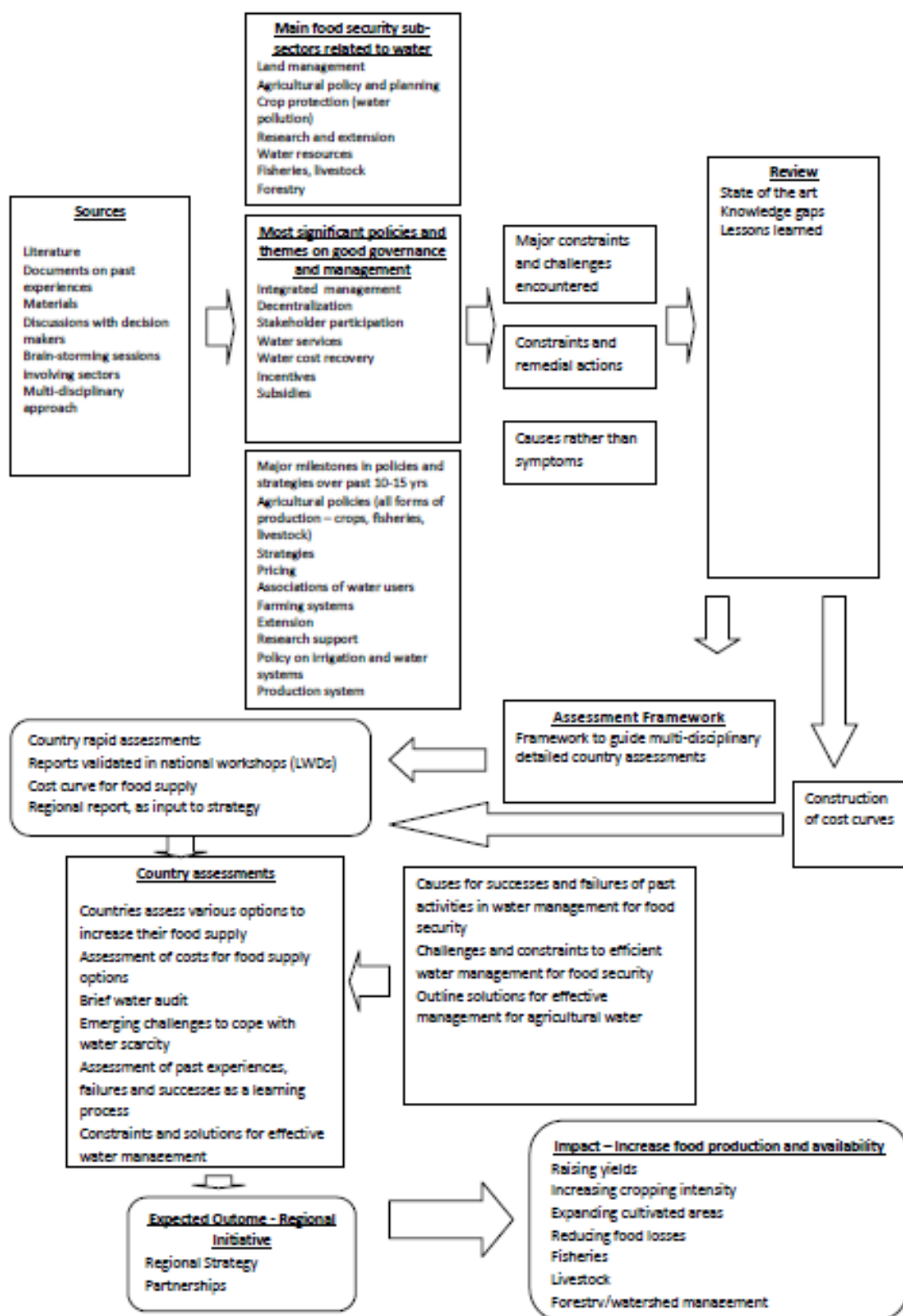
The preparation of that Strategy is to be informed by National Assessments in a number of countries. Those National Assessments are to have taken account of

- An assessment of various options to increase their food supply
- Assessment of costs for food supply options
- Brief water audit
- Emerging challenges to cope with water scarcity
- Assessment of past experiences, failures and successes as a learning process
- Constraints and solutions for effective water management

informed by causes for successes and failures of past activities in water management for food security, challenges and constraints to efficient water management for food security, and outline solutions for the most cost-effective and uptake-scaled interventions in water that will impact upon food security. Those intervention options would then form the basis for the Regional Initiative from 2014-15 onwards whereby FAO would work with partners in response to country and regional demands to implement that strategy.

Those National Assessments, to be conducted during mid-2013 are to have been supported by the introduction of 'Food Supply Cost Curves' and by a review of the state-of-the-art, lessons learned and gap analysis.

Figure 1 Logic diagram for the Pilot Regional Initiative



1.4 Structure of this report

Within the overall logic of the pilot initiative, this report represents an initial review of the state-of-the-art and lessons learned, with the purpose of informing a preliminary gap analysis and providing guidance to subsequent National Assessments. Accordingly,

Section 2 presents an initial review of findings by several of the principal actors who have been supporting NENA countries to achieve impact at-scale through water within agriculture with the region's national partners

Section 3, informed by evidence, presents a provisional framework constructed from the main building blocks that could be considered useful to guide the water and food security/agriculture agenda of the region

Section 4 focuses on the perceived scope of the FAO Regional Initiative within that wider framework

Section 5 presents an initial assessment of gaps

Section 6 presents preliminary guidance to the National Assessments, emerging from the preceding

2. Initial Review

Within the context of this study's 'Logic Framework' of identifying preliminary gaps and providing guidance to National Assessments, this Initial Review has focused on the published findings of several of the principal actors who have been supporting NENA countries to achieve impact at-scale through water within agriculture with the region's national partners, namely the World Bank, African Development Bank, IFAD and FAO, as well as politically-connected entities including the Arab Water Council and the World Economic Forum, and strategic 'think-tank' type organisations including IFPRI and research institutions including the CG-system – all potential partners in the future Regional Initiative. The supporting information is drawn from the Bibliography set out in Annex 1.

2.1 On food security

As discussed in the introduction, there is not one single development pathway to food security (which embraces both national food security/sovereignty and household food and nutrition security). Four generalised pathways have been identified, including domestic production, commercial imports (financed by earned foreign exchange revenues, themselves generated by export-oriented agriculture), food aid and more recently the directly sourcing of food requirements from overseas (including by the leveraging of including leveraging hydrocarbon resources with reciprocal food security agreements and diversifying overseas investments).

Although not yet well elaborated, each food security pathway embodies different agricultural and water management implications for national natural resources (and in countries from where food is imported), for example staple food production (including rain-fed) and consumption compared with high-value export crops into European markets (large commercial and small-holders), with "a strong dualism between traditional agriculture and modern agriculture".

The strategic decisions on food security pathways (where such strategies are in tandem with farmers' own crop decisions) lie at a political level above water management per se and lie ultimately with groups and individual farmers. They are influenced also by market-pull factors that

are influential on profitability, productivity and value chains, thus directly connecting water management to the factors around possible market expansions (eg South:South, European, internal), existing volatilities, current and future trade access, and ultimately competitiveness with extra-regional and emergent countries exporting to NENA. A narrower domestic production-based focus for food security would not be the full story for future water/food security dialogues in NENA.

2.2 On the different demands for water

Economic and social drivers for jobs, employment, income and export earnings, inter alia, are all influential upon water use and interconnected with food security, not just among the rural agricultural population but also among the urban-based non-agricultural populations. Thus, food security (at national or household scales) is not the sole aspirational outcome from water use and management.

The overall goal of for countries in the region is to secure sustained agricultural growth, reduce poverty and improve food security, as agreed at the Arab Economic Summit in Kuwait in 2009. This overall goal places diverse drivers onto water. A water/food security strategy cannot be pursued in isolation of drivers for other outcomes that will similarly depend on water. Indeed, it has been advocated by some that agricultural sector policies should be sub-ordinate to the pro-poor growth goal and not to the goal of food self-sufficiency. “At present, several interrelated policies and rigidities in many MENA economies reduce employment opportunities outside agriculture and discourage farmers from diversifying into other crops. This leaves large populations farming—and using water— inefficiently” – such that part of the solution lies in diversifying (re-)employment opportunities outside of agriculture.

Indeed, it has been concluded that water shortage in the MENA region will be enormous in the next decades and that shortages will be driven primarily by demand. 80% of future shortage has been attributed to a steep increase in demand owing to strong population growth and fast economic development (including the rising demand of a wealthier middle-class, with different dietary habits). In addition there are supply-side pressures, with an estimated 20% of future shortage being attributable to climate.

2.3 On assessing relative effectiveness of water interventions

An assessment of the relative effectiveness of different water interventions in the NENA region has so far applied a cost-curve approach focusing primarily on water technologies, aimed at identifying those interventions with high impact and low cost. For example, while yields can be high (rice under irrigation in Egypt at 7 tons per ha) grain yields remain very low in several NENA countries, well below Euro-Mediterranean averages, so boosting yields is seen as one intervention option. Innovation and new technologies that focus on drought stress and salinity tolerance – including desalination, wastewater recycling and products of agricultural research – are also seen as having potential to play an important role in the future water supply.

The cost-curve approach adds value because numerous agencies have cited localised examples of water interventions, including for example floodwater capture in the Sudan, climate proofing in Jordan and ecosystem protection in Morocco (IFAD). FAO has itself experiences of water technology interventions, with experiences (yet to be captured in detail) from 60+ review meetings, the FAO climate project database, the AgWater Solutions programme, investment projects under TCI, field experiences under TCSS and TCE and the ALAWUC initiative, among others.

In search of prioritising the most effective water technology options to overcome water shortage, World Bank/Future Water progressed application at national level in numerous NENA countries (eg

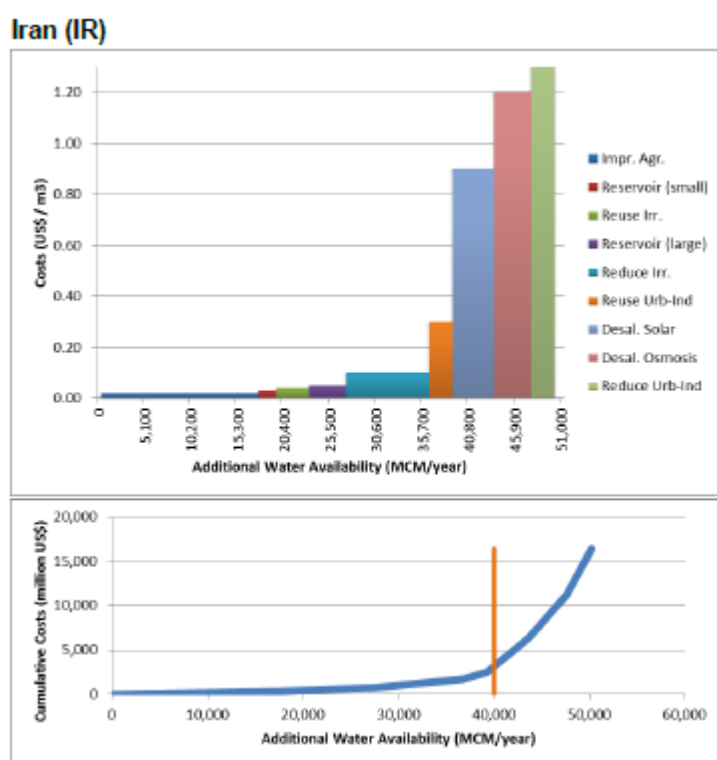
Box 1) of the cost curve approaches to nine different technology-focused options within the three broad categories of

- i) increasing productivity,
- ii) expanding supply and
- iii) reducing demand.

The findings across the region have indicated that a mix of approaches is required and that these are country-specific in their relative contribution. Overall, that study has concluded with a MENA regional annual cost to overcome water shortage in 2050 of approx US\$100 billion per annum, ranging between 27 billion and 212 billion depending on different climate scenarios.

However, a key finding is that while cheaper options identified by the cost-curve approach may be introduced first, that study has concluded that cheaper options alone might not be sufficient to overcome water shortage completely. Therefore, even the more expensive options will be required to bridge the water 'gap'. Thus, while there will be good reasons for implementation of prioritised lowest cost/highest impact interventions, such interventions can only be expected to make a partial contribution and to fall short of resolving the water/food security challenges. By the implication that all technology options will anyway be required, orientations may lean as much towards the relative practicalities of implementation and uptake as a basis for scheduling and prioritisation, rather than costs and impact in alone.

Box 1 Water technology cost curves in Iran



2.3 On agricultural policies – Some key messages that have emerged in respect of agricultural policies include the following, reflecting an overall call for governments to upgrade their food security strategies, with strategic options under a regional perspective, and as part of complementary policies and public investments:

“In addition to the agenda for agricultural development, strategic options are needed in order to achieve food security and alleviate rural poverty. All possible alternatives that work

in favor of meeting needs in the long term must be considered. This requires a regional perspective, very different from the fragmented approaches that have dominated the history of Euro-Mediterranean policies. “⁵

“It is important for governments to allow farmers to respond to market signals, which could be the best way to address food staple scarcity over the longer term. For shorter term concerns governments need to upgrade their food security strategies, either through improved management of inventories, or by reliance on market mechanisms such as future markets or long term contracts.”⁶

“most policies cannot be implemented in isolation. Rather, policies tend to be most effective when implemented along with complementary policies and public investments”⁷

2.4 On Water management measures

There has been significant assessment of a variety of water management measures, including the following in respect of institutions and policies, Water User Associations, water demand management, subsidies and water pricing, water allocation, public management and decentralised governance, and private sector engagement/PPPs:

Water management institutions and policies have highlighted that there has been strong progress in improving water policies and institutions, but that within agricultural programs there is a lack of synergy among participants in rural development. Countries have in place some governance structures for managing irrigation, but all countries have room for improvement regarding economic incentives and decentralised institutions, with a gap in community-based resource management groups. While there is some association of agricultural water with transboundary waters, this may not be as strong as in other regions – though the association with groundwater is higher than elsewhere.

“MENA has much to be proud of in its water management. The countries of the region have made great progress improving water policies and institutions”⁸

“most (agricultural) programs lack a common vision of cooperation and synergy among those participating in rural development”⁹

“IFAD’s thematic priorities encompass (inter alia) a new focus on managing land and water resources for poverty reduction, including the key role of empowerment of community-based resource management groups”¹⁰

“Innovation and adoption of new technologies are important, yet improving water management and institutions are necessary for better food security. Most MENA countries with irrigated areas have some governance structures in place for managing irrigated water See Box 2. All countries, however, have room for improvement in water resource management, particularly regarding economic incentives and decentralized institutions”...

“The often short and ephemeral rivers in the region and the significance of groundwater probably contribute to the relatively low share of river basin organization in MENA.”¹¹

⁵ GMF (2012) Agriculture in North Africa: A Chance for Development, p.4

⁶ World Bank (2008) Agriculture and rural development in MENA, p.4

⁷ IFPRI (2013) Evidence on Key Policies for African Agricultural Growth. Abstract

⁸ World Bank (2007) ‘Making the most of scarcity - Accountability for Better Water Management Results in the Middle East and North Africa’. p.136

⁹ GMF (2012) Agriculture in North Africa: A Chance for Development, p.3

¹⁰ IFAD (2007) IFAD in the Near East and North Africa, p.2

¹¹ IFPRI (2010) Food Security and Economic Development in the Middle East and North Africa - Current State and Future Perspectives, p.16

Box 2: Assessment of water policy instruments in a sample of MENA/NENA countries ¹²

Country	Water policy?*	Specialized agency for basin-level management?	Dedicated irrigation infrastructure development entity?	Empowerment of water user associations?	Irrigation strategy?*	Irrigation action plan?*
Algeria	Yes	No	Yes	No	Yes	No
Djibouti	Yes	No	Yes	No	No	Yes
Egypt*	Yes	Yes	Yes	Early stage	Yes	Yes
Libya*	Yes	No	No	No	Yes	Yes
Morocco	Yes	Yes	Yes	Yes	Yes	Yes
Sudan*	Yes	No	No	Yes	Yes	Yes
Tunisia	Yes	No	Yes	Yes	Yes	Yes

Water User Associations – principal findings on the effectiveness of WUAs in the MENA/NENA region can be drawn from a recent IWMI assessment ¹³, conducted in association with IFAD. While there are a small number of successful experiences, the overall experience has been reported to be far less positive:

“On effectiveness, reviewing the performance of WUAs in their three main responsibility domains (water management, maintenance, financial management) was disappointing. Even aggregated or qualitative indicators of changes were found to be illusory. Few WUAs in the region can be said to be active and performing as planned.

“(WUAs) are basically creatures of the state that may analytically be separated in two categories: first, WUAs that are set up to be the counterpart of donor- or state-initiated projects, and are expected to ensure the physical and financial sustainability of these projects (generally at the community level); second, WUAs that are set up to co-manage large public irrigation schemes with public agencies”

“Although in line with the emergence of participation as a central theme of natural resources management, PIM/IMT policies are unambiguously linked to the fiscal deficits and “rollback-the-state” ideologies of the late 80s and 90s and to donors’ frustration in the face of the recurring degradation of irrigation infrastructure. As a result, state-initiated PIM/IMT policies often heavily emphasize the financial autonomy of Water User Associations in charge of, or benefiting from, some water infrastructure (whether small scale or part of a larger public scheme). Financial autonomy means that WUAs are chiefly expected to ensure both cash and in-kind contributions to the operation and management of these hydraulic networks, thus lowering state expenditures.” (Note that other recent IFAD findings are that other forms of association eg Farmers Organizations, Commodity Associations that can perform similar cost recovery functions may have demonstrated increased chances of doing so, because they are better connected to markets, value chains and credit institutions, and thus are part of a wider virtuous financing cycle for farmers)

“There is a sheer lack of independent, comprehensive, long-term assessments, which makes it very difficult to discuss the sustainability of any arrangement or reform. Determining whether WUAs in the NENA region are effective or not, and how they could be made more

¹² IFPRI (2010) Food Security and Economic Development in the Middle East and North Africa - Current State and Future Perspectives, p.16

¹³ IWMI (2012) Water Users Associations in the NEN Region - IFAD interventions and overall dynamics

efficient and sustainable, quickly appeared to be impossible to ascertain based on the evidence available”.

Water demand management - whereby extensive consultations supported by IDRC ¹⁴ revealed an essential disconnect between Water Demand Management and water efficiency, and also with scope to a stronger potential contribution to greater equity of water use.

“The most striking conclusion is that in no MENA nation is WDM the main impetus for action. With wastewater the need to deal with growing volumes of sewage is the main force, and with the other three (IDRC consultation) forums it is the need to reduce government budgets. Future work to promote water demand management in MENA must be oriented towards identifying and strengthening linkages to other water policies or programs, notably by distinguishing the role of WDM as a tool for greater water use efficiency from its role as a tool for greater water use equity.”

Subsidies and water pricing – with subsidies largely having been driven by many MENA countries in accord with an Import Substitution Industrialization Strategy (ISI) that has sought to artificially create conditions that would foster the growth of industries that compete with imported goods, and also driven by mitigation responses to the 2007/2008 Food price shock, and remaining in force, yet overall being seen as unsustainable, and with pricing disconnected from actual water value. As a result, incentives for excess irrigation are principally to be found outside of the water sector, and within the wider political economy:

“Budgetary provisions have been substantial in these (North African) countries in the form of social transfers. ... These measures have often been ineffective and burdensome for the state”. “Subsidies are not sustainable, especially within scenarios of increasing cereal prices” ... “a blind subsidization of food consumption” ¹⁵

“Water subsidies are the broadest and deepest form of subsidies used. The cost of water for farmers was virtually zero. The pricing of irrigation water in many countries does not even cover O&M costs. The combined effects of water subsidies and government price controls on low water consuming crops, encouraged this transfer of water towards less competitive crops that have no price controls but require higher water input. An unofficial partnership between the government and agricultural sector prevented this sector from being held accountable for its water consumption. Adequate water pricing reflecting the actual value of water will render several agricultural activities no longer profitable.” ¹⁶

“Regardless of what is considered ... to be the right cost of water to be paid by farmers, it is apparent that actual prices reflect more pragmatic realities. Irrespective of the price of water charged to users and of the way it is recovered in practice, it is abundantly clear that water fees are always insufficient to cover operation and maintenance costs, even if there were fully recovered, which is never the case.” ¹⁷

¹⁴ IDRC (2007) Water Demand Management In The Middle East and North Africa: Observations from the IDRC Forums and lessons for the future. International Water Resources Association - *Water International*, Volume 32, Number 2, Pg. 193-204, June 2007

¹⁵ GMF (2012) Agriculture in North Africa: A Chance for Development, p.3

¹⁶ Mohamad Al-Ississ (2009) Applying For-Profit Principles in Water Management and Agricultural Policy in the Middle East and North Africa. Dubai Initiative 2009, p.1

¹⁷ IWMI (2012) Water Users Associations in the NEN Region - IFAD interventions and overall dynamics p.10

Box 3: Incentives for excess irrigation¹⁸

Table 7. Incentives for excess irrigation

Countries	Barriers to imports	Domestic price support	Subsidized credit	Energy subsidies
Algeria	✓	✓	✓	✓
Bahrain	x	x	✓	✓
Djibouti	✓	-	-	-
Egypt	✓	✓	✓	✓
Iran	✓	✓	✓	✓
Iraq	x	✓	✓	✓
Jordan	✓	✓	✓	✓
Kuwait	x	x	✓	✓
Lebanon	✓	✓	x	✓
Libya	✓	✓	✓	✓
Morocco	✓	✓	x	x
Oman	x	✓	✓	✓
Qatar	x	x	✓	✓
Saudi Arabia	✓	✓	✓	✓
Syria	✓	✓	✓	✓
Tunisia	✓	✓	✓	x
United Arab Emirates	x	✓	✓	x
West Bank and Gaza	✓	x	x	x
Yemen	✓	✓	✓	✓

Source: Table adopted from World Bank 2007a.

Water allocation – assessments have raised real concerns that the current allocation of water is not sustainable, driven primarily (but not uniquely) by agriculture, with proposed solutions lying in water markets and an even greater shift towards food imports if food security goals are to be attained without further water resource depletion:

“The current allocation of water in the MENA is unsustainable, as it uses more water resources than are possibly renewable. Yet, with increased efficient water management programs that seek to reallocate water towards sectors with higher returns, the looming crisis can be averted. There is an urgent need to create an adequate market for trading water in the MENA similar to those markets trading other scarce natural resources like oil and gas.” ... “Opening up of the MENA economies and abandoning the “war mentality” that prevented the region from depending on food imports will achieve the goals of food security without risking its future by depleting its water. It is no longer feasible to keep the real losses incurred in the agricultural activities as a result of using the valuable water off the national and regional balance sheets”¹⁹

Public management and decentralised governance – for which assessments conclude that political feasibility is the over-riding bottleneck, with disconnects between reform and political time schedules, and calls for a far wider whole-of-government and non-state actor engagement. Decentralised governance is not enabled by hypothecation of fees. Where accountability is strong, prospects for political reform are strongest.

“A wealth of technical reports exist containing investment plans, financing strategies, legal analysis, and policy recommendations for each country in the MENA and for the region as a whole. However, most of them remain on the water ministers’ shelves because they are not

¹⁸ IFPRI (2010) Food Security and Economic Development in the Middle East and North Africa - Current State and Future Perspectives, p.18

¹⁹ Mohamad Al-Ississ (2009) Applying For-Profit Principles in Water Management and Agricultural Policy in the Middle East and North Africa. Dubai Initiative 2009, p.2

politically feasible. Policy makers perceive the costs of reform to be greater than the benefits, at least in the short term. The key question is how to establish positive conditions to facilitate the implementation of such reforms.”²⁰

“The water sector’s intrinsic characteristics call for a multidisciplinary and whole-of-government approach reaching out to stakeholders, citizens and businesses. Water is not an isolated “sector” but part of wider economic, social and natural systems that include agriculture, trade, energy, real estate, finance, social protection and so on. Changes in these wider systems may even have more impact on water management than actions within the sector. Water reforms must be designed and implemented with full understanding of the changing realities of the political economy. Involving non-water decision makers, representing the sectors mentioned above, in water policy reform may increase comprehension and open new grounds for partnerships and action.”²¹

“Financial flows (who pays how much, to whom and for what) in public schemes are critical to ensuring both sustainability and accountability between parties. In most cases, however, water fees go to state coffers, without direct link with, and much impact on, the local operation and maintenance. It is apparent that most reforms are launched based on unrealistic assessments of the costs (underestimated) and of the benefits (overestimated). When the former end up offsetting the latter then the whole process of collective action is undermined and quickly annihilated. Governments, on their side, tend to focus on their perception of the benefits (reduction of state expenditures). This explains why the “expected outcomes” do not materialize to the extent that would make the associated concrete benefits large enough to infuse adherence of members to the reform.”²²

“Although political considerations have blocked important water reforms in the past, the factors that determine the political feasibility of water reforms change over time. The positions and relative influence of various interest groups relating to water have the potential to change in the near future, which could improve or worsen water outcomes, depending in large part on the strength of accountability mechanisms. When accountability is strong, changes in the political economy could provide “political space” for reforms. But without accountability, the changes may worsen MENA’s water situation, if a small elite is able to capture the benefits.”²³

Private sector engagement and PPPs – with assessments showing real and practical opportunities through a variety of different models oriented towards farmer needs.

“The key conclusion (of an analysis of PPP in irrigation development and management) is that the objective is improved efficiency—a more timely and inexpensive water service responsive to farmers’ needs. It is important to design the most appropriate institutional setup. Given that the private sector is demonstrably efficient in many of the functions in I&D, it is likely that in many cases a PPP arrangement would in fact be optimal. However, a range of third-party service providers can be considered, either public (for example, a reformed and financially autonomous government agency) or private (for example, a private

²⁰ OECD (2010) ‘Progress in Public Management in the Middle East and North Africa – Case Studies on Policy Reform’ p.298

²¹ OECD (2010) ‘Progress in Public Management in the Middle East and North Africa – Case Studies on Policy Reform’ p.298

²² IWMI (2012) Water Users Associations in the NEN Region - IFAD interventions and overall dynamics p.11

²³ World Bank (2007) ‘Making the most of scarcity - Accountability for Better Water Management Results in the Middle East and North Africa’. p.59

I&D service provider looking for business, a non-governmental organization (NGO) specialized in irrigation management, or a WUA turning into a private corporation).”²⁴

2.5 Overall performance issues facing some other agencies

World Bank

In 2010, World Bank had a total of 29 projects with a primary focus on water in eight countries, with total commitments of US\$2.1 billion²⁵. About 64 percent of this total focuses on water supply and sanitation issues, with the remainder supporting water resource management, irrigation and related fields.

Informed by its own strong strategic perspectives, the World Bank (as at 2010) was focusing its lending/AAA efforts on water in the MENA region on engaging or scaling up its activities in (i) priority countries in line with the Millennium Development Goals objectives (e.g. Morocco, Egypt, West Bank and Gaza, Iraq, Yemen, and Djibouti) (ii) further deepening sector policy dialogue in countries where the Bank has had long partnerships (e.g. Morocco, West Bank and Gaza, and Yemen) and (iii) restoring basic services and building capacity in conflict or post-conflict countries (e.g. Iraq and West Bank and Gaza). In terms of areas of dialogue, the Bank was focusing its efforts on the following:

- *Extending services to the urban poor*: The Bank has carried out several municipal development, rehabilitation (Morocco, Tunisia, and Yemen), and community infrastructure (Jordan) projects.
- *Decentralization of service provision*: The Bank has continued to promote decentralization of water supply service delivery by helping create independent public companies responsible for service for small cities and towns (Yemen, Algeria, Jordan).
- *Expanding wastewater collection and treatment services*: In many countries of the region, the current focus of the sector is the improvement of the sanitary conditions of urban areas through the collection and treatment of wastewater (e.g. Yemen, Morocco, etc.).
- *Increasing rural access to water supply and sanitation (WSS)*: Rural water supply and sanitation has received the least investment support, and that support is generally through multi-sector programs in the agriculture sector or social funds.
- *Improving operator performance*: The Bank is focusing on utility reform and improvement of sector finances largely through expansion of public-private partnerships. Urban water supply and sanitation operations are underway in seven of twelve countries. Management contracts were successful in Jordan, the West Bank and Gaza, and in the pipeline for Yemen, which witnessed progress in corporatizing the WSS services.
- *Managing water resources effectively*: Several water resource management projects have been launched focusing on groundwater management, water demand management, monitoring, water planning at the basin or aquifer level, environmental protection, intersectoral coordination and other issues.
- *Improving irrigation efficiency*: Projects in several countries (Egypt, Yemen, Morocco, Tunisia, and Iraq) address the efficiency of water and energy-use in irrigation, decentralization of management responsibility to farmers' associations, pricing policies, re-use of treated wastewater and other issues.

Elsewhere in Africa, and including in NENA, the World Bank has been attempting to simplify the wide diversity of water interventions within a smaller number of (five) business lines, as follows:

²⁴ World Bank (2007) Emerging Public-Private Partnerships In Irrigation Development and Management. Water Sector Board Discussion Paper Number 10.

²⁵ World Bank (2010) MENA Water Sector Brief

Business Lines	1. Large-scale market-oriented irrigation on a PPP basis or purely private basis	2. Modernization and expansion of existing large-scale irrigation	3. Individual micro- and small-scale irrigation for high value crops	4. Small-scale community-managed irrigation	5. Enhanced water management in rainfed agriculture
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IFAD

Over 60% of IFAD's water interventions worldwide ²⁶, including in MENA, have experienced major implementation difficulties, mostly not connected to the technology per se, but as a result of weaknesses in alignment with impact, delivery modalities and absorption). This represents a major challenge for IFAD as it attempts to scale-up impact in line with lifting 80 million people out of poverty under its IFAD9 funding window. Recognising the importance of water, IFAD has earmarked 28% of its future investment support to Land and Water, but recognises the need to mobilise its full suite of delivery instruments (including policy dialogues, partnerships, knowledge management and risk management) alongside investment programs.

Some central and overarching lessons learned from the body of experience from agricultural water in NENA, as have already been stated, are that:

"Non-water policies in particular create incentives for inefficient water use"

"Any agenda for reform of water policy in MENA must respond to the realities of the political economy"

"Water is not an isolated sector but an integral part of a wider economic system". Any agenda for reform of water policy must respond to the realities of the political economy"

"Non-water policies in particular create incentives for inefficient water use"

"Actions outside the sector will be important. No matter what changes are made within water ministries, service providers and interest groups, if forces outside the sector encourage inefficient water use, unsustainable water will prevail"

"Potential solutions to the region's water problems are well known but have often not been implemented because of constraints in the broader political economy"

"Countries (outside MENA) that have introduced or accelerated water reforms have often done so as part of broader economic and structural changes"

3. A PROVISIONAL FRAMEWORK TO GUIDE 'WATER AND FOOD SECURITY' IN MENA

3.1 Implications of review findings for the Assessment Framework

FAO's principal interests in water within the region, many of which have been covered by the preceding review, lie in the areas of

- Agriculture/Irrigation policies and investments
- Water governance in general (accountability, participation, etc.) and its impact on agriculture
- Integrated approach to agriculture water management for agriculture (allocation, pollution control etc.)
- Water laws and related regulations
- Irrigation water tariff/ water services cost recovery

²⁶ Compiled from IFAD Project Completion Reports

- Decentralized management of water resources
- Irrigation management transfer
- Irrigation modernization focusing on technological transfer to localized irrigation
- Water conservation and management under rainfed conditions

In respect of the main findings from the review of Section 2, most of the principal actors in agriculture, water and food security see live and viable opportunities for agricultural and water sector reform as part of ongoing structural economic change. Political drivers towards this political-economy based agriculture/water/food security reform model at national level are continuing and also beginning to coalesce at a regional level. Examples at national level include inter alia

- Qatar National Food Security Programme (2010)
- Oman 7th National Development Framework and Oman Economic Vision 2020

Regionally, these include, inter alia,

- the Doha Ministerial Declaration on Food Security in Drylands (2012), in part backed by the UN Secretary-General's Zero Hunger Challenge
- the Barcelona Process – Union for the Mediterranean (with its targets to have attained full implementation of IWRM targets by 2015)
- European Neighbourhood Policy and Action Plan, and European Blueprint, based on an incentive approach supportive of partners engaged in reform processes
- Arab Water Council
- World Economic Forum's New Vision for Agriculture

Clearly, however, the evidence base and the strategic orientations that are being set by most of the regional, national and partner actors are not towards a continuation of piloting small, isolated interventions, with limited impact and replicability, although such experiences can give direction and yield some experiences. Rather, they are aiming at 'bigger picture' reform, with water firmly embedded within a political economy framework that offers better prospects for unlocking impact at-scale. At this higher-level, the scaling-up factors are different from the factors that tend to emerge from small pilots.

The preliminary review that has focused on constraints, causes not symptoms, and possible remedial actions around water management and governance offers major support to such an approach. The reasons why water management and governance actions have not been influential at-scale lie in interconnected ways among

- markets, political visions and development strategies, food security pathways and social/economic outcomes
- regional and national institutions and financing
- principal agricultural business lines, food supply interventions and decisions by different farmer groups

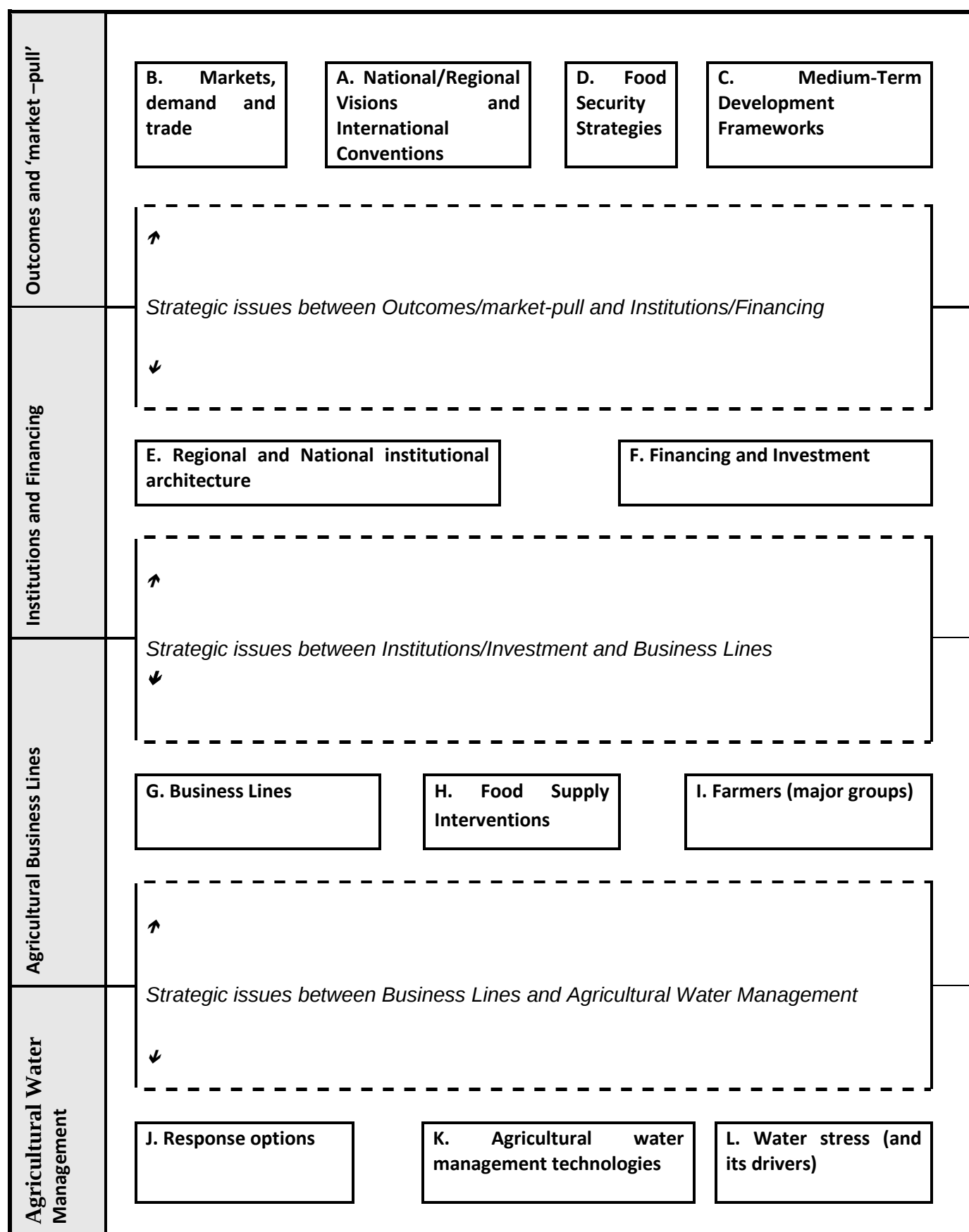
as well as within agricultural water management, response options and the various drivers of water scarcity. Hence, the main proposition that a Regional Initiative on Water Scarcity in MENA that seeks to exert impact at scale and engage in effective partnerships would similarly reflect such dimensions.

3.2 Provisional Framework

With all of the diverse, but interconnected dimensions interacting with a central FAO focus on water management interventions for food security, a Framework is considered to introduce a valid and useful point of reference – both for highlighting individual issues but also for beginning to construct the essential interconnections. Based on the preceding discussion, Figure 2 introduces a provisional framework, with 12 core components framed within four tiers.

Annex 2 introduces illustrative background information for each of the 12 core components, using where available MENA/NENA based illustrative graphics, else drawing on graphics from similar situations elsewhere (including in Sub-Saharan Africa – these are known to apply to different water/food security situations, but nonetheless they successfully convey messages relevant to MENA/NENA).

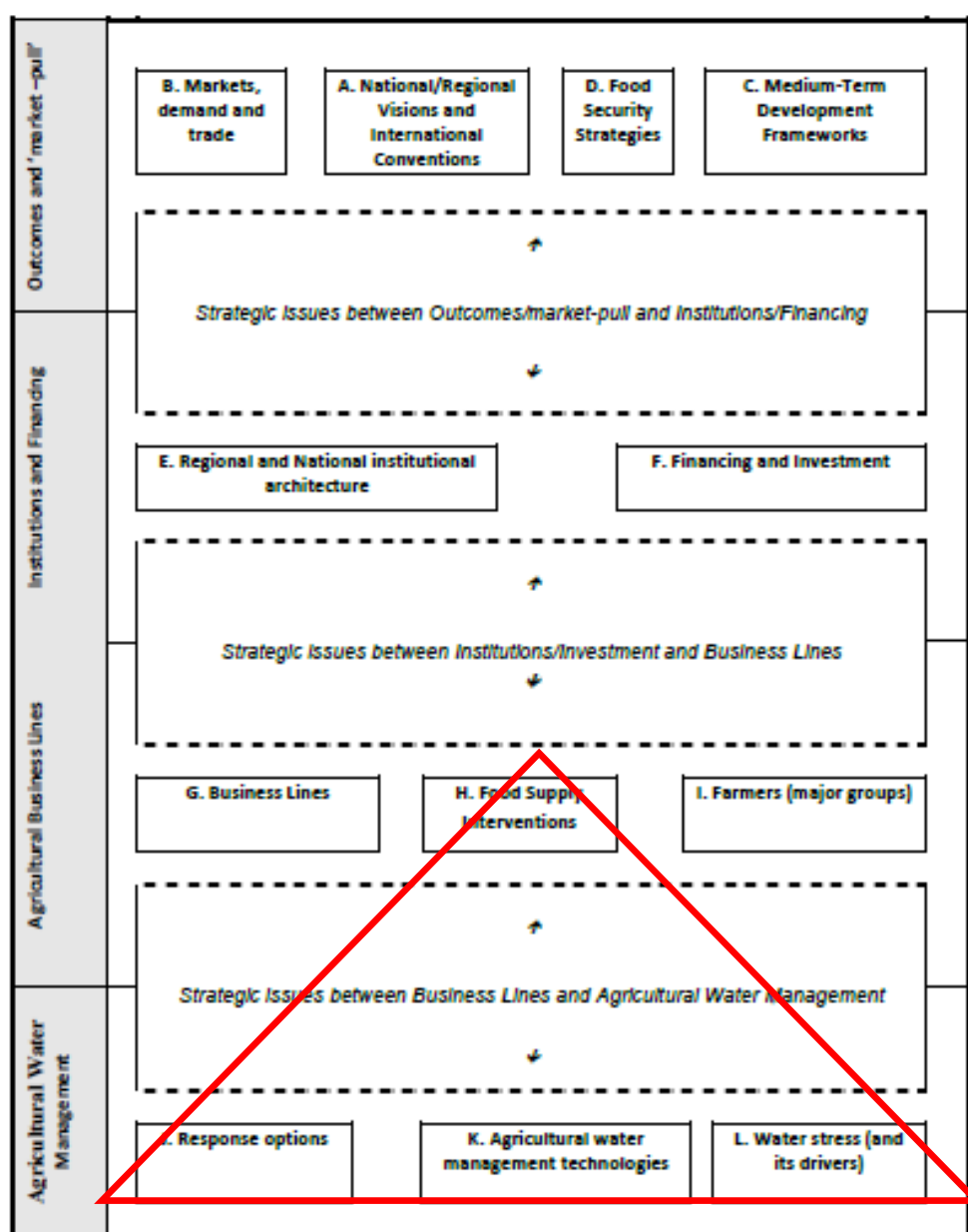
Figure 2: A preliminary Framework



With the particular focus of the FAO Regional Initiative on water management interventions, and in the context of what is achievable by a single organisation, the scope of the Initiative will inevitably be narrower than the full framework, and is more likely (subject to future negotiations) to focus on that part illustrated by the 'red triangle' in Figure 3. Thus, the FAO Regional Initiative will be more focused, but will still nonetheless to take account of different components – for example the four pathways to food security and the water implications thereof.

The essential message from the review, however, is that the narrower focus on a water:food security agenda is unlikely to achieve scaled-up impact unless it advances within the prevailing political economies, and begins to tackle constraints and opportunities outside of the narrower water focus. Thus, the wider connections within the Provisional Framework remain of high relevance and cannot be neglected, if not prioritised by the Regional Initiative.

Figure 3 Probable focus of the FAO Regional Initiative within the wider Provisional Framework



4. GAP ANALYSIS

This section focuses on an analysis of possible gaps within three dimensions, namely

- a) in potential contribution to outcomes
- b) in response to political economy drivers
- c) the NRM-focus of the Regional Initiative

4.1 Possible gaps in potential contribution to outcomes

This dimension draws from the Provisional Framework in an upward direction in support of response options that deliver food security outcomes at scale for particular beneficiary groups, in the context of the wider anticipated suite of outcomes from agriculture (jobs, employment, foreign exchange) and from water (WASH, environmental, commercial etc)

↑	Outcomes
	Institutions and Investment
	Forms of Agriculture
	Agricultural Water Management

- a) Making explicit the scale and blend of (up to four) food security pathways currently being adopted in NENA/MENA countries, and the vision/strategy of the future blend being pursued for attaining food security improvements
- b) The current association of differentiated water strategies within each food security pathway, including the current status of each in its contribution to food security; under forward projections, the aspired for/targeted (future) water management setting that would be needed for attainment of aspired food security outcomes under each pathway
- c) The ceilings on each of the different food security pathways that are invoked by maximum (potential) limits on water availability (land, labour etc); the trade-offs that such NRM limits impose on each particular food security pathway, and therefore the future blend of food security pathways that can be achieved

4.2 Possible gaps in response to political economy drivers

This dimension draws from the Provisional Framework in a downward direction with development outcomes and the drivers of market, demand and trade being influential upon the Food Security/water agenda

↓	Outcomes and market pull
	Institutions and Investment

	Forms of Agriculture
	Agricultural Water Management

- d) A compilation of the aspirational outcomes for food security and water within regional and national visions, and signature of/ commitments to international conventions, in respect of outcomes.
- e) The nature of the association in regional/national visions of food security outcomes with/from other agricultural outcomes including employment, jobs, wages, poverty reduction, economic growth, foreign exchange earnings, import substitution etc . In essence, to what degree is achieving food security tied into achieving other agricultural outcomes simultaneously?
- f) Assessment of the global, regional (eg Southern Europe), intra-regional and national market pulls in respect of:
 - NENA (current and future) ‘exported’ agricultural goods, and the water demand implications thereof
 - NENA (current and future) ‘consumed’ agricultural goods for intra-regional and national markets, and the water demand implications thereof
 - NENA’s imported agricultural goods and the region’s affordability of purchase (eg in international grain markets)
- g) Incentives and disincentives to water use efficiency and inefficiency, both inside and outside the food/water arenas, and how these can be tackled
- h) Institutional architecture for delivering food security/water pathways, most notably in respect of
 - Institutional roles and responsibilities at the food security/water interface
 - Roles of non-state actors in delivery
 - Provision of support services to farmers (which, in some cases, could be purchaseable), differentiated by food security pathways
- i) The scale and mechanisms of different sources of financing (eg based on 3-Ts, but also including straightforward food purchase and value chains), including projected financial requirements and disbursement channels

4.3 Possible gaps within the NRM-focus of the Regional Initiative

- j) The relationships between the drivers of water stress - sectoral demands and climate - and water/food security pathways, including their significance to the scale and viability of each particular food security pathway

- k) A multi-disciplinary narrative on the associations of fish, livestock and watershed management among the connections between water and food security pathways
- l) Evidence from pilot or nationally scaled-up implementations of water technologies, including lessons learned on what has worked, what hasn't – and in both cases, why?
- m) Evidence from pilot or nationally scaled-up implementations of water management interventions, including policies, pricing, subsidies, institutions etc with lessons learned on what works, what doesn't – and in both cases, why?
- n) Detailed information on the costs of different water technology interventions, and the financial incentives for farmer uptake within a farm economy model
- o) Evidence that water 'saved' from technology interventions is made available 'elsewhere' – either for other farmers or for new entrants, for other competing uses, or for the environment, in light of strong suggestions that farmers saving water on one crop will merely use the 'saved' water for their own production at farm level, including possibly for more water-consumptive crops
- p) The implementation reality of factors affecting the adoption of technology options, including incentives and disincentives, costs, and scale of impact in terms of food security. Association of these factors with different farmer groups, in respect of their absorption/uptake.
- q) Business line categorisation/simplification of the wide variety of AWM technology options

5. PRELIMINARY GUIDANCE FOR NATIONAL ASSESSMENTS

The core of the national assessments will need to focus on the essential problematic, as has been framed by the scope (logic framework) of this pilot study, in a way that gathers evidence for, and supports the preparation of food supply cost curves.

That said, it would be highly neglectful of lessons learned if the assessments failed to frame the above focus within the wider framework of the political economy and non-water drivers.

Therefore, some preliminary guidance emanating from this report may focus National Assessments within the designated clusters in line with the provisional framework, emphasising the scope of the FAO Regional Initiative but without neglect of the essential wider political economy issues that bear upon that scope:

Agricultural water management

- a) What is the national status of adoption or pursuit of
 - o Agriculture/water/Irrigation policies or strategies
 - o Institutional roles and responsibilities
 - o Water governance in general (accountability, participation, etc.) and its impact on agriculture

- o Integrated approach to agriculture water management for agriculture (allocation, pollution control etc.)
- o Water laws and related regulations
- o Irrigation water tariff/ water services cost recovery
- o Decentralized management of water resources
- o Irrigation management transfer
- o Irrigation modernization focusing on technological transfer to localized irrigation
- o Water conservation and management under rainfed conditions

including response options already identified by FAO within this domain (Annex 3)

- b) What national alignments have been secured between the above and food security
- c) What is the national base of evidence of effective interventions in water (technologies and water management) that have contributed to food security pathways, either under pilots or at scale, in respect of increasing productivity, expanding supply or reducing demand
- d) What is the known scale of projected cross-sector water demand and climate drivers of water stress
- e) What is the narrative on agricultural crops, fisheries, livestock and watershed management in relation to food security, through water

Food security

- f) What are the stated National Vision, Medium-Term Strategic Framework aspirations and international or regional commitments on food security
- g) How does an existing national agricultural policy/SWAP frame food security and water
- h) What is the current national scale and blend of current (different) food security pathways
- i) Has there been any future projection of the scale and blend of future (different) food security pathways?
- j) Has there been any assessment of the of food security planning/aspirations based on ceilings of maximum water availability

Farmer groups and business lines

- k) What are, and what is the scale of, the major farming groups (and business lines) in relation to food security?
- l) Has there been any national assessment of the Incentives and disincentives (farm-, scheme- and economy-level) to water management efficiency and inefficiency for food security

Institutions and financing

- m) What are the institutional roles and responsibilities for food security, water and at their interface (centralised and decentralised)
- n) Is the known of scale of different financial flows (origins and fates, including disbursement channels) for food security, water and their interface (centralised and decentralised)

Market pull

- o) Has there been any assessment of market pull (in inter-regional, intra-regional and within country) on commodities dependent on improved water control and the rain-fed sector

Annex 1: Bibliographic foundation for Review

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Annex 2 Building Blocks of the Provisional Framework

The purpose of this Working Note is to contribute towards a Framework that can inform and guide the ongoing FAO study on Water and Food Security in the Near East and North Africa.

This initial Framework serves two purposes – first, to provide focus for a state-of-the-art review and gap analysis. Second, to provide guidance to national assessments in pilot countries, where both purposes are in line with the overall intention of the study is to identify relevant, cost effective options in water scarce situations to contribute to food security.

The rationale of this Working Note is that no such Framework yet exists. A short study commissioned by DFID in 2007 identified that “No existing Framework forges the politically relevant links between Agricultural Water Management and outcomes”.

A Framework is necessary within this study in order to be able to frame and contextualise evidence. The framing is in order to identify the many and diverse components that are relevant to the purpose. The contextualisation is to enable connections to be built around issues within a wider development framework. Thus, the identification of gaps is not limited to component issues per se, but also rather how (often well-known) issues are connected within the Framework.

This Working Note does not conclude with an agreed framework. Rather, it assembles the building blocks, building from established and emerging thinking on AWM, but AWM within the context of development, and wider water agenda.

Section 1 explores a series of possible component Building Blocks of the Framework, and Section 2 concludes with a broad interconnecting structure for a future Framework, with suggestions for the way in which the Framework can be used in a diagnostic manner.

Level 1: Building Block A: National/Regional Visions and international conventions

Level 1 of the Framework could focus on the Building Block of the overarching governance drivers of National Visions, Regional Visions and international commitments (eg MDGs and their successors) and conventions. Included within this building block would be

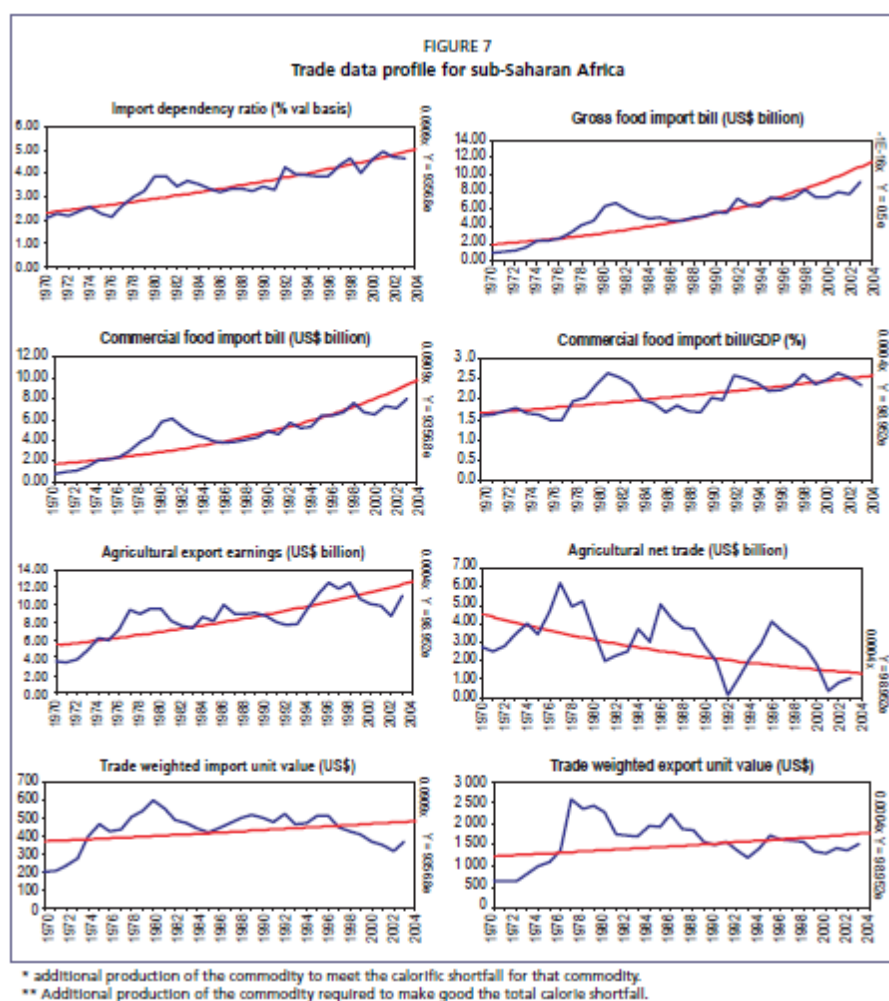
- a) National Visions eg
 - "A Future Vision of Egypt 2030: The General Framework" (issued by the Cabinet, January 2007)
 - Vision for Oman's Economy, 2020
- b) Regional Visions eg
 - Africa Water Vision 2025
 - CAADP (and eg Maputo Declaration)
 - Union of the Mediterranean
 - European Blueprint (as relates to the European Neighbourhood)
- c) MDGs (especially MDG 1) and emerging post-2015 goals, and international conventions

insofar as they set the longer-term framework of national development aspirations (including food security, agriculture and water), and represent an 'umbrella' over a series of shorter-term planning cycles.

Level 1: Building Block B: Markets, demand and trade

Using the example of SSA, Figure 1 indicates the series of market, demand and trade factors around agriculture. Food security is one part of, but not the whole, of the agricultural market, demand and trade story, and other factors are also influential upon Government policy. Ultimately, demand and the markets for agricultural produce in NENA must frame future responses.

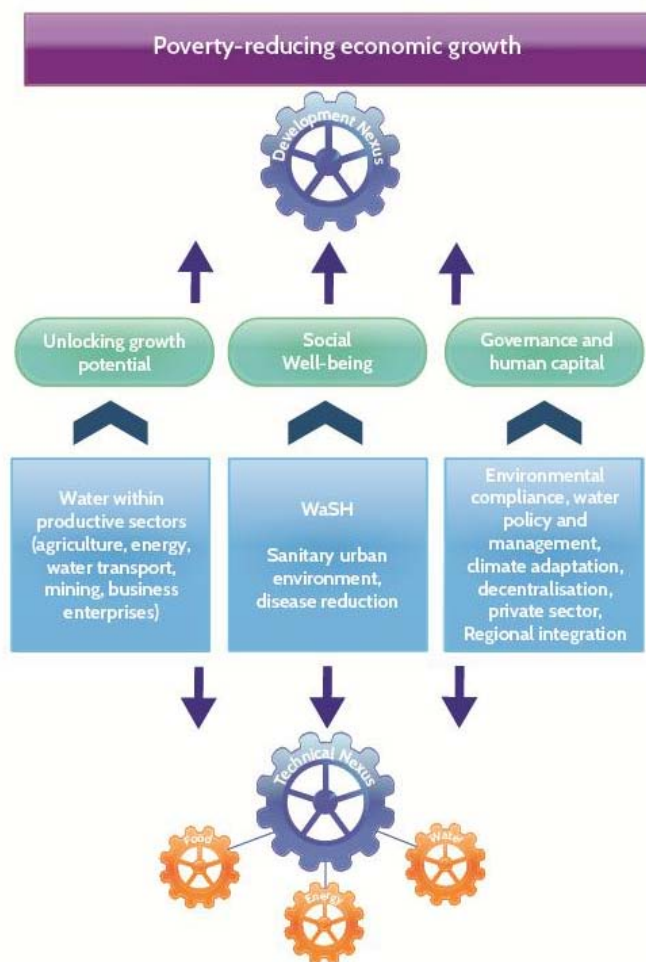
Figure 1: Example of a trade data profile



Level 1 Building Block C: Medium-Term Development Frameworks

This Building Block could focus on the Medium-Term National Development Plans and National Growth and Poverty Reduction Strategies. Such Plans/Strategies are typically 4-5 years in duration, and are generally part of an ongoing series to deliver progress towards Visions and international development goals. Such plans set the principal orientations of agriculture, food security and water (in into diverse uses), and provide the integrating framework for different Sector-Wide Plans, and the base for economy-wide nexus opportunities and trade-offs (Figure 2). Since the mid-2000s, such plans have been principally oriented by nations towards poverty-reducing economic growth, structured according to strategic pillars, each of which may set particular agricultural, water or environmental orientations. Such Frameworks are increasingly backed by Public Expenditure Frameworks, and by Results-Based Frameworks. Food security through water management must be contextualised by water demand in energy, domestic, urban and commercial settings and environmental standards.

Figure 2: Generalised framing of (medium-term) National Growth and Poverty Reduction Strategies and National Development Plans



Eg Egypt - Sixth Five-year National Development Plan (2007-2012), improve the living standards of all Egyptians through raising the economic growth to an annual average rate of 8%. Such an annual increase would, in turn, raise the average per capita income to LE 13 thousand by the end of the plan; provide job opportunities to around 3.8 million workers, enable the government to provide quality services and public utilities particularly in the health, education, potable water, sanitation and environment areas.

underpinned by

Long - Term Agricultural Development Strategy (2017)

- Increasing agricultural production by 3.9% annually, through achieving economic efficiency in allocation and use of resources to sustain development and protect the environment.
- Achieving food security and develop agricultural exports by exploiting comparative and competitive advantages.
- Contributing in increasing employment opportunities and improving living standards in rural areas.

The Presidential Election Program: eg Establishing 70 thousand job opportunities annually in agriculture and related fields

Water Resources Development Strategy (2017) – eg rationalizing irrigation water use by changing the crop mix to reduce areas cultivated with water-intensive crops, such as rice and sugar cane, and reducing the use of the traditional surface irrigation systems in new lands, while improving such systems in old lands

eg Mauritania

The Government of the Islamic Republic of Mauritania's third Poverty Reduction Strategy Paper (PRSP-3) provides a comprehensive framework for implementing an ambitious growth and poverty reduction agenda over 2011-2015.

Main pillars of strategy

- (i) accelerating economic growth and maintaining macroeconomic stability;
- (ii) making growth more inclusive;
- (iii) improving the potential of the Mauritanian people and their access to basic social services;
- (iv) enhancing governance and institutional development; and
- (v) improving planning, monitoring and evaluating systems.

On agriculture and water ...

Improving the productivity of the agricultural sector is key to poverty reduction. Authorities' goals are committed to making the sector more modern and productive, while ensuring food security. Emphasis on the importance of developing supportive infrastructure such as irrigation, improving distribution networks, and building capacity. The authorities' plan to establish a regulatory framework for public-private partnerships (PPPs) a pre-requisite for any type of PPPs introduced to encourage private investments in irrigation projects.

Enhancing productivity of the agricultural sector and better targeting of subsidy schemes represent key near-term priorities.

With agricultural activity concentrated in rural areas where poverty is most prominent, measures to improve irrigation systems (and distribution networks for fertilizers) could yield large pro-poor near-term dividends.

Suggestion that ill-targeted subsidy schemes be replaced by better targeted social safety nets that can directly improve the lives of the most vulnerable.

Level 1 Building Block D: Food Security Strategies

This level could highlight the important distinctions between National Food Security/Sovereignty and Household Food (and Nutrition) Security,

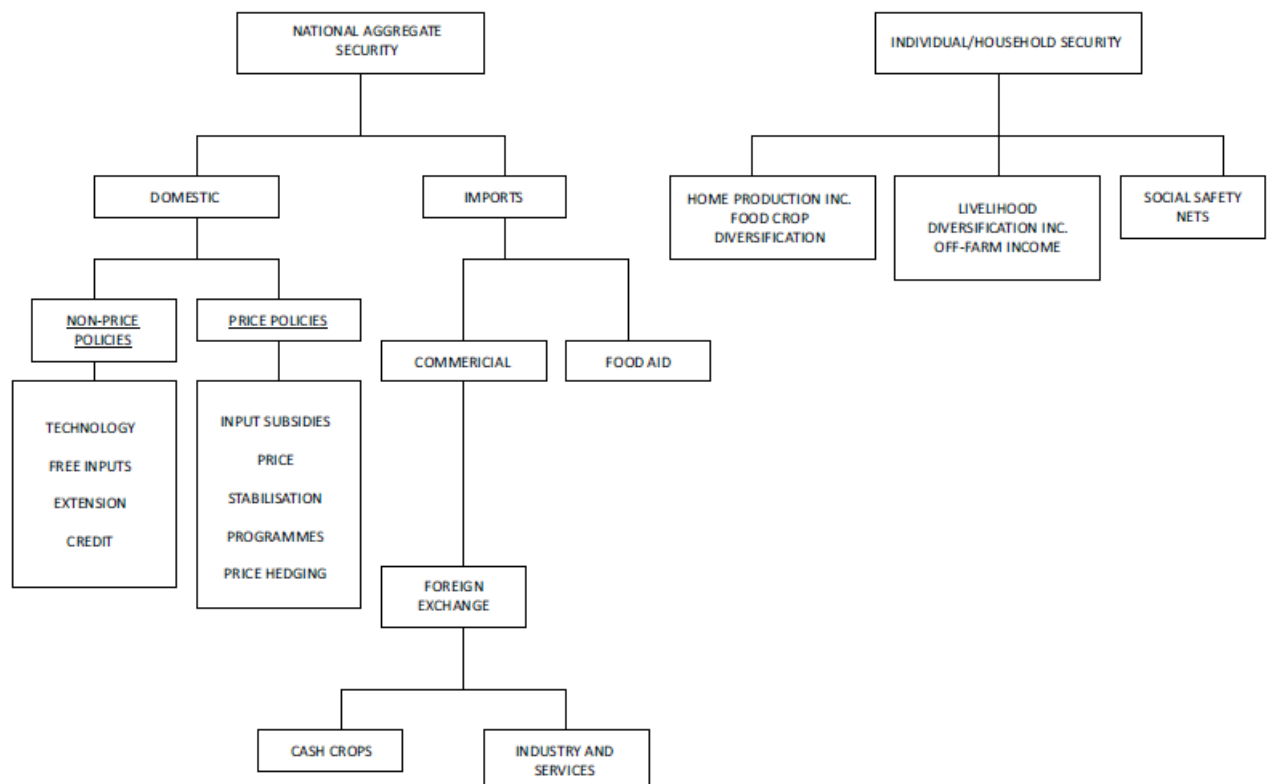
Figure 3 embeds three 'general strategies' for national aggregate food security, while the AfDB document introduces a fourth, namely

- Domestic production
- Commercial imports (whereby cash crop production generates the foreign exchange needed for commercial food purchase)
- Food Aid imports
- Directly sourcing food requirements by acquiring land and water resources overseas

Each food security strategy (which each operates within its own frame of political economy, incentive/disincentives, financing and institutional framework), imparts different aspirations, pathways and management implications onto agricultural water, both in the nation-state and in other food-originating countries.

Thus, exporting irrigating cash crops (for example citrus) in order to secure foreign exchange that enables purchase of wheat imports is one pathway within a water:food security strategy, as much as irrigated berseem for livestock fodder, or irrigated wheat or sorghum for direct domestic consumption. Commercially imported foodstuffs or food aid (where used) shifts water consumption to the food-originating countries, and is subject to another set of political economy/incentives etc factors.

Figure 3: Generalised model of food security strategies



Level 2 Building Block E: Regional and national institutional architecture

Regional institutions (example of PIDA in Figure 4)

Figure 4: One example of regional institutional architecture for NENA (PIDA)

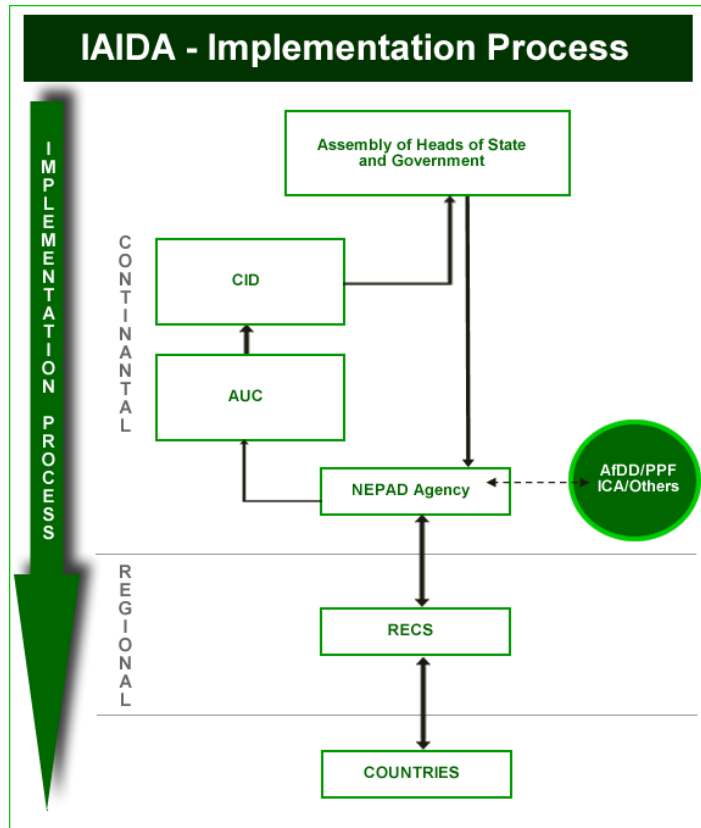
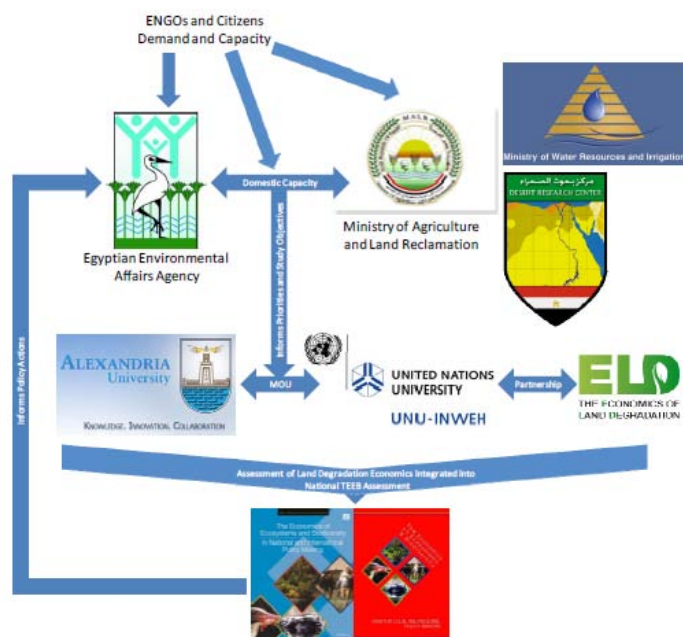


Figure 5: An example of country level architecture (in this case of Egyptian capacity for Environmental Economics)

Egyptian Capacity for Environmental Economics to Combat Land Degradation and Desertification



Level 2 Building Block F: Financing and Investment

Financing model – 3Ts based on tariffs, transfers and taxes – this model may require adaptation to reflect value chains and farmer investments

Investment in Capital, O&M and services ...

Figure 6 Some fundamentals of a water financing model

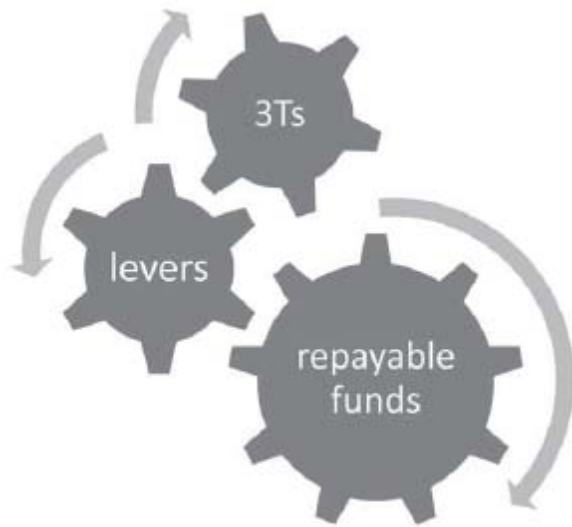
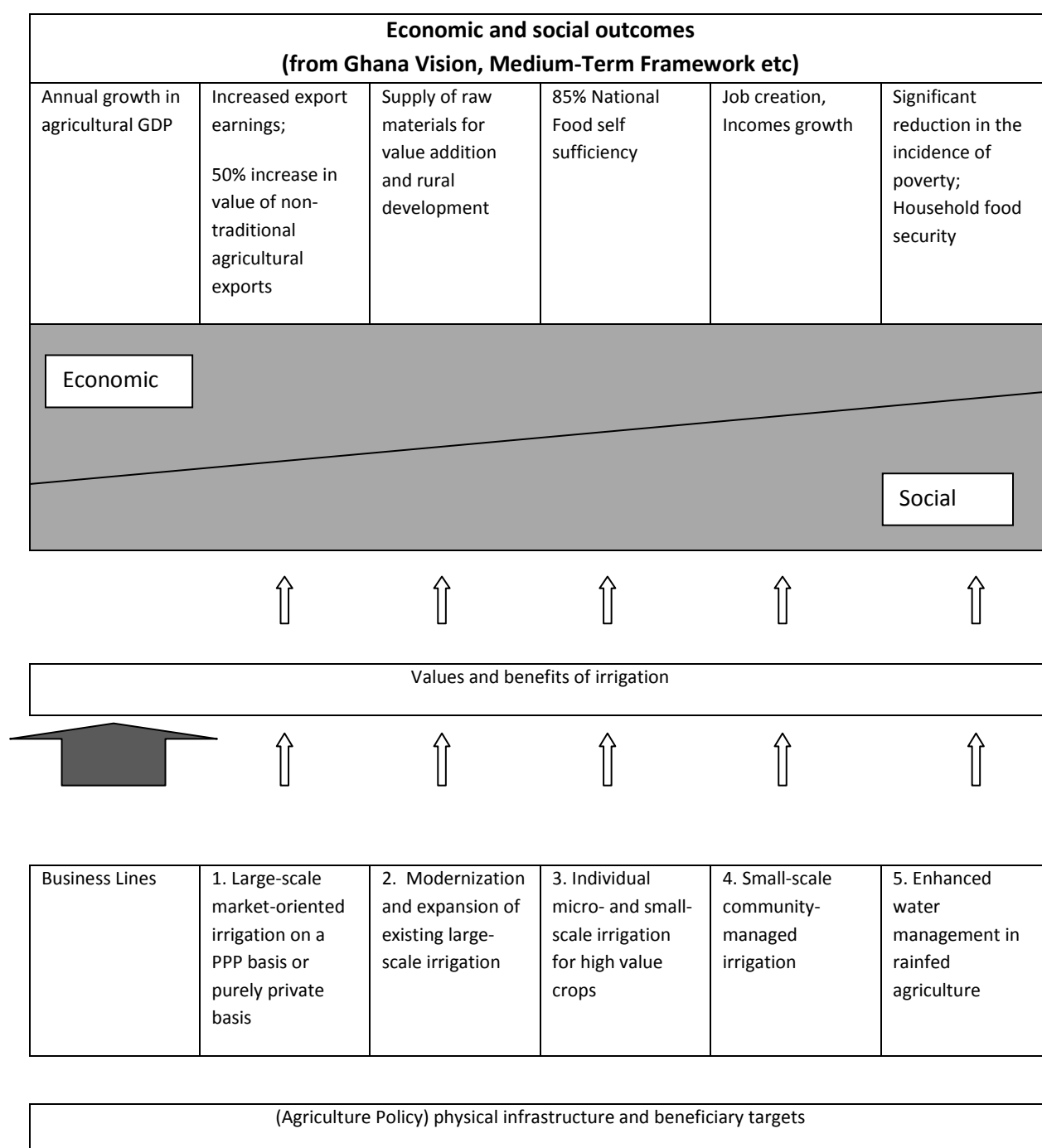


Figure 1. The water-financing model

Level 3: Building Block G: AWM Business Lines connected to economic and social indicators

This Building Block of the Framework could introduce emerging thinking around Business Lines within AWM – namely that AWM is not a single ‘bloc’ of actions, but are differentiated by different agricultural ‘businesses’. The Level could further build on thinking – for example, by Ghana Irrigation Development Authority – that recognises that different AWM Business Lines contribute differentially to economic and social outcomes (Figure 7). That contribution hinges on the values and benefits of water management to outcomes.

Figure 7 Connecting Agricultural Water targets to economic and social outcomes through business lines



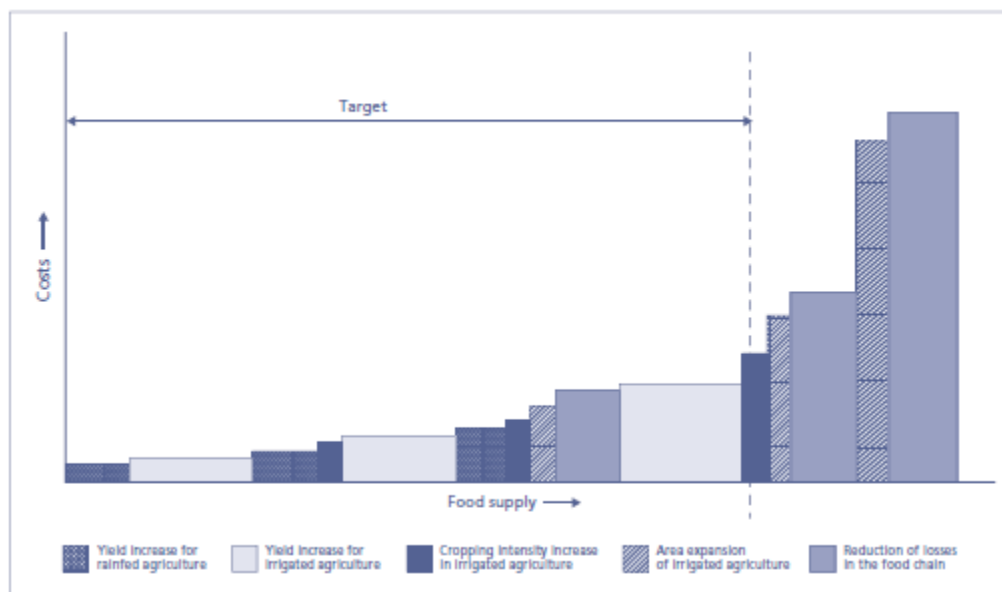
Level 3: Building Block H: Cost and scale of Food Supply interventions

This study seeks to introduce Food Supply Cost Curves (Figure 8), suggested as an innovative means of rationalising AWM interventions in terms of the scale of their contribution to food supply and costs of intervention options.

Locating such Food Supply Cost curves within a wider framework can bring benefits of structuring options by Business Lines, by connecting to different pathways/strategy for food security and by locating water for food supply within the wider and diverse framework of water demand for economic growth (and other social and economic outcomes eg employment/jobs, foreign exchange earnings).

Figure 8 Food supply cost curves

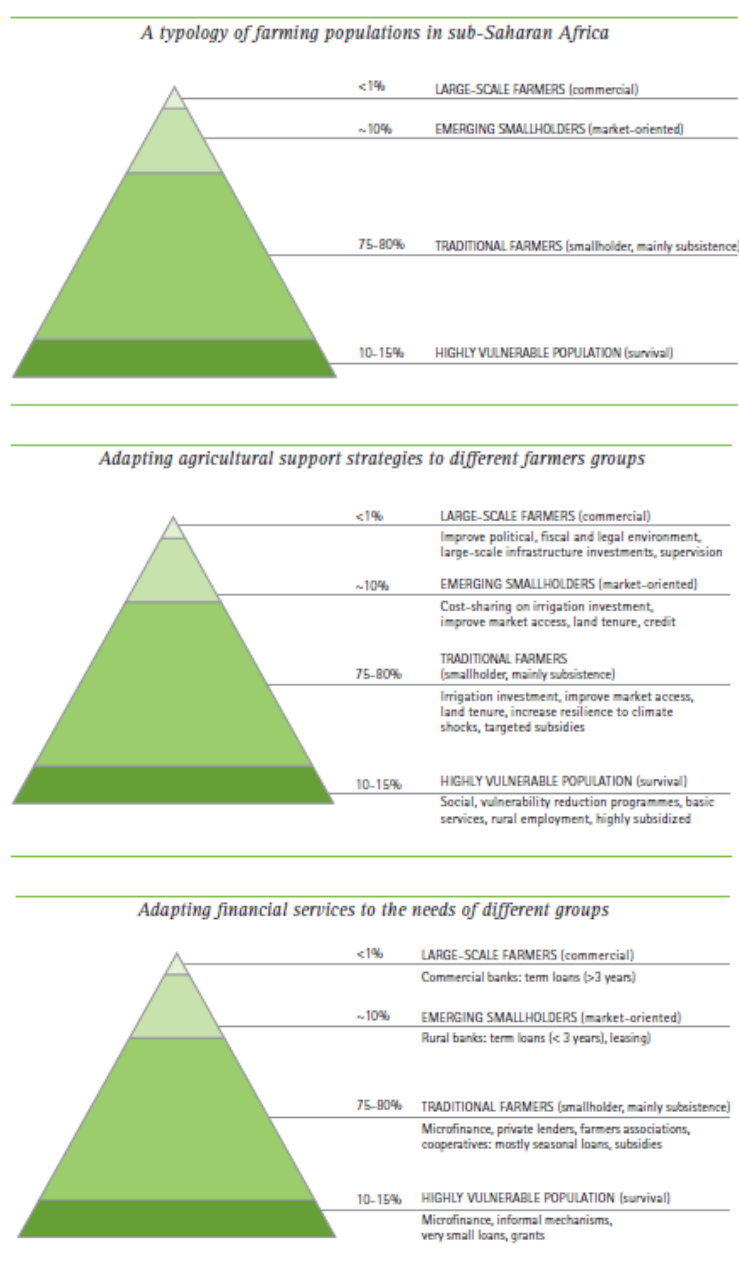
Food supply cost curve – the case of a country where all land resources are already in use



Level 3: Building Block I: Farmers and farming systems

The Framework can recognise different types of NENA farmers (fishers, livestock, and forest accessors), recognising that they are at the core of food security challenges, and ideally in a way that interconnects them within the Business Lines (and their political economies, incentives etc), and also with the diverse sets of AWM interventions, through which proposed options may be targeted under the Food Supply Cost Curve approach. While recognising different types of farming populations, it is also vital to recognise that different types of farmers access rural resources, support services and finance in different ways. Note, that Figure 9 presents typologies of farming populations for Sub-Saharan Africa as illustrative of the type of typology that may be influential in NENA. With a high policy emphasis on jobs and employment (including on-farm and off-farm), it is important that the Framework is considerate not only of existing farmers but of potential new entrants, and the progression (and possible regression?) of farming enterprises. Furthermore, that value chains and market-pull factors will be heavily influential on agricultural viability, and the absorption of measures by farmers.

Figure 9 Typology of farming populations



Level 4: Building Block J: Response options

This Building Block can set out the different response options (Figure 10), in support of the Food Supply cost curve approach, and if framed within different AWM Business Lines and by their connection to different farmers in respect of scale, implications incentives/disincentives etc of their uptake.

Figure 10 Different response options

Scale of application of different response options

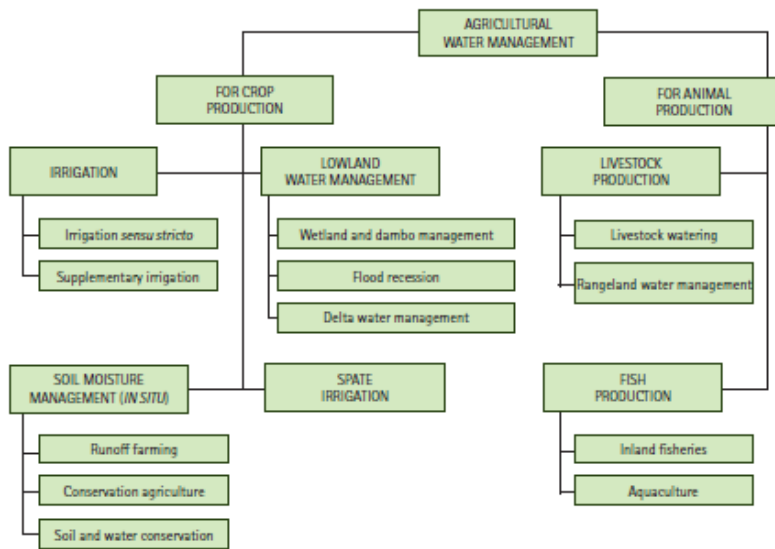
	Measure	River basin/aquifer	Irrigation scheme	Farm/plot	Beyond production
Supply-side options	Reducing inter-annual variability of river flow	Increased storage (multi-purpose dams)	On-scheme water storage	On-farm water conservation	-
	Enhancing groundwater supply capacity	Groundwater development, management and artificial recharge			-
	Water recycling and re-use	-	Re-use of urban wastewater for crop production		-
	Pollution control	Basin - level monitoring, regulation and incentives for pollution control	-	Integrated plant production and protection	-
	Importing water	Inter-basin transfers	-	-	-
Demand-side options	Reducing water losses	Improved water allocation planning	Pressurized conveyances of water, Improved irrigation scheduling and distribution and canal lining	Pressurized application of water (drip), Improved irrigation scheduling and moisture control	-
	Increasing water productivity	Better water management mechanisms, enhanced predictability of supply, early warning	Yield gap reduction through improved agricultural practices	-	-
	Water re-allocation	Intersectoral transfer (through water markets or other water allocation mechanisms)	Scheme-level water transfer mechanisms	Shift to higher value crops in irrigation, restraining cropped area under irrigation	-
	Reducing losses in the value chain	-	-	Reduction in crop losses through pest control	Reduction post harvest losses in storage, processing, distribution, and final consumption
	Reducing demand for irrigated products and services	-	-	Reduced yield gap in rainfed production	-
	Reducing water use per capita	-	-	-	Changes in food consumption patterns (less water-intensive diets)

Level 4: Building Block K: Agricultural water management typology

This Building Block can set out the general categories of AWM practices (Figure 11) and AWM technologies (Figure 12) in NENA, as a basis for structuring the relevance of response options, but only where such a typology has built connections to Food Security and outcomes within the broader framework.

Figure 11 Typology of AWM practices

A typology of agricultural water management practices showing the diversity of options



Source: Adapted from FAO-AQUASTAT (2008)

Figure 12. AWM technologies and their uses

USES	TECHNOLOGIES			
	Water capture	Water storage	Water lifting	Water use/ application
Domestic water use (safe drinking-water for cooking, bathing, laundry, cleaning)	Shallow tubewells: ■ dug wells ■ drilled wells Spring diversion Deep tubewells Recharge enhancement system: ■ recharge wells Underground water harvesting system: ■ cistern or other underground water storage structure fed by a catchment area Above ground rainwater harvesting system: ■ rooftop tank or jar		Human powered pumps: ■ hand pulleys and buckets ■ hand pumps Solar pumps Motorpumps	Water purification methods: ■ filters (e.g. sand filters) ■ boilers for drinking-water chlorination
Irrigated crops (including urban and small plot cropping)	Shallow tubewells: ■ dug wells ■ drilled wells Spring diversion Deep tubewells Water harvesting systems, composed of: ■ catchment area and a water storage structure aboveground (e.g. excavated pond, impounded reservoir) ■ catchment area and a water storage structure belowground (e.g. cistern)	Elevated tanks/drums	Human-powered pumps: ■ hand pulleys and buckets ■ hand pumps ■ treadle pumps Animal-powered pumps: ■ mohte ■ Persian wheel Motorpumps: ■ petrol ■ diesel	Aboveground: ■ shallow trenches or ditches ■ family/drum drip irrigation kit ■ low cost hose irrigation system Belowground: ■ porous ceramic jars ■ porous and sectioned pipe
Supplementary irrigation	Shallow tubewells: ■ dug wells ■ drilled wells Deep tubewells Run off the river diversion Water harvesting systems composed of: ■ catchment area and a water storage structure above ground (e.g. excavated pond, impounded reservoir) ■ catchment area and a water storage structure below ground (e.g. cistern)	Small dams/reservoirs	Human-powered pumps: ■ hand pulleys and buckets ■ hand pumps ■ treadle pumps Animal-powered pumps: ■ mohte ■ Persian wheel Motorpumps: ■ petrol ■ diesel	
Enhanced water management for rainfed	Soil and water conservation and management (runoff farming): ■ stone bunds, ridges, broad beds, furrows ■ no-tillage ■ infiltration pits ■ contour bunds (semi-circular, triangular) ■ vegetative bunds ■ terraces (eyebrow, Negarim) ■ mulching			
Aquaculture and inland fisheries	Run off the river diversion	Small dams and reservoirs Integrated paddy and fish production		Basins Ponds Water-level control in small streams

USES	TECHNOLOGIES			
	Water capture	Water storage	Water lifting	Water use/ application
Livestock watering	Shallow tubewells: ■ dug wells ■ drilled wells Spring diversion Water harvesting systems composed of: ■ catchment area and a water storage structure above ground (e.g. excavated pond, impounded reservoir) ■ catchment area and a water storage structure below ground (e.g. cistern) Micro-catchment water harvesting systems for rainwater runoff: ■ contour bunds (semi-circular, triangular)		Human-powered pumps: ■ treadle pumps Animal-powered pumps: ■ mohte ■ Persian wheel Motorpumps: ■ petrol ■ diesel	Watering facilities: ■ watering troughs

Source: Adapted from FAO (1998)

Level 4: Building Block L: Types of water stress

Of high significance to the study framework will be the types and scales of acute and chronic water stress that characterise the NENA region, including meteorological and agricultural deficits, and the drivers of stress within the context of the water resources (surface /soil moisture/groundwater, national and transboundary), their (re-)useability, and the competition for their use.

Figure 13: Types of water stress

<i>Types of water stress and underlying causes in semi-arid and dry subhumid tropical environments</i>		
	DRY SPELL	DROUGHT
Meteorological		
Frequency	Two out of three years	One out of ten years
Impact	Yield reduction	Complete crop failure
Cause	Rainfall deficit of two- to five-week periods during crop growth	Seasonal rainfall below minimum seasonal plant water requirement
Agricultural		
Frequency	More than two out of three years	One out of ten years
Impact	Yield reduction or complete crop failure	Complete crop failure
Cause	Low plant water availability and poor plant water uptake capacity	Poor rainfall partitioning, leading to seasonal soil moisture deficit for producing harvest (where poor partitioning refers to a high proportion of runoff and nonproductive evaporation relative to soil water infiltration at the surface)

Source: Rockström et al (2007)

Annex 3 Strategies and policies to cope with water scarcity

TABLE 4
Strategies and policies for coping with water scarcity according to categories of decision-makers

Level	Supply side	Demand side
WHAT: OBJECTIVE		
National water authority	Providing safe and sufficient water to all sectors of the economy while maintaining the integrity of the resource base	Ensuring efficient and sustainable use of freshwater
National authority for agriculture and irrigation	Securing sufficient water supply to satisfy the needs of the agriculture sector	Ensuring highest productivity of water used in agriculture
River basin or aquifer authority	Ensuring that available supply of water is provided to all users in a transparent, reliable and effective way	Ensuring efficient and sustainable use of freshwater by all users at river basin or aquifer level, avoiding conflicts and ensuring environmental protection
Irrigation scheme manager; Water User Association	Ensuring that a sufficient supply of water is provided to all users in a reliable, timely and effective manner	Ensuring that available water is used in the most productive way
Farmers	Securing supply of water for all farm operations	Using available water most productively and profitably
HOW: STRATEGIES & POLICIES		
National water authority	Construction of multi-purpose dams, desalination plants, inter-basin transfer; Pollution control; negotiation of transboundary allocations; establishment and enforcement of environmental flows	Adaptation of water laws; development of water institutions; tighter enforcement; promotion of water markets; trade mechanisms; water charges or quota mechanisms; administration of water rights; water allocation and water quality standards; public awareness campaigns; buy-back for environmental purposes
National agriculture and irrigation authorities	Construction of irrigation dams; negotiation of water allocation to agriculture	Incentives for irrigation modernization; adoption of service-oriented management of irrigation; adaptation of irrigation infrastructure for increased flexibility and reliability of water supply; review of agricultural water tariff policy
River basin or aquifer authority	Construction of large dams, dam operation rules, aquifer recharge, well drilling (groundwater development)	Optimization of dam management; management of water allocation mechanisms; administration of groundwater use; pollution control
Irrigation scheme manager; Water User Associations	Negotiation of water allocation; recycling of drainage water; collective land improvements; on-scheme storage development and management	Reducing losses in distribution; incentives for increased economic efficiency of field-level water use (subsidies, volumetric pricing, water markets)
Farmers	Individual well drilling; re-use of drainage water; on-farm water conservation investments; on-farm water storage; trading water; scavenging water; collective action	On-farm efficiency improvement (pressurized irrigation), deficit irrigation, adaptation of crops and crop varieties to water supply conditions

TABLE 5
Summary of options to cope with water scarcity

Measure			All sectors	Agriculture			
Supply side options	Within the water domain			Reducing inter-annual variability of river flow	Increased storage (multi-purpose dams)	On-farm water conservation	
				Enhancing groundwater supply capacity	Groundwater development, management and artificial recharge	Aquifer recharge enhancement in irrigation	
				Water recycling and re-use	Closed loop re-use and recycling	Re-use of urban wastewater for crop production	
				Pollution control	Point source pollution control (Industry, cities)	Integrated plant production and protection, control of pollution from agriculture (including payment for environmental services)	
				Importing water	Inter-basin transfer, desalination		
Demand-side options	Within the water domain			Reducing water losses	Improved monitoring, leakage control, dosing circuits (Industry)	Pressurized conveyance and application of water (drip), improved irrigation scheduling and moisture control, canal lining	
				Increasing water productivity	through better water control	Better water management mechanisms, enhanced predictability of supply, early warning	Improved water delivery service in irrigation (increased reliability and flexibility of water delivery through modernization of infrastructure and management), precision irrigation, deficit irrigation, drainage in irrigation
					through improved production process	Dry cooling (power)	Yield gap reduction through improved agricultural practices (fertility management, pest control), improved genetic material
				Water re-allocation	Intersectoral transfer (through water markets or other water allocation mechanisms) Intra-sectoral transfer (including restraining demand)	Shift to higher value crops in irrigation and/or limiting evapotranspiration by reducing areas under irrigation	
	Outside the water domain			Reducing losses in the value chain	Waste control, improved processing and distribution	Reduction of post-harvest losses: storage, processing, distribution, final consumption	
				Reducing demand for irrigated products and services	Import of manufactured products	Reduced yield gap in rainfed production (improved agricultural practices; fertility management; pest control; soil moisture management; mulching, weeding; drainage, improved genetic material, seasonal forecast and crop insurance schemes).	
						Import of food and other agricultural products (virtual water trade)	
				Reducing water use per capita	Changes in consumption habits	Changes in food consumption patterns - less water intensive diets	