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Water, Food Security
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in the Middle East
and North Africa
Region

by

Shobha Shetty

Water, Food Security and Agricultural Policy in the Middle East and North Africa Region

Shobha Shetty

July 2006

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ABBREVIATIONS AND ACRONYMS

CNCA	Caisse Nationale de Crédit Agricole
ET	Evapotranspiration
EU	European Union
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GIS	Geographic Information System
GNP	Gross National Product
GOI	Government of Iran
ICARDA	International Center for Agricultural Research in the Dry Areas
IMPACT	International Model for Policy analysis of Agricultural Commodities and Trade
IPM	Integrated Pest Management
IWMI	International Water Management Institute
JVA	Jordan Valley Authority
MFN	Most favored nation
MNA	Middle East and North Africa
NOAA	National Oceanic and Atmospheric Administration
NFIDC	Net Food Importing Developing Country
NPC	Nominal Protection Coefficient
O&M	Operations and Maintenance
SD	Standard deviation
WTO	World Trade Organization
WUA	Water Users Association

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The objective of this note is to provide an overview of the key issues in water management, food security, and agricultural policy in the Middle East and North Africa region today with a view to furthering discussion and debate on this critical issue to growth in the MNA region. It is not intended to be the definitive analytic work on the subject – rather it is intended to reach a broader audience of policymakers, researchers and practitioners with a general interest in water management and agricultural policies in the MNA region within and outside the World Bank.

The note was subsequently revised based on comments from peer reviewers Dr. Randolph Barker Principal Researcher, International Water Management Institute (IWMI), Sri Lanka, Shawki Barghouti, Adviser, Agriculture and Rural Development (ARD), and Jock Anderson, Adviser, ARD. The paper also benefited substantively from comments provided by MNSRE colleagues Vijay Jagannathan (Sector Manager, Water and Environment), Jose Simas, Satoru Ueda, Nabil Chaherli, Kutlu Somel, Maher Abu-Taleb, Nathalie Abu-Ata and Ashok Subramanian (AFTNL). Comments and suggestions of Ariel Dinar (ARD) are gratefully acknowledged. Comments from an anonymous reviewer helped in sharpening the findings and presentation of this paper.

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**WATER, FOOD SECURITY AND AGRICULTURAL POLICY
IN
THE MIDDLE EAST AND NORTH AFRICA REGION**

Shobha Shetty

ABSTRACT

The Middle East and North Africa (MNA) region is one of the most water scarce regions in the world, with a regional annual average of 1,200 cubic meters per person (world average is close to 7,000). While agriculture and the rural economy are important elements in the MNA countries, the relative contribution of agriculture to overall GDP in most countries is low and has been declining. Internalizing the private as well as the social costs of water by the largest user is a challenge that countries will have to face for agricultural development to be successful and sustainable, especially in the context of increased competition with more trade liberalization.

Water, not land, is now the limiting factor for improving agricultural production in the MNA region. Maximizing water productivity, not yield per unit of land, is, therefore, a better strategy for on-farm water management under such conditions. Raising water productivity in response to the new evapotranspiration (ET) water management paradigm demands more than just changes in irrigation technology. It requires integrated attention to improving technical, agronomic and management measures. Water User Associations (WUAs) greatly facilitate the implementation of integrated measures. Using satellite remote sensing technologies, planners and policy makers can make more effective decisions to ensure a stable supply of water for food and the environment.

All MNA countries with the exception of Morocco are net importers of agricultural products. The greatest benefits for MNA will be generated by comprehensive domestic agricultural reforms, in tandem with higher market access in European and world markets. MNA governments will face issues relating to timing and sequencing of reforms. Given its current resources endowments and growth prospects, it is in the best interest for MNA countries to push towards proceeding with the liberalization of markets in developed countries. At the same time, they could ask for some sort of compensation for higher prices and lost preferences in the form of non-trade distorting financial schemes or even cash grants for those countries facing significant losses as a result. Countries will have to pay a particular attention to the implications of this gradual approach for government revenues, adjustment costs and credibility of reforms.

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POLITIQUE DE L'EAU, DE SECURITE ALIMENTAIRE, ET AGRICOLE DANS LA REGION DU MOYEN-ORIENT ET DE L'AFRIQUE DU NORD

Shobha Shetty

AVANT-PROPOS

La région du Moyen-Orient et de l'Afrique du Nord (MENA) est l'une des régions au monde les plus affectées par les pénuries d'eau, avec une moyenne annuelle régionale de 1.200 mètres cubes par personne (la moyenne mondiale est proche de 7.000). Quoique l'agriculture et l'économie rurales aient leur importance dans la région MENA, la contribution relative de l'agriculture au PIB est faible et à la baisse dans la plupart des pays. L'internalisation des coûts privés et sociaux de l'eau par le plus important des usagers est un défi que les pays devront relever pour que le développement agricole puisse être couronné de succès et durable, en particulier dans le contexte d'une concurrence croissante dérivée d'une plus grande libéralisation du commerce.

L'eau, et non la terre, est actuellement le facteur qui limite l'amélioration de la production agricole dans la région MENA. Dans ces conditions, maximiser la productivité de l'eau, et non le rendement par unité de terre, constitue une meilleure stratégie de gestion de l'eau à l'exploitation. Pour accroître la productivité de l'eau face au nouveau paradigme de gestion par évapotranspiration il faut plus que de simples changements dans la technologie d'irrigation. Il faut une approche intégrée à l'amélioration des méthodes techniques, agronomiques, et de gestion. Les syndicats d'irrigants facilitent grandement la mise en œuvre des mesures intégrées. En se servant de technologies de satellite de télédétection, les urbanistes et les décideurs peuvent prendre des décisions mieux informées pour garantir un approvisionnement stable d'eau pour l'alimentation et l'environnement.

Tous les pays de la région MENA, à l'exception du Maroc, sont des importateurs nets de produits agricoles. Les plus grands avantages pour la région MENA dériveront de réformes exhaustives du secteur agricole national en parallèle à un accès élargi aux marchés européens et mondiaux. Les gouvernements de la région MENA seront confrontés aux enjeux liés au calendrier et à l'échelonnement des réformes. Tenant compte de leurs dotations actuelles en ressources et de leurs perspectives de croissance, il est dans l'intérêt des pays de la région MENA de faire progresser la libéralisation des marchés dans les pays industrialisés. Parallèlement, ils pourraient demander une certaine compensation pour les prix plus élevés et la perte du statut préférentiel, sous forme de régimes financiers ne faussant pas les échanges, voire même de dons en espèces pour les pays qui, en conséquence, seront confrontés à des pertes importantes. Les pays devront prêter une attention particulière aux implications de cette approche graduelle sur les recettes publiques, les coûts d'ajustement, et la crédibilité des réformes.

EXECUTIVE SUMMARY

The Middle East and North Africa (MNA) region¹ is one of the most water scarce regions in the world, with a regional annual average of 1,200 cubic meters per person (world average is close to 7,000). Water scarce countries such as Saudi Arabia and Jordan have per capita annual water resources less than 200 cubic meters (Figure 1). By 2025, due to population increase, the regional average water availability is projected to be just over 500 cubic meters per person per year. The region is characterized by high population growth rates, large and rapidly increasing food deficits, highly variable income levels both within and between countries, and limited natural resources, particularly arable land and water. Most of the region falls within the arid and semi-arid rainfall zones, where 60 percent of the total MNA population lives.

While agriculture and the rural economy are important elements in the MNA countries, the relative contribution of agriculture to overall GDP in most countries is low and has been declining. However, agriculture is by far the dominant user of water, where in some countries like Iran, Morocco, Syria and Yemen, agriculture consumes close to 100 percent of all available water resources. However, rather than focus exclusively on the absolute water use, relative water use and the existing inefficiencies of irrigated agriculture in the region are of more concern. Due to low water prices which do not even capture the full private costs, agriculture is an extremely inefficient and wasteful user of water. Internalizing the private as well as the social costs of water by the largest user is a challenge that countries will have to face for agricultural development to be successful and sustainable, especially in the context of increased competition with more trade liberalization. These are exacerbated by distorted agricultural policies which subsidize “strategic” crops cereals and sugar. Irrigated crop production of products such as rice and sugar are very inefficient, twice that of producing wheat at world prices. There is very little justification for producing these crops under the water-scarcity of the MNA region. Livestock and dairy production is also hugely inefficient in water-scarce environments. **Costly producer support policies** affect the lives of the poor in three major ways: 1) by encouraging strategic crop production over production of crops with comparative advantage which could increase the incomes of households engaged in agriculture, 2) increased water use contributing to accelerated environmental degradation which leads to lower long-term productivity and 3) agricultural subsidies taking away public support from other social services such as education, health and social protection.

Reforms in land tenure policy and drought management are identified as key issues in agricultural development especially with respect to the poor. Because of a higher degree of vulnerability to drought in the MNA region, countries have been forced to review their approach to **drought management**. Most of the drought-coping strategies implemented by governments of the region have focused on mitigation measures and emergency plans. With greater population growth rates and higher demand on declining water resources,

¹ Defined for the purposes of this study to include the countries of the Maghreb (Algeria, Libya, Mauritania, Morocco, and Tunisia,) and countries of the Mashreq (Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Lebanon, Oman, Saudi Arabia, United Arab Emirates, West Bank & Gaza, and Yemen).

governments need to address the issue as a structural phenomenon, inextricably linked with the socio-economic production system and within the context of scarce, declining and degraded water resources. The careful management of water resources will become increasingly important in mitigating the impact of drought on the economies of the region in the future. National Mitigation Strategies and Drought Relief Planning Systems will need to be developed more systematically than at present in accordance with each country's agro-ecological specificities.

Water, not land, is now the limiting factor for improving agricultural production. **Maximizing water productivity**, not yield per unit of land, is, therefore, a better strategy for on-farm water management under such conditions. Changing the focus from land to water requires not only new technologies and policies for water management but also a change in land use and cropping systems. Strategic research on field crops, such as cereals and legumes, shows that substantial and sustainable improvements in water productivity are attainable only through integrated farm resources management. Water use-efficient on-farm techniques, coupled with improved irrigation management options, better crop selection and appropriate cultural practices, improved genetic make-up, and timely socioeconomic interventions, can help to achieve this objective. Conventional water management guidelines designed to maximize yield per unit area need to be revised for achieving maximum water productivity instead. National policies need to be adjusted to encourage more efficient water use in agriculture and a new land use and cropping system that maximizes water productivity. Using satellite remote sensing technologies, planners and policy makers can make more effective decisions to ensure a stable supply of water for food and the environment. These remote sensing tools complement traditional methods for tracking water availability and measuring the productivity of water used in agriculture. Because they often use public domain satellite images this approach offers developing countries a low-cost way to improve water management. These are now being used to link evapotranspiration (ET) monitoring with spatial hydrologic models to support cutting edge water resource planning, monitoring, and management in river basins and irrigation areas in some countries – this is worth emulating on a larger-scale in the water-scarce MNA region.

Groundwater acts as a strategic buffer and serves both domestic and agricultural irrigation needs. Yet groundwater today suffers overexploitation and pollution and this can endanger the livelihoods of those depending on these resources due to subsidized energy prices, trade protectionism, and subsidized agricultural credit. Government policies have thus contributed in no small measure to the tremendous increase in groundwater irrigation with its attendant negative consequences. The overall thrust towards irrigation expansion coupled with attractive output prices and subsidized agricultural credit for wells, have proved to be strong incentives for farmers to take up groundwater irrigation in many areas. In areas where groundwater tables are declining due to overpumping, energy costs have increased substantially with negative equity and environmental implications since the larger farmers continue to pump the over-exploited aquifer while the smaller farmers are forced to leave the market. Countries like Jordan are showing the way towards rationalizing aquifer exploitation through a primarily regulatory offensive.

All MNA countries with the exception of Morocco are net importers of agricultural products. Over the last two decades, MENA net agricultural imports have ranged between US\$ 16 –20 billion. But domestic reforms, combined with greater market access to European export markets, would reverse these losses. Much of the losses in MNA originates from allocative inefficiency which can be corrected by removing distortions in domestic agriculture. The greatest benefits for MNA will be generated by comprehensive domestic reforms, in tandem with higher market access in European and world markets. MNA governments will face issues relating to timing and sequencing of reforms. It is likely that the adjustment costs of a combined set of measures will be higher than the sum of those related to a sequential implementation. The heaviest domestic and border distortions are encountered in the livestock, dairy, oilseeds and cereal markets. Programs will have to be put in place for this collection of markets in a gradual way and according to some pre-announced plans. Given its current resources endowments and growth prospects, it is in the best interest for MNA countries to push towards proceeding with the liberalization of markets in developed countries. At the same time, they could ask for some sort of compensation for higher prices and lost preferences in the form of non-trade distorting financial schemes or even cash grants for those countries facing significant losses as a result. Countries will have to pay a particular attention to the implications of this gradual approach for government revenues, adjustment costs and credibility of reforms.

WATER, FOOD SECURITY AND AGRICULTURAL POLICY IN THE MIDDLE EAST AND NORTH AFRICA REGION

1. State of Water, Food Security and Agricultural Policy in the MNA region

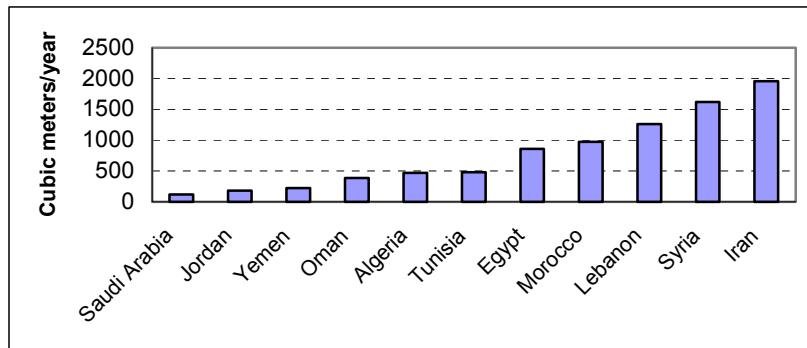
1.1 Water Scarcity in MNA

The Middle East and North Africa (MNA) region² is one of the most water scarce regions in the world, with a regional annual average of 1,200 cubic meters per person (world average is close to 7,000). Water scarce countries such as Saudi Arabia and Jordan have per capita annual water resources less than 200 cubic meters (Figure 1). By 2025, due to population increase, the regional average water availability is projected to be just over 500 cubic meters per person per year. The region is characterized by high population growth rates, large and rapidly increasing food deficits, highly variable income levels both within and between countries, and limited natural resources, particularly arable land and water. Most of the region falls within the arid and semi-arid rainfall zones, where 60 percent of the total MNA population lives.

Not only is water scarce, but rivers are highly variable and difficult to manage. Many countries are mining groundwater, a temporary and risky expedient. The MNA region also accounts for about 60 percent of the world's desalination capacity but this option is restricted to the major oil-exporting countries. Major water resources in the region are shared between countries lying both within and beyond the region. The most significant basins are those of the Jordan, Nile, and Euphrates/Tigris, all of which are subject to contentious riparian issues. Large aquifers underlie North Africa and the Arabian Peninsula but are costly to develop and pose potential problems insofar as agreement on abstractions by several countries is difficult to achieve. Deteriorating water quality is also an increasingly serious issue in many areas due to a combination of low river flows, inadequate treatment, agricultural runoffs, and uncontrolled effluent from industry. Seawater intrusion into coastal aquifers is a critical issue in most locations, and water logging and secondary salinity affect several of the major irrigated areas. The water scarcity situation is increasingly affecting the economic and social development of most countries of the region (World Bank, 1995a).

² Defined for the purposes of this study to include the countries of the Maghreb (Algeria, Libya, Mauritania, Morocco, and Tunisia,) and countries of the Mashreq (Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Lebanon, Oman, Saudi Arabia, United Arab Emirates, West Bank & Gaza, and Yemen).

**Figure 1. Total available renewable water resources per person
(m³/capita/year)**

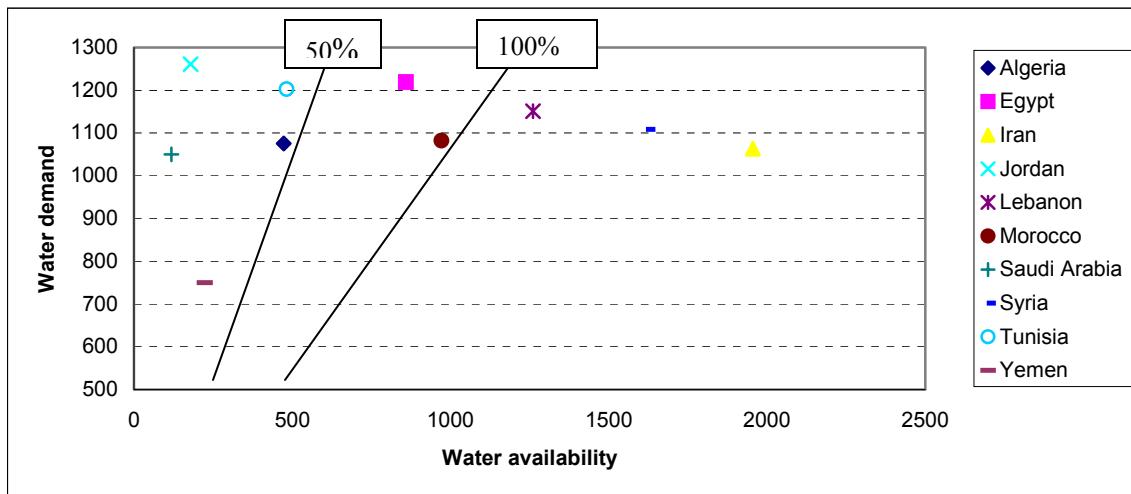


Source: AQUASTAT, FAO

To further illustrate the situation of water scarcity in the MNA region, Figure 2 shows the relation between water demand³ and availability. The line labeled 100 percent marks the points along which 100 percent of per capita water demand are being met by domestic per capita water availabilities. Countries lying to the right of this line have more domestic water resources than their basic minimum water needs (Iran, Syria, Lebanon). However, countries lying to the left of the 50 percent line face severe water shortage as water availability in these countries do not even meet half of their water demands (Jordan, Saudi Arabia, Yemen, Tunisia, Algeria).

³ Water demand was calculated in the following way. First, we calculated a national population weighted average total per capita daily caloric intake for the region (2,990 cal/per capita/day). Secondly, we divided the Gleick (2000) data on amount of water required to produce a typical regional diet for the MNA region (2,940 liters/per capita/day or 1070 m³/per capita/year) by the weighted average total per capita daily caloric intake to obtain a regional level of “water required to produce 1 calorie of diet” (0.98 liters/per capita/day or 0.36 m³/per capita/year). Thirdly, we multiplied this with FAO data on daily caloric intake by each country to obtain per capita water demand to produce a typical diet for each country. Finally, we added on to this value a recommended minimum basic water requirement for human domestic needs (drinking water, sanitation services, bathing and food preparation excluding water required to grow food) to obtain the total per capita water demand. For this, we used a value of 50 liters/per capita/day or 18.3 m³/per capita/year (Gleick, 2000).

Figure 2. Water availability and demand per person ($\text{m}^3/\text{per capita/year}$)



Source: Calculated from Gleick (2000) and FAOSTAT, FAO

1.2 Agriculture: the Dominant User of Water

While agriculture and the rural economy are important elements in the MNA countries, the relative contribution of agriculture to overall GDP in most countries is low and has been declining. Table 1 shows that agriculture, even in Syria, which has the highest share of contribution to GDP in the region contributes only 24 percent, whereas agriculture in Jordan contributes to a mere 2 percent of GDP. However, agriculture is by far the dominant user of water, where in some countries like Iran, Morocco, Syria and Yemen, agriculture consumes close to 100 percent of all available water resources.

The wide gap between water use and GDP contribution for agriculture is highlighted even more when contrasted to the industrial sector (Table 1). To obtain a rough indicator to gauge how much GDP share 1 percent of water use contributes to, we divide the GDP share percentage by the water use percentage. For example, Algeria uses 69 percent and 15 percent of its water in agriculture and industry but its contribution are 12 percent and 60 percent of GDP respectively, thus 1 percent of water consumption contributes to 0.17 percent and 4 percent of GDP in agriculture and industry respectively. We see that in every country, the contribution of GDP is less than 1 percent for agriculture but between 4 and 48 percent for the industrial sector. Therefore, from a narrow macroeconomic perspective, rationale of justifying the allocation of water to agriculture over industrial and other sectors is weak.

Thus, as countries confront the water crisis situation, there will no doubt be increasing pressure to allocate water away from agricultural to industrial and municipal uses as well as to increase water efficiency within the agricultural sector. Some MNA countries such as Israel, Tunisia, Morocco and Jordan have begun addressing the issue of water re-allocation where others, notably the Gulf countries, have not (Adams et al., 1999).

Table 1. Water use and GDP contribution of agriculture and industry

	Ag. share		Contribution of 1% of water to GDP (%)	Industry share		Contribution of 1% of water to GDP (%)
	Water use (%)	GDP (%)		Water use (%)	GDP (%)	
Algeria	69	12	0.17	15	60	4.00
Egypt	88	14	0.16	8	34	4.25
Iran	92	19	0.21	2	22	11.00
Jordan	75	2	0.03	3	125	8.33
Lebanon	72	12	0.17	4	22	5.50
Morocco	93	16	0.17	3	32	10.67
Saudi Arabia	90	7	0.08	1	n/a	n/a
Syria	96	24	0.25	2	30	15.00
Tunisia	87	12	0.14	3	29	9.67
Yemen	96	15	0.16	1	48	48.00

Source: Water use share: AQUASTAT, FAO, GDP Contribution: World Development Indicators

However, from a broader development standpoint, it is important to note that agriculture claims the largest share of the work force in the region with a high proportion of the poor depending on the sector for the livelihoods. Region-wide, 88 percent of economically active population works in the agriculture sector. In some countries such as Egypt and Morocco, more than 90 percent of the economically active population is agricultural workers (Table 2). Thus, despite the small contribution to GDP, agriculture is still the key to development in many developing regions including the MNA region.

That the irrigation/agriculture sector consumes the bulk of water is not unique to the MNA region, indeed it is a common feature world-wide. The more important issue is not just the absolute use but the *relative* use of water. Since water will continue to be the main input in agriculture, it is more important (and realistic) to focus on how technology and research may be able to help improve efficiencies and reduce overall usage.

Table 2. Share of agriculture in total economically active population

	Total economically active (1000)	Agriculture (1000)	Share of agriculture (%)
Algeria	10,458	7,257	69.39
Egypt	25,790	24,871	96.44
Iran	24,169	18,543	76.72
Jordan	1,566	562	35.89
Lebanon	1,256	130	10.35
Morocco	11,780	10,909	92.61
Saudi Arabia	6,095	2,002	32.85
Syria	5,165	4,493	86.99
Tunisia	3,826	2,329	60.87

Source: FAOSTAT, FAO

II. Poverty, Productivity, and Trade

In this chapter, we discuss three key issues that are intricately linked and that affect water, food security and agricultural policy in the MNA region. The three key issues are: poverty and social dimensions of agriculture, agricultural productivity, and agricultural trade.

2.1 Poverty and Social Dimensions of Agriculture

After the deep recession faced by the region in the 1980s, wide ranging economic reforms have been implemented in the 1990s aimed at tightening demand, liberalizing trade and improving the regulatory framework in which the process of development was being implemented. Those reforms gave a significant boost to growth with an average annual GDP growth around 3 percent (World Bank, 2000) and have started putting the foundations of a market-based economy where the private sector is called to play a more prominent role.

Despite these signs of economic recovery, the region still suffers from the burden of an inefficient public sector, high levels of unemployment, substantial poverty, slow steps in global and regional integration and a mounting pressure on its natural resource base as a result of population growth, urbanization and demand changes. All these challenges are related in one way or another to the performance of agriculture, a sector still significantly contributing to growth and employment. While some of these challenges have directly or indirectly hindered the development of the sector, others are the result of its inability to achieve substantial jumps in productivity. In the context of the MNA region, it is nevertheless difficult to dissociate the causes from the consequences of the limited agricultural potential reached thus far.

The limited progress achieved in the agricultural sector has important implications with respect to the fight against poverty, considered as an important dimension of the development agenda in the region. Research efforts are particularly needed on this front because of the mixed messages given about the region from the various assessments made on poverty patterns. Poverty in MNA though limited relative to other developing regions has been increasing, except for Tunisia and Morocco, since the early 1980s in absolute terms (van Eeghen, 1995) but the percentage of poor people has gone in different directions depending on the period considered⁵. A closer examination at the trends for recent years show that poverty is more pronounced in the rural areas where 70 percent of the poor people while only 43 percent of the population is supported by the rural areas (Table 3). However, we also observe that in some countries urban poverty is increasing. This can also be considered a consequence of increasing rural poverty because poor families in rural areas often send members into cities to supplement their rural incomes. However, without the necessary skills, most migrants end up in menial jobs in urban cities, joining the ranks of the poor in urban cities. Thus, rural poverty has far-reaching

⁵ Examples of conflicting assessments include findings for an increasing trend in the second half of the 1980s as in Hamdan (1996) and referenced in Doraid (2000) and findings for a decreasing trend between 1985 and 1994 as in van Eeghen and Soman (1995).

consequences well outside the rural space. Taking other indicators of poverty besides the standard income and expenditure based measures, the MNA region does not fare well when it comes to the concept of “poverty of opportunity”, an indicator measuring access to basic services (van Eeghen and Soman, 1998). All these various elements seem to indicate that earning opportunities in rural areas are disappearing and that key human development factors have been impeding the development of agriculture and rural areas in the region.

Though there exists extensive theoretical and empirical evidence on the positive impact of growth on poverty reduction, the link between growth and improved equity in income distribution is rather ambiguous. While income distribution at the national level is relatively equal in MNA countries as compared to other developing countries⁶ (van Eeghen and Soman, 1998; Rodriguez, 1998), the increasing gap between rural and urban raises important concerns with respect to income distribution as it relates to geographical location (urban v. rural) and agro-ecological characteristics (high potential v. low potential agriculture). Looking at the experience with government programs for poverty reduction and their effectiveness (van Eeghen and Soman, 1998; Kossaifi, 1998) the region tends to allocate huge sums to social programs (2.5 percent of GDP on average) that have proven overall to be inefficient in lifting all the poor people out of poverty because of the high degree of leakage and their inadequate and difficult targeting scheme. Food and consumer subsidies have proved to be a major drain on governments (1-2 percent of GDP) and have benefited the urban areas more than the rural areas while public works programs have had lower financial endowments but with a higher impact on the poor and the rural areas (e.g. Tunisia and Morocco). With the existing poverty patterns, increases in income inequalities have generated some social tensions that could prove to be detrimental to efforts to spur growth. As current poverty reduction programs are being challenged on efficiency and inequality reduction grounds and alternatives sought, the challenge for policy makers is to identify policies that could promote growth without worsening income distribution.

⁶ Using Gini coefficient estimations for the mid nineties, income inequality in the MENA region was found to average 38.03 percent. In comparison, MENA fares better than Sub-Saharan Africa (46.95 percent) and Latin American and the Caribbean (49.3 percent) but has more income inequality than the industrial countries (28.94 percent). Its performance is similar to other developing regions such as East Asia and the Pacific with 38.09 percent or South Asia with 31.88 percent (Rodriguez, 1998). Within the region and, Algeria (38.70 percent in 1988), Morocco (39.57 percent in 1991) and Tunisia (40.23 percent in 1990) have lower inequality levels than Jordan (43.3 percent in 1992) based on World Bank data (van Eeghen and Soman, 1998).

Table 3. Population below National Poverty Line (%)

	Survey Year	Rural	Urban	National Survey Year	Rural	Urban	National
Algeria	1988	16.6	7.3	12.2	1995	30.3	14.7
Egypt	1981	24.2	22.5	26.0	1995-96	23.3	22.5
Jordan	1987	23.7	16.6	18.7	1997	18.2	10.0
Morocco	1990-91	18.0	7.6	13.1	1998-99	27.2	12.0
Tunisia	1990	13.1	3.5	7.4	1995	13.9	3.6
Yemen	1992	19.2	18.6	19.1	1998	26.9	21.8

Note: Rural poverty (urban) rate is percent of rural (urban) population living below the national rural (urban) poverty line, National poverty rate is percent of population living below poverty line deemed appropriate for the country by its authorities.

Source: World Bank, 2002a

Since agriculture is the main industry in rural areas, agricultural development is key to successful rural development. Conversely, mismanaged agricultural policies will have a direct impact on the lives of rural people, in particular the rural poor who are most vulnerable to shocks and/or disasters. In the MNA region, where arid and semi-arid areas account for 85 percent of the land area and contain 60 percent of the population, the vicious cycle between rural poverty, unsustainable agricultural practices and environmental degradation is especially reinforcing.

Since agriculture is the predominant industry for the rural population, low agriculture productivity is a major hindrance to rural development. In this context, three main policy areas have been identified as major obstacles to agricultural development and thus contributing to rural poverty: pricing, land tenure, and drought management.

Pricing Policy

Overall mismanagement of various policies dealing with both input and output prices in agriculture contribute to rural poverty in a substantial way. When prices do not reflect the actual scarcity and are artificially set, over-consumption and under-supply tend to occur. Heavy subsidy for producers of “strategic crops” such as wheat, sugar, oilseeds, beef and dairy products as well as on irrigation water are common pricing policies in the MNA region. Producer subsidies for these “strategic crops” are often justified by a policy of promoting self-sufficiency. By encouraging the production of crops in which countries have little comparative advantage, public support which could otherwise have been channeled towards crops with clearer comparative advantage are being used inefficiently. Furthermore, targeting mechanisms are generally weak and therefore, subsidies tend to benefit middle and high income producers rather than poor ones who have limited access to markets or state purchases.

Producer subsidies often take the form of guaranteed minimum prices, obligatory delivery and collection prices given by state monopolies or floor prices with a premium over reference prices based on production costs or international prices. The producer subsidy of bread wheat in Algeria and Saudi Arabia are well-known to be especially high, at almost double the world price. Such producer subsidy policies not only distort investment decisions but impose a large burden on government expenditure. For

example, in Algeria, one-third to one-half of the public expenditure in the budget of the Ministry of Agriculture and Fishery are allocated to financing the price support program for wheat. Table 4 shows the share of agriculture expenditures in total government functional expenditure. Agricultural expenditure ranges from 7.4 percent to 27.4 percent of total government expenditure in select MNA countries.

Table 4. Share of agriculture in total functional expenditures share (%)

	Agriculture expenditures (%)	Total functional expenditures (%)	Share of agriculture in total functional expenditures (%)
Egypt	5.27	31	17.00
Iran	2	27	7.41
Jordan	3.79	34	11.15
Morocco	4.15	33	12.58
Tunisia	8.23	30	27.43
Yemen	7.82	42	18.62

Source: IMF, 1999

Indirect subsidy on irrigation water is another commonly prevalent policy despite the fact that the MNA region is the most water scarce region in the world. Cost of water for irrigation is set at below cost recovery levels in the MNA countries. In some extreme cases such as Algeria, current tariffs are equivalent only to 1 to 7 percent of the marginal cost of water depending on source and loss assumptions (World Bank, 2002a). On-farm water use efficiencies in the MNA region are low⁷ and this is partly due to low/negligible irrigation tariffs that discourage its efficient use as an economic input in competitive and profitable agricultural production and ultimately threatens the sustainability of this scarce resource. Region-wide, only 30 percent of the water used in flood irrigation ever reach crops. As a consequence of such inefficient use of water, reserves are quickly being depleted. For example a typical farmer near Sana'a, Yemen has deepened their well by 50 meters over the last 12 years while the amount of water they can extract has dropped nearly two-thirds (World Bank, 2002a).

Economic theory argues that only when the price paid for a commodity reasonably reflects the true price can market forces work for efficient distribution. In other words, subsidized water leads to waste in agricultural practices, little incentive for research and development of conservation techniques and practice, and too much water allocated to agriculture as opposed to industry where contribution to GNP per unit of water is often much higher. The primary alternative to quantity-based allocation of water is incentive-based allocation, either through volumetric water prices or through markets in transferable water rights. Empirical evidence shows that farmers are price-responsive in their use of irrigation water. The four main types of responses to higher water prices are use of less water on a given crop, adoption of water-conserving irrigation technology,

⁷ While inefficiencies seem to imply the potential for huge savings from existing irrigated agriculture, the potential savings in many river basins are not as dramatic, nor as easy to achieve because much of the water “lost” from irrigation systems is reused elsewhere (Seckler, 1996). For example, estimates of overall water use efficiencies for individual irrigation systems in the Nile Basin are as low as 30 percent, the overall efficiency of the entire basin is of the order of 80 percent.

shifting of water applications to more water-efficient crops, and change in crop mix to higher-value crops. However, this has to be balanced against the fact that for most countries in the world, water price elasticities in agriculture are very low, and the MNA region is no exception (See Table 5)

Table 5. Comparative Water Price Elasticities

Region/Country	Domestic	Industrial	Agriculture
Latin America	-0.40 to -0.50	-0.70 to -0.80	-0.07 to -0.12
SSA	-0.45 to -0.55	-0.60 to -0.8	-0.10 to -0.15
West Asia/North Africa ⁸	-0.44 to -0.57	-0.75 to -0.85	-0.10 to -0.20
South Asia	-0.35 to -0.40	-0.65 to -0.75	-0.08 to -0.11
Southeast Asia	-0.35 to -0.45	-0.65 to -0.80	-0.09 to -0.12
Japan	-0.22	-0.45	-0.04
United States	-0.30 to -0.50	-0.45 to -0.72	-0.08 to -0.14

Source: Rosegrant et al, 2002. Ranges indicate different river basins or subregions. SSA – sub-saharan Africa

Despite the declining per capita water supplies in the region, water charges in irrigation are typically well below even the inadequate levels of the municipal sector and, in contrast to the municipal sector, many governments are unwilling to accept even the principle of irrigation cost recovery. Irrigation and other subsidies are often rationalized as a means of offsetting low farm prices controlled to keep down urban food prices. In Jordan, irrigation tariffs were last raised in 1995 from 6 fils/m³ (US\$0.01/m³) to 15 fils.m³ (US\$.02/m³) as part of the Agriculture Sector Adjustment Loan conditions which covers only 62 percent of O&M costs. A rational tariff policy to at least recover the Jordan Valley Authority's (JVA) O&M costs is an urgent priority if government fiscal burdens are to be reduced. (World Bank, 2001). Egyptian agriculture, unlike other countries in the region, is entirely dependent on irrigated land. The government now provides irrigation water free except for cost recovery of on-farm investment projects. Annual irrigation subsidies are estimated at US\$5.0 billion in Egypt (Bhatia and Falkenmark, 1995).

The fact that a significant portion of the labor force is involved in agriculture in the region is an important consideration for any policy intervention. It is important that the policies be designed to reduce water consumption to sustainable levels while at the same time ensuring adequate jobs and increasing economic returns. Economic incentives should be designed to support these objectives. An approach to meeting these objectives might result in an overall reduction in irrigated area, but a conversion to higher-value, more labor intensive crops and agro-processing. However, poor wheat farmers with small plots will have major difficulties in successfully navigating this transition. Diversification should be complemented by other support services - market information systems and market access are critical to promote diversified cropping. Development of agricultural markets can drive investment and productivity in irrigated agriculture. At the

⁸ Includes Turkey and Cyprus.

household level, market development can help drive irrigation modernization and improve water productivity. It can promote investment, generate growth through diversification and productivity gains, increase and diversify incomes, provide employment, and reduce the cost of food and increase its availability. Market development can promote more efficient and less water-intensive crop management practices and higher-value cropping patterns—fruit, vegetables, flowers. The Government of Jordan (GOJ) has promoted a policy environment that is designed to promote exports and attract direct foreign investment. Continuing the reforms made in the agricultural sector, GOJ is now seeking to prepare the basis for the modernization of Jordanian agriculture from its current high water consumption but relatively low value-added terms to GDP to one that maximizes this scarce factor through promotion of horticultural exports. Even though horticultural production grew by 29 percent in 2000, about 25 percent of the total produce was wasted because of lack of adequate exporting outlets. GOJ is now increasingly cognizant of the need to improve quality and standards to break into the lucrative EU market. These call for substantial improvements in produce quality in terms of better standards of production, post-harvest handling, packaging and preserving the integrity of the cold chain. GOJ also recognizes the need to improve market information and logistics to monitor demands. Through a World Bank-financed project⁹, GOJ is now looking to address the key challenge of linking small and medium-scale farmers with the reliable large-scale farmer-exporters by way of incentives, timely marketing information and support services and systems.

Governments should also encourage investments in rural infrastructure (especially roads), communication systems and storage. An assured and stable market, and readily available inputs and credit, are essential to sustain agricultural diversification. Another key public investment is in research, development, and extension or technology transfer, which need to be carried out in partnership with professional and commercial bodies. Extension programs with relevant up-to-date information on irrigation techniques, agronomic practices and economics are enormously beneficial to farmers. A third area is in the proactive development of farmer-market links, a difficult area for governments because this is essentially a market-driven private activity, but one where business-oriented NGOs have some comparative advantage (World Bank, 2004; 2006). Public private partnership (PPP) approaches (example Egypt and Morocco) that involve the private sector, produce economies of scale and with high labor requirements could very well achieve these objectives. These recent developments in private public partnerships in Egypt and Morocco that involve the production and processing of fruits and vegetables for export to the EU have demonstrated the scope for innovating, although private sector investment in large scale irrigation for smallholders is likely to remain limited. Another recent initiative by IFC's Advisory Services concerns the new PPP being developed for the Government of Brazil, through its agency CODEVASF, that intends to transfer the PONTAL project land to the private sector for development into intensive irrigated agriculture. The land at PONTAL is not currently irrigated. CODEVASF also intends to transfer the operation and maintenance of the existing partially built irrigation infrastructure to a qualified private sector operator. The operator will commit to complete additional irrigation

⁹ Horticultural Exports Promotion and Technology Transfer Project, Report Number 24428-JO, Project Appraisal Document, June 25, 2002, World Bank, Washington, D.C.

infrastructure as required to develop over time PONTAL's approximately 7,897 hectares. The project is located in the Municipality of Petrolina (state of Pernambuco), a region with a proven track record of success in fruit production and agribusiness exports, near other irrigated projects developed by CODEVASF. This is different from the Morocco Guerdane or the Egypt West Delta Irrigation PPP projects where the terms of the concessions relate to the construction and management of the irrigation infrastructure only.

The dominant constraint on any cost recovery scheme is socio-political resistance rooted in equity concerns. However, studies in Egypt have shown that even a fee covering just O&M costs would be equivalent to 1-2 percent of gross farm revenue, 3 percent of net farm revenue (including return to family labor) and 3-4 percent of total costs. Similar figures for a fee covering both O&M and capital costs are 3 percent of gross revenues, 5-6 percent of net revenues or 6-7 percent of total costs (World Bank, 1992). While such cost increases are not insignificant, they are well within the farmer's capacity to pay especially considering that real net farm incomes have risen by about 40 percent since 1984. In Morocco, irrigated areas comprise about one million hectares which account for 13 percent of cultivated area and account for 45 percent of value added and 75 percent of exports. However, the policy of supporting prices for the big import-substitution crops (cereals and sugar) has a powerful impact on resource allocation, production and competitiveness of the irrigated areas that constitute the country's most dynamic creator of agricultural value added. Thus, nearly 40 percent of irrigated lands are currently occupied by cereals for which there is no proven comparative advantage. The orientation of agricultural policy also favors the continued cultivation of sugar-producing crops in regions that do not appear to have any comparative advantage for those crops. The absence of a true profit constraint weighing on the public sugar refineries creates a bias, through the price paid to producers, in favor of these crops at the expense of other alternatives such as market gardening, fodder crops, and legumes. The current incentive structure leads to intensive water utilization for the production of import substitution crops, even though their production is far from economically profitable. The financial returns on these crops, artificially maintained by high border protections and guaranteed prices and markets, prevents the reallocation of this scarce resource towards more labor-intensive export crops (e.g., horticultural crops) and those with higher-value added for which Morocco does have a proven comparative advantage. They represent a comparative advantage for the country, allow for more efficient use of water and are more labor-intensive. (Aloui, 2002; World Bank, 2001b).

These costly producer support policies affect the lives of the poor in three major ways: 1) by encouraging strategic crop production over production of crops with comparative advantage which could increase the incomes of households engaged in agriculture, 2) increased water use contributing to accelerated environmental degradation which leads to lower long-term productivity and 3) agricultural subsidies taking away public support from other social services such as education, health and social protection. Irrigation prices do not play a role in allocation of water in Morocco but informal water markets have emerged in some areas that value water more accurately. (See Box 1)

Box 1. Water Markets in Morocco

Although Morocco had a long tradition of water-rights markets to deal with allocation issues, the implementation of the public ownership provision and the prohibition of water rights independent of land made all formal water markets obsolete. They closed, but informal water markets emerged whenever the need to adjust allocations locally was perceived. These informal markets are located in regions where traditional irrigation and water rights were prevalent.

In the Nfis perimeter, a large-scale irrigation perimeter with low pressure distribution at the farm gate, the official rate for irrigation is lower than the farmers' perceived value. The Regional Agricultural Development Offices (ORMVA) allocates quotas based on irrigated land area. The farmers buy and sell quotas and informally tell the network managers about their transactions. Distribution is then revised accordingly.

In the Haut Ziz perimeter, the same arrangement is used, although the network is based on gravity distribution. Two kinds of transactions occur: the pumping stations sell their water and use the network for transport; the owners of rights to dam water also sell and buy rights. The network management accommodates the transport and the use of water rights, although these are not officially recognized.

These arrangements are designed to overcome the constraints on allocation flexibility in the official settings. They are seen as a major instrument for overcoming rigidities in the water allocation process at the macro level.

Source: Pricing Irrigation Water, Tsur et al, 2004

However, for water markets to play a more effective role in improving allocation of scarce water resources, it is imperative to have a system of formal and structured **water rights**. International experience has shown that the following principles are emerging that are being applied to water use rights systems across the world (World Bank, 2003):

- Recognition of the underlying public ownership of water resources
- A right to reasonable water use for basic human needs (without license)
- All other uses of water subject to grant of a license or appropriate instrument
- Rights issued for a limited duration
- Transparency (e.g., public registers of rights)
- Customary rights changing to specified rights (with or without a license)
- Provision for transferability of water use rights
- Customary rights within irrigation schemes managed by farmers' organizations
- Public participation in licensing processes

The experience of Mexico is illustrative of the problems faced in the implementation of a practical water rights system. It is relevant to many of the MNA countries since it is also a strongly groundwater-dependent country. To introduce water use rights, the Mexican Government introduced a public water registry. In the National Water Commission, a special office was established to register water use rights (concessions/titles). In theory, the record includes both quantity and quality. However, the model proved to be too cumbersome for both water users and regulators to manage. Originally, the nation-wide registration was supposed to take only a year, but it has taken nearly a decade to complete 90 percent of the registration as of 2003. The meticulous procedures to prevent corruption eventually became the cause of non-transparent judgment by the bureaucracy, which in

turn has fostered corruption. Furthermore, market mechanisms only work if the government has tight control over water measurement and abstraction, and good monitoring – the reality was that the government had neither. Australia is another country whose agro-ecology is similar to the arid MNA region. Here, water resources are vested in the states (not nation). All states and territories are in the process of strengthening property rights and removing restrictions on water trading consistent with the national competition policy and national agreements on water resources. Water use rights are only one part of the overall scope of water resource management, and must be developed and implemented inside the framework adopted by each country for this water resource management. Design of a water use rights system should reflect the four pillars of good governance – accountability, transparency, predictability and participation by external entities.

Land Tenure Policy

Land tenure issues have been identified as a major impediment to agricultural growth in the MNA region. The first issue concerns land fragmentation. In many countries, successive land reform and land distribution have taken place resulting in land fragmentation. For example, Table 6 shows that in Egypt more than 90 percent of land holders own land smaller than 1 hectare. Similarly, in each of the five countries surveyed (Algeria, Egypt, Jordan, Saudi Arabia, Tunisia), more than half of all land holders own land that is smaller than 5 hectares. Land fragmentation is an impediment to agricultural growth because small land holdings make mechanization and investments in new technologies infeasible. Some countries such as Iran have policies to encourage the establishment of farmer cooperatives to achieve economies of scale in production and marketing. In November 2000, there were 752 Rural Production Cooperatives, or RPCs, all over the country, and this number is planned to rise to 1700 by the end of 2005. In addition to awareness campaigns, GOI provides financial incentives for the establishment of cooperatives. To encourage land consolidation, Government finances the necessary studies, including land consolidation design, as well as land leveling, road construction, and the irrigation network. However, the success of cooperatives has so far been limited to certain areas due to socioeconomic and technical constraints. (World Bank, 2001d)

Table 6. Agricultural Land Size

		Less than 1 ha		Less than 5 ha	
		Holders (%)	Area (%)	Holders (%)	Area (%)
Algeria	1985	--	--	74.05	29.11
	1993	--	--	61.61	14.18
Egypt	1982	95.40	52.90	97.92	63.63
	1985	95.40	53.92	97.80	64.41
	1987	95.29	53.03	97.79	63.43
	1990	95.80	56.35	98.08	66.05
	1994	95.97	57.09	98.22	66.73
	1975	24.30	1.07	63.47	13.63
Jordan	1983	30.39	1.66	71.81	18.57
	1979	36.32	2.64	74.98	14.34
Saudi Arabia	1982	--	--	72.34	7.48
	1986	--	--	45.73	7.48
	1990	11.81	0.41	49.73	8.46
	1995	17.32	0.61	53.28	9.05

Note: “—“ is n.a.. Data for Algeria is for private owned farms only (does not include socialist agricultural fields (DAS)). For Egypt, the category “less than 1 ha” should be replaced with “less than 2.1 ha”, “less than 5 ha” with “less than 4.2 ha”.

Source: Arab Organization for Agricultural Development, 1996

The second land issue concerns the skewed land distribution in some countries. For example, in Tunisia, 53 percent of landowners occupied only 9.1percent of total cultivated land in 1995. de Janvry and Sadoulet (1993) find, in the context of Latin America, in cases where land and income are unequally distributed, only a handful of large landowners benefit from the income effects of agricultural growth and that there is pressure on small landholders to be “pushed” out of agriculture to non-farm sectors. Adams (1999) finds similar results for the case of rural Egypt. Thus, although land tenure policies, especially land distribution issues are politically sensitive and thus difficult to implement, evidence seems to show that they greatly affect the objective of achieving rural development.

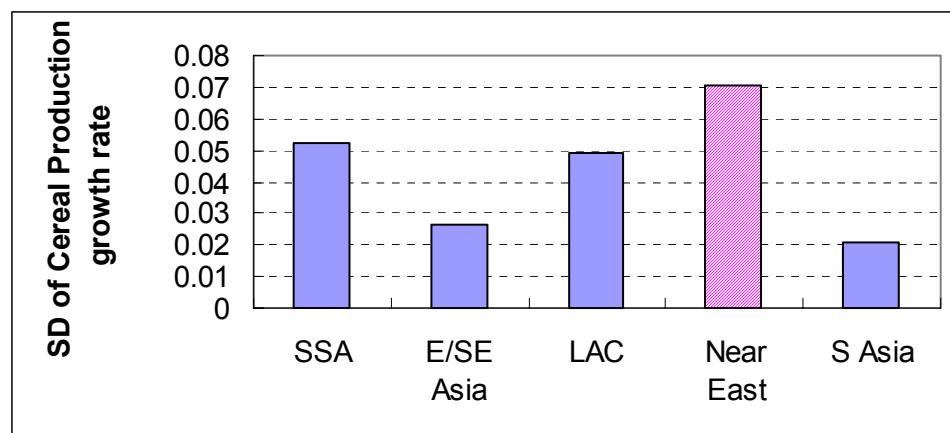
Finally, in some countries, lack of land titles and registration limit farmers’ access to formal credit as well as leads to unsustainable exploitation of the land. For example, in Algeria, farmlands formerly owned by the state were distributed to individuals and collective farms in 1987 to form individual private farms and collective private farms. However, the preoccupation of the central authorities to maintain viable farm sizes and prevent fragmentation and parcellization has been slowing the process of establishing official ownership rights (“actes administratifs”) for these lands. Traditionally private sector farms (“melks”) have also faced the same problem of lack of official deeds due to the fact that only 600 out of a total 1,541 communes had cadastres (World Bank, 1994).

Drought Management

Due to its arid climate, most parts of the MNA region experience frequent droughts. In recent years, Morocco suffered from drought during 1980-85 and in 1990-95, Tunisia in 1982-82 and then again in 1993-95, and several countries during the three year period of 1998-2000 (FAO, 2002b). FAO identified Iran, Iraq, Jordan, Morocco and Syria as being most affected by drought during this period. Droughts cause a major reduction in agricultural output mainly in rainfed areas but also in irrigated areas where inflow into reservoir will be reduced. Dramatic changes in climatic and hydrologic features in recent years have affected the economies of the region and specifically those of the dry areas where rainfed agriculture is the dominant activity and the only source of income for a majority of the rural population.

Droughts of higher frequency and longer duration have had a serious impact on development in several countries of the region, with severe repercussions for economic growth, food security and poverty alleviation. Droughts affect the lives of the rural poor through decreased agricultural production, death of livestock and endangered environment as seen in loss of soil fertility, loss of species and the threat of extinction. In the 1994/95 crop season, a drought season in Morocco, agricultural output of 1995 was 45 percent lower than the previous year, a non-drought year and rural landless or small landholders lost 100 million work days in agricultural employment. During the 1981-82 drought, 25 percent of cattle and 39 percent of sheep were sold or died and it took 5 years for the livestock population to reach previous levels (World Bank 1995b). In addition, water use for irrigation was reduced by 35 percent, and in some areas (Souss), by 90 percent. Livestock rearing, which is typically engaged in non-arable arid land is also heavily hit by reduction in vegetation on rangeland and shortage of drinking water. However, the largest impact is on rainfed agriculture land. Cereals, which occupy 58 percent of agricultural land in the region, are produced entirely by rainfed agriculture or a combination of rainfed and some irrigation. Figure 3 shows the standard deviation of cereal production growth rate as a proxy for volatility of cereal production in different developing regions. The Near East has the highest standard deviation of approximately 7 percent for the 1990-2000 period. Severe and periodic droughts are believed to be the main cause of production volatility.

Figure 3. Volatility of Cereal Production Output (1990-2000, SD = Standard Deviation)



Note: SSA = Sub-Saharan Africa, E/SE Asia = East/South East Asia, LAC = Latin American and the Caribbean, Near East = Near East Asia and Near East Africa, S Asia = South Asia

Source: Calculated from FAO, 2002

Poor people in rural areas live on the most marginal land with little assets to hedge their risks. Furthermore, droughts are difficult to forecast, even at the beginning of the crop season. Therefore, there is a clear link between droughts and the financial well-being of poor farmers. With respect to risk management, droughts increase the level of indebtedness of rainfed farmers who borrow for agricultural production purposes, in turn, putting agricultural financial institutions at risk after repeated drought occurrences. In Morocco, since 1999, the public agricultural bank, CNCA (Caisse Nationale de Crédit Agricole), which finances more than 80 percent of all loans to the agricultural sector, has made the purchase of a drought insurance a mandatory condition for obtaining an agricultural loan in drought prone areas (World Bank, 2001). Further studies have recently been conducted on developing a more specialized and objective insurance tool, a rainfall-based index insurance, in Morocco which aims to minimize the risk of moral hazard and adverse selection and promote a streamlined pay-out process (Skees et al., 2001).

Because of a higher degree of vulnerability to drought in the MNA region, countries have been forced to review their approach to drought management. Most of the drought-coping strategies implemented by governments of the region have focused on mitigation measures and emergency plans. With greater population growth rates and higher demand on declining water resources, governments need to address the issue as a structural phenomenon, inextricably linked with the socio-economic production system and within the context of scarce, declining and degraded water resources. The careful management of water resources will become increasingly important in mitigating the impact of drought on the economies of the region in the future. Box 2 discusses some of the steps that need to be put in place for a National Mitigation Strategy, and a Drought Relief Planning System.

Box 2. Elements of Successful Drought Mitigation Planning

One of the biggest challenges in successful drought planning is getting all the right groups of people to communicate effectively with one another. Three main particular groups need to be involved: scientists, managers, and decision makers (**political authorities**); **climatologists and others**, who monitor how much water is available now and in the foreseeable future; (Monitoring Committee); **natural resource managers** and others who determine how lack of water is affecting various interests, such as agriculture, recreation, municipal supplies, etc. (Impact Assessment Committee); and high-level **decision makers**, often elected and appointed officials, who have the authority to information they receive about water availability and drought's effects. (Drought Task Force) The U.S. National Science Foundation developed a 10 step-planning process in 1990 which is considered international best practice especially in arid/semi-arid environments. Getting these three groups functioning is the core of a successful drought plan, which is step 5 in a general 10-step process that can be tailored to the needs of an individual region, state or country:

- Appoint a drought task force
- Define the purpose and objectives of the drought plan
- Seek stakeholders participation and resolve conflict
- Identify drought risk and potential risk reduction actions
- Develop a drought plan that includes monitoring, impact assessment, and decision making
- Identify research and institutional needs
- Integrate science and policy perspectives
- Publicize the drought plan
- Teach people about drought and water supply
- Keep the drought plan up to date, and evaluate it after droughts

The drought planning process was outlined in USA in 1990. Since 1990, it has been revised and updated to reflect more state-level experience with drought planning. Additional changes have come as a result of a greater emphasis now being placed on mitigation and preparedness, recent workshops on drought planning held around the country, and a methodology developed to conduct drought risk analyses. The result of these efforts is a model for drought planning that is focused at the state level but can be easily tailored for states, cities, or other communities.

Source: Simas, J pers. comm..

Conclusions

While by some measures, poverty in the MNA region does not stand out among other developing regions, 85.4 million people or 29.9 percent of the population live on less than \$2 a day (1998). 70 percent of these poor people live in rural areas; they are either landless or small landholders, mostly growing cereals on rainfed land and/or rearing livestock. Furthermore, farmers in the MNA region live and work in the most water scarce region, where in some countries the available water is less than half of the water demand. However, at the same time, due to low water prices which do not even capture the full private costs, agriculture, which uses 87 percent of all available water resources, is an extremely inefficient and wasteful user of water. Recent PPP approaches in Guerdane (Morocco) and W.Delta (Egypt) offer an alternate way to support rural employment and improve farmer incomes. Internalizing the private as well as the social costs of water by the largest user is a challenge that countries will have to face for agricultural development to be successful and sustainable, especially in the context of

increased competition with more trade liberalization. Specifically, reforms in land tenure policy and drought management are identified as key issues in agricultural development especially with respect to the poor. Finally, although reform policies will produce positive results in the long run, social safety nets and protection policies that directly target the poor are necessary in the short run as they are likely to be made worse off in the short run.

2.2 Agricultural and Water Productivity

“We need a Blue Revolution in agriculture that focuses on increasing productivity per unit of water – more crop per drop”.

Kofi Annan
Secretary-General of the United Nations

Report to the Millennium Conference, October 2000

In the MNA region, where water is extremely scarce, producers face a severe water constraint despite the fact that agriculture consumes on average 87 percent of the region's entire water withdrawal. Furthermore, due to low capital investment and insufficient agricultural support services such as research on high yielding varieties and extension work, agricultural productivity in MNA is low. Table 7 shows that MNA's cereal yield is lower than all other developing country region except for Sub-Saharan Africa. Yield rates have been increasing in the last decade but the average cereal yield in the region (1973 kg/ha) is below the developing world average of 2312 kg/hectare. For the most important cereal in the region, wheat, trends in area harvested and yields shown in Figures 3 and 4 confirm that productivity gains are highly unlikely, with the possible exception of Egypt. Reasons for low cereal yields in general include the aridity of the climate and high variability of precipitation, risk-aversion to adoption of new cultivars and fertilizer application, and continuing resource degradation. In addition, the region generally possesses very low stocks of human capital in comparison with other countries at similar income levels: for example, while the region has a similar land-to-labor ratio as Latin America, labor productivity was significantly higher in Latin America (Oram et al, 1998; Karshenas, 1999).

Table 7. Cereal Yield (kg per hectare)

	East Asia/pacific	Latin America/Caribbean	South Asia	Sub-Saharan Africa	MNA
1990	2314.30	1997.57	1828.83	991.55	1220.00
1995	2584.16	2462.80	1966.69	1072.38	1625.00
2000	2942.07	2462.93	2354.23	1130.35	1349.87

Source: World Bank, 2002b

Figure 4: Wheat Area Harvested (ha.):1991-2005: Select MNA Countries

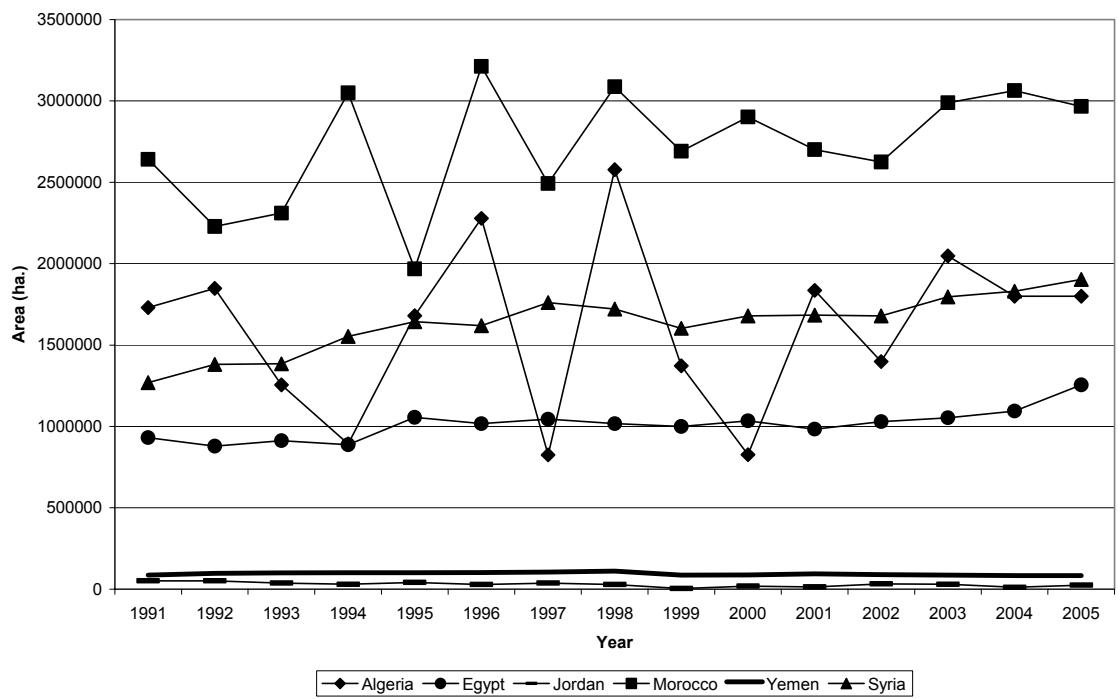
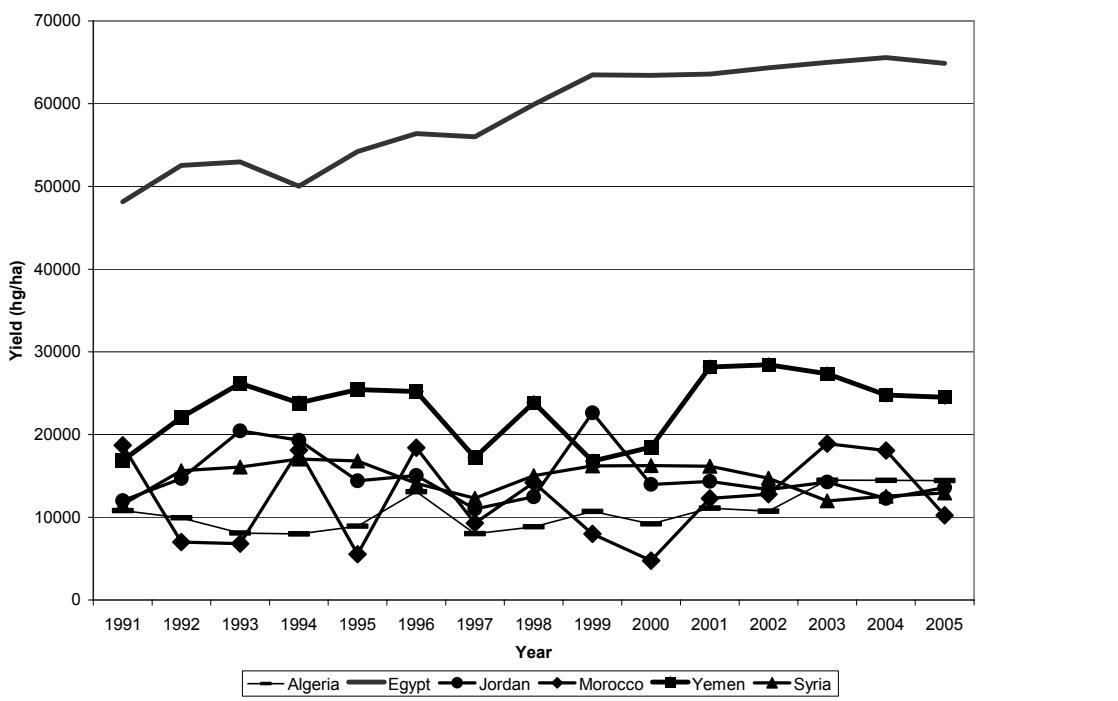


Figure 5. Wheat Yields: 1991-2005: Select MNA Countries



Water Productivity

Water productivity (WP) has been defined as “the crop yield (P) per cubic meter of water consumption including ‘green’ water (effective rainfall) for rainfed areas and both ‘green’ and ‘blue’ water (diverted water from water systems) for irrigated areas”. Water consumption (WC) includes beneficial (BWC) and nonbeneficial (NBWC) consumption as in the equation below (Rosegrant et al, 2002):

$$WP \text{ (kg/m}^3\text{)} = P \text{ (kg)} / WC \text{ (m}^3\text{)} \quad (1)$$

where $WC = BWC + NBWC$.

A modification to the above would be:

$$WP \text{ (kg/m}^3\text{)} = NPV \text{ (\$)} / WC \text{ (m}^3\text{)} \quad (1a)$$

where NPV is the value of production per unit of water consumed and this would take into account conversion to higher-value crops.

Water productivity can be increased by either increasing crop yield (that is, increasing the numerator in equation (1) through other inputs while maintaining constant water use level, or reducing water consumption and maintaining the yield level (that is, decreasing denominator), or both. The most viable option to cope with water scarcity in the MNA region is to substantially increase agricultural water productivity. In this region, it is now water, not land, that is the limiting factor for improving agricultural production. MNA countries are prone to water logging and salinization in many areas and these areas are prime targets for increasing water productivity because they have low yields and high water consumption (ET). Maximizing water productivity, not yield per unit of land (the second option above) is, therefore, a better strategy for on-farm water management under such conditions. Changing the focus from land to water requires not only new technologies and policies for water management but also a change in land use and cropping systems. This varies from region to region and field to field, depending on factors such as crop and climate patterns, irrigation technology and field water management, land and infrastructure, and inputs including labor, fertilizer, and machinery.

In many areas, potential productivity is not realized and this is in large part due to poor irrigation management. The Imperial Valley in California which is situated in a desert environment like MNA shows spread in wheat yields from 2 t/ha to 6 t/ha with a corresponding spread in productivity of water from 0.5 kg/(m³ of ET) to 1.3 kg/(m³ of ET). Strategic research on field crops, such as cereals and legumes, shows that substantial and sustainable improvements in water productivity are attainable only through integrated farm resources management. Key areas of focus in MNA would be:

- (i) improving the productivity of water on existing irrigated lands**, either through water-saving practices or by increasing the productivity of water consumed by the agricultural process keeping in mind the new ET water management paradigm. Conventional water

management guidelines designed to maximize yield per unit area need to be revised for achieving maximum water productivity instead.

(ii) *improving the productivity of water in primarily rainfed areas through supplemental irrigation.* There are a number of water harvesting, groundwater use, storage, and water application practices being developed that have the potential to raise the productivity of water in these areas. Many of these practices are particularly suitable for use by smallholder farmers and can go a long way in the fight against poverty. ((Molden, et al 2001). On-farm water-use efficiency techniques, coupled with improved irrigation management options, better crop selection and appropriate cultural practices, improved genetic make-up, and timely socioeconomic interventions, can help to achieve this objective.

Water Use Efficiencies: Improving water use efficiencies is an area that deserves increased attention. All over the world (including in MNA) officials and technicians alike have mistakenly considered that improving irrigation efficiency results in major water savings. An average irrigation efficiency of 30 percent does not imply that 70 percent of "losses" is water that can be saved through efficiency improvements and made available for other uses. The fact is most of the water remains in the hydrological system, where it is available for reuse or recycling. As water is recycled through the hydrological system, the efficiency of use increases. Thus while every part of the system may be at low levels of water use efficiency, the system as a whole can be at high levels of efficiency, the so-called "water efficiency paradox" (Seckler et al. 2003). Irrigation efficiency improvements usually result in reductions in return flows and increases in consumption (negative "real" water savings). Under the new paradigm, the objective is to maximize the value of agricultural production per cubic meter of ET, i.e. water productivity is measured in terms of the value of output per unit of ET for agricultural and non-agricultural uses. "Real" water savings results from reductions in net water use or water consumption (ET), and also from reductions of return flows that end up in contaminated or saline water bodies (including the ocean) that are unusable. Actions that reduce water consumption (ET) resulting in "real" water savings and therefore increase water productivity can include irrigation technology improvements, but also should include agronomic/cultivation and management measures.

ET Management: Raising water productivity in response to the new ET water management paradigm demands more than just changes in irrigation technology. It requires integrated attention to improving technical, agronomic and management measures. Technical measures can include modern surface irrigation systems, local micro-irrigation systems and even green houses. Agronomic measures can include mulching, zero tillage, improvements to seeds, fertilization and soils, Integrated Pest Management (IPM), and cropping pattern adjustments. Examples of management measures are changes in water delivery (volumes and schedules) and pricing. By implementing an integrated package of on-farm measures, water productivity can be greatly increased when compared to improvements in technical measures alone. Water User Associations (WUAs) greatly facilitate the implementation of integrated measures.

Use of new technologies: Remote sensing techniques have developed to the point where very accurate actual ET estimates can be made from thermal band satellite information. Affordable images such as from the National Oceanic and Atmospheric Administration (NOAA) help provide a quick scan of parameters necessary for water-productivity assessment. Because they often use public domain satellite images this approach offers MNA and other developing countries a low-cost way to improve water management. Satellite data can be used to determine crop occurrence, actual ET by crops, crop yield, and indirectly, net groundwater use. This is enormously beneficial especially where data are not present or difficult to access. Coarse images such as NOAA are suitable for getting an overall impression at scheme level. Smaller areas or specific crop types would require finer-resolution images, such as those available from Landsat and the Advanced Spaceborne thermal Emission and Reflection Radiometer (Bastiannsen, W. et al, 2003) These remote sensing tools complement traditional methods for tracking water availability and measuring the productivity of water used in agriculture. They help determine: where there is available water in a river basin at various times of the year; where water is reaching – or not reaching – crops in an irrigation system; and the interaction between the water and the plant, in natural vegetation and agricultural areas. The International Water Management Institute (IWMI) has identified five applications that will benefit planners in developing countries: *Where is a country's water being used? Where are the opportunities for harnessing more water for productive use? Where is the crop receiving enough (or too much) water? Is the water reaching the crop in all areas? Will a season's harvest provide enough food to meet demands?*

These are becoming increasingly important questions for policy makers and planners, as competition for water increases among different uses and users of water. Remote sensing technology makes it possible to answer these questions quickly and inexpensively. Satellite maps can be analyzed to measure the total available water flowing out of a country's watersheds into the sea or into groundwater aquifers, in millions of cubic meters per month. Combined with rainfall data, this analysis shows where water enters a system and how it leaves-through evapotranspiration and runoff. Using this information, planners can identify areas where there is potential for development of new water resources; where water can be reallocated from one use-or one basin-to another; and identify potential areas of water scarcity before water shortages occur. Satellite images clearly show planners where crops are receiving the right amount of water for maximum yield, where they receive too much water, or not enough-on a daily, weekly or monthly basis. Based on this information, water can be reallocated within the system to prevent water stress or waterlogging, before yields are affected. Satellite images showing various stages of the growing season can be interpreted to predict crop yield. This helps agricultural planners to deliver the right resources at the right time for optimal food production. Policy makers can also use this information to identify potential 'food gaps' before they occur. This information gives countries an accurate view of what kind of harvest they can expect in a given year. It is a powerful new tool for poverty and food security planning. By using these techniques to systematically map a country's water availability and plant growth, planners can evaluate factors such as land use change or degradation, to measure whether or not environmental damage is being done¹⁰. The Bank

¹⁰ www.iwmi.org/Low-cost, high-tech tools for development; accessed May 4, 2006

is currently using these technologies to improve basin water management in the Hai Basin and the Tarim basins in China. Because there are vast tracts of irrigated land in MNA with low water productivity, particularly in areas with poor drainage, water logging and salinization, there is tremendous potential for increasing agriculture production and not increasing water consumption using this new paradigm and the new remote sensing technologies.

Groundwater Management

An aquifer that is almost always full, is almost as badly managed as one that is almost always empty.

David Burdon
(hydrogeologist: Ireland, 20th century)

Table 8: Sources of Irrigation Water in Select MNA Countries

Country Name	Total Area (1,000 ha)	Share (%)			Data year
		Surface	Groundwater	Non-conventional	
Egypt	3,246	95.4	4.5	0.1	1993
Iran	7,264	49.9	50.1	0.0	1993
Iraq	3,525	93.8	6.2	0.0	1990
Jordan	64	39.7	54.6	5.7	1991
Lebanon	88	54.3	45.7	0.0	1993
Morocco	1,093	68.3	31.1	0.6	1989
Oman	61	0.0	100.0	0.0	1993
Saudi Arabia	1,608	3.2	95.6	1.2	1992
Syria	1,013	39.8	60.2	0.0	1993
Tunisia	355	37.3	60.7	2.0	1991
UAE	67	0.0	100.0	0.0	1993
Yemen	482	20.0	80.0	0.0	1994

Source: FAO Aquastat

Note: The irrigated areas of Yemen include spate irrigation areas.

Groundwater is of major importance to rural development in many countries of the world, and this is particularly true for the MNA region as shown in Table 9 above. Countries like the UAE, Saudi Arabia and Oman are almost exclusively reliant on groundwater resources while other countries such as Syria, Tunisia, Yemen and Jordan derive more than 50 percent of their water resources from groundwater. In many of these countries groundwater acts as a strategic buffer and serves both domestic and agricultural irrigation needs. Yet groundwater today suffers overexploitation and pollution and this can endanger the livelihoods of those depending on these resources. Key (indirect) economic instruments that influence groundwater management include energy prices, trade

protectionism, and subsidized agricultural credit. Energy prices in many MNA countries, especially for agricultural users are highly subsidized. Increases in diesel and electricity prices are perceived as being politically problematic. Trade restrictions on imports of “strategic” crops such as cereals result in artificially high domestic support prices which prove to be a strong incentive to increase production, often at the expense of scarce groundwater resources. Syria is a classic case in point. Groundwater use, particularly for irrigation, has increased dramatically over recent decades. A substantial portion of the increase in groundwater use is related to increases in irrigation for cotton, wheat, the dominant winter crop, cotton, citrus, and sugar beet. Area increases have been substantial over the last decade in sugarbeet (32 percent), cotton (75 percent), irrigated wheat (40 percent), and citrus (40 percent). Much of the expansion in wheat has been driven by increasing support prices for wheat while water costs have remained low¹¹. The ICARDA research indicates that farmers from public irrigation schemes obtain water at extremely subsidized rates and groundwater costs do not reflect their real value because the energy required for pumping is also subsidized. As a result, most farmers tend to over-irrigate with water use reported at three times the optimal rate as defined by research trials. Irrigation water continues to be subsidized while support prices for wheat have been higher than world prices for several years. Government policies have thus contributed in no small measure to the tremendous increase in groundwater irrigation with its attendant negative consequences. The overall thrust towards irrigation expansion coupled with attractive output prices and subsidized agricultural credit for wells, have proved to be strong incentives for farmers to take up groundwater irrigation in many areas. In areas where groundwater tables are declining due to overpumping, energy costs have increased substantially with negative equity and environmental implications since the larger farmers continue to pump the over-exploited aquifer while the smaller farmers are forced to leave the market. (see also Box 3 for the case of Saudi Arabia where exploitation of nonrenewable groundwater resources for growing wheat illustrates the relationship between market protectionism and unsustainable groundwater abstraction, and the increasing importance of environmental implications.

¹¹ ICARDA, 1993.

Box 3. Unsustainable groundwater use in Saudi Arabia: A Cautionary Tale

In the 1980s, Saudi Arabia embarked upon a program of rapid irrigation development using groundwater in an attempt to achieve food self-sufficiency especially wheat. With price supports, input subsidies and other incentives, prices, agricultural growth exceeded 70 percent in the 1985-91 period; wheat production peaked at 4.1 million tons in 1992. Saudi Arabia became an important wheat exporter, and exports reached 2.5 million tons (MT) in the 1992/93 crop year. However the associated costs were high in economic and environmental terms and the government has slowly cut back on its program of subsidies and incentives with the result that wheat production has declined significantly. Despite government efforts, almost a third of the scarce arable land still remains devoted to wheat cultivation. The cost of producing wheat in Saudi Arabia have been estimated at about four to six times the cost of wheat in the world market even without counting the scarcity price of water or subsidy costs. Wheat exports mainly reflect the export of the scarce water resource used in producing irrigated wheat. The situation here may be that it might not be possible to reallocate large volumes of groundwater from rural to urban uses because the fossil aquifers in many areas are in danger of being totally depleted due to lack of effective government interventions, and in some cases , have become too saline for potable use.

Sources: Abderrahman, 2002; World Bank, 2002c.

Countries like Jordan are showing the way towards rationalizing aquifer exploitation through a primarily regulatory offensive. In 1995, the government embarked on a comprehensive water sector review and a subsequent action plan to confront the water resources crisis. It was decided that both demand and supply side management measures were urgently needed and in respect of groundwater the following have begun to be implemented (Foster et al 2000, RWI Proceedings 2002, Shatanawi, 2002):

- ✓ *Agricultural sector investments have been targeted on improving irrigation water-use efficiency, and effecting real water savings through drip technology, and not on extension of irrigated lands;*
- ✓ *Detailed groundwater basin studies have been undertaken as a precursor to defining management criteria and establishing 'basin protection units';*
- ✓ *By 2000, the number of wells registered was 2449 of which 1830 were used for irrigation. Around 1100 abstraction permits have been issued*
- ✓ *Much more severe constraints were imposed in relation to issuing of permits for new wells and the replacement or modification of existing ones*
- ✓ *By 2002, meters had been installed in about 95 percent of operating wells*
- ✓ *There has been a public campaign of denouncement of illegal water operators.*
- ✓ *In 2002, the cabinet of Ministers approved a new pricing policy on irrigation water—even on amounts already granted in existing licenses—with a block tariff system, where charges increase in relation to the amounts of water extracted. The new pricing system will go into effect in three years. Details of the block*

tariff are: abstractions from one single well of less than 150 thousand cubic meters remain free of charge; abstractions of 150 to 200 thousand cubic meters will be charged at US\$ 0.036 per cubic meter; and abstractions over 200 thousand cubic meters will be charged at US\$ 0.09 per cubic meter. The introduction of this new pricing policy of irrigation water is expected to reduce greatly the amount of pumping water used for irrigation.

2.3 Agricultural Trade

While it is a long way for MNA countries to reach high levels of food security, there is indication that agricultural trade liberalization could have an important role to play to achieve this important objective sought for in the region. Both the domestically implemented structural reforms currently conducted in the field of agriculture and the WTO negotiations under way for almost three years aim at substantial improvements in the environment in which farmers and consumers of agricultural and food products operate by reducing the trade-distorting mechanisms currently in place. The outcome of domestic reforms, free trade agreements with the EU and other partners, and the WTO negotiations will effectively form the boundaries within which agricultural and trade policies for MNA countries and their major trading partners can develop for the next few decades. This is why countries of the region are expected to take a much more active part in the multilateral negotiations.

It is crucial at this juncture to know what the major issues are and the position of MNA countries and their key trade partners, in order to generate information to be used in the formation of alliances or the design of national strategies to deal with the changes needed as a result of the bilateral and multilateral negotiation outcomes related to agriculture. Some of the major features of the agricultural production and trade in the region and the directions taken in terms of policy reforms are reviewed below before addressing in more details concerns about food security in the region.

Constraints and opportunities in MNA agriculture trade

As evidenced by some of the trends in the region, most MNA countries are currently opening their agricultural markets at three different yet related levels: unilateral liberalization, regional integration and multilateral trade liberalization. On the unilateral front, the agricultural sectors have been liberalized by eliminating or reducing input subsidies and guaranteed prices for several commodities though prices for a number of ‘strategic’ commodities are still under state control. At a more macroeconomic level, exchange rate policy and trade regimes are also being liberalized. At the regional level, provisions for further trade liberalization extended to agricultural products have been included in regional trading arrangements such as the EU-Mediterranean partnership, the Arab Free Trade Agreement or the Arab Maghreb Union. These two levels of liberalization attempts are related to a great extent to developments on the multilateral front and in particular to the commitments to liberalize agriculture trade under the WTO Agreements and most importantly the Agreement on Agriculture. This agreement is of relevance not only to WTO members from the region but also to countries currently

engaged in accession procedures or others planning to submit an application in the near future. In order to capture the particular implications of these liberalization attempts and future commitments, and analyze specific issues of interest to the region, common features of the agricultural sector in MNA and key challenges and opportunities for agriculture trade are highlighted next.

Agriculture contribution to GDP fluctuates around 15 percent¹² but has a substantially higher share in employment¹³. There is a limited area of arable land, scarce water resources and important threats on the natural resource base (desertification, soil degradation etc). There are mostly dry-area agricultural systems dominated by cereal farming with small ruminant livestock but with an irrigated farming system (large-scale and small-scale) found throughout the region and contributing substantially to agricultural production (e.g. cash crops such as cotton and sugar beet, vegetables, other high-value crops, fruit trees and fodder).

Over the last two decades, net agricultural imports have ranged between US\$ 16-20 billion. MNA is the largest grain importing region in the world with widening food gaps as a result of high population growth and modest technology adoption rates in cereals. There is a high dependency on food imports with one third of the cereal needs imported though considerable variation exists between countries. Agricultural exports are dominated by fruits and vegetables with a number of countries exporting live animals, cotton, pulses and even cereals. The main trading partner is the EU (destination of most of the fruits and vegetables and origin of an important share of MNA's imports of cereals, oilseeds, dairy and meat. Exports entering the EU face various levels of tariffs depending on the product, season, country of origin and could also be subjected to duty-free seasonal tariff quotas. Overall, current WTO members from MNA had little difficulty meeting their Uruguay Round Agreement on Agriculture commitments. Domestic support is being progressively re-allocated from Amber Box¹⁴ type of measures to less trade distorting measures (Blue or Green Boxes). In comparison to other developing countries, average levels of bound and applied tariffs are substantially higher in some cases as shown in Table 9. Different patterns in tariff dispersion and bindings are also noticeable hinting at probably different interests and concerns in the multilateral negotiations on agriculture.

¹² Ranging from 25 percent in Syria to less than 2-4 percent in Jordan and Libya.

¹³ Rural employment is between 30-60 percent with the exception of Lebanon and Libya having less than 20 percent.

¹⁴ The Amber Box contains all domestic support measures considered to distort production and trade. These include measures to support prices, or subsidies directly related to production quantities. The Blue Box contains support measures that would also require farmers to limit production. In the Green box are included those subsidies that do not distort trade, or at most cause minimal distortion. They have to be government-funded and must not involve price support.

Table 9. Applied Rates and Bound Tariffs on Agricultural Products

	MFN Applied Tariffs			Final bound	
	Reference Year	Mean Rate	Median	Mean	Median
Egypt	1995	20.8	20	62	20
Jordan	2001	20.7	10	22.8	20
Morocco	1997	48.9	35	65.2	34
Tunisia	1998	35.4	43	109.9	100
Developing Countries	1996-1999	18.1			
	Weighted Average				
Industrialized Countries	1996-1999	6.4			
	Weighted Average				
Global				62	40

Sources: AMAD, (2000)

Empirical evidence drawn from various simulation analyses reviewed in Chaherli (2002) shows positive economy wide effects as a result of multilateral trade liberalization following reduced protection in agricultural products and better market access prospects for MNA exports; however, the aggregate welfare gains hide some potentially substantial losses in the agricultural sector and rural economy; these negative effects could be mitigated if liberalization in agriculture is conducted progressively and reciprocal terms are obtained from the EU. Studies allowing for enough disaggregation by commodity and farming system have also pointed out at the importance of specific liberalization terms in the determination of the direction and magnitude of the gains and losses in the agriculture sector; overall, producers of vegetables and fruits gain while farmers involved in field crop and livestock activities lose; farming systems with current extensive poverty patterns tend to lose the most as a result.

More specifically, the issue of reciprocity in market access will largely determine the extent to which MNA countries could potentially maximize the net benefits of the liberalization process as unilateral liberalization was found to yield significant losses for the agricultural sector in the above review. On a second front, because of the high protection levels in field crops and livestock, those sectors are bound to face the most difficult challenges. To minimize the potential losses, farmers involved in these activities have to think about alternative products with better market prospects as a result of improved market access to principally the markets of the Northern Mediterranean Countries in particular and the EU in general. To some extent, it is those farmers in the mixed farming systems (highland, rainfed and dryland) as well as those in pastoral systems that might incur the highest risks from the liberalization process. The increased prospects in terms of off-farm income arising in non-agricultural sectors could be a key factor in mitigating the potential negative effects of trade liberalization in agriculture. See Box 4 for a recent World Bank study on the impact of trade liberalization in Tunisia.

Trade and food security

With respect to their preparation for a future round of multilateral negotiations, MNA countries have overwhelmingly raised some concerns with respect the need to take into consideration food security in the reform of food, agricultural trade and overall trade policies. Food security could be affected by agricultural trade liberalization as a result of two sets of policy reforms, those emanating from the governments of the MNA region and those resulting from changes in how the Quad countries¹⁵ and in particular the EU could be conducting their agricultural and trade policies in the future. As food self-sufficiency has been an elusive target in the region, governments have adjusted their economic plans to include instead food security as a key objective to reach. This has undoubtedly given the agriculture sector a new role in the development efforts undertaken by MNA countries. Recognizing the difficulties and lack of relevance of reaching food self-sufficiency, policy reforms are now being conducted to use food security and the protection of natural resources as the overriding goal in agricultural policy-making. However, despite the efforts made to qualitatively change policy design to accommodate the new objectives, the concept of food security still carries several misunderstandings as to its essence and the strategies to be put in place to reach it. While food security - whereby every person has economic and physical access to sufficient food to lead to a healthy and productive life- is determined by food access and availability (Haddad, 1997), the case has mistakenly been made that access and availability should be related to domestically produced supplies. In this regard, the debate is still ongoing as to whether better agricultural trade prospects could improve indeed food security in MNA by increasing the potential for economic and physical access to food.

The discussion on the links between trade liberalization and food security in MNA should start by modifying the link mistakenly made between food insecurity at the national level and the status of Net Food Importing Developing Country (NFIDC) that most of the MNA countries have. Diaz-Bonilla, Thomas and Robinson (2000) make the case that a better approach is needed to identify countries according to their food security profiles in order to make the negotiations in WTO on food security adapted to the context of those countries in need of such a differential treatment when it comes to agricultural trade liberalization. In their cluster analysis classification based on five measures of food security¹⁶, most of the MNA countries are under a food neutral¹⁷ rather than a food insecure group. The authors provide also evidence suggesting that being a net food importer appears to be a weak indicator of food vulnerability. There are a few exceptions in this analysis and because of its high trade stress, Egypt is a case that would require a more careful treatment when it comes to the implications of trade liberalization in terms of food security.

¹⁵ Canada, U.S, Japan, and the 15-member European Union (EU).

¹⁶ The measures used as proxies for food availability, access and utilization at the national level are: measures are: food production per capita, the ratio of total exports to food imports, calories per capita, protein per capita and the share of non-agricultural population.

¹⁷ The group includes Egypt, Morocco, Tunisia, Jordan, Kuwait, Algeria, Lebanon, Saudi Arabia, Iran, Libya and Syria. The mean values of the food security variables are: 1976 calories per capita, 82.7 grams of proteins per capita, 135 US\$ of food production per capita, a share of food imports to total exports averaging 11percent, and 82percent as the share of non-agricultural population.

Cereal and livestock based products account for a large portion of imports to MNA countries. Those commodity groups happen to be highly protected in the EU. As a consequence of agricultural trade liberalization, world prices of those goods are expected to go up more than the prices of commodities exported by MNA such as vegetables, fruits, and oils and fat. Results from simulation reported by Diao, Roe and Somwaru (2001) show that a move towards complete liberalization in agricultural markets would result in at least a rise of 10 percent in cereal prices and 25 percent in livestock prices. If those trends materialize, this could imply a significant rise in the food bill for MNA countries. What would be then the implications of higher dependency rates on international markets for food security in the region if the current climate of political uncertainty and instability remains? The answer would very much depend on the ability of MNA countries to finance their food imports out of total export revenues and their capacity to quantitatively and qualitatively improve their agricultural exports. It is obvious in this context that the liberalization of agricultural markets in the industrialized countries has implications not only in terms of rising food bills but also of erosion of trade preferences. Given its current resources endowments and growth prospects, it is in the best interest for MNA countries to push towards proceeding with the liberalization of markets in developed countries. At the same time, they could ask for some sort of compensation for higher prices and lost preferences in the form of non-trade distorting financial schemes or even cash grants for those countries facing significant losses as a result.

Box 4. Tunisia: Impacts of agricultural liberalization: results from a study

The purpose of the study was to assist Tunisia outline a strategy for medium-term adjustment of the agricultural sector, defining the means and measures to create more favorable conditions enabling Tunisian agriculture to become more competitive. In the case of Tunisia, the principal results of liberalization indicate that:

- ✓ the economy as a whole will gain from agricultural liberalization as investments and labor are diverted to activities that are more productive and efficient in their use, increasing overall GDP growth rates by as much as 1.7 percent per annum, which is equivalent to over a 50 percent increase in total GDP within the time perspective of 1998 – 2025 for which these results were obtained;
- ✓ resources (labor and capital) would be transferred out of the agricultural sector which is currently protected;
- ✓ overall, the agricultural sector will thus be affected adversely as agricultural and agro-industrial production declines, but also positively as production becomes more competitive.
- ✓ the cereals sector would be affected disproportionately more adversely; competitive cereal production, mostly on medium and large size farms, is concentrated in the high potential humid/sub humid zones; and fruit and vegetable production under irrigated conditions remains flexible and competitive; and tree crops appear to be the solution for the arid/semi-arid zones where they remain competitive.

Labor and Employment Impacts of Agricultural Liberalization: Among the diverse effects that agricultural liberalization will have, the impact that is of the greatest concern to policymakers is that on rural labor and employment. Trade liberalization will lead to displacement of labor out of agriculture, but the adaptive process is complex. There will not be automatic and massive out-migration to cities as the adjustment of the different farm households will be a process as a function of the opportunities and the constraints within the agricultural sector as well as the cost of migration. Hence a segment of the labor market will adapt within the agricultural sector, mainly by shifting from the production of subsistence crops to the production of higher value cash crops. A segment of the labor force will shift into the non-agricultural sectors (manufacturing, services, construction, etc.). Expected effects would be as follows: (i) there would be pressure on wages which can cause economic and social problems; and (ii) some of the established and unskilled or semi-skilled non-agricultural labor will be pushed out by the incoming displaced agricultural labor and would migrate or join the pool of unemployed. A segment of the farm labor will not be able to adapt to the impact of liberalization. These would be mainly the older members of the labor force. In the final analysis, the basic policy issue that merits consideration is that, if the objective is to achieve efficiency in agriculture (as well as the economy), the agricultural sector and rural areas can not be expected to maintain their traditional role as a buffer for labor and unemployment absorption in a disproportionate manner as compared to other sectors. Hence, labor transfers from agriculture should be accepted *a priori* so that adequate measures are taken to manage the transitional issues. In the case of the long term effects of total liberalization in Tunisian agriculture while the EU maintains the protection of European agriculture, the costs of transition is estimated at around \$US1 billion, with a third going to transitional costs associated with labor and capital and two thirds going to upgrading technologies, training programs, modernizing market regulations and standards, and improving overall efficiency. For this scenario, the present value of the benefits of liberalization is estimated to be around TD 10 billion at a discount rate of 5 percent. In other words, the benefits of liberalization would be more than adequate to finance the costs of transition, provided the benefits can be captured to serve the end of financing the transition. Clearly, the critical question is the challenging task of managing of the transition politically, socially and economically.

Source: Republic of Tunisia: Agricultural Competitiveness: A Policy Note on Transition Issues in the Process of Agricultural Liberalization, Report Number 22545, July 25, 2001, The World Bank.

III. Policy Implications for the Future – The Road to Reform

While MNA countries tend to be facing similar challenges related to structural and chronic problems (drought, modest agricultural growth rates, limited rural infrastructure and natural resource base, bias in favor of urban areas, land tenure and property rights), the range of opportunities depends not only on how the future of their agriculture is perceived but also on other economic development issues such as diversification within and outside the agriculture sector, reliance on an oil-based economy, macroeconomic performance and the role of the state in the economy. Policies encouraging misuse of rangeland areas and the extension of crop production into fragile rainfed soils and inefficient water pricing have been guided by a desire to improve food security, but they will destroy the natural resource base over the long run. A skewed system of land distribution and insecure property rights are also important impediments to long-term sustainable agricultural growth.

The future challenge lies in how to increase water use efficiency and productivity. Clearly, countries in the MNA region will need to move towards reform if they are to meet water and food needs for their burgeoning, rapidly urbanizing populations. Some countries such as Egypt, Tunisia, and Jordan have already moved towards implementing far-reaching changes in the agricultural and water sectors. The most viable option to cope with water scarcity is to substantially increase agricultural water productivity. In this region, it is now water, not land, which is the limiting factor for improving agricultural production. Maximizing water productivity, not yield per unit of land, is, therefore, a better strategy for on-farm water management under such conditions. Changing the focus from land to water requires not only new technologies and policies for water management but also a change in land use and cropping systems. Research results from ICARDA and others, as well as harvest from farmers fields, showed substantial increases in crop yield in response to the application of relatively small amounts of supplemental irrigation. This increase covers areas having low as well as high annual rainfall. The impact of supplemental irrigation is not only on yield, but also more importantly on water productivity. Both the productivity of irrigation water and that of rainwater are improved when both are used conjunctively. Average rainwater productivity in MNA is about 0.35 kg/m³. However, it may be increased to as high as 1.0 kg/m³ with improved management and favorable rainfall distribution. Strategic research on field crops, such as cereals and legumes, shows that substantial and sustainable improvements in water productivity are attainable only through integrated farm resources management. Water use-efficient on-farm techniques, coupled with improved irrigation management options, better crop selection and appropriate cultural practices, improved genetic make-up, and timely socioeconomic interventions, can help to achieve this objective. Conventional water management guidelines designed to maximize yield per unit area need to be revised for achieving maximum water productivity instead. Raising water productivity in response to the new ET water management paradigm demands more than just changes in irrigation technology. It requires integrated attention to improving technical, agronomic and management measures. The new remote sensing technologies offer a powerful and relatively inexpensive means of supporting cutting edge water resources planning, monitoring and management tools complement traditional methods for tracking water

availability and measuring the productivity of water used in agriculture in river basins and irrigated areas. They help determine: where there is available water in a river basin at various times of the year; where water is reaching – or not reaching – crops in an irrigation system; and the interaction between the water and the plant, in natural vegetation and agricultural areas. National policies need to be adjusted to encourage more efficient water use in agriculture and a new land use and cropping system that maximizes water productivity (Oweis and Hachum, 2003).

Reforms in land tenure policy and drought management will be critical especially with respect to the rural poor. Because of a higher degree of vulnerability to drought in the MNA region, countries have been forced to review their approach to drought management. Most of the drought-coping strategies implemented by governments of the region have focused on mitigation measures and emergency plans. With greater population growth rates and higher demand on declining water resources, governments need to address the issue as a structural phenomenon, inextricably linked with the socio-economic production system and within the context of scarce, declining and degraded water resources. The careful management of water resources will become increasingly important in mitigating the impact of drought on the economies of the region in the future. National Mitigation Strategies and Drought Relief Planning Systems will need to be developed more systematically than at present in accordance with each country's agro-ecological specificities.

But technical innovations and water sector reforms need to be accompanied by agricultural sector reforms. Empirical evidence indicates that water sector reforms in the absence of concomitant reforms in the agricultural sector will be unproductive and unsustainable. A clear generalization from the existing research is that relying mainly on domestic grain reserves to cover year-to-year fluctuations is an expensive solution when trade is a real possibility. The “virtual water hypothesis” which asserts that the presence of water embedded in agricultural crops or “virtual water” is the prime reason why water scarce regions such as MNA have been able to avoid water shortages. In essence, countries that are scarce in water choose to import agricultural crops in order to save on water required for production. The hypothesis makes the case for a strong link between water scarce regions and import of water intensive crops such as wheat.

Subsidies and incentives played a critical role in leading agricultural development and growth in the region but they have also resulted in environmentally unsustainable and allocatively inefficient uses of a scarce resource. They have led to market distortions, excessive use of groundwater for irrigation and a high fiscal burden. These incentives have served the agriculture sector well in adopting improved technologies and introducing new crops. Agriculture might have needed subsidies and protection to attain some economies of scale in production and marketing. However, agriculture has become a more mature sector that needs to improve efficiency further, become more competitive in a more open trade environment, and less reliant on subsidies. Reduction of some subsidies, and possibly phasing out other subsidies, such as for irrigation, would reduce the rate of depletion of aquifers to a more sustainable level, encourage efficiency gains in the sector by promoting a shift towards higher value added crops By phasing out price

support and input subsidies and shifting to direct payments and other less distorting ways of providing support, policy reforms have in many cases generated a double benefit: they have resulted in a less inefficient allocation of resources (including water) and even enhanced certain positive environmental externalities. The issue however, is not abandoning farmers but rather helping them in a more efficient way when it comes to public expenditures and implementing reforms in a phased manner. Empirical evidence worldwide indicates that the results of agricultural liberalization and water sector reforms will imply net benefits to the economy. It should also be noted that this process of reform will entail trade-off among options, which are political decisions. The critical issue is channeling the interest of the policymakers towards developing options on the duration, sequencing and financing of the transition.

Greater integration with world markets will become essential; likewise investments in human capital, natural resource management, research and technological development. The food and feed import dependence of the MNA countries is likely to increase and the MNA countries need to develop stable means for financing the imports through service industries, manufacturing and advantageous non-agricultural and agricultural exports. The reliance on water-saving cereal imports makes economic and environmental sense for the MNA region, but it must be supported by faster nonagricultural growth. There are huge dilemmas for labor-abundant countries. When labor supply is also growing dramatically, labor-absorption in rural and agricultural sectors also will demand that water cannot simply be re-allocated away and public and private investment will continue to drive investments into these sectors, even if it is more rational otherwise to shift labor (and water) out of agriculture (if they can). Pricing water correctly is therefore the tip of the problem; labor questions too have to be answered with growth in rural areas and agriculture and non-farm activities, assuming that the switch to non-agriculture will take time. Trade and pricing reforms will reduce help reduce allocative inefficiencies and enable the switch incentives to alternative crops. The other part is transforming the increasingly costly investment to some other better uses in the same sector. The rising public and private investments in water resources management with older staple water-intensive technologies needs to be transformed as ICARDA and IWMI research indicates to a much more knowledge-intensive system--developing alternative research and development and skill-intensive responses in research and extension capabilities, farming skills, and building the infrastructure to develop alternative crops, water management, marketing and supply enhancements, and into huge untapped areas of agro-processing of such alternative crops and practices. That would facilitate an eventual switch to much more efficient agriculture and ensure its future growth and vitality, which will also begin to address the labor absorption issues. This of course also depends critically on market access for these crops, as has been highlighted in this paper.

In this context, the impact of further trade liberalization will be largely shaped by elements inherent to agriculture's own dynamics in terms of policy reforms and developments within the sector. However, due consideration should also be given to how the region could position itself to capture most of the benefits arising from the multilateral negotiations process. It is therefore crucial to design a regional strategy that could eventually be tailored according the needs of each country and its own specificities.

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