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PERSPECTIVES ON THE MIDDLE EAST WATER CRISIS: ANALYSING WATER SCARCITY PROBLEMS IN JORDAN AND ISRAEL

Richard Sexton

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Richard Sexton

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PERSPECTIVES ON THE MIDDLE EAST WATER CRISIS: ANALYSING WATER SCARCITY PROBLEMS IN JORDAN AND ISRAEL

Richard Sexton

1 INTRODUCTION

Water management problems, when related to water scarcity, present major difficulties for analysis, particularly when they involve fully developed water systems reaching the limits of their resource capacity. It is a truism to say that water cannot be studied without reference to the socio-economic context in which water is manipulated. However, while there is agreement that water problems can no longer be viewed simply in technical terms and that water management is now a legitimate sphere of investigation for the social sciences, there is no single, unequivocal and clearly definable approach which firmly anchors water management in socio-economic reality.

It is clear then, that how we define our approach is going to determine how we understand water problems and how we ultimately come to resolve them. It is instructive that in the case of the Middle East, while the physical dimensions of Middle East water crisis are generally known, this knowledge has not helped to identify the solutions needed for resolving the problem. In many cases, the fixation with water as a physical resource has resulted in what can be described as 'supply-side' bias. There is a fear that if analysis moves too far away from water, i.e. becomes too concerned with socio-economic issues, the supposed subject - raw water - will be lost altogether! As a result, the problem of Middle East water scarcity is most often described from the supply-side alone.

Most explanations for the Middle East water crisis hold stubbornly to the view that the situation exists because demand is somehow inelastic and that water shortage is likely to have a dislocating effect on economic development. All too often the main premise of interdisciplinary analysis when looking at Middle East water problems is that the resort to demand-cutting (allocative efficiency improving) measures represents a 'failure' of water policy. However, it is my contention that Middle East water problems faced now, are 'qualitatively' different from those faced in the past. The focus on policy failure, or rather, the focus on the inability of water institutions to augment water supplies may only hinder the

eventual transition to what could be described as a 'post-shortage' Middle East water economy.

An alternative approach might be to view water development as a 'demand constituting' process, since demand patterns are as much politically, economically and historically constituted as the evolution of water supply systems. To understand why particular forms of water use have evolved, it is also necessary to examine shifts in economic structure, state formation and the impact of exogenous forces (e.g. world markets in the case of agriculture). In addition, ideological and institutional factors, social structure and politics play a major role in mediating the relationship between water users and the state. How much autonomy the water sector has for making shifts in water allocation is tied to these types of relationships. Of course, such analysis does not imply that we ignore the supply-side altogether, rather the reverse is true; the two need to be integrated.

Acute water scarcity provides an opportunity for rethinking basic approaches to water problems. Water, like all economic resources, is scarce. However, it is rare to find water, in the context of the Middle East, being talked about as if it were an economic resource. There are whole sets of questions concerning water use efficiency which have not been touched upon in the current debate on Middle East water. For example, to what degree are current water use patterns locked into uses where the marginal value of the water is low? What impact has developing economic structure had on water demand? Should we assume that there is a basic incompatibility between demand-decreasing and demand-shifting measures and economic growth? Could modifications in economic structure and trade allow for reduced water demand without being economically restrictive? These questions still await answers.

This paper explores two of the most frequently cited examples of water 'crisis' in the Middle East: Jordan and Israel. Not only are they of interest for the severity of their water problems, they also have the most 'developed' and most 'planned' water economies in the region. It is in the context of managed resource development that crisis has evolved. This paper hopes to challenge some of the prevailing assumptions about the Middle East water crisis, and in doing so present an alternative framework for looking at the Middle East water scarcity problem.

2 ANALYSING WATER SCARCITY PROBLEMS

2.1 The 'failure' of Water Policy

Criticism has been levelled at water policy-making in the Middle East for having failed to generate solutions for water shortage problems, particularly given the impending disaster facing Middle East countries when water requirements can no longer be met. In each case, scholarly approaches have tended to reinforce the notion that poor water policy is responsible for water scarcity. This is a view which has taken its most articulate expression in the work of Naff and Matson[1], and Starr and Stoll[2].

These authors see water shortage as disastrous to the region; likely to cause constraints on development, discord between states, and general upheaval. The 'gravity' of the problem is seen to provide the focus for analysis, and with it the weaknesses of resource planning mechanisms. Their response is to see the solution in comprehensive water management programmes and improved technical information. Lack of technical information and lack of communication across planning and decision-making structures is regarded as the 'fault' of the existing water policy and administration. Ideally, coordination around technical considerations provides for 'optimality' in resource allocation. In these accounts, both the problems of water shortage and the means for achieving a solution all lie in water policy, which has both to reform its deficiencies and find new solutions.

This view is actually not that helpful. Policies, however well thought out, can never be entirely separated from the reality in which it operates, and there will always be external constraints on effective policy, even with better information and coordination. Although information and coordination are desirable, neither requirement explains why water policy and planning has been deficient. We need to escape from static concepts like 'failure', and from stereotypes of 'better' policy, and especially the belief in instant substitutability of 'poor' policies by 'better' policies, if we are to obtain more appropriate management.

Supply-side approaches assume that water institutions are (or can become) stable administrations performing an apolitical 'guardianship' role in relation to water resources. However, water institutions are not autonomous entities, existing outside and apart from society and state. Neither do they possess independent rationality, enabling them to formulate 'correct policy'.

2.2 The "Success" of Water Policy

An alternative approach might be to view water policy as having been tremendously successful. Indeed, over the past thirty years or so, water development in the Middle East has largely achieved what it set out to do, namely, to bring about a substantial increase in water supply to agriculture. In the case of Jordan and Israel, expanding water supply was considered the key to a thriving modern agriculture. Water institutions were successful in meeting this challenge. These developments - the integration of water and agricultural planning - could not have taken place unaided, nor were they the result of poor and uncoordinated policy. Contrary to the notion of the 'failure' of water policy; policy more than proved its efficiency. It is only now in retrospect, when faced with a problem of water shortage, that we begin to talk about water policy as if policy has failed. What has been at stake is not so much policy, as policy objectives. If water institutions were established in order to expand water supply, they cannot be blamed for the resulting water shortage problem. If objectives prove contradictory then objectives will not be met.

Although Naff and Matson, and Starr and Stoll propose a number of high-technology solutions for augmenting water supply - desalination, the application of solar energy to water technology, improved irrigation technology, etc - it is clear that no amount of 'fine tuning' and sophistication in water technology can alter what is basically a problem of finite water reserves. Rather, there appears to be a mismatch between problem identification, policy prescription and cure. Policy will undoubtedly fail if the objectives involved are unobtainable. What is required are new policy objectives, not just 'better' policy.

2.3 Scarcity as a Policy Concept

In fact neither seeing water policy as 'success' or 'failure' brings us any closer to recommending changes for water policy when full utilisation is reached. In this context, an important contribution to the discussion lies with the work of Galnoor, 1980. Galnoor has argued that water shortage is not simply the product of 'poor' planning, it instead represents a distinct phase in the development of a water system. The subtlety of the distinction between different types of scarcity determines the planning orientation to be taken. Galnoor argues that: "... there is a difference between scarcity as a supply schedule and 'scarcity' as a physical constraint. This difference dictates the 'orientation' of water policy-making ... scarcity in the first sense means that water is available somewhere in the system ... In the second sense, 'scarcity' is determined

by the fixed quantity (of water) that technology can supply within the boundaries of a certain system."[3]

The problem identified is in the nature of the transition in policy - "where previous water policy cannot be continued, a new one cannot be readily formulated."[4] The problem for water policy is that changes in the nature of scarcity pose major cognitive problems for formulating new strategies. The bias of water organisations, and their integration with wider state institutions, blocks the definition of new objectives, new powers and new administrative structures.

When the second condition of physical scarcity is in force, Galnoor recognises that augmentation from unconventional sources, such as desalination, may not necessarily be the answer if each "marginal addition of water supply to the system implies a disproportionately higher cost over benefit, which the society cannot afford."[5] In other words, costs involved in continuing to expand water supply which may be as great, if not greater, than the losses incurred if water was not developed. This means that water management can no longer be simply concerned with supplying water.

If, at inception, water institutions were established to 'engineer' access to water supply, this role has been made redundant. Yet water policy, now geared to a somewhat different objective of maintaining sustainable water systems, places a premium on a new function - allocation, - which also remains their responsibility. Vardi (1980), notes that in the case of Israel: "The peculiarity of the situation is emphasised by the fact that water resource management efforts usually concentrate on finding optimal ways for further development of potentially still available resources rather than on the unpleasant task of optimising curtailments in allocation to one sector in order to satisfy the needs of another one that has been assigned a higher priority."[6]

Indeed, there are a whole series of major questions concerning the functioning and competance of water institutions operating under conditions of acute water shortage. Firstly, can institutions, technically equipped to expand water supply, simply re-package themselves in order to perform this new allocative function? Secondly, optimality on the supply-side is not the same thing as optimality on the demand side, and how can the water sector pursue this in the economic sphere in addition to the technical sphere? A subsidiary question would be - how does the water sector extend its influence to these sectors?

Ultimately, the water issues of the Middle East in the 1990s are not so much concerned with desalination, improved irrigation technology, and the application of solar energy to water technologies, as they are with creating new structures for proportioning water between different end-uses. If we accept Galnoor's schema, then it is clear that scarcity existed as a supply issue when economic priorities were fixed, agriculture was a major priority and the water sector functioned to provide agriculture with water supply. The shift to scarcity as a fixed physical constraint requires a major re-ordering of priorities. It also means re-examining the imputed relationship between expanding water supply and economic well-being. This identification involves the telescoping of a number of complex relationships together, and lies at the heart of the Middle East water dilemma.

3 SQUARING AGRICULTURE WITH WATER SHORTAGE

Our discussion so far has focused on the relationship between the water sector and water shortage, showing how orthodox supply-side approaches, with their focus on water supply and related policy, fail to locate demands within the framework of a broader water economy. The assumption that there are 'only demands to be met' ignores the fact that how demand is demanded, is as important as how supply is supplied. It is evident that if water is to be supplied efficiently then water must also be demanded efficiently.

It is striking that in the accounts of Naff and Matson, and Starr and Stoll, there is no discussion of water allocation, water markets, or of the methods used by different water institutions for allocating water between different end-uses. While it is acknowledged that water is used inefficiently no indication is given to the type and magnitude of the inefficiencies involved. Positions concerning efficiency are most often sublimated to quite different arguments which advocate the introduction of water conserving, water productivity-enhancing technologies. Yet it is clear that achieving technical efficiency is not the same thing as achieving economic efficiency. End-uses can be technically efficient but not economically efficient if their marginal productivity is low. Similarly, if water is not constantly being transferred to end-uses where its marginal value productivity is high, then its use is economically inefficient. What is not discussed is whether it is desirable and economically efficient to allocate water and capital (through advanced technologies) to extremely marginal types of end-use. Should we be talking about new 'hard' technologies for water conservation and efficiency improvement, or augmenting water supply, before having looked at how water is currently being used?

However, if we locate agricultural water use within the broader water economy, we can begin to see a different interpretation of the water problem. Here agriculture is the marginal sector (the sector where its marginal productivity is lowest). Analysis of agrarian strategies demonstrate that it is not water shortage which is the problem; rather it has been the building-in of structural overcapacity in irrigation schemes. Water supplying projects have tended to generate large irrigation infrastructures with a built-in propensity to supply more water than actually required, at least in terms of the volume of production generated by irrigation projects for agricultural markets. Agricultural surpluses of crops grown under irrigation have been the norm rather than the exception. Rather than water shortage, there has been a contrary tendency, involving diminishing marginal productivity in water use in agriculture.

Agrarian strategy has thus played a major role in deciding the parameters of the water shortage problem. Getting the agrarian dimension right is therefore critical to how the water problem is ultimately resolved. Yet, it is the agrarian dimension that has been accorded the lowest priority in the current debate about Middle East water scarcity. In the two sections which follow, we shall explore in greater depth the relationship between water shortage and agriculture with Jordan and Israel as our case studies.

4 WATER SHORTAGE AND AGRICULTURE IN JORDAN

4.1 The Water Problem

Studies since the mid-1970s have predicted water shortage in Jordan. A study conducted by consultants Howard Humphreys, completed in 1977, predicted major shortfalls in water supplies as shown in the assessment in Table 1.

Naff (1985) puts the deficit more conservatively, at between 170 million cubic metres (MCM) to 200 MCM by the year 2000.[7] Estimates by the Future Group (1985) suggest that water requirements stemming from population growth can only be met by sizeable transfers of water from agriculture to domestic and industrial consumption. Even with projected gains in irrigation technical efficiency, there would still be the need for a reduction in irrigated areas in Jordan around the year 2000. 'Worst' case scenarios, assuming high population growth rates, indicate the need for a reduction in Jordan's irrigated area from 440,000 dunums to 290,000 dunums between the year 2000 and 2010 (1 dunum = 0.1 hectare).[8] Even the 'best case' scenario, involving a relatively modest population growth rate assessment assumes the need for a reduction to 330,000 dunums in

the area irrigated and a net transfer of 26% of water used in agriculture to domestic and industrial consumption by the year 2010.[9]

Table 1[10] : WATER SUPPLY AND DEMAND, 1975-2002 (million cubic metres per year (MCM))

	1977	1987	2002
Supply			
Potential Resource	760	760	760
Recoverable Resource	610	610	610
Reuse	5	35	75
Total Useable Supply	615	645	685
Demand			
Domestic and Industrial	80	146	289
Irrigation	384	639	694
Total Demand	464	785	983
Surplus/(Deficit)	151	(140)	(298)

It is evident that the water problem can be expressed tangibly in terms of cuts in water supply to agriculture. Although individual figures may be in dispute, the overall picture is clear. Water shortage does imply curtailment in agricultural water use and the net transfer of resources to relatively higher value uses. What is not clear, is how we should set about weighting these large transfers of water from agriculture. Would they, as the conventional wisdom suggests, pose a serious threat to the viability of Jordan's economy, or would they, by unlocking water from marginal uses, lead to feasible economic restructuring and the development of a sustainable water economy?

4.2 Agrarian Priorities and Water Development

It is often assumed, given Jordan's special emphasis on irrigation expansion, that irrigation has been accorded this priority because Jordan is in some sense, an agrarian based society. Certainly, Jordan's largest

irrigation scheme, the Jordan Valley Project, has been described as the 'linchpin and litmus test of Jordan's ability to develop a viable economy and a coherent social and economic structure'.[11] Priorities in development in Jordan have been attached to expanding water supply to agriculture and these priorities have largely determined the functions and responsibilities adopted by the water sector. For almost forty years, the water sector has been geared almost exclusively to meeting the needs of the agricultural sector.

The original planning effort for the Jordan Valley Project commenced in 1953 when it was proposed that 'idle and unproductive' land in the Jordan Valley should be turned 'into the richest kind of production.'[12] By 1966 over 117,000 dunums had been brought under irrigation. The size of the irrigated area had increased again to 130,445 dunums by 1975, accounting for 40% of Jordan's total irrigated area.[13] With the completion of the project in 1988-89, the area under irrigation was planned to total 360,000 dunums, an almost threefold increase in the size of the project area since 1975.[14] Today, the Jordan Valley Project accounts for the greater part of all water used in irrigation.

Given the focus on irrigation expansion, and the implicit underlying notion of correlation between expanding water demand schedules and economic growth, that has characterised much development assistance, the development of such a large irrigation project has passed largely without question. Yet, despite major investments in irrigation, agriculture's contribution to the economy has declined steadily. In 1984, it amounted to no more than 8.2% of Jordan's GDP.[15] Nor is agriculture particularly important from a welfare point of view. In Jordan's case it does not sustain large economically marginal, populations. In 1984, it was responsible for the employment of only 7.8% of Jordan's labour force. Ironically, because of labour shortages, 57.6% of those employed in agriculture were foreign workers.[16] Other forms of justification might be found in the form of food self-sufficiency and food security. However, the vast bulk of Jordan's food deficit is comprised of cereals, meat and dairy products, not the fruit and vegetable crops most commonly grown under irrigation in the Jordan Valley.

In exploring how water demand schedules have been constructed in agriculture we face major problems in explaining why it was decided that such large areas of the Jordan Valley should be placed under irrigation. A finer-grained analysis reveals, in retrospect, that many of the decisions made about the size of irrigated areas and the amount of water required, rested on quite arbitrary assumptions about market expansion and the type of cropping patterns that farmers were likely to adopt. Indeed, the

ambitious nature of irrigation expansion and the more modest outcomes in terms of what has taken place in the way of agricultural market expansion has resulted in structural overcapacity in the irrigation network. It is this problem which we shall begin to explore now.

4.3 Formulating Water Plans, 1953-1967

The Jordan Valley irrigation project, as initially proposed by the US Economic and Technical Assistance Program (Point IV) and the United Nations Relief and Works Agency (UNRWA) in 1953, was designed to utilise the whole of the Jordan Valley's water reserve to irrigate an area of 461,000 dunums on both sides of the Ghor.[17] The later Baker Harza Report, 1955, commissioned by the Jordanian Government, proposed an even larger project utilising 760 MCM to irrigate 504,200 dunums on both sides of the Ghor to be implemented over a ten year period.[18] In both cases, project planners adopted a 'supply-side' orientation. In other words, their objective was to expand water supply according to what was 'technically' possible given the total physical resource available. Project proposals did not pay too much attention to defining the production possibilities of the areas to be irrigated in relation to markets.

Market assessment and reconnaissance played a minimal role in the early stages of project formulation. The 1954 UNRWA Report noted that marketing considerations were 'taken into account in a rough way when computing cropping patterns'. Neither did the study devote much attention to the future expansion of production in areas devoted to dry farming or to trends in irrigated areas outside the main project areas. However, in 1956 the question of market potential began to be taken seriously by UNRWA, when they realised that fruit and vegetables were promoted as key crops in almost every agricultural development scheme throughout the Middle East.[19] The IBRD (1957) Country Report noted that the: "... full development of minor irrigation sources in the valley will nearly meet the local demand for perishable fruit and vegetable crops. The subsequent development of major irrigation in the valley would therefore yield little increased revenue from such crops."[20]

On the basis of the IBRD assessment, it was plausible that a smaller project might have met all domestic food requirements, of the crops grown under irrigation, whilst utilising less than 10% (75 MCM) of the water supply and less than 20% (100,000 dunums) of the area proposed by Baker-Harza. Significantly, this was what was achieved. The failure to reach agreement over the Maqarin dam (which aimed to provide the bulk of the water required for the larger project), led to a smaller project being

implemented. In 1966, 117,000 dunums were under irrigation, an area close to the size suggested by the IBRD.

It is, therefore, of some significance that during the early 1960s, even with the smaller size of the area being developed under irrigation, output kept pace with demand. In trying to summarise Jordan's early experience, it might be concluded that the failure to construct the Maqarin dam saved agriculture from an incipient over-production crisis, although at the time, it was the stalemate over the Maqarin dam which seemed to jeopardise the integrity of Jordan's agricultural planning.

4.4 Market Expansion, Irrigation Expansion, 1973-1990

Irrigation expansion resumed in 1973, following a particularly turbulent period in Jordan's history. A new ambitious irrigation plan emerged to achieve what the earlier pre-war 1967 plans had failed to do, namely, the 'full' development of the irrigable area of the east Jordan Valley (Israel having occupied the western side). For our purposes, it is important to recognise that irrigation expansion was premised on production for export. Market assessment largely assumed a rapid expansion of regional markets, but perhaps as important, Jordan's ability to retain and expand its market share.

There was an opposing view that the expected expansion in market demand could have been met from yield increases alone. Indeed if surpluses were to be avoided, a reduction rather than an expansion of Jordan's total irrigated area (particularly vegetables) was required.[21] However, the optimistic assessment of market demand and supply prevailed, and significant expansions took place in the size of the irrigated area, both inside and outside project areas.

In 1985, a total area of 523,854 dunums was under irrigation, with 276,753 dunums, or 52% of the area accounted for by the Jordan Valley project.[22] This represented a 35.8% expansion in irrigated area over its 1975 extent. Of course, the rapid expansion of irrigation did not itself preclude a reduction in the area under vegetables. However, actual shifts in cropping patterns did lead to a concentration on vegetable production, a trend which has since continued. Despite government research and more than twenty-two different recommendations on cropping patterns for the Jordan Valley between 1953 and 1982, cropping went largely unregulated.[23] In the period 1976 to 1986, vegetable production in the Jordan Valley never averaged less than 69% of the total cropped area, rising to 78% in 1984.[24]

Accordingly, it is possible for agricultural surpluses to exist alongside water shortage. Throughout the 1980s, market prices have been depressed, production surpassing the absorptive capacity of both local and export markets. In the 1984-85 agricultural season prices reached an extremely low level, forcing the introduction of a compulsory cropping pattern. Although attempts have been made to reduce the area under some of the main vegetable crops by as much as 40%, a combination of yield increases and creative crop planning by farmers has sustained production at its pre-cropping pattern levels. Perhaps more worrying for Jordan have been USAID (1988) projections for future surpluses. Even with 'generous' domestic demand assumptions, USAID predict that future surpluses of Jordan's main irrigable vegetables (the quantity available for export) will rise from 36% of total production in 1987, to 55% by 1992.[25] Yet trends in export markets do not support this projection. Data for the period 1979-87 indicates that although vegetable exports peaked in 1984 (after a steady climb over the preceeding 5 years), it is a trend which has since petered out. In 1986, for example, vegetable exports by volume had fallen to 58% of their 1984 high.[26]

Although it is too early to say that Jordan's agricultural exports are in decline, there is no corresponding trend to suggest that if export markets were to expand, Jordan would be party to this market expansion. The Gulf states, which were major importers of Jordan's horticultural crops during the 1970s and early 1980s (due to labour force expansion and the oil boom) have moved to internationalise their markets. Turkey, with its lower labour costs, has proved highly successful in taking-out a large slice of Jordan's market share in Gulf countries. With the construction of Turkey's South East Anatolia irrigation project, which aims to irrigate an area the size of East Germany, Jordan's market is likely to tighten still further.

4.5 Development and Water Supply

Thus much of Jordan's development policy towards agriculture and water has proved inconsistent and sometimes contradictory. Irrigation has been justified from a national development standpoint in terms of the need to feed expanding populations, increase incomes and to provide a suitable agrarian base for a growing economy. However, a deeper examination suggests a certain illogicality behind these positions.

First, from the point of view of the agricultural sector, continually expanding productive capacity through irrigation development is not beneficial unless markets are expanding at the same time. Irrigation expansion - which creates agricultural surpluses and inadvertantly lowers

farm prices (below levels possible even with productivity increases) - is wasteful, not only for the national economy, but also for the agricultural sector and the water sector. Furthermore, agricultural surpluses have thrown both agricultural policy and water policy into disarray. While in principle, the water sector should be cutting back on agricultural water supply, the agricultural sector is moving in the opposite direction; trying to find ways of keeping expensively developed irrigated land in production.

In addressing vegetable over-production, quite desperate measures are now being envisaged to tackle the problem. Rather than taking land out of production, consideration is being given to providing incentives to encourage farmers to grow irrigated wheat. Although justifications may be found, for example, improved crop rotation and a reduction in import dependency, economically, the overall impact will be negative. Even if the domestic price of wheat and yield levels were to increase two-fold, the average revenue productivity of land, water and labour used to grow the wheat would rank only 16th in a list of 20 alternative crops being grown in the Jordan Valley. The international price for wheat would have to rise from US$ 128.6 per ton to US$ 257 per ton before Jordan derives any comparative advantage from growing cereals under irrigation.[27] From the water resource angle, the shift is in the wrong direction, crops with low marginal value productivity are being expanded whereas water supply constraints suggest that these crops should be contracting.

Second, we must also recognise that from the point of view of economic structure, Jordan is not an agricultural country. Although the 'supply-side' approach would have us believe that water has been crucial for Jordan's development; macro-economic policies adopted have all tended to contradict this assessment. The aim of using irrigation expansion to enlarge Jordan's agricultural productive capacity by encouraging agricultural exports, has been severely frustrated by fiscal policy. The value of the Jordanian dinar has been kept high (pegged to Special Drawing Rights, the International Monetary Fund's global unit of account), thus eroding Jordan's competitive edge in agricultural exports. Debt service and economic growth have been financed largely by foreign exchange earnings - aid receipts and workers remittances - not by agricultural trade.

If there are any doubts as to the marginality of agriculture in Jordan's overall economy, it is worth just looking at a few indicators. In 1984, Jordan's total commodity export earnings were JD 234.1 million.[28] Export earnings from fruits and vegetables accounted for just 8.5%, or JD 19.7 million of total export earnings.[29] In contrast, remittance earnings in the same year amounted to JD 415 million.[30] A policy which gave preference

to agricultural export over remittance earnings would clearly be absurd given that the value of all agricultural output in 1984 amounted to no more than JD 97 million.[31] The assumption that Jordan's agriculture and economy is somehow dependent on water supply and irrigation is evidently at odds with the government's own assessment. A more realistic interpretation is that both agriculture and the broader economy are reliant on the ebb and flow of remittance earnings, and how Jordan ultimately sets out to define its relationship at a broader economic level to the Gulf.

5 WATER SHORTAGE AND AGRICULTURE IN ISRAEL

5.1 The Water Problem

Studies have predicted water shortage in Israel since the mid-1970s. In 1983, estimates suggested that by the year 2000 Israel faces a gross imbalance between supply and demand of 730 MCM per annum (49% of the country's average annual replenishment), although 370 MCM per annum could be made up from re-use options and spill reductions. In 1986, total water use amounted to 1,987 MCM.[32]

In addition, current levels of utilisation have further compounded problems with water quality. In order to stabilise reserves facing degradation, there is a requirement to allocate growing quantities of water for recharge and water quality control purposes. Optimum strategies for 'effective long term protection' against salinity would require a 50% reduction in abstraction from Israel's main coastal plain aquifer. A nitrification alleviating strategy would involve a 50% reduction in fertiliser use and continuous artificial recharge of 25 MCM per annum over a period of ten years.[33] Partial solutions, which would aim to utilise the natural buffering characteristics of aquifers by relocating the centres of recharge and abstraction to more advantageous locations, have so far proved prohibitively expensive.

While the technical dimension of Israel's water shortage problem has been understood and planned for by the water sector, technical knowledge has not been translated into realisable policy. In 1975, planning forecasts by the Water Commission projected a curtailment of the water allocation to the agricultural sector of 35% by 1985.[34] The 1977 estimate by *Tahal* water corporation assumed a reduction of 20% by the year 2,000.[35] Although the estimates vary, there has been a consistent and unavoidable requirement for major reductions in agricultural water use.

5.2 Agrarian Priorities and Water Development

Like Jordan, irrigation expansion in Israel assumed a quite special importance in the early stages of the country's development. Agricultural development plans reflected an underlying continuity from the pre-state period when it was envisaged that the economy of a Jewish state in Palestine would be agrarian based. Although economic and social circumstances changed radically with the formation of the new state, objectives and priorities went largely unchanged.[36] As a consequence, agriculture was the beneficiary of 45%, or more, of the state's Development Budget between 1948 and 1962.[37] Between 1955 and 1961, 77% of gross capital formation in agriculture, water and land reclamation was accounted for by capital sources provided by the state.[38] Rapid expansion in irrigation and water was therefore an inevitable consequence of development priorities defined through the state.

In 1948, only 300,000 dunums were under irrigation, representing 18% of the total cultivated area. From 1948 to 1965, the cultivated area grew by 253% while the area under irrigation grew by 516%. During the 1950-65 period, two-thirds of the increase in cultivated area was being accounted for by increases in the irrigated area. In 1986, the irrigated area was 2,193,000 dunums, or 50% of Israel's total cultivated area.[39]

Between 1948 and 1965, water supply to irrigation increased from 230 MCM to 1,329 MCM (from 15% to 88% of the country's total renewable water stock). Full utilisation was reached in the early 1970s.[40]
By the 1980s water shortage had begun to bite, with agriculture receiving a diminishing share. In 1986, the sector consumed 881 MCM, its share of total water use having fallen to 61%.[41]

Despite the major investments which agriculture received, the model agrarian economy never materialised. Agriculture developed, but not at a pace which kept pace with growth in the economy as a whole. Even during the period of its peak expansion, agriculture was never able to command more than 13.3% of Israel's net domestic product or employ more than 16% of the total labour force.[42] Indeed, during the 1970s and 1980s as the economy continued to deepen, agriculture's position declined relative to the rest of the economy. In 1984, agriculture accounted for 4% of net domestic product and 5.5% of the labour force. It is also estimated that one in three of the labour force are superfluous, with the sector requiring no more than 3% of the total labour force.[43]

Yet, this does not imply that Israel's agriculture has not been successful. In terms of its ability to produce, it has been entirely successful. The

domestic market reached saturation in the early 1950s. Shifts were made to export production in the early 1960s. Plans in 1985 assumed that 42% of Israel's total agricultural production would be exported providing 60% of the value added in agriculture.[44] In the same year, two-thirds of Israel's farmers were making a living from export production.[45] Though the quantities exported were considerable, they accounted for just 7.7% of Israel's total exports.[46]

Again, when trying to assess the impact of water scarcity and the curtailment of water supply to agriculture, it is important to take a broader view encompassing the economy as a whole. Similarly, it is important to be clear about the purpose, and the type of externalities involved in keeping large areas irrigated on a permanent basis. In this respect the experience of Israel has been remarkably similar to that of Jordan.

5.3 Building in Structural Overcapacity

One feature that has underlain all attempts to expand irrigation in the Middle East is the belief that it is desirable to irrigate as large an area as possible. Israel is no exception; throughout the 1940s and 1950s, there were major debates about Palestine's water resource potential and how much water could be allocated to the Jewish state from water reserves lying partially within its border. Much of this discussion was motivated by the very dubious assumption that by simply expanding irrigation, it was possible to absorb increasingly large numbers of people into irrigation projects. As a result, when irrigation projects were planned they were planned big.

In the case of Israel, irrigation development proceeded on the basis of a rather optimistic assessment of the area's total water resource potential. Water shortage emerged initially as a product of successive overestimations of water availability. It was assumed that Israel had an average annual replenishment rate of 2,700 MCM per annum, and the irrigation network was designed in relation to this figure. In the period 1948 to 1961, estimates were revised downwards to the figure for average annual replenishment of 1,500 MCM. The water system and irrigation network being constructed had overcapacity, 180% greater than the total water resource available.[47]

Significantly, the new findings concerning Israel's water potential did not preclude the possibility of agricultural surpluses. In the period 1948 to 1953, rapid agricultural expansion gave rise to incipient overproduction in vegetables and fodder crops. This development took place within the first four years of the state's establishment. It is estimated that agriculture's

relative prices fell by 23% in the subsequent period, 1954-1961; real incomes had fallen by 10% by 1959, and the total open subsidy received by the sector to close the differential between non-farm and farm income had come to represent 29% of net farm income by 1961.[48]

Both the 1950 Four Year Plan and the 1953 Seven Year Joint Jewish Agency/Ministry of Agriculture Plan had assumed that market constraints would not be a problem. The export sector had remained largely unplanned, since it was assumed that any domestic surpluses could be exported. This proved not to be the case, and the Seven Year Plan was abandoned in 1956. It was not until the early 1960s that attempts were made to reconstitute the sector on the basis of low value staples, citrus, industrial and other export-orientated crops. The shift from vegetables to heavy water-using crops such as cotton and citrus placed an even greater strain on scarce water supplies.

These developments dictated new conditions and constraints. In order to sustain farm incomes without losing productivity, (whilst increasing productivity in water use), the most feasible option was to substitute labour and water with a third production factor - capital, (i.e. improve agriculture's technical efficiency). Throughout the 1970s, the capital intensity of Israeli agriculture increased. One impact was to reduce the quantity of water needed per unit of production. This has allowed for a gradual transfer of water from agriculture to other sectors, but not enough to solve either the water problem or to equalise the marginal output of water in agriculture. A second impact has been a declining capital-output ratio. Improved technical efficiency in water use necessitated a permanent capital allocation for stock renewal. In 1964, depreciation constituted about 53% of the total gross investment in agriculture, by 1970 the ratio had soared to 70%.[49] The debt crisis now afflicting Israel's agriculture suggests that this level of stock renewal cannot be sustained.

Finally, efforts to substitute water with capital have not diminished the two mutually reinforcing pressures working on the water sector; the demand for increased access to water, and access at a lower cost. Water has represented a disguised income subsidy, priced at a nominal value below cost. This has not only increased effective demand for water but has also weakened the relationship between the real cost of water and its marginal product. The Israeli irrigation network, in consequence was designed with structural overcapacity. Not only has there been a propensity to utilise water supply over and above average annual replenishment; its productive capacity has also been responsible for generating price instability and declining profitability.

5.4 Agrarian-Centred Water Institutions

The rapid development of Israel's agriculture could not have taken place without an exemplary performance from the water sector. Although estimates of water potential were greatly exaggerated and problems subsequently emerged in agriculture, these considerations do not detract from the water sector's undoubted achievement. The water sector's ability to meet expanding agricultural water demand arose largely from its institutional structure and the clear identity of interest that existed at policy-making and planning levels between the agricultural sector and the water sector. Such an identity of interest went beyond the bounds of purely formal liaison and coordination.

It is here where Galnoor's distinction between shortage as a supply-schedule and shortage as a physical constraint is important. Water institutions have been successful only in meeting the problem of shortage as a supply-schedule. In the water shortage as a physical constraint phase, water institutions have proved unsuccessful. One explanation lies in the organisational forms adopted. Although water institutions evolved effectively to meet the supply-schedule problem, it is those same organisational structures which now preclude the movement forward to solving the physical shortage problem.

From inception, water planning functions were incorporated within a framework established by the Ministry of Agriculture (MOA). Co-ordination was to be conducted 'in-house.' There was to be no separate Ministry of Natural Resources dictating water resource policy.

This is clearly seen in the provisions of the 1959 Water Law, which made the Water Commissioner responsible to the Minister of Agriculture and a National Water Council. The National Water Council was established to advise the Minister of Agriculture on water affairs,[50] and had at almost every level some form of affiliation with the agricultural sector. The National Water Council had no powers other than to give advice and make recommendations to the Minister of Agriculture. Policy-making and planning was conducted by the public corporation, Tahal 'Water Planning for Israel Ltd." Tahal is controlled by the government which has a 52% stake and the Jewish Agency and the Jewish National fund, each with a 24% stake.[51] The latter two organisations are both concerned with agriculture, the Jewish Agency through settlement activity, the Jewish National Fund through the Israel Land Authority. The Israel Land Authority controls 90% of Israel's Jewish cultivated area.[52] Tahal advises the Minister of Agriculture rather than the Water Commissioner. The final institution in what comprised a polyglot structure of inter-linked

institutions was Mekorot, charged with the construction, maintenance and licensing of water infrastructure. The state was represented through the position held by the Minister of Agriculture on the Board of Directors.

We can observe the linkages between water institutions and the agricultural sector in three crucial areas: (1) the predominance of agrarian representation at all levels of water policy formulation, and the centralisation of judicial and water functions within the MOA; (2) interlocking shareholdings which secure the controlling position of agrarian centred institutions; (3) fragmentation and weak linkages between component elements of the water institutions. It is within this framework that the institutions of policy-making and water planning evolved. Water resource development in Israel was a product of planning frames and organisational forms which arose almost entirely within the agricultural sector.

During the past two decades, as the water shortage problem has grown in magnitude, the water sector has been drawn even closer to the institutional framework of agriculture. Galnoor (1980), has observed that there has been a weakening of the long range planning unit, Tahal: "important functions have been transfered to the planning divison of the MOA and to Tahal's traditional rival - Mekorot."[53] Rather than strengthening the autonomy of the water sector, these developments have merely served to strengthen its internal divisons, and increase its dependency on the MOA.

Throughout the 1980s, the water sector has conducted a policy of ad-hoc crisis management. Competition over budgets with the Ministry of Agriculture, and the growing peripheralisation of small farmers has led to confrontation over quota and pricing issues, and a lack of funds for basic development work. Moreover, the water sector has never succeeded in winning for itself, the basic policy instrument required for grappling with water shortage. In 1990, Gidon Zur, the Vice-Water Commissioner acknowledged that: "... the Water Commission doesn't have the authority to dictate the way in which water is used. It can only reduce [the amount of] water."[54]

In practise, the quotas that the Water Commissioner has imposed have been applied stringently only in drought years or and the immediate period after. There has been no sustained effort to use quotas as a policy instrument for building-up water stocks. Similarly, the water sector has no control over water pricing. This has always been determined by the MOA in consultation with the agrarian-dominated National Water Council. The final decision comes from the agrarian-influenced Knesset Water

Committee (government). In 1990, the Water Commissioner announced drastic cuts in water supply of between 13 and 25%. However, the Water Committee was prepared to continue price subsidies amounting to US$ 200 million, despite the expected shortfall of 400 MCM in water supply.[55]

It is perhaps ironic that the only body actively promoting water conservation is the Treasury through its budget cutting activities. Since 1985, the Treasury has intervened on several occasions to bring down water subsidies, aware that it is a cost that the economy as a whole can no longer afford. Yet, pricing, a formal signalling and pricing mechanism has never been developed as a policy instrument by the water sector.[56] Indeed, it is true that the water sector has had very little control on Israel's overall water economy, following the completion of its initial task of expanding water supply to agriculture.

5.5 Emerging Farm Crisis

Water shortage has developed against a background of growing difficulty in the farm sector. Over the past decade, the sector has seen the withdrawal of subsidy support and increased competition in its main European markets. Problems have been compounded by indebtedness, a product of wreckless borrowing practises during the early 1980s, but also linked to sector's expanding requirement for capital to finance stock renewal. Two of its key export branches, citrus and cotton, have experienced market collapse, and a recovery in the forseeable future is most unlikely. Overall, economic conditions for agriculture are likely to deteriorate still further, underpinned by worsening terms of trade. It is probable that if a major contraction in agriculture is not brought on by water shortage, then the contraction will occur all the same, brought on by the deepening agricultural recession. What is not clear is the response of planners and policy-makers, will they sit Canute-like until the crisis overwhelms them, or will they start to square the water and agriculture equation?

The impact of the recession has been felt most acutely in the Moshav cooperative farming sector, where it is estimated that 83% of Moshav have ceased to be economic and 30% are beyond saving.[57] The Kibbutz, the collectivised farming sector, (where only 26% of labour time is actually spent in agriculture), has been adversely affected by the collapse of cotton. In the private sector, it is the citrus growers that have been hit. The net affect has been the abandonment of agriculture and a fall in land prices. In 1987, 8,000 persons, or one-tenth of the total agricultural labour force, left agriculture. Between 1980 and 1990, land prices fell from US$ 6,000 to US$ 1,000 per dunum.[58]

However, farm recession also stems from a process of structural change. The decline in exports has been structural (as have changes internally within Israel's agriculture). Disappointing export performance is linked to a major re-alignment of market forces within the European market, responsible for two-thirds of Israel's total agricultural export.[59] Projections made by Tovias in 1988 predicted a fall of between 8% and 20% in Israel's total fruit and vegetable export to the EC, as a result of competition from Spain, trade diversion and the dumping of production in non-EC markets.[60] The European position has been to encourage Israel to expand its industrial base for export, since it is here that Israel has most to gain from EC enlargement.

6 THE CONCEPTUAL POVERTY OF THE 'SUPPLY-SIDE' APPROACH

The overview presented here indicates that there is more to the Middle East water problem than just water supply. The current emphasis placed on projecting even greater water deficits and expanding water supply is unlikely to solve the Middle East's water problem. Similarly, high-technology options, which aim to improve technical efficiency, will probably have only a marginal contribution to make. At best, these approaches can only postpone water crisis and, in doing so, generate huge costs and inefficiencies. At worst, they will detract and even negate from the central task of restructuring water in agriculture and redirecting water from end-uses with low net incomes per unit used. Even if we assume that further capital-intensive technical efficiency measures were applicable to countries with intensive agriculture, there is no side-stepping the need to improve the marginal value productivity of water. These are the considerations which should legitimately form the core of any agenda on Middle East water scarcity.

Evident also from our account is the degree to which water issues are intimately intertwined with the emergent agrarian crisis in both Jordan and Israel. Indeed, there appears to be an underlying symmetry in how water shortage and production overcapacity problems have evolved. Given this double-edged character to the water crisis, suitable approaches to looking at water problems in the Middle East have not materialised.

Supply-side approaches tend to assume that water institutions are essentially 'prefigurative' and stable, that they relate solely to the task of managing water systems according to some 'intrinsic' interest defined through the water system. From the demand-side, this approach is brought into question when it is realised that water institutions have evolved in order to perform a 'historically specific' task. It is through their

'specificity' of function, i.e. in opening up water supply, they have gained the appearance of autonomy of action. Meeting water supply targets has given water institutions a highly visible profile. However, a major part of water policy decision-making has been carried out de-facto by the agricultural sector. Historically speaking, water institutions in the Middle East have had little jurisdiction over how water demand has been constituted. But how much room is there for cogent responses to water shortage given the constraints faced by water institutions in both Jordan and Israel?

First, it is important to recognise that economic structures are dynamic and not static. The economies of Jordan and Israel have undergone considerable change in recent years. It might be the case that structural change has created more, rather than less room to maneouvre around water shortage. The fallacy of the supply-side approach is that economies are believed to grow in a linear direction, with all economic sectors growing proportionately to each other. An inelastic demand curve is presented as the inevitable result. Thus we also arrive at the idea that "... internal development ... may be seriously constrained."[61] This notion continually overplays the importance of agriculture in economic development, reinforcing the idea that agriculture has some prior claim to water. Similarly, it overplays the actual weight that agrarian interests have, politically, in maintaining the status quo. There is no 'structural imperative' that ensures agrarian interests remain dominant, rather, the converse may be true. The deep and sustained crisis afflicting agriculture in Jordan and Israel suggests that the political base of such interests is being eroded rather than sustained.

Second, while economies in the Middle East are prone to economic crisis, this does not detract from the essential task of restructuring. It would be erroneous to assume that agricultural expansion, or the maintenance of the status quo in agriculture, represents an adequate response to economic crisis. Economic crisis relates to broader economic and political questions and requires a solution, quite independently of anything that might happen in regard to agriculture and water. Projects which aim to allocate scarce capital resources to expanding water supply and improving water use impinge directly both on water and on the economy as a whole. If capital is to be deployed where water-end use economic efficiency is low, then there is an opportunity cost is involved, involving an inefficient capital allocation and a drag on the rest of the economy. Similarly, if restructuring is to take place in agriculture and water, it is also dependent on a shift towards industrial and non-agricultural growth, a shift which is also logical from the viewpoint of the overall economy.

Third, the exercise of cutting back on the least valuable use of water in agriculture, involves only crops which in most cases are already economically marginal. Net value product may be lost to the sector but the overall productivity of the sector will increase. Such a development will have a knock-on effect to other sectors through backward and forward linkages. In viewing the nature of the restructuring process there is a tendency to believe that absolute declines are involved whereas, in fact, what is being discussed are shifts in resource allocations between different economic sectors.

Finally, the mechanisms and policy instruments for achieving such a transfer of resources are not new. They can be found in a number of other policy-making areas. In the context of the European Community's (EC) Common Agricultural Policy (CAP), the problem of farm surpluses is being tackled through a combination of direct income support and 'set-aside' policy. However, such mechanisms are not normally associated with water policy or water institutions. Supply-side approaches have failed to see that the quite exceptional conditions posed by Middle East water scarcity require something other than conventional water management practises. It is in this quite different context that we begin to locate the changes required of water institutions and water policy under conditions of acute physical resource scarcity. Rather than devising new and increasingly sophisticated water plans, the onus is on the formulation of new policy objectives for 'demand-decreasing' and 'demand-shifting' measures and the establishment of new reformed institutions capable of bringing about its delivery.

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