



IRRIGATION MANAGEMENT NETWORK

**THE POLITICS OF WATER SCARCITY: IRRIGATION AND
WATER SUPPLY IN THE MOUNTAINS OF THE YEMEN
REPUBLIC**

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THE POLITICS OF WATER SCARCITY: IRRIGATION AND WATER SUPPLY IN THE MOUNTAINS OF THE YEMEN REPUBLIC

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1 INTRODUCTION

In environments where water is scarce, competition for resources is a pervasive phenomena. Institutions for the resolution of disputes over water will be a fundamental component of indigenous water management in such areas. However, development interventions which put new pressures on resource allocation can cause serious disruption and conflict. The question facing many governments in the 1990s is how to promote evolution of water management consistent with economic and social change and how to handle the potential upheaval, protest and resistance they fear may come from existing beneficiaries and bureaucracies.

The past thirty years of experimentation in resource management has not shown a great sensitivity and flexibility to changing needs in water institutions and has often been contradictory. There have been attempts to introduce 'ideal' comprehensive centralised water administrations, at the same time as attempts to decentralise management to 'ideal' community administrations with very little actual understanding of the actual complexity of organisations at either level. Both these approaches lead to the separation of 'policies' from 'politics' mentioned by Sexton (1991), where 'politics' is synonymous with the local anarchy that prevents 'rational' development interventions being implemented. Thompson and Warburton (1985) issued a timely reminder that politics is not anarchy, but is the art of the possible in the cultures, economies and environments concerned.

This paper attempts to look at the 'art of the possible' in water allocation activities using the requirement to transfer water for agriculture over to domestic water supply. Through both general debate, and actual field results it provides an analysis of the circumstances that can encourage negotiated settlements for disputes over water, or enable serious conflict can emerge. The discussion uses experiences in disputes and conflict resolution over small water supplies in Al Jabin district, part of the Raymah sub-governorate in the western mountains of the Yemen

Republic¹ during 1985 - 87, within a Unit involved in constructing rural water supplies. Agriculture in these mountains is predominantly rainfed, depending on low rainfall that has recently also become less reliable. Irrigation water is at a premium, and most water sources are already devoted to irrigation with very limited resources for domestic water supply. New domestic water schemes had to be served either from new sources, or by increased volume from rehabilitated irrigation and domestic sources, and was in direct competition with irrigation interests. The area has a high degree of customary water management; water rights are determined primarily in relation to the permanence and variability of water sources, and their proximity to settlements, rather than as surface water or groundwater sources.

It is useful to start with a reminder that opportunism and argument are very human qualities. In many areas disputing is a normal form of social interaction, through which an individual tests his/her position and opportunities in the world (Parnell, 1988). Much disputing is highly ritualized in many societies, and does little actual damage to the society, in fact it may strengthen it. Heavy levels of verbal exchange, and changes in opinion and allegiance may seem like assault or treachery to those unfamiliar with them, but they may not be symbols of conflict to that group, which may in turn be disoriented by lack of opportunities to argue, manoeuvre and test alliances.

Dealing with disputes, even if it seems like an endless form of fire fighting, is an important source of validation, and provides important information on the reality of local water management. It is extraordinary to consider the amount of time spent in technical feasibility in most projects, when so little time is allowed for establishing trust, legitimacy and authenticity. It is high expectations of achievement (low tolerance to transaction costs), and the rapid turnover of personnel (and hence knowledge), that makes disputing a problem for a development programme, rather than a problem to the local society concerned.

Conflict, on the other hand, is a more dangerous situation. The costs to development interventions through lost time, shattered personnel and wasted equipment and construction work can be enormous. To individuals and communities who suffer loss of entitlements, or whose community

¹ Raymah was part of the Yemen Arab Republic (YAR), which united with the Peoples Democratic Republic of Yemen in May 1990 to form the Yemen Republic. For a fuller description of water management in the YAR see Vincent (1991).

organisation is weakened, the impact of conflicts can be devastating. Yet conflict is not always negative; it is also the means by which groups can overcome inappropriate or 'unjust' distribution of resources, and conflict can empower community organisations and individuals, and may improve interaction and respect between local and central organisations. Clearly, the meaning of 'conflict' and 'conflict resolution' needs to be restated, for better understanding of how conflict emerges. Also, what general initiatives in water institutions, and changes in local organisations can promote negotiated and acceptable settlements of disputes. Finally, there is a need to understand the risk strategies involved in conflict, especially when local groups perceive a water project and associated personnel as a source of additional power to win a conflict, which they might otherwise not have provoked.

The term 'conflict' is used in this paper for more serious forms of disruption, although this is not easy to define since 'conflict' is a cultural concept, and takes different forms in different societies. Hunt (1990) notes that "... conflict arises when disagreement becomes a public issue... (p 145)", but 'public' is a difficult word to interpret in customary water management. A slightly different view is to see conflict occurring when disputes cannot be resolved within a community, so that local groups turn to a 'supra-group' to deal with 'supra-community' problems. Much of the impasse in development assistance to water programmes may exist because governments and donors do not know whether to strengthen the 'supra-group', or whether to strengthen the community so that it does not have to turn to 'supra-groups' so often.

This point is very important in institution-building in water-scarce areas, because the causes of conflict are very variable. On the one hand, we have the *depletion* of resources, such as the groundwater over-exploitation described by Shah (1991), where farmers and communities are largely characterised by *helplessness*, because there are no rules to encompass the technology, and the technology itself requires no social interaction to support it. On the other hand, we have *misappropriation* of water as a source of conflict, which require special requests for adjudication, often after *physical violence and destruction*. Here rights are well established, and groups fight to keep them or change them. The potential role of local and central organisations are quite different within these different areas of conflict.

Instead of working to design new control and enforcement procedures at state or community level, it may be better to explore advisory and support roles in the 'supra-group'. Equally, the community may want new forms of the support from the supra-group, rather than be delegated a range of

management functions that cannot be handled fairly. As Shah (1991) points out, we need pragmatism in promoting both community and state management options. Rather than idealistic stereotypes, we need an environment of dialogue to explore options.

A useful framework for understanding sources of controversy in water use is provided by Bromley and Cernea (1989), who identify two sets of problems in rural management:

- (a) unclear institutional arrangements, including property rights and access to water:
- (b) the absence of an authority systems to give meaning to these institutional arrangements.

They clarify property as a right to a benefit stream that is only as secure as the duty of others to respect the conditions that protect the stream, a form of definition very relevant to the Moslem world. They then distinguish between state, private, common property and open access property regimes, noting the tendency for valuable resources to be under some form of private ownership, whereas less useful or inaccessible resources will usually be accessed as common property or open access resources. However, unlike open access resources, common property resources do have clear group rights and group responsibilities attached to them.

Resources, therefore, commonly have different forms of property regimes attached to them in different locations relative to settlement patterns, and we cannot characterise a catchment or aquifer as being under one type of property regime. As the property regime varies, so too will the authority systems called in to deal with disputes. One source of early mistakes in the Raymah work was to look to just one section of the local administration to answer all queries about water management. We also had to learn that, although conflict and uncertainty was emerging in one local property regime, this did not invalidate all local customary management.

Gelles (1988) also points out the importance of avoiding oversimplification and stereotypes of the community, of communal institutions, and of interactions between them. It is important to understand how different local institutions are used by many different social groups and families to deal with water management issues.

For example, in Al Jabin, groundwater can be a privately owned from a spring cistern, be a common property resource where it rose in springs in

less accessible parts of the mountain, where it was nevertheless lying within tribal (village) lands, or an open access resource where it is being exploited through wells. Unclaimed water sources also existed as open access sources in valleys previously too unhealthy or barren for settlement. Different representatives were called upon for advice and support depending on what type of property was under threat.

Much of the recent debate over local resource management has focused firstly on difficulties in defining property regimes, and secondly on the loss of legitimacy of indigenous institutions as central administrations have intruded via 'nation-building' activities, so that authority systems breakdown or become unclear. Although these are important sources of disputes, there are additional causes of disruption.

Conflict is not only associated only with definition or clarification of water rights. Knell and Whiteford (1989) show that much of the conflict over small-scale irrigation in Mexico stems from the separation of land and water rights consequent to land reform, where land was redistributed, but water rights were not. Similar problems can be found in areas where the abolition of bonded labour or slavery have left land rights out of phase with water rights. The result is sharecropping of water, which may exist alongside of a completely different framework of sharecropping of land, and sometimes an antagonistic environment where locals are both patrons and clients. Ironically, however, this degree of interdependence still makes local people prefer to use indigenous resource management institutions, rather than rules and courts imposed from outside. Such courts are unlikely to be able to deal with the complex reality of water use, and may not be prepared to honour the oral evidence which has always been important in indigenous systems.

Similarly, locating tension and conflict purely at the interaction of indigenous and new administrations, misses many important lessons on what kinds of authority systems work in different kinds of resource management problems. Indigenous water institutions are not always the equitable and benevolent entities that many writers seem to believe, nor are new initiatives in central organisation necessarily harmful. Many of the conflicts in rehabilitated Andean water systems have been due to difficulties in reconstituting an authority system to enforce the property rights largely recognised by farmers. In Cabaconde, Peru, it was the limited rotation of certain common rights through wealthier representatives, when they should have had wider circulation, which led farmers to protest through a variety of new local institutions as they developed (Gelles, 1988). Bacdayan (1980) provides a success story of one village community in the Philippines that successfully laid claim to a remote, previously unutilised

stream using opportunities provided within the state system, empowering itself in the process.

How then, can one separate the rhetoric used to promote centralised or decentralised initiatives for water management, to make some practical recommendations for water scarce areas? We draw some conclusions at the end of this paper, after reviewing results from Al Jabin district.

2 TECHNOLOGY AND CHANGE IN WATER USE AND MANAGEMENT IN AL JABIN

Local interests in the mountains of Raymah are complex. In many respects there is still a tribal organisation operating through the extended family, with many communal customary entitlements in control of water and access to land for fuelwood and fodder. This customary law is still largely applied through representatives selected for traditional management roles, although a new civil administration has been developing since the advent of the Yemen Arab Republic in 1970. Alongside this, however, operate extensive private interests in land and water. Landholdings are frequently large, with considerable sharecropping of production from both rainfed and irrigated land.

This tribal system has been under pressure in parts of Raymah for many years. Early influences include the impact of the Ottoman occupation on the western slopes of the mountain, and more recently the civil war, and the effects of out-migration, which has both weakened sharecropping arrangements and the scope of agreements over water use. However, a hallmark of the inhabitants of the area is an intense loyalty to their land, which has led migrants to return and attempt to invest their savings in the area despite its scarce resources. Such attachments to the land perpetuate an involvement with customary rules on resource use, which are tribal in origin, even if allegiances and ties between families and representatives are under stress. This paper, therefore, uses the terms 'tribe' and 'tribal' in discussing the organisation and operation of indigenous resource management.

Very limited rainfall records exist for Al Jabin, with annual rainfall estimated around 650 mm on the western slopes, falling to around 400 mm or less in the east. There is no data on rainfall reliability and drought frequency, but the cropping system is regarded as a stable one, reproducible in most years. The land is extensively terraced on all but the steepest slopes. Sorghum/bean intercropping is the main rainfed land use, but other pulses such as lentils and fenugreek are produced, and grass collected from fallow terraces is important for livestock and draught

animals. Coffee is the main irrigated crop, with some production of vegetables and qat, which increase in importance elsewhere on the mountain, and some irrigated sorghum in wadi areas. Most crops are irrigated through flooding of bunded plots. There has been no experimentation with sprinkler or drip techniques. Drip technology is marketed but is expensive, with polyethylene pipe commanding almost the same price as galvanised iron pipe of the same diameter.

This terracing and cultivation pattern has considerable influence on the nature and volume of the available groundwater. The geology is largely metamorphic and volcanic, with groundwater only available in fissures, faults and bedding planes, and as seepage under the terraces. These groundwater resources support seepage points, springs and a number of perennial streams, although their point of emission and discharge do fluctuate seasonally. In some valleys there is sufficient infill of unconsolidated materials to conduct groundwater, but even in these wadis sub-surface flow appears to follow sub-surface drainage lines, so that its development can be unpredictable.

The settlement pattern is a mixture of villages, hamlets and isolated homesteads. In Al Jabin, the typical size of a village was 200 people, but ranges from 50 to 1500. This diffuse settlement pattern is one of the first challenges to a rural water development programme. Some rainwater is harvested in cisterns for general use, but much of the drinking and irrigation water is mobilised from springs or streams supported by groundwater flow. In the past, hand-dug wells were only an occasional feature of the upper mountain slopes, but are now expanding; usually they tap throughflow under the terraces, or colluvial deposits, in wells typically 10 - 30 m deep. They are more common in wadis, where they range 5 - 30 m in depth.

The most important innovations in water technology in the Yemen are pumps, pipes (rubber and galvanised iron), and the expansion of well construction technology. New construction technology includes both limited horizontal tunnelling and better construction of vertical wells. Although borewells have received the most attention by aid donors, these are not common in mountainous areas like Raymah, for reasons of both access and geology. The proliferation of dug wells in one wadi has already caused drawdowns in the groundwater, affecting all irrigation farmers in the wadi, and the traditional domestic water sources.

Pumps also enable the lifting of water back up a hillside, from cisterns or streams, thus enabling individuals or groups to access water that may previously have been unutilisable. However, they are expensive, and are

unlikely to be left in situ in parts of the mountain some distance from settlements for fear of theft or damage. So far, pump lifting of water for irrigation has only expanded on one perennial stream where small petrol pumps are in use, with farmers resident in the locality.

Piping has probably had the biggest impact on water use on the mountains of Raymah, especially cheap rubber piping, which is used to carry small amounts of water considerable distances. While homesteads near streams draw small amounts of water from the flow, the main expansion has been in the excavation and use of small seepage points for irrigation. The main impact of this activity is to decrease the total volume of seepage down the mountain. Water levels in some wadis have fallen, and it seems that sub-surface drainage lines are changing, leading certain wells in lower wadis to dry up. While road construction, drought and deforestation are also affecting the groundwater resources of the lower mountain slopes, the private expansion of irrigation up-mountain has also had an important impact.

Roads and vehicles have also led to substantial transportation of water, both for domestic water supply and to maintain high value irrigated crops like qat, and considerable private water markets exist. They exist in situ, for example, where expansion of water for irrigation by pumping has led to separation of cultivators, water owners and pump owners, with complex sharecropping arrangements (see Makin, 1977). They also exist spatially through the transport of water, both for irrigation and domestic supply, and it is these transport markets which are strongest in Al Jabin. Some of the early water supply initiatives were brave enough to suggest that villages should continue to supply or pay for their own domestic water through transportation, as it was so much cheaper than building infrastructure. However, the shift in responsibility for water supply to local councils, plus aid preferences to install infrastructure rather than support recurrent costs has kept water transportation outside the list of technical solutions supported by aid donors. Suspicions include fears that transported water would be used preferentially for certain villages, or for irrigation.

Clearly, there is considerable innovation taking place in water use alongside of customary practices. How this is happening, and the extent to which domestic water supplies are experiencing the same success, is the subject of the next two sections.

3 TRIBALISM, ISLAM AND THE STATE IN WATER MANAGEMENT

The existence of an extensive body of Islamic law for all aspects of society, and the central importance of water in many Islamic societies, seems to mislead donors into thinking that there will be a cooperative spirit in the development of water projects, and that there will be a forum in which management solutions are easily hammered out. This is far from the case, for several reasons.

The first reason is the ongoing recognition of customary law in water management, which is actually very complex because of the practical day-to-day concessions that often underlie the ideal principles. Secondly, while the importance of 'brotherhood' and coexistence in a tribe means that disputes will be settled within customary law where possible (Mahdi, 1986), but this does not prevent disputes which are often opportunistic and irrational, and sometimes very bitter. Most disputes go to wider courts only in desperation because of cost, *unless* these new courts provide a specific opportunity to make a claim. Thirdly, religious guidelines can only be used for problems discussed in the Koran or bodies of law subsequently derived. New technologies, especially pumps, borewells and pipelines, provide huge challenges to customary and religious law which many enterprising farmers are currently busily exploiting.

Another reason is the distinction between what aspects of water management are collective and what may be privately controlled. Even though the 'Law of Thirst' insists that all individuals must be allowed to drink water, the nature of access becomes very different between water sources, and as competition for water develops. In Al Jabin, no one will ever be refused a drink of water, but the controllers of a water source can and do refuse the right of individuals to fill containers, or do charge for them. The opportunities for drinking water development offered by the Law of Thirst is confused by an additional guideline that water should never be wasted, and that any surplus water should be always made available for irrigation.

One key to understanding these guidelines on access and appropriation is the rule that water cannot be owned or charged for unless it is stored and measured. Thus in terms of water as property, water resources management is defined as collective; it is only after it is mobilised and conveyed that it can become private property. Water flowing in small natural streams, irrigation canals, and from springs and wells developed jointly, are subject to joint ownership, with upstream users having priority over downstream users. However, water contained in receptacles or

tanks, or wells and springs developed by an individual on their own land, is subject to private appropriation. Some Islamic sects recognise the principle of 'harim', whereby no water project can be constructed within a specified distance of another project (Caponera). In the Yemen this distance is supposed to be 500 m for well developments, but we see no evidence of this rule operating in Al Jabin.

There are few sources of information in English on customary law for water in the Yemen Republic (Makin, 1977; Varisco, 1982, 1983). The work available, however, stresses a division between the organisation of irrigation water from flash floods or intermittent streams, and permanent flow supported from groundwater. Varisco (1983) distinguishes these as 'sayl' and 'ghayl' respectively.

Varisco (1982) cites the Islamic jurist Al-Mawardi (1960) as distinguishing three types of spring:

- (1) natural flow out of the ground, which is free for all to use;
- (2) springs opened up on private land;
- (3) springs opened up on unowned land, the effort of which confers private ownership but with certain communal obligations.

This classification also appeared to apply in Al Jabin, where springs provided the bulk of water for irrigation and drinking water. However, for spring type (3), the ruling is rather unoccupied or uncultivated land, since all land on the mountain is divided up into local territories or 'uzlas', largely synonymous with family groups. These general rights are complicated further by the issue of whether there is land by the stream for cultivation, or whether water has to be conveyed. Thus concepts of 'free for all' and 'communal' make spring types (1) and (3) very prone to dispute.

Both Mahdi (1986) and Varisco (1983) discuss the way tribal groups develop a management strategy in relation to available technology, judicial rules and norms of social conduct. Mahdi (1986) notes how there is a dual challenge in water management; that posed by the environment, which the group overcomes by using its technical knowledge, and that posed by other groups who compete for water. He points out the subtleties of tribal water use that can confuse any outsider trying to understand, let alone rationalise water use, and makes four observations which are relevant to Al Jabin district.

The first point is that even though rules appear precise and complex, they are actually only theoretical guides, and are often corrected and adapted to the difficulties of the moment. Peaceful coexistence is important, and rigid adherence to the rules signifies a crisis in the group.

As a consequence, rules are periodically ignored, so that while the system serves as a foundation, it is supplemented by improvisation. Such adjustments are not part of traditional law, but are derived from local customs and relations, so that it may be difficult to understand the real local daily organisation. The complications are such that tribesmen prefer to discuss their system in the ideal terms of water rights rather than the actual utilisation. Thus oral history on the actual permutations of water access, and why it was permitted, is a vital key in the operation of the system.

Thus, the role of *knowledge* in the community is emphasised well as allocation, and the responsibility for each may lie with separate individuals. By virtue of being monopolised by a few, this knowledge can be manipulated if required. It is necessary to separate out those who use the water, the oral historians, those who allocate water and those who adjudicate generally for the community, and to understand the balance of power between them. Only then can one understand how resource management takes place and is integrated into the general administration of the community.

This complex pattern of local water law can be made more difficult by the invisibility of water management functionaries on small water sources, except at times of stress. Gupta and Ura (1990) point out the 'episodic' nature of events which challenge the finely-balanced and managed agriculture in Bhutan, with management also designed as 'episodic' to deal with crisis events as and when they arose. In his case study of a highland spring system in Yemen, Varisco (1983) demonstrated that there was little need for day-to-day supervisory activities as the irrigator was capable of handling the entire sequence of activities involved in irrigation by himself. Thus although there was an elected official, the wakil (called 'aqil' in other areas) responsible for the solution of disputes, his role was entirely separate from decision-making responsibilities in the distribution process or production system.

We found a similar pattern in Al Jabin, and some of these officials did not even reside permanently in the district. What is of interest is that we were never introduced to a wakil as part of our initial discussion of the suitability of a water project. Our facilitator was the local government representative, the village sheikh or the Primary Health Care worker, who

may or may not have been providing accurate information about the water source. Despite the presence of local counterparts, we failed to make distinctions on the location of knowledge until bad disputes showed us the importance of this issue. It was not hidden from us, but we just never asked to meet the right people. Because we initially failed to understand the form of local representation, we could not initially participate in a forum that reflected local water management, and thereby set the scene for some disputes to turn into serious conflict.

The final point from Mahdi's work concerns the way physical and technical constraints lead to the communal use of water, which in turn prevents other groups from using it. He describes the existence of groups within the tribe, endowed with specific territory. Each group consists of several villages, each of which is a conglomeration of lineages from several extended families. Members of the group share a strong identity in three ways - of territory, of social origins and of mutual defence. Thus there may be more than one model of communal ownership - there may be property of the group and property of the village. Thus rights may actually change their form between smaller and larger social groups. Allegiances alter depending on the location of the threat. This can help explain why an irrigator group may not allow development of drinking water supplies from a source, even if it supplies their own village or territory. Gelles (1988) also discusses the shifting patterns of groups that form in claims for water.

The way group responsibilities and opportunities are described may prevent certain forms of change being admitted, as such descriptions are value statements, and may well be linked to other rights. Also importantly, forms of agreement and coercion may be accepted within groups which are not acceptable from other organisations, especially the state.

Although the advent of the Republic has not yet changed water laws in Al Jabin, it has begun to change their administration. Traditionally, disputes moved through a series of local representatives, depending on the scale or nature of the problem. Many local leaders have derived their wealth from fees for setting 'supra-community' disputes. However, by 1985 most areas of the YAR had a centrally appointed, legally trained district officer (mudiir), available as a judicial alternative or to participate along side of local leaders in serious disputes. This extension of central courts of justice has meant a loss of power to some local leaders, and has also represented a new opportunity for the presentation of claims in water disputes.

The joint operation of both customary and new forums in communities is found in many countries, regardless of whether new water codes and new water administrations have been formed. However, this may be a very appropriate mixture for communities in a state of agrarian and constitutional change, and is not necessarily a sign of confusion and disorder. Thompson and Warburton (1985) make a powerful case for preserving plurality of institutions as the case which offers the *villager* most options. Complexity of property regimes in particular may require plural attitudes to problem solving. They also contend that uncertainty and plurality can be worked with. The art is accepting that there is not just one problem, but many conflicting problems. One cannot, and should not, determine who is right, but rather understand why certain stances are taken. One can then understand which kinds of social transaction are best handled by which form of institution.

Approving new laws is a complex issue in plural societies, and it is no accident that many countries have little actual water legislation beyond generalisations laid down in their constitutions; Some Moslem countries may observe Islamic law (the Shari'ah) in its entirety; other countries maintain religious laws for family and inheritance issues, but develop civil codes for other problems, which is why some Moslem countries have enacted central water legislation while others have not. It is also worth emphasising that the Shari'ah does not include the concept of the 'public domain' for water that operates in many Western countries, but rather has the concept of management for the community. It thus becomes extremely delicate to distinguish private and communal priorities, just as under the Law of Thirst, it may be difficult to prevent someone excavating for water. For example, in central Tunisia, farmers are not prevented from digging new wells, but they may have their extraction of water restricted in volume, in the community interest.

Caponera (1973) describes how legal development in Shari'ah law to deal with new problems may derive from five different roots, with adoption varying between different Moslem sects. It seems that both the dominant sects in Yemen recognise the principle of 'ijma' or consensus, although attitudes vary as to whether this consensus should come from the nation, the community or Moslem scholars. Controversy does lie, however, over the use of 'qiya' or deduction by analogy, because of differences in the schools of law which are acceptable, and particularly whether legal solutions from non-Islamic countries could be considered. Finally there are issues in who applies this law - tribal or religious representatives, or a civil judge. Despite this picture of confusion and complexity, Islamic law can be remarkably flexible and pragmatic. Islamic Constitutions that have adopted Water Codes have usually been assiduous in developing a

constituency of interests in committees and public assemblies that enable laws to be agreed with consensus rather than public dispute.

There are some clear lessons here for donors and governments impatient to introduce new laws and new enforcement structures for water scarcity. Not only will it be virtually impossible to codify the reality of much customary management, it will be very difficult to introduce new legislation. Weak central governments have to be careful how they debate issues, to prevent 'problems' being seized by interest groups capable of making trouble. As Thompson and Warburton (1985) point out, if there are no easy solutions, then it may be better not to identify problems, and rather direct energy and money towards the inevitable, unless this becomes financially and politically impossible. It is probably no accident that the actual evolution of water management in many countries has been towards improving forums to hear case law, rather than launching new centralised water institutions and water codes.

4 INTEGRATING IRRIGATION AND RURAL WATER SUPPLY

Although the competition between water for rural water supply and other uses is featured in economic studies on water scarcity, there are few articles which examine the practicalities of joint development of irrigation and rural water supply, or the reallocation from one to the other. Annis and Cox (1982) summarise advantages from joint development as reduced construction costs and increased volumes of water for improvement in health and hygiene. However, they note that social investigations are required about the actual prospects to develop new sources or rehabilitate existing schemes.

The reality of many initiatives is much murkier. Countries like India drill all of their public drinking water wells on lands which are not privately owned, to prevent wells being subsequently appropriated for irrigation. In the YAR, there were also cases of wells originally developed jointly for irrigation and drinking water on private lands being reappropriated entirely for irrigation. Nor is separate development without its problems. Gelles (1988) provides a classic example of a drinking water pipeline broken to provide irrigation water to a nearby irrigation canal.

The prevailing wisdom in the YAR when the Unit started work was that domestic water schemes should be kept separate from irrigation. By 1985, many donors also actively avoided developing springs for domestic water supply, because of the disputes they attracted, and some donors focused exclusively on borewells. Since most villages actively sought water supply

improvements, it is worth understanding why disputing became such a strong tradition in rural water development programmes.

On a mountain the 'losses' of one area supply water for other users down-mountain; villagers face complex questions on whether to opt for improvement or reallocation of existing sources, or whether to exploit 'new' sources of water, any of which may cause consequences to topographical neighbours. The advent of technology which allows the incorporation of 'unutilised' water at a point in space may be creating a spatial reallocation problem outside the scope of existing customary legal controls.

Thus villagers may justifiably fear the impact of projects on their water rights, and in reverse, new technologies and pressures may be exploited by local interests to gain greater control or access to available water supplies. There is a serious dilemma for villagers between, on the one hand, wanting an improvement and risking new technologies, while on the other hand, judging the ability of local legal forums and foreigners to protect their interests. Disputing and negotiation at least gives the opportunity to test the reality of suggestions made by water technicians. *This issue is particularly crucial when local villagers are asked to accept a technology which they cannot visualise, so that they have no real grasp of how it will affect their environment.*

Technicians in a water programme have to understand what 'new' (unutilised) resources can be brought into a system, what reallocation *in uses* can take place at a source or spatially between sources, and what reallocation can take place *in users* can take place at a source. Just because a village has a right to use a water source, or identifies a previously under-utilised source, this does not mean that it has a right to develop it. Varisco (1983) demonstrates the importance of understanding exactly what a 'share' or 'right' to water is, especially the need to distinguish between rights of access and the physical appropriation of amounts of water. In Al Jabin, conflict or uncertainty has arisen over drinking water projects, because installation of piped water to a village previously having rights of access to a water point is seen as a form of physical appropriation, and may be disputed by a neighbouring group.

A useful example of this 'access' controversy arose with two spring sources developed for irrigation, but which also gave access for drinking water. These were both situations where considerable flows from large springs were piped around coffee terraces, and where differential domestic uses were permitted, depending on the relationship that the spring developer had with the villagers. Villagers were either allowed regular daily access to the irrigation pipes, or weekly access to use flows on Friday, the day of

prayer. However, scheme owners refused permission for piped connection to be made to the spring system for irrigation purposes.

By 1987, the local council of Al Jabin had drawn up a list of village water improvements required, and the sources that could be used. This list provides interesting insights into what local representatives themselves thought were possible, and had 192 projects for 428 villages. 42% of villages could not identify a new water source for an improvement, and requested assistance with cistern construction. However, 47% of villagers wanted an improvement on a 'spring', a term they used to cover all the three types of spring mentioned in Al-Mawardi's classification. Some villages had new spring sources in mind, for example, spring sources within their territory but too far away to be currently used, or locations they suspected would yield water with excavation, or springs recently exposed by new road construction. However, many projects were simply improvements to springs in existing use. 56% of spring projects linked up more than one village, but there was an obvious preference for a project to be developed for one village only. Half of the spring projects requested involved pumps for lifting water. Unlike the limited local development taking place with small pumps in irrigation, the communal pumped domestic water schemes could be supplying settlements some distance from the water source.

The Unit suspected that this programme was a 'window dressing' exercise in financial terms, as money was unlikely to be found for all projects. However, we did not initially consider that there was 'window dressing' as far as suggested sources for development were concerned. In fact several highly controversial projects were on the list. It is hard to say if there was some ignorance on rights at the village level, although there was undoubtedly some uncertainty as to whether groups would cooperate or disagree in the face of new initiatives. Certainly many villages hoped they could convert access rights into a physical connection. However, some projects were undoubtedly a means to test the commitment of new leaders, and as an opportunity to redefine water rights if possible. Given the opportunistic spirit within which some water projects were put forward, the actual approach of the Unit became all important in influencing whether disputes turned into conflict.

In the upper part of the mountain, where springs are usually small, most springs have been developed to provide a small collection chamber for domestic water. If any surplus seepage is seen as adequate for irrigation, it will be collected in a small cistern for irrigation and piped to the fields. The quantities of water involved are very small, from 0.1 litres per second to less than 0.01 litres per second, with many springs in this lower range.

At some springs water is conveyed by pipe to a collection chamber near the village, with an open pipe for the outlet of water. Most improvements are simple; to clean the collection area, or reconstruction of the seepage point to reduce wastage of water.

All such improvements on springs for domestic supply were easily undertaken as long as all regular collectors of water could be supplied by the scheme. Negotiation was required if there was a loss of irrigation water through the renovation, or of land to the project, and this depended on the relationship between the irrigator and the villagers. With small water supplies, the irrigation income loss is small, especially if the irrigated production is sharecropped. Compensation could be arranged in money, land or water elsewhere.

On the lower slopes of the mountain, the springs are larger, and usually collected into cisterns for communal irrigation based on a rotation system. These springs yield in the range 0.2 - 2 litres per second. Domestic supply is taken either directly from the cistern, or from the spring seepage above. To reduce losses and release water for domestic usage, such cisterns can be improved by concentrating spring flow, lining the cistern and canal, and increasing storage to utilise all night flow. The water can then be piped or pumped to village, as the terrain requires. It is these projects which have proved the most troublesome to develop, because of the complex interests and numbers of people involved with them. However, only occasionally were disputes linked to water rights, usually because an individual with an irrigation share lived in a different village, and wanted domestic water taken to that village. The one serious conflict we experienced on such springs was opportunistic retaliation by one family in order to discredit a local sheikh, and had very little to do with water rights.

The groundwater streams in Al Jabin seemed an obvious source of projects, and we were asked to consider them by several representatives. We estimated that streams on the western slopes ranged 0.5 - 5 litres per second. Streams on the eastern slopes tapped the major part of the groundwater catchment and surface flow ranged from as little as 0.5 litres per second to 50 litres per second on the lower wadis draining towards Wadi Rima. However, we met resistance to development for all groundwater streams, except for those with very localised flow and limited irrigation development. It is hard to know if the enthusiastic advice of the representatives was opportunism to stake a claim, or just ignorance of the complex rules that surround the use of such streams.

As soon as we examined streams in use for irrigation, whether there were complex rotational arrangements within a village, or a sequence of irrigators along a stream, we met with resistance, even though we argued that there was surplus in the scheme. Large pump lift projects were particularly controversial, as they were seen to help villages that had no family links with wadi dwellers. No one will be denied access to water, but the actual removal of a share of water will only be possible for communities with a tradition of using drinking water from the stream, or where they already have a customary entitlement to remove water for irrigation, and thus become concerned with their own internal reallocation.

The utilisation of these perennial streams is highly individual, depending on their hydrology, local settlement density, land tenure, and whether cultivable land exists by the stream or some distance from it. Such streams could fall under category 1 of Al-Mawardi's classification. They are a difficult water source for which to state general principles of use, even within one district. However, one possible distinction is between streams that rise and disappear within relatively short distances, and those which flow continuously through several 'territories'.

In the first case, offtakes are permitted, and have either gravity offtake canals or an irrigation rotation in situ, depending on local topography. Where there are a small number of irrigators, and the domestic scheme is for the small hamlets where they live, there are few problems in introducing a piped domestic supply. However, if the stream has been developed by a specific group of irrigators, they will not allow a domestic water supply system to be introduced, for fear that in the future this usage will be claimed as a right, and expanding domestic requirements permitted to reduce the irrigation component. In the second case, streams which flow through several villages are utilised only for the collection of domestic water supply and of irrigation approved by local representatives. No extensive piped offtake of domestic water was permitted in our first round of investigations.

Wells also proved a complicated source to develop. Any well located too close to an irrigation cistern or groundwater stream used for irrigation was liable to be destroyed, even if on communal lands. In one wadi, extensive well development for irrigation had led to the abandonment of traditional well sites, with villagers taking domestic water from an irrigation well. Redeveloping the traditional well for a pump lift domestic scheme proved controversial because of its effect on local irrigation wells. Nor were we only concerned about the technical impasse of such sites. We were uncertain of social tensions between the wadi dwellers, and the mountain dwellers that projects would serve. The only well sites we visited

that were not immediately controversial were in wadi sites where terrain made agriculture unviable, or where they lay clearly within an uzla or related group of villages.

It appeared that virtually all types of sources could be worked with on Jabal Raymah, because local customary practice is actually very flexible. This is particularly true for small-scale irrigation offtakes, which may be developed to include domestic water supply easily within village territory, through group negotiation. Discord and delays in projects materialised as groups tested the utility of new programmes for laying new claims to water sources, or to protect their rights, but were often not serious. Sometimes disputes developed simply to air old grievances or retaliate against other groups. However, conflict blew up over all proposed schemes which threatened very uncertain communal water sources like groundwater streams, or rights to water development in 'communal' 'uncultivated' land.

This brings us to the difficult issue of what constitutes 'communal' land on a mountain. Communal lands are usually steep sections of mountain, often at some distance from the village, over which different groups within an uzla have variable rights of access and disposition. Uzlas on the mountain have clear boundaries, often running along wadis, and sometimes communal lands lie between the villages and the boundary. Unfortunately, these boundary wadis are often conveyors of water. It is common for an uzla to have springs and groundwater streams rising on communal land which the villages of the uzla do not use because of the distance of the spring or stream down mountain. Often one uzla allows access by downstream uzlas on a practical basis, but still claim the right in theory to dispose of those sources as they wish. This is a pragmatic solution as a downstream uzla or village may lay violent claim to the water source if access cannot be negotiated.

However, the pressure on supplies, and the new opportunities offered by pumps and pipes have renewed interest in 'communal boundary' areas. The issue is whether the access permitted pragmatically by another uzla or landowner now has a force of law over the theoretical rights to disposal and use held by the traditional controllers. The worst conflict experienced by the Unit occurred in this situation over a spring used by two downstream villages, by village A for drinking water only, and by village B for drinking water and irrigation. The upstream group with theoretical ownership of the spring wished village A to have a piped water project, and there was certainly enough water in the system for all uses to continue. The project tipped over into a serious dispute because of the problem of 'knowledge', with village B claiming that in a previous dispute

they had been awarded rights to the spring, but with villages A and the territorial group claiming that the entitlement had been obtained corruptly, and without the understanding of illiterate villagers.

Territoriality is the key issue of how water sources can be used and reallocated, whether for irrigation or water supply, with jealous protection of rights to water usage. Clear lines of authority also constrain disputes. Within one tribal area, newly discovered sources can be allocated to water supply, existing water sources will be allocated between irrigation and water supply, and rehabilitation permitted to release water for domestic use for an irrigation system, without too many problems. Disputes may arise from opportunism or retaliation, but can be resolved if careful debate and detailed clarification of agreements is encouraged. However, more serious disagreements are likely in villages with internal divisions and historic feuds over water sources.

It seems that water development is straightforward on most private land. While this seems a predictable response to market opportunities, we are also seeing the influence of local decisions on the scope of customary law. Many of the developments taking place lie within an areal configuration allowing issues to be decided by villagers and their local representatives, without recourse to wider debate or other authority systems. However, we also suspect the influence of certain landownership patterns, where innovations are allowed on a day-to-day basis because that land is farmed by powerful families, either directly or sharecropped. Thus the negotiation that can take place for individual smallscale irrigation development is much more flexible than that which can take place for communal/domestic water supply improvements, which may link up several groups or factions. An additional problem was very unclear authority lines in supra-community roles at this period for common-property regimes. Attempts by villagers to use new central forces (and donor interventions) failed because of weaknesses and inconsistencies, resulting in one conflict which became extremely destructive in property and relationships to both sides, and is still unresolved.

5 CONCLUSIONS

This paper began by noting the confusion facing governments and donors on how to recommend political changes consistent with economic changes. The answer cannot be found through experimentation with stereotypes of centralised or decentralised management systems, but by a careful study of the dilemmas facing governments and communities in dealing with resource management. We may need more experimentation in forums for negotiation rather than new rules to solve problems. The most difficult

part of planning for change is to get behind existing institutions to find out what changes are needed, and are possible. This requires understanding of the economic attraction to collaborate rather than compete, of the legitimacy of 'micro-institutions' that control villagers, and the incentives for new institutions to develop and serve a locality.

Ironically, there may be more potential for community structures in areas still characterised by customary water management, despite the high level of dispute and endless attempts at misappropriation of water. In such areas heavy interdependence through sharecropping of land and water, and communal mobilisation of water and maintenance create economic reasons for cooperation, while strong traditions of 'brotherhood' in the face of external rule provide some framework for decentralised management, providing this management is not strongly focused in the hands of a ruling elite.

Sadly, in Al Jabin, there has still been very little increase in the power of villagers relative to their micro-level institutions, nor has the economic productivity of the area increased, thereby reducing incentives and possibilities to cooperate in project rehabilitation, water reallocation or resolution of territorial disputes. Some Andean water projects, while also riven with disputes, appear to have greater potential for community management in the longterm because of agrarian reform, although new local organisations still need a great deal of support to settle historic disputes before real changes can be made. Peru, like the Philippines, is at least providing us examples of the way diverse state institutions can give social and legal support, rather than just technical assistance, for water programmes.

For areas facing problems of resource rapid depletion, it will be very hard to strengthen community structures if there are no ongoing economic incentives to do so, or where there are wide disparities in income and little overall increase in political power available to individuals. As Shah (1991) points out, it is very difficult to introduce a water functionary where there is no tradition of this role, and where current technologies and agrarian relationships promote individualism.

The legitimacy of local representation is very important, not only for water functionaries, but also for local groups that make the representation to courts or 'supra-group' authorities. The Philippine study by Bacdayan (1980) shows a village council long respected by locals, interacting successfully with the State through advisers and bureaucrats sympathetic to local management. The studies by Gelles (1988) in Peru, and Knell and Whiteford (1989) in Mexico, show new local organisations with a strong

political base slowly flexing their muscles in water management, with a fair judgement of the conflicts they are likely to win,

In Raymah, however, a new local council system had recently come into force, containing individuals of widely varying status. Most seriously of all, many council representatives were important landholders or religious leaders, who had previously taken the 'supra-community' role in water disputes. Our water programme became bound up in the attempts of villagers to test the commitment of their new leaders while also trying to reverse 'unfair' decisions previously made by some of these same individuals! The results of these disputes were sometimes drastic, because there was such confusion in who to turn to for 'supra-community' help. Despite central government representatives and bureaucrat with genuine interest and sympathy in supporting villagers, it seems that villagers had to stay with customary rights because they could not organise popular local representation that could also fight their case genuinely in new legal procedures on offer.

Relevant changes in the legal environment include the improvement of forums for the hearing of cases, clarification over submission of oral and written evidence, and careful attention to preservation of legal information. Continuity of personnel is also intensely important for villagers trying to obtain state assistance or take a case to court. The development of new water codes may be less essential; indeed, the actual complexity of customary law (as opposed to its theoretical form), and its rapid change over time, may make central codification very difficult. Resource management advisers should stop trying to detect if local resource management fits a stereotype, but work from the social and economic realities of the location.

Although a certain amount of physical and social research is essential before work begins, programmes may have to become operational for actual water management practices and tensions to be demonstrated. Villagers also gain more understanding of the impact of the project, which they may often cannot forecast while a project is in a theoretical stage. So, a slow but deliberate start may be necessary in water projects simply for the programme to be taken seriously.

The nature of potential opportunism needs to be considered in the early stages of a project. Careful attention has to be given to the range of local representatives likely to be involved in water management. Special attention must be given to the 'form' of knowledge and agreement on water use, especially the status of verbal and written statements that materialise in a dispute. It is often helpful to study or attend other

resource management disputes in the neighbourhood, to understand procedures and loyalties. Properly drawn up agreements and discussion at the investigation, design and implementation stages, involving all villagers and all local representatives are time-consuming but can prevent much individual or family feuding. This can also help limit the damage to the enthusiasm of villagers, and the reputation of individuals, that will be caused by a stream of potential projects which never materialise.

The complexity and confusion of localities like Raymah may appear intimidating, but they should not necessarily be avoided for assistance; nor should they have technological packages superimposed upon them, simply because a development intervention needs to fulfil targets. Thompson and Warburton (1985) comment that understanding only the fixes can bring nasty surprises in implementation; understanding just the obstacles may mean never taking the risk of implementation. The 'obstacle' of local water management can be unpacked to find out the causes of disputes, and solutions developed if an appropriate forum for local water politics is facilitated.

The enthusiasm of villagers for water improvements needs support, especially where initiatives can strengthen and empower communities. It is only through new initiatives and programmes that they can resolve tensions encouraged by new technologies and changing economic circumstances.

In new political, economic and technical circumstances, the individual/community/supra-community interrelationship has to be explored carefully. What seems to be emerging from studies of disputes is that communities can manage their water resources if local institutions have the legitimacy to do so, and if social and economic incentives encourage their performance. Mismanagement and confusion not only occurs where structures are inadequate, but also where communities have no clear, accepted or agreed 'supra-community' institutions to deal with conflict. In an environment characterised by small, disparate water supplies, and limited central government involvement in local affairs or production, community management may offer most potential. However, this potential will be assisted by sympathetic agrarian and local government reform, and sensitive advice and support services to define 'supra-community' roles, rather than specific new water management structures developed at the centre.

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