Water, Rules and Gender: Water Rights in an Indigenous Irrigation System, Marakwet, Kenya

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ABSTRACT

The management of indigenous irrigation systems has received increasing attention both from social science researchers and from those development agents who seek to change them, or to find in them a model for organizing newly developed irrigation schemes. This article discusses how water is allocated within one such irrigation system, the hill furrow irrigation of the Marakwet escarpment in Kenya. It describes the 'formal rules' of water rights, giving particular attention to the issue of gender with respect to water rights. It then discusses the 'working rules' relevant to water allocation, involving various informal practices of sharing, buying and stealing. The implications of this complexity for understanding the operation of indigenous farmer-managed irrigation systems are examined.

INTRODUCTION

There has long been interest in the social context of irrigation. This work has tended to focus either on the relationship between irrigation and society (for instance, Coward, 1979; Hunt and Hunt, 1976; Steward, 1955; Wittfogel, 1957), or (increasingly) on the pragmatic questions of making irrigation systems more productive (for example, Bottrall, 1981; Chambers, 1981, 1988; Uphoff, 1986). The rise of interest in farmer-managed irrigation systems (FMIS) by the international development community (particularly the FMIS Network of the International Irrigation Management Institute, IIMI) has thrown increasing research effort into the exploration of the ways in which people organize themselves to capture, direct and allocate water for irrigation (see, for example, IIMI, 1987; Vincent, 1995; Yoder and Thurston, 1990).

One of the most significant stimuli for interest in FMIS has been the recognition of the poor economic, social and environmental performance of large-scale, centrally-planned and bureaucratically-organized irrigation schemes. Failures of 'operation and maintenance' (O&M) have been seen to be critical to the disappointing economic and technical performance of formal (and particularly newly-constructed) irrigation schemes (Bottrall, 1981; Chambers, 1988). Engineers and development planners have responded to the need for improved O&M tasks on formal irrigation schemes by suggesting that these should be handed over to new kinds of management

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organizations run by farmers themselves — 'water user associations' (Cernea and Meinzen-Dicks, 1994; Hunt, 1989).

The aim of turnover is to reduce O&M costs and production subsidies (critically, reducing state subsidy), and to deal effectively with problems of water distribution such as conflicts between 'topenders' and 'tailenders' (Diemer and Slabbers, 1992; Geijer et al., 1996; Martin and Yoder, 1987; Smout, 1990; Uphoff, 1986). However, the notion of water user associations is relevant both to newly-formed groups of farmers on formal irrigation schemes, and also as a label for the groups of people that manage indigenous irrigation systems (i.e. those planned, established and organized locally, and without deliberate outside technical or financial assistance). In both cases, there is obvious force to Hunt and Hunt's argument (1976) that attention should be focused on the ways in which the tasks necessary for irrigation, such as construction, maintenance, water allocation and conflict resolution, are organized. They suggest that 'all societies with irrigation that we have so far studied have an institutional locus which is primarily responsible for the maintenance, repair allocation and minor dispute-resolution functions' (Hunt and Hunt, 1976: 391). This 'institutional locus' has become the focus of research and explanation of the way irrigation systems work (Tang and Ostrom, 1993; Uphoff, 1986).

However, informal collective management of indigenous irrigation systems may deviate considerably from the simplified models of social organization ascribed to water user associations. There may be flexibility in the definition of who has water rights (or 'hydraulic tenure'; Coward, 1979; Vincent, 1995), and complex arrangements that determine who actually receives water, and what they have to do to get it. Because indigenous irrigation systems are seen to work, and obviously require management to do so, there is a tendency to assume that there are 'indigenous management organizations' that operate in a simple and systematic way to arrange water and system management, and furthermore that the 'rules' by which they operate can be relatively easily uncovered and codified by researchers and used to direct development interventions. Vincent (1995), for example, criticizes 'the belief that there are ideal, standard irrigation management arrangements where production objectives and social principles emphasize intensive, market-oriented output and water rights' (Vincent, 1995: 94).

Of course, field enquiry can sometimes generate a consistent set of 'rules' about issues of irrigation system management and water allocation that are recognized in the local community. However, this approach to irrigation management institutions can be problematic if it is too simplistic, for the institutions that govern water use are rarely entirely simple. Ostrom (1990) distinguishes between 'formal rules' and 'working rules' (or 'rules-in-use') in collectively-managed resource use systems. Formal rules may forbid, or require some sort of action (for example, about who may take water at a particular time), but such regulations may be ignored in practice. The working rules are 'those actually used, monitored, and enforced, when individuals

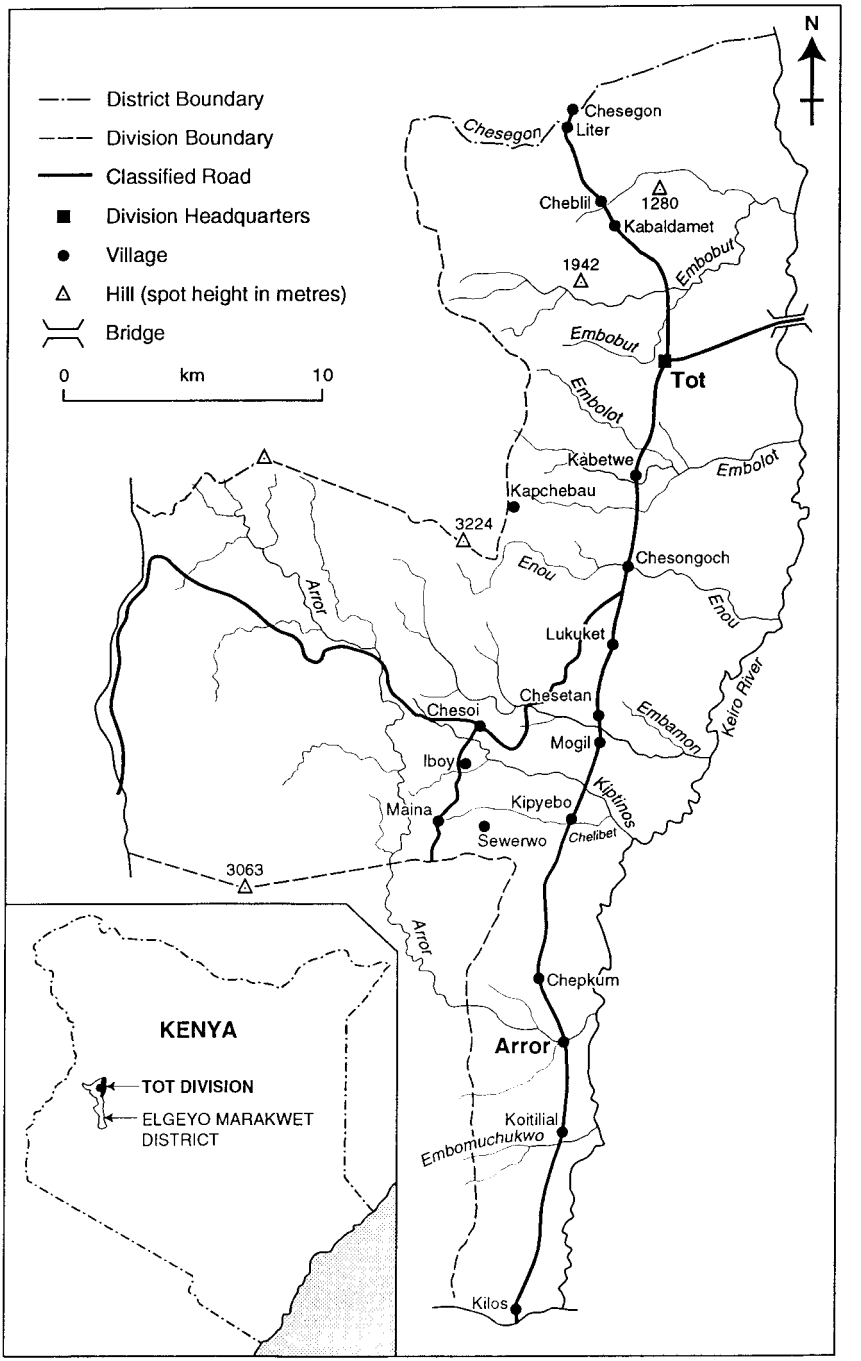
make choices in operational or collective-choice settings' (Tang and Ostrom, 1993: 4). It is clear that there may well be a difference between formal and working rules in the case of bureaucratic irrigation systems, where rule-breaking ('illegal' water appropriation) may be the norm and not the exception. Thus farmers in canal irrigation systems may be involved in more than one collective-choice entity, for example at the systems level (the irrigation scheme) and at the sub-system level (for instance, as a member of a group of tail-ender farmers). What may be less obvious is that in indigenous farmer-managed irrigation systems there may also be differences between stated formal rules and observed working rules. Tang and Ostrom (1993) point out that rules provide stable expectations for participants in indigenous FMIS, but not all actions judged allowable are the subject of such rules. Furthermore, formal rules lack flexibility: 'Rules are changed less often than the strategies individuals adopt within rules' (ibid: 6).

The 'management rules' for indigenous irrigation systems therefore need to be seen against this background of more complex patterns of relationships and activities associated with the tasks of canal maintenance and water allocation. Hunt and Hunt recognize this in distinguishing between two separate components of accounts of how irrigation systems 'work': a normative account of how the system 'ought to work', and a descriptive account of 'how it really works' (Hunt and Hunt, 1976: 392). The former reflects the 'formal rules' of operation and water allocation. The latter reflects the accepted norms or 'working rules', a much richer matrix of cultural, social and political factors that interact to determine the actual course of events relating to the use of the irrigation system and access to water. Fleuret (1985) develops this perception in his account of indigenous hill furrow irrigation in the Taita Hills, Kenya. He offers a descriptive account of the physical layout, utilization, maintenance and management and social organization of a furrow system, and emphasizes the way resource management and the management of social relations are tightly embedded in each other, arguing that 'one cannot legitimately distinguish between the management of social relations and the management of natural resources' (Fleuret, 1985: 116).

That interface between what Fleuret calls 'the moral order, the social order and the natural order' (ibid: 161) is obviously very important, particularly to attempts to improve options for sustainable livelihoods through development intervention. To an extent, development assistance can be offered without seeking to unpack these systems of rules, for example using participatory techniques to work with stakeholders to operate on their own reality and understanding of it (Breemer et al., 1995; Chambers, 1994a, 1994b, 1994c; Moris and Copestake, 1993). However, it remains important that the complexities of the institutions governing indigenous collectively-managed irrigation systems are studied so that their diversity and flexibility, and the sources of their resilience and flexibility, are clear to outside agents of development intervention.

This article discusses the collective management of the indigenous farmer-managed irrigation on the Marakwet Escarpment in the Kerio Valley, Kenya

Figure 1. Location of the Study Area



Source: redrawn from Cappon et al. (1985).

(Figure 1). It provides a brief introduction to the irrigation system, and develops Ssennyonga's account of the rules (i.e. the formal rules) of Marakwet irrigation management (Ssennyonga, 1983). It discusses the social organization of maintenance of the irrigation canals, and the way in which water is allocated between and within villages, looking in particular at the issue of gender and water rights. It then develops this account of the formal rules of water use (how the system 'ought to work', as Hunt and Hunt describe it), with an exploration of some of the complexities of the working rules that overlie them (how the system 'really works'), looking at some of the means by which people obtain water outside the formal system of allocation.

STUDY AREA AND METHODS

Irrigation occurs along more than 40 km of the Marakwet Escarpment, from south of Arror to north of Tot, on the western side of the Kerio Valley in northern Kenya, and also round under the northern slopes of the Cherangani Plateau in Pokot (Dietz, 1991; Dubbel and Kwaasteniet, 1983; Hogg, 1984; Moris and Thom, 1990; Soper, 1983). This study focuses on the southern, 'Marakwet' part of this area. The form of irrigation is by gravity, with water being diverted from steep and fast-flowing rivers down the escarpment and carried by extensive systems of branching furrows across and down the escarpment to the valley floor 1500 m below (Soper, 1983). In Vincent's classification of hill irrigation systems, Marakwet irrigation falls into the category of a 'slope offtake irrigation system' (Vincent, 1995).

This system of 'hill furrow' irrigation is one of a number of similar systems that exist in East Africa, for example in Kenya on the Taita Hills (Fleuret, 1985), and in Tanzania on Mount Kilimanjaro (Grove, 1993) and in Sonjo (Adams et al., 1994; Gray, 1963). These irrigation systems are of unknown age, but are certainly pre-colonial in origin (Adams and Anderson, 1988). Sutton (1984, 1986) has described the extensive archaeological remains of former irrigation systems at Engaruka in Tanzania, abandoned in the seventeenth century. There is no direct evidence of the antiquity of the Marakwet irrigation furrows (Kipkorir, 1983; Kipkorir and Welbourn, 1973; Moore, 1986; Sutton, 1973), but they are clearly pre-colonial since they are mentioned by Thomson (1885). They have long impressed outsiders to the area (for example, Henning, 1941; Huxley, 1959).

As shown in Figure 1, the Marakwet Escarpment is served by an unsurfaced road that runs south–north between Iten and Tot along the West bank of the Kerio River. The escarpment rises up to 1500 m above the road, and there is a steep rainfall gradient between the top and the bottom, with an average annual rainfall of 1365 mm at Elgeyo Forest Station (with rain in every month), and only 597 mm per year at Tot on the valley floor. Rainfall is seasonal, with peaks in April/May and in July/August. Only in April and May does rainfall exceed potential evapotranspiration (Muchena and Kibe, 1984).

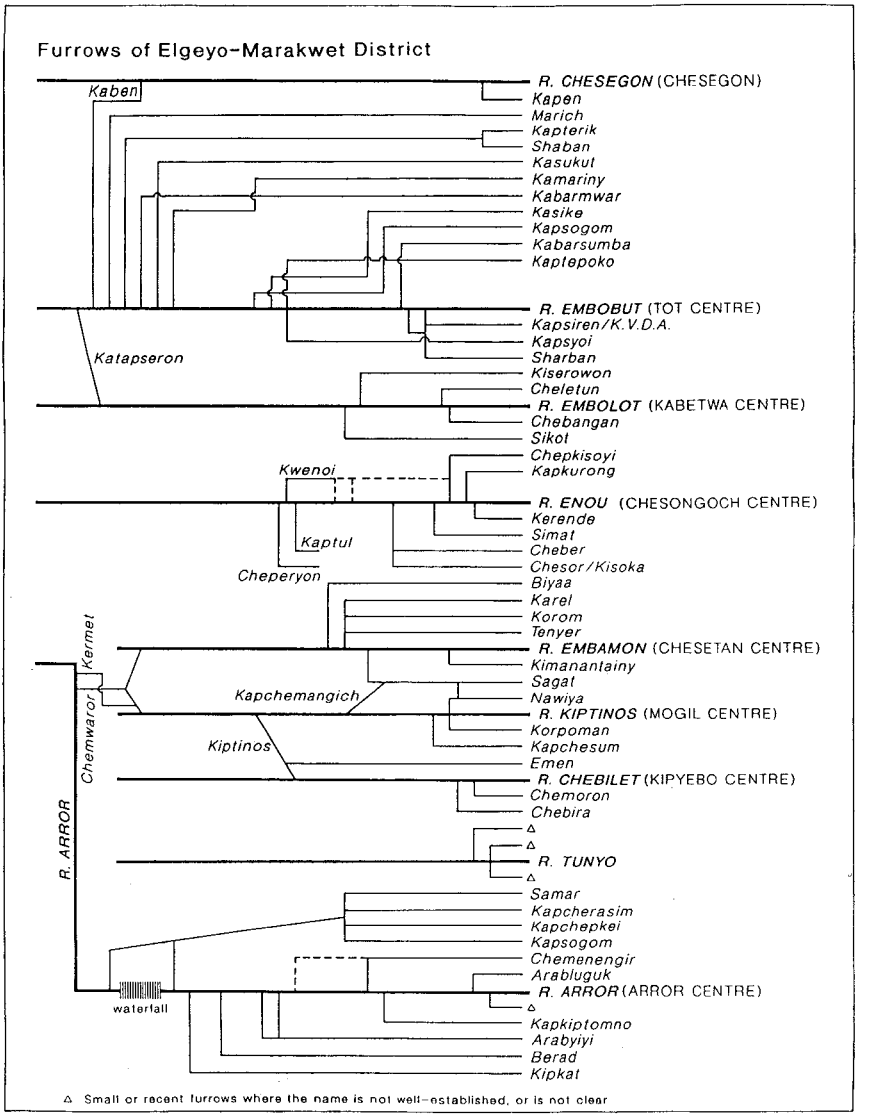
Rainfall above the escarpment supplies water to the irrigation furrows. Two permanent rivers descend the Marakwet escarpment, the Arror in the South and the Embobut in the north. Irrigation water is also supplied by smaller impermanent streams (the River Enou and Kiptinos), and from some streams supplemented by 'feeder' furrows from the Embobut and Arror (the Embolot, Embamon, Kiptinos and Chebilet). Irrigated cropping takes place over the period of the rains in April/May.

Marakwet villages are spread along the escarpment (called *lagam* in Marakwet), and there are also a series of trading centres along the valley-foot road, for example Arror, Chesongoch and Tot. People have remained loyal to escarpment living, partly because of the lack of malarial mosquitoes, despite other apparent disadvantages (Critchley, 1983; Kipkorir, 1983; Moore, 1986). Farms stretch from the escarpment side to the valley floor (*keu* in Marakwet). The main crops have traditionally been finger millet and sorghum, but a wide range of crops, including cassava, cotton, bananas, maize and vegetables are now also important (Watson et al., forthcoming). Finger millet is grown using rainfall on the escarpment, and in wet years may be grown without irrigation on the valley floor.

The physical construction of the furrow systems of the Marakwet Escarpment has been described in detail by Soper (1983). Water is diverted from streams descending the escarpment by semi-permeable diversion dams made largely of brushwood and rocks, and directed into a series of earth channels (furrows) strengthened with rocks, and sometimes partially dug into the hill, or provided with complex aqueducts of logs or brushwood and mud (Soper, 1983). These carry water down and across the face of the escarpment, irrigating both the fields on the escarpment side and those on the wide and dry floor of the valley below. The furrow system is extensive, and has been mapped by Soper (1983) and Gibb (1987). Soper identified forty-nine furrows totalling 265 km in length on the Marakwet escarpment. The largest furrows were 14 km long, and descended over 1400 m. Furrows can extend some distance (up to 4 km) from the foot of the escarpment. The furrows fed by the Arror River are shown in Figure 2. The data on which this article is based were collected in 1992 and 1993. In 1992, work focused on land irrigated from the Arror River, and in 1993 on land area irrigated by water from the Embamon river (the Chesetan area) and the Enou River (the Chesongoch area). Basic socio-economic data were derived from a questionnaire survey of 70 households in 1992, the sample being stratified by age and gender.[1]

1. All Marakwet share a system of eight cycling age-sets. Those present during the fieldwork, from youngest to eldest were: Kimnyigeu, Kaplalach, Kabereu, Korongoro and Sawe (see Kipkorir and Welbourn, 1973; Moore, 1986). The questionnaire sample consisted of 25 per cent young men from Kimnyigeu age-set; 25 per cent middle aged men from Kaplalach age-set, 25 per cent elders from Kabereu, Korongoro or Sawe age-sets; and 25 per cent female-headed households. All interview were carried out by E. Watson, with the assistance of an interpreter.

Figure 2. Irrigation Furrows Supplied by the Kerio River



Source: Fieldwork 1992–3. Base redrawn from Survey of Kenya, 1:50,000 sheet 90/1 (Kapsowar).

Information was also collected through informal in-depth interviews about agriculture, water management and socio-economic change, and by observation (and where possible participant observation), particularly of the tasks of furrow maintenance and the meetings held to allocate irrigation water. In addition, the daily activities of ten selected respondents (four women and six men from different age sets) were recorded in diary form. Staff of three

development agencies which are operating in the Kerio Valley (the Kerio Valley Development Authority, KVDA; the NGO World Vision; and the District Arid and Semi-Arid Lands — ASAL — project) were also interviewed.

Fieldwork was hampered by continuous cattle raiding by Pokot (related to the wider clashes prevalent and much reported in Kenya in 1992 and 1993), which caused widespread disruption in the villages. Raids affected 87 per cent of respondents in 1992, with significant impacts on farming practice, particularly in the form of shortened days on the farms, restricted use of land away from the escarpment foot, and a great reluctance to irrigate at night. By 1993 people had become more used to the fighting and were trying to farm around it, although 90 per cent of respondents were affected, and many people were spending as much time as possible in highlands. Partly as a result of these impacts, potential respondents were suspicious of answering questions, and it was difficult to locate interviewees.

The extent of irrigation on and below the Marakwet Escarpment is not accurately known, but is estimated to be in the order of 4000 ha (Watson et al., forthcoming). Further areas are irrigated to the north, in West Pokot District (Dietz, 1991; Hogg, 1984). Surveys revealed a mixture of views about the adequacy and operation of the irrigation system on the part of Marakwet farmers. Respondents to the questionnaire survey complained about the lack of rain (33 per cent), but more complained of the lack of irrigation water (50 per cent). Irrigation serves primarily to supplement rainfall, and 43 per cent of those interviewed said they would respond to poor rains by irrigating more. In terms of problems experienced with irrigation at field level, 46 per cent of respondents complained about the way in which gullies and hills prevented furrows from commanding areas of otherwise irrigable land, 8 per cent mentioned soil erosion, while 35 per cent identified no particular problems with irrigation. Of the respondents, 49 per cent obtained water every two weeks or less, and 85 per cent at least once a month. However, allocations were mostly of short duration, 88 per cent getting on average only one hour per week.

The irrigation system has repeatedly attracted the attention of outside agents of development, both in the colonial period and more recently from the District ASAL project and the Kerio Valley Development Authority. Attempts to intervene in local production systems to 'improve' irrigation practices have been unsuccessful (Adams, 1996; Dietz, 1991; Kipkorir, 1983), although the irrigation itself continues to sustain a diverse agriculture on the valley floor in an area deemed only suitable for millet and livestock (Cappon et al., 1985). However, it is important to note that significant social and economic changes (spearheaded by education, religion, labour circulation and cash-cropping) are occurring throughout the Kerio Valley (Dietz, 1991; Dubbel and de Kwaastiniet, 1983; Roberts, 1996; Watson et al., forthcoming). The implications of these changes for different aspects of the irrigation system are discussed at relevant points through this paper.

MANAGEMENT OF THE FURROW SYSTEM

Marakwet irrigation furrows require considerable inputs of labour to keep them in safe and effective condition. This work involves both piecemeal local maintenance and repair (routine inspection, monitoring and regulating water flow, opening and closing water points, and small-scale repairs), and short periods of organized and intensive work (cleaning out furrows at the start of each irrigation season, a task called *balwa*), and carrying out major repairs (Ssennyonga, 1983). Our research shows that all farmers will repair small leaks as they are noticed, and almost all will have the necessary skills and knowledge to tackle the job, derived from their work with small furrows at or near their fields where the onus of responsibility is always on individual farmers. In addition to this, all the users of water from a particular furrow elect a 'furrow man' to be in charge of the technical management of the furrow on a day-to-day basis. His responsibilities include the regulation of water levels (using whatever control structures exist), the repair of any small damage, and alerting other farmers of problems that are sufficiently serious to need a communal maintenance effort. Most furrow men have farms high on the escarpment, near the furrow intake, and so are at hand to cope with problems.

Extensive maintenance and repair tasks on the furrow are undertaken communally. The Marakwet call the communal maintenance of the furrow *kakukut konde*. This translates literally as 'the blowing of the horn', because traditionally a horn is blown as a signal that everyone should go to the furrow with their hoes and work. The horns have been passed down from generation to generation, though not all villages have them. The possession of a horn, however, does not appear to signify any superior claim to the furrow, and the responsibility of calling for *kakukut konde* does not fall to any man in particular.

Communal furrow work is chiefly needed when there has been some damage to the furrow, or when sediment must be removed and the banks built up to increase water flow during the cultivation season for irrigation. The chief maintenance problems of the main furrow reported in surveys were channel embankment breakages or leaks, blockages of the channel by rocks or mud, and problems with the intake.

When men arrive for communal furrow work, the intake is closed and water is redirected into the river. The furrow is then divided into parts, one for each village (*kor*).[2] The work carried out depends on age. Usually, the older men's main task is supervision; middle age-sets will carry out the main work, while those from the younger age-sets may be sent to fetch materials,

2. The *kor* is a territorial, exogamous unit, where all the members share the same totem. There may be one or more villages of the same totem, which indicates that they are all descended from the same ancestor.

such as branches and vegetation. Communal furrow work may last some days, but rarely more than a week. According to some old men, the furrow used to be prepared over several weeks in February, before the cultivation season. The water was then cut off so that the rains did not cause damage until the main dry spell came and irrigation was needed. Patterns of maintenance are currently less predictable in the survey villages.

When maintenance is finished, water is redirected from the river into the furrow, an important moment which has in the past been surrounded by ritual, sometimes involving sacrifices.[3] The significance of rituals associated with furrow maintenance is fading, however, and they seem to have become quite rare: in 1992 and 1993 no such rituals occurred in the survey villages. Although this was obviously an important element in the whole process of furrow maintenance in the past, fewer people are now said to be willing to take part in the rituals; they are also more reluctant to work hard, as less prestige and meaning are attached to the work. This decline in the social and cultural importance of maintenance is related to wider changes in ideas and attitudes, particularly among the young, associated with increasing social and economic contacts with areas outside the valley, and especially the incidence of male labour circulation (Dubbel and de Kwaastiniet, 1983; Roberts, 1996; Watson et al., forthcoming). As awareness of urban lifestyles and different economic opportunities spread, traditional farming activity (and with it furrow maintenance) is increasingly viewed as ineffective, time-consuming and unattractive. There are more than enough young men in the valley to continue to maintain the furrows properly, but they are (mostly) not interested in doing so.

In 1992, communal maintenance on the Chemenengir furrow at Arror took place in January, June, July and September. The major maintenance effort took place in July, when crops began to need water urgently, and mainly involved the removal of sediment and work on furrow banks to allow more water to reach the fields. The questionnaire survey showed that 76 per cent of respondents had worked in July (compared to only 3 per cent in June and 2 per cent in January), but few people turned up for the full four days. The largest number turned up on the last day, because it was the day when their presence was necessary to qualify for water (see below). The proportion

3. The Marakwet traditionally believe in a distant god *Asis* who is male, omnipotent and omnipresent, and is also the sun. *Ilat* is his counterpart, a spirit who is seen and acts as lightning, is associated with water, lives in pools in rivers, and acts for *Asis* on the earth. All the water that is taken from the river is perceived as given and controlled by *Ilat*. Only a man whose first-born is a daughter is allowed to go and redirect the water into the furrow, as *Ilat* is said to be partial to young girls. Those with first-born daughters go and slaughter a goat or a sheep, and take honey beer, the oldest and sweetest of the beers. They cook and eat the food and read the entrails. This ceremony is to honour *Asis* and *Ilat* and to thank them for the water. *Ilat* is not considered wholly benign: if there are problems with erosion of the furrow, it is thought that *Ilat* has not been placated enough by these sacrifices and the ceremony will be performed again.

of households involved in communal maintenance in the Chesongoch/Chesetan area (surveyed in 1993) was slightly greater than that in Arror (93 per cent of respondents compared to 76 per cent), reflecting the area's slightly lower rainfall and the correspondingly greater importance of irrigation water.

FORMAL RULES OF WATER ALLOCATION

Water rights are organized in terms of the most basic Marakwet institutions of the village (*kor*) and the clan (*kapkei*).[4] Water rights are defined by rights to a particular furrow, and are held by the descendants of the original builders. However, as Ssennyonga (1983) points out, rights to water basically accompany rights in land, since clans have generally built furrows to supply the area where that clan's land lies. Modern institutions (trading centres, missions and schools, for example) can also make claims to furrow water in particular cases. Irrigation water is distributed through a series of meetings called *kimwoi*, which are attended by all those with water rights. These *kimwoi* take place after each period of communal maintenance activity.

The first *kimwoi* is attended by people from different villages, and decides a timetable so that each village that has rights to water from the furrow has a turn using the water. For example, in the case of the Chemenengir furrow, which takes water off the north side of the Arror River (see Figure 2), a series of villages lying several kilometres North of Arror Centre have rights to water in the Chemenengir furrow.[5] Each village then meets again to decide how to divide the water between its clans (*kapkei*), and each clan then divides it between its members. Every meeting where the distribution of water is decided is called a *kimwoi*.

Immediately after each episode of maintenance, water is called *turrul* or 'special water'. Each village is allocated 24 hours of *turrul* water in turn. In principle, the only people to be given a share of *turrul* water are those who worked on the furrow during the communal maintenance period: however, if someone missed maintenance for an acceptable reason (such as being away or being ill), they may be allowed a share of *turrul* water. After two cycles of

4. Moore describes the *kapkei* as a clan section, a 'residential group of agnatic males who trace their descent to a single founder. The names of such groups are formed by prefixing the syllable Kab or Kap to the founder's name' (Moore, 1986: 20). Here the general Marakwet term *kapkei* is used. It is worth noting that this is a different unit to the 'clan' described by Kipkorir, who uses it to refer to the thirteen patrilineal totemic groups of the Marakwet which cross-cut the *kor* units (Kipkorir and Welbourn, 1973). Each village contains more than one clan. The land of each *kapkei* stretches in a strip down the escarpment from the steep slopes to the valley floor.
5. These villages are Resim, Kabias, Kabarkinam, Kaptung, Kapkomur, Kaptul and Kapterik. They are referred to in this article as the 'Chemenengir villages'.

turrul water, the water becomes *kereb* or 'real water'; and during this time even those people who did not take part in the maintenance are eligible for water. *Kereb* continues until the next *kakukut konde*, when the cycle begins all over again. If one village is particularly desperate for water, it can appeal to the others to be given water first, in addition to its place in the normal cycle. This arrangement involves very careful discussion at the *kimwoi*. In order to qualify for extra water, there must have been a very good turnout for maintenance by that village. On the other hand, if two villages are particularly poorly represented, with few people contributing to the maintenance, they may be asked to share an allocation of *turrul* water.[6]

Once the allocation of water to each village has been agreed, each 24 hour period is further divided into three time categories: *tisho* (sometimes called *kekiti*), *toboi* and *lugon*. *Tisho* is afternoon/evening irrigation, from 2 or 3 pm to 11 pm, and from 11 am to 1 pm (the main period of irrigation is the evening, but there is an extra period in the morning to allow the farmer to make sure that all his field has been properly watered). *Toboi* is night irrigation, from 11 pm to 11 am. *Lugon* is a period of variable length, between *tisho* and *toboi*, when one village is taking the water over from another village. At this time, anyone can go and take water. Within the 24 hour allowance, each village divides the water among the clans (*kapkei*). For example, Kaptung Village has four clans, Kapsengech, Kapchebikech, Kapchoren and Kapchelal. They are divided into pairs, with two clans sharing *toboi* and two clans sharing *tisho*, so that all have water within the 24 hour period.

Each clan then decides how to divide the water among its members. It may divide it up among extended families, or allocate it to individual men. (As will be discussed below, women do not receive an allowance of water in their own right.) If there are four main extended families in a clan, the period when water is available will be split four ways, so that in a 12 hour period each extended family will have the water for 3 hours. Within this, the family must share it among themselves. In the past, it was often the case that members of an extended family (for example, the households of a father and married sons) would farm together in the same area. They could therefore arrange to

6. At the time of fieldwork, in 1992 and 1993, the Chemenengir villages had equal rights to water from the furrow. In the past, however, one village (Kapkomur) had only *kereb* water. According to local legend their ancestors played no part in building the furrow: the Kapkomur ancestor arrived after the other six ancestors had settled and built the furrow between them. The Kapkomur ancestor was invited by a Kaptul man to stay on as a servant. He stayed, bought his own land and lived between Kaptul and Kaptung villages, but had no rights to *turrul* water. About six years ago, the Kapkomur men called all the Chemenengir villagers together and gave them large amounts of food and drink. When the Chemenengir villagers were all well fed, the Kapkomur appealed to them and asked to be allowed to use *turrul* water. Having eaten all the Kapkomur people's food, the others could not refuse the request, and agreed that access to *turrul* water would be granted for five years. By 1992 there were murmurs that this agreement was long past, and that Kapkomur should revert to getting only *kereb* water.

direct the water to their fields and irrigate together, thus concentrating flows in the same furrow for longer, reducing transmission losses and minimizing changeover time. However, many people (both married and unmarried sons, and women) are now farming independently and it is quite normal for water also to be given to individual men who request it. They might justify their application for water by arguing that they have not had water allocated to them very recently. In this way, a farmer with a very large field may be allocated a whole night irrigation period (*toboi*).

Water distribution at this clan level is decided through meetings, still called *kimwoi*, but often very informal and impromptu affairs. Allocation is constantly being negotiated. Everyone knows what everyone else is growing, how much water they need, how much water they have been allocated in the recent past, how much maintenance they carried out and what other community work they have done (in other words, how much they deserve: people who work hard are thought of favourably). Decisions about water allocation are hotly debated. It is worth noting that if there are few men in a *kapkei* then they will have more water each, and that the formal rules of allocation in no sense achieve equality of distribution between clans, let alone amongst individuals.

A major equalizing feature of the formal rules is the *lugon* period, during which, in theory, anyone can take water. The actual availability of water to an individual farmer, however, depends on how many other people are trying to use it as well; people with plots near the main furrow, and especially those with land near its head (top-enders), have easier access to the water, giving them a natural advantage during the *lugon* period over tailenders. However, analysis of questionnaire data indicates that there is no systematic imbalance between the water share of top-enders and tail-enders.

Other factors are more important in determining the amount of water received, such as the size of the extended family, success in arguing for a larger share at the *kimwoi*, and the ability to influence other irrigators. Residential location is also important; many farmers live on the escarpment, some distance from their fields (cf. Critchley, 1983; Moore, 1986). The people of Resim Village, for example, live at least 10 km from their fields and the Chemenengir furrow, and say that it is not worth their while to walk all that way on the off-chance that they will be able to have water for a single hour. The labour involved in making use of *lugon* water is also a factor. Even farmers with land nearer to their homes say that it is not worth having to search around to find the water (which might be running in another sub-furrow some distance away) and redirect it to their land for just one hour. At the time of fieldwork, in 1992 and 1993, there was some confusion over the *lugon*. Because of fear of Pokot cattle raids, people were reluctant to stay on their farms at night. As a result, the change-over between villages was being hurried, so that as much irrigation could be carried out during the daytime as possible. The *lugon* period was thus being squeezed.

One person has unique rights to water — the furrow man. In return for his work at the intake to control flows in the furrow, and for doing running

repairs, he is given two whole days of furrow water to himself. Nobody else is allowed to use water at this time, although he is free to sell it to people who are in need of water. The post of furrow man is both honourable and useful, because of the water rights attached to it. Most furrow men therefore work fairly conscientiously, so that they might be elected for another year.

GENDER AND WATER ALLOCATION

It is clear that there is a pattern to the way water is allocated, and that distribution is fairly flexible and open to the varying needs of farmers in the community. However, the apparent completeness of the provisions for the allocation of irrigation water is an illusion, since women lack primary water rights. Women obtain usufructuary rights to land under various circumstances (notably on marriage, Moore, 1986), but the organization and regulation of water use is sanctioned by cultural taboos which mean that women live under a very different regime of access to water than men.

Women are not allowed to take part in any work connected with the irrigation furrows, the general maintenance, the control of the water level at the intake, or the diverting of water onto the crops from the furrow. The reasons for this seem somewhat insubstantial. Some respondents said that it was because the work was too heavy for women, but this is clearly untrue, as women often carry out the heaviest work of actually spreading the irrigation water on the fields. The furrow maintenance work is mostly carried out communally, and is not physically (or technically) very difficult. However, women are not allowed either to go to the intake of the furrow or do this work.

Dubbel and de Kwaasteniet (1983) explored the taboo of women and furrows among the neighbouring Pokot at Wei-Wei. Women are forbidden to bathe in the furrows, and a woman who has given birth to twins, or had a breach birth, is not even allowed to touch the water in a furrow. Problems with the furrows, such as leakage or bank breakage, were blamed on women breaking the taboo. Marakwet women are not restricted to this extent, being, for example, permitted to bathe in furrows. However, there is a taboo about women working on the furrows, which is generally observed. Older women do occasionally divert water from furrows themselves; those interviewed explained this by saying that it was particularly young women who could not work with the furrows (some said that there was a fear that their breast milk would mix with the irrigation water), but that once they were beyond child-bearing age this was no longer a problem.

Whatever the symbolic element, the practical result is that women cannot play a part in communal repair work on the furrow. Since primary rights to irrigation water are allocated through such work, a woman is therefore only able to obtain this water through her husband, other male family members (e.g. a grown-up son), or another man willing to work on the furrow on her

behalf (probably for cash payment). In the past this might not have mattered greatly, since a woman would usually have been able to call on male labour within the family for water for her own fields. However, in recent years there has been an increase in the number of female household heads. These include widows (who have probably always been among the poorest of the community), wives whose husbands have migrated to the highlands and nearby urban areas to work (sometimes for years at a time), and women who have had children without being married. In recent years, with the lack of contraceptives and family planning, the number of unmarried mothers has increased, with both local and immigrant men fathering children outside (or before) marriage.

Some of these women may still be able to live in the same household as their parents, but not all. If they do not live with male relatives, it is extremely difficult for them, not only to obtain irrigation water, but also to do all the farm-work themselves (particularly fencing, land clearance and bird-scaring). The only alternative for a female household head is to employ people to carry out some work for her, particularly the 'male' tasks of canal maintenance. She may also employ other women to help her with weeding and other agricultural tasks. Women usually have other female kin around, and they can help each other with weeding; a woman on her own may not have these resources.

In addition to widows and unmarried women, there are also a number of what Roberts (1996: 227) calls '*de-facto* female-headed households'. These are married women whose husbands are absent for most of the year while engaged in off-farm work. Roberts points out that this is more common in villages above the escarpment than those in the less accessible areas of the escarpment or the flood of the Kerio Valley, but, as Dubbel and de Kwaasteniet (1983) suggest, the phenomena has been established for many decades. Our data suggest that this is a recognized and growing feature of life in the Kerio Valley. Those women whose husbands have well-paid jobs, and who send money home, may be able to operate effectively as farmers and irrigators within a cash economy. Those who do not receive such remittances are in a much less favourable position.

Interviews with female household heads show that some can pay for water. One informant (C), whose husband is away but who sends her money every month, pays someone to find and buy water for her whenever she needs it. However, others are quite unable to obtain irrigation water, and some widows have given up irrigated farming altogether, relying instead on millet grown on rainfed farms high on the escarpment. One informant (A) found that even when she obtained a share of irrigation water, men who were also in need of irrigation water would come and put pressure on her to give them some of her share. Other women are able to obtain some water, but never without considerable effort and cost. Several simply ask for water from neighbouring farmers. One widow (informant B) has nobody who can go for maintenance for her, and lives in an area quite far from the other members of

her village, so they cannot help her when it is their turn. She can only get water occasionally by asking people from another village, farming close by. Another widow (informant D) also obtains water from neighbouring farmers, but also helps herself to water from one of the main furrows that runs near her field during *lugon*.

Some women do obtain water in effective quantities, but even for them, access is haphazard and dependent on various men. An older widow (informant H) has boys at primary school whom she sends for maintenance. She is allocated water which she herself diverts onto her fields from the main furrow, at night. She says she is not afraid of breaking the taboo. Another widow (informant E) lives with an unmarried adult son who can go for maintenance for her. Unfortunately, he is not always around, and so she cannot get water all the time. She chooses to grow sorghum, which does not need much water. Informant F's husband is away, working: she can only irrigate when her husband is around to divert the water from the furrow for her. He is rarely present when the men are called for maintenance, so they have to wait until all those who went for maintenance have finished before they can take some water. Interestingly, two women were among those who received the largest allocation of water. These are both women who have husbands working in towns, and who send money. They also receive a lot of support from their husbands' families. They have fields next to furrows and pay people to irrigate for them. One of them pays someone to go for maintenance for her; in the other case, the woman's husband's brother, a well respected and employed man, goes for her.

Clearly women can and do get access to water for irrigation. One method that is assuming increasing importance is through cash payments, either for labourers to do furrow maintenance on the woman's behalf, or simply to purchase water. Female-headed households also need money to pay for farm labour, as well as for the costs that all households face, such as providing children with clothes and paying school fees. The main source of cash for women is by brewing and selling millet or maize beer (*buzaa*). Whereas the brewing of honey beer (*kipketin*) by men is long-established, extensive brewing of *buzaa* by women is relatively recent, and on the increase. It has become an important feature of the economy of many female-headed households, and also has an impact on irrigation: there is now a lot more alcohol available on the escarpment than there used to be, and this adversely affects the ability and willingness of some men to work on furrow maintenance, and their enthusiasm for intensive irrigation work more generally. These changes compound the problems of urban aspirations among young men, and increasing male out-migration, and have significant implications for the sustainability of the irrigation system (Watson et al., forthcoming). There is an important gender dimension to these changes.

Apart from the gender division in access to water, it is worth noting that some men also do not get a share of water allocated. In the 1992 survey ($n = 70$), 10 men said they did not obtain a share of the irrigation water. This

was mostly because of their age. One man claimed to be too old to farm, and four other older men prefer to farm on the escarpment only, where they could obtain a reasonable yield of millet without the labour input required by irrigation. One man claimed not to use water at all, but he had recently been involved in an incident during which he had attacked and injured someone who was stealing his water. He was still irrigating, but obviously did not want to discuss anything to do with irrigation in case he was questioned about the fight.

WORKING RULES AND WATER ALLOCATION

The structural weakness of the position of women in obtaining irrigation water reveals an important dimension of the formal rules of water allocation. The ability of women to circumvent these rules to get water demonstrates the importance of the 'working rules' of the system: there is a complex pattern of social norms and practices that affect actual patterns of water distribution. It is common for both men and women to get their irrigation water through means that are quite distinct from those implied by the formal allocation rules.

In the 1992 survey of users of the Chemenengir Furrow, only 16 per cent of the irrigators interviewed confined their use of water to that allocated to them by the *kimwoi*. This allocation was not always sufficient for their needs; 84 per cent of the sample who actively sought out extra water for their fields did so in a variety of ways. The most obvious source of such water, the 'free period' (*lugon*), was used by 29 per cent of respondents. This low figure reflects the fact that relatively few people had fields near enough to the furrow to be able to draw water during this period, as well as relating to the particular problems with Pokot cattle raids in 1992 and 1993.

By contrast, 62 per cent of respondents obtained extra water from allocations made at the *kimwoi* to other people. Such exchanges took two forms. In the first, a farmer might obtain water by offering labour in return, helping a neighbour with the work of field water application. This is an onerous and risky task, since irrigation is by wild flooding, fields can be steeply sloping, and are not divided into basins. As soon as irrigation is finished on the first farm, the water can be taken off to the helper's farm for the remainder of the allocated time. This is a fairly straightforward exchange of labour for water, and 31 per cent of respondents obtained water in this way. This form of exchange works because the donor often has water for more hours than it is needed at any one time; with help, water distribution within the field is completed more quickly, and with less risk of water getting out of control and causing erosion. It should be noted that 75 per cent of respondents interviewed in 1992 had help with irrigation, and 48 per cent of them paid for it. The benefits of sharing spare water were said to be considerable.

However, 31 per cent of farmers obtain water simply by requesting it from another. A farmer may plead for a share from a neighbour who has been allocated, or is going to be allocated, water. This form of exchange of water

now in return for a possible favour sometime in the future, is informal and by its very nature uncertain, and the water may or may not be given. The most important factor in determining the donor's decision seems to be the likelihood that the favour will be repaid. In such a small community, a person who does not reciprocate is well known. Interviews made it clear that if the supplicant is richer or more influential than the farmer with water, then the potential donor is more likely to agree because he might expect the favour to be repaid. However, there is also a strong tradition of mutual reliance, and joint farming operations between members of the same clan, so mutual aid is an integral part of normal relations. Furthermore, reciprocation may not just be in the form of water, but can be in help of any kind, and return favours are not necessarily simple or linear, but can involve more complex relations between individuals. Networks of exchange penetrate all aspects of life, and the community is able to pay school fees and hospital fees through such mutual reliance. However, social and economic change are starting to affect the basis of this kind of informal co-operation and exchange (Dietz, 1991; Dubbel and de Kwaastiniet, 1983; Roberts, 1996). Inequality is increasing, and introducing a new element of competition into agricultural relations (Watson et al., forthcoming).

In addition to informal exchange, it is now common for someone with money simply to purchase water from another farmer who has been allocated water from the *kimwoi*: 60 per cent of respondents reported that they had bought water from another farmer at one time or another. In many cases the purchaser also paid for that farmer to do the irrigation. As noted above, this is a particularly important means by which female household heads obtain water. Many farmers need money for school fees or hospital bills, or to buy consumables such as salt, sugar or beer. Those farmers who sell crops, and are relatively rich, usually have no problem persuading a more subsistence-oriented farmer to sell water. Increasingly, money is allowing people to hire good land near to a furrow, and the hiring arrangement includes access to water, as long as maintenance is carried out.

Finally, farmers also obtain water by theft, or diverting it from a furrow against all formal rules and without prior arrangement or agreement with the person to whom it is allocated. Although only 9 per cent of those interviewed in 1992 admitted to taking water in this way from the furrow, this is likely to be a gross underestimate. Fully 40 per cent of respondents claimed to have had their own water stolen at one time or another (18 per cent said that water of theirs had been stolen in 1991, 11 per cent had had water stolen in 1992), and 45 per cent claimed to have seen others stealing water. It is obviously very difficult to assess the number of people stealing water, or how common it is, because it is a sensitive matter. People do not like admitting to stealing, and some respondents were also reluctant to admit that their water was taken. The practice of diverting small amounts of water from a furrow into a field is certainly widespread, although the theft of large amounts of water is probably not common.

Theft of water is a matter subject to formal rules (Ssennyonga, 1983). Sanctions controlling the every-day running of the irrigation furrow are enforced by the *kokwa*, a meeting of circumcised men. The composition of the meeting depends on the subject matter under discussion (see Moore, 1986). According to our observations, there is no 'official' ranking or discrimination of people by age at this meeting, as all circumcised men are taken to be equal. However, male elders are considered to be especially wise and experienced and their advice is often sought and listened to with respect. Women are not encouraged to attend these meetings, unless the subject particularly concerns them. When they do attend, they must remain seated even when speaking.

Interviews indicate the formal rule that someone reported to the *kokwa* for stealing water is required to pay a fine of a goat to the community (this is familiar from other East African furrow systems, such as Sonjo in Tanzania; see Adams et al., 1994; Gray, 1963). Nowadays, this fine is often paid in money, and the amount is extremely variable, up to about 250 Kenyan shillings.[7] Under formal rules, stealing water is viewed as anti-social behaviour, and in addition to this fine, the thief may experience rough treatment from his neighbours. In the past, the thief could be expected to be publicly shamed at meetings and ceremonies, for example, by being openly ridiculed in songs. Our Marakwet interviewees presented a consistent picture of the past, one in which formal rules were respected, and where such sanctions meant that the majority of people conformed most of the time, so that water theft was a rare event. In addition, the person whose water was stolen would be likely to seek personal — violent — vengeance. Many people were said to have died as a result of arguments over water, and the consensus of the community was that a water thief deserves everything he (or conceivably she) gets.

However, this account of the draconian effectiveness of formal rules is not the whole picture, for not all forms of water appropriation are considered anti-social or illegal. Many people obtain their water through 'leaks' in the furrow which may have been deliberately made. People take this water for household use and for livestock (it is sometimes referred to as 'goat-water'), but it is also used for irrigation, and this use is tolerated. In other words, a degree of 'stealing' is acceptable. It seems likely that the acceptability of taking or stealing water varies with the situation: when the need for water, and pressure on the resources, are low, then such appropriation is tolerated. When the need for water is high, for example after a long dry spell, then taking water out of turn can have extreme consequences for someone else who is relying on having the water; it is thus considered a severe transgression and extremely anti-social, and is likely to be punished.

There are also ways of avoiding fines, by only taking water from other members of your extended family. The *kokwa* has always been organized as a

7. In March 1993, there were 45.53 Kenyan Shillings to one US dollar.

meeting of extended families related to whatever problem has to be discussed. If someone is fined, it is up to the extended family to ensure that the fine is paid, usually by making a contribution themselves. Someone whose water is taken by a member of their own family will not, therefore, report them to the *kokwa*. The thief is, however, still in danger of being hurt physically.

Social change in the Kerio Valley is also affecting the 'traditional' authority of the *kokwa*, which is said to be less respected now than it used to be. Its authority has been undermined by young people with new values, orientated around formal education, money and town life, rather than the traditions of their forefathers. There are some who are happy to incur the wrath of the community by flaunting their taboos and pinching water. They do not care about any shame attached to particular acts, and manage to trick their way out of paying fines.

CONCLUSIONS

The allocation of irrigation water in Marakwet is organized collectively through the local kinship and territorial organizations such as the *kor*, the *kapkei* and the household. The formal rules of water allocation are sanctioned by Marakwet beliefs and taboos. Water is distributed to all farmers of the same *kor* or *kapkei* who comply with set conditions (i.e. attend the communal maintenance). Water is not equitably shared: there are fundamental structural imbalances between the access of men and women to water, while the availability of water to men of different villages and clans, and to those with fields near the furrow and farther away from it, can vary considerably. None the less, the formal rules of water allocation can be written down relatively simply, and it would be easy to conclude that there is an 'indigenous management system' in place that is effective and unproblematic.

However, behind the formal system there is a complex network of exchanges between farmers that generate water allocation solutions according to quite different 'working rules'. Water is shared, sold and stolen. Through such means, women are able to obtain water despite a lack of a formal allowance in their own right, and men are able to adjust the timing and size of their allowance to fit their needs. In some ways these activities make the allocation of water more equal, by providing means for those with limited rights (particularly women) to obtain more water, and in some instances they certainly make it more flexible.

It is in this area of informal working rules that social and economic changes are chiefly influencing the Marakwet irrigation system. Changes in attitudes to valley life and farm work, awareness of economic opportunities outside the valley, and changing views of traditional structures of authority are having a significant effect. Religion, cash cropping and wage labour are influencing the way men undertake irrigation work, as are the social changes

consequent on the increase in female-headed households and the rise of millet beer brewing. Irrigation water is becoming a commodity, subject to cash-based exchange relations rather than collective allocation. Those who have money are able to bypass the system of formal rules and obtain water from anyone who is willing to part with it. The future sustainability of the Marakwet irrigation system depends critically on the evolution of the working rules. Understanding of the 'informal' (and even the 'illegal') system of water allocation is vital if the impact of contemporary changes upon it are to be understood.

The complexity and flexibility of the 'working rules' of water allocation in Marakwet suggests that it may not be entirely feasible, either practically or theoretically, to say how an irrigation system 'really works' (cf. Hunt and Hunt, 1976). At the margins, formal and working rules blend into the reciprocities and interactions of social life, rather than existing as an abstract 'management system'. This has obvious implications for agencies interested in intervening in farmer-managed irrigation systems, to 'rehabilitate' or otherwise change them (cf. Adams et al., 1994). Great care is needed before the results of social science research into indigenous irrigation systems are used to inform policy. Although farmer-managed irrigation systems now constitute a major theme of socio-economic research and donor agency policy interest in sub-Saharan Africa, as elsewhere, interventions into indigenous irrigation systems are unlikely to yield positive and predictable results unless they are based on a great deal of insight into the very many and diverse levels at which these irrigation systems work. Indeed, the FMIS approach to indigenous irrigation systems can itself be problematic (Funnel, 1994). Vincent (1995) points out that external interventions are not always the optimal tool for transforming the livelihoods of hill irrigators.

Social science research has much to contribute to the process of development in irrigating communities, although the research needed must be subtle, and some will be time consuming and costly. It must also be participatory, as Edwards emphasizes: 'we cannot change the world successfully unless we understand the way it works; but neither can we understand the world fully unless we are involved in some way with the processes that change it' (Edwards, 1989: 124–5). Insiders' knowledge of and ideas about water needs and water management must be placed at the centre of attempts to engage with farmer-managed irrigation systems (cf. IIMI, 1987; Uphoff, 1986; Vincent, 1995; Yoder and Thurston, 1990).

Participatory approaches can contribute significantly to prospects for sustainable livelihoods for irrigating communities, not least because they offer the chance of improving communications between farmers and development agents (Vincent, 1992). Diemer and Vincent (1992: 152) call for a 'transformation of current attitudes in technical assistance and reform of training' in irrigation planning in Africa. Recognition of the complexity of the formal and working rules governing water use need to be fundamental features of that transformation.

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