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Land-Water Interactions: Opportunities and Threats to Water Entitlements of the Poor in Africa for Productive Use

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1. INTRODUCTION

Rising population, economic development and resource depletion, including climate change, threaten access by the poor to water for direct consumption and for productive use. Drawing on examples from across the African continent, this paper examines the effects of development interventions that have separated and conflated the land and water rights of poor producers. Negative outcomes have resulted from the failure of governments and donors to appreciate the vulnerability of poor people to the loss of their water entitlements, arising from sheer neglect, the dysfunctional design of development interventions and the privatisation of group-based property rights by the powerful.

The African land mass is about 30 million square kilometres, of which 7 million (23 percent) are arid, 13 million (43 percent) are semi-arid, and 10 million (34 percent) are sub humid or humid. The main focus of this paper is on land-water interactions in the two thirds of Africa comprising the arid and semi-arid areas, where, for much of the year and in the absence of adequate rainfall, crop and livestock production are possible only with the aid of lifting and hydraulic structures (wells, pumps, reservoirs, dams, diversion weirs etc.) or with the carefully managed use of available natural water sources (streams, rivers, ponds, pans etc.). Two broad production systems are thus considered: irrigated agriculture for crop and livestock production, and pastoralist systems (extensive livestock production).

In terms of quantity, irrigated production systems are by far the biggest consumers of water. In rural areas of semi-arid Africa, for example, a good water supply for domestic and livestock use will be a very inadequate supply for irrigation; if all the water consumed in a month by a rural community of 1000 people with 250 cattle and 500 sheep and goats were used for irrigation, it would be adequate for only two irrigations a month to about a quarter of a hectare of annual crops (e.g. maize, cotton, groundnuts).

People can be 'water poor' - in the sense of not having sufficient water for their needs - because the physical infrastructure is ill developed, or because water is unavailable or limited in quantity for other reasons, and/or because of loss of entitlements as a result of policies outside their control. Water poverty can also be related to loss of water entitlements in the different production systems (irrigated agriculture and pastoralism) that are linked to broader sets of property rights regulating people's access to land and water. In very general terms these can be characterised as weak group-based rights to land and water for pastoralists, based almost exclusively on unwritten traditional or customary law (Niamir-Fuller 1990), and relatively stronger individually-based rights for irrigators, which are also sometimes informal in nature but are more commonly rooted in statutory law. Changes to land and water rights over time may contribute to water poverty, as a result of, for example, the differing origins and evolution of customary and statutory law, and of changes in government policies and conditions of access (as influenced by broader socio-economic, political and environmental change). In turn, these factors affect both the equity of access to and control of land and water and the sustainability of their use.

The planning and execution of land and water policies, and the laws governing land and water allocation and use, are almost universally poorly administered across Africa. Public institutions are typically over-centralised, inaccessible, rent-seeking, corrupt and arbitrary (Okoth-Ogendo 2000). Arrangements for the resolution of disputes over land and water rights and for hearing appeals against administrative decisions are inadequate. Land and water management functions are poorly funded, executed and largely ignored. Equitable resource allocation in both sectors has therefore proved very difficult, each in its own way. The challenge now is to harmonize land and water allocation and use in order to obtain integrated management of these resources and secure the livelihoods of the poor. Many African countries have adopted formal land and water policies influenced by the emerging international consensus. But there have so far been few examples of successful implementation. What now are the most promising entry points, and what worthwhile initiatives can be identified?

In seeking policy options to meet these challenges, the paper reviews the nature of the resources concerned, the principles and evolution of land and water rights in irrigated and pastoral systems (covering both customary and statutory rights), the administration and management of land and water rights and, finally, suggests policies which might contribute to more equitable, productive and sustainable water use, and to future water developments that offer opportunities rather than threats to the poor. The issues relating to land-water interactions are illustrated throughout with examples drawn from across the region. These examples are to be found in the appendices to this report.

2. RESOURCE CHARACTERISTICS AND CONSTRAINTS

2.1. Irrigation Resources

Irrigated agriculture is ill-developed over most of Africa and average water withdrawals per head of population are well below those in other continents. Formal irrigation is concentrated in the lower Nile Valley (Egypt and Sudan), other arid and semi-arid areas of Northern Africa (Morocco, Algeria, Libya and Tunisia), and in South Africa and Madagascar. Together, these eight countries account for about 85 percent of the presently irrigated land, with the balance (15 percent) distributed sporadically across the other 45 countries on the continent (FAO 2006). At the risk of over-generalisation, we outline the major characteristics and constraints of the three most important irrigation contexts in turn, respectively those of: (i) the lower Nile Valley, (ii) the arid and semi-arid regions where formal irrigation is firmly established, and (iii) the (predominantly) semi-arid regions where irrigation has still to be successful.

Egypt (27.5 percent) and Sudan (14 percent) together account for more than 40 percent of the total area under irrigation in Africa. Irrigation in the lower Nile Valley is of ancient provenance, with cultivation dependent on the annual Nile flood. In Egypt, rights to use water are intrinsic to the conditions of land tenure (given the very limited productive value of arid land without water), and in the old lands ancient customary water rights have been incorporated into what are essentially all now private rights to land (Appendix 1). In Sudan, during the colonial era large-scale irrigation was established on land which had

limited alternative agro-pastoral use, and new forms of land ownership and rights evolved (Appendix 2). Although this was not without consequences for groups such as pastoralists and women (Appendix 3), the financial returns were large and unambiguous, management was effective and, with intensive irrigation secured by storage dams or the use of pumps, and relatively abundant water resources and fertile soils, these investments in capital works have generally proved durable. As in the traditional riverine areas of Egypt, rights to water in Sudan are now closely linked to those to land.

A somewhat comparable situation has evolved in other arid and semi-arid regions of both northern and southern Africa where formal irrigation has taken root. Well-managed irrigation supporting intensive crop production gives such high returns relative to any alternative agricultural use of land that it has frequently overwhelmed local customary rights, with rights of access to water having become largely determined by either land ownership or occupation of land within irrigation schemes. However, in contrast to the Nile Valley, water resources are often limited relative to the land area commanded. In water-scarce, closed river basins, available resources may be almost fully developed through a combination of public and private initiatives.¹ Expanding populations, economic growth and the needs of the environment are putting pressure on the water available to agriculture. Declining water tables, pre-emption of supplies by rich commercial farmers and water shortages experienced by land holders at the end of water distribution channels ('tail-end problems') undermine the water security of weaker and more vulnerable farmers in ways that neither government regulation nor community action have so far been able to adequately address. At critical times of the year, farmers within irrigation schemes cannot always be certain that they will receive the supply they expect on the basis of prior or established use, as their rights are eroded by a combination of declining supplies and changes in power relations within the scheme management.

It is in the vast semi-arid regions of Africa where formal irrigation has still to be successful that the most complex difficulties and conflicts around land and water arise. It is commonly said that there is large potential for irrigation in these areas, given unexploited water in the rivers. But irrigation can be very costly and water variability and seasonal scarcity often provide an inadequate basis for profitable investment. Moreover, rainfall during the wet season already supports long-established communities based on alternative patterns of land use, exploiting rivers and wetlands in numerous different ways, including local techniques of furrow and falling-flood irrigation. These communities have evolved coping strategies for surviving through the dry season that are reflected in customary and informal arrangements that are difficult if not impossible to incorporate in formal irrigation design (Appendices 4 and 5). Such arrangements are themselves typically dynamic, as individuals and communities respond continuously to the incentives and opportunities that they encounter; this dynamism is not without tensions, but the imposition of modern forms of irrigation can be particularly counterproductive. If the economic justification for investment is unambiguous, some sacrifice of traditional arrangements and values may be a necessary consequence. But if,

¹ A closed basin is one where the water is fully committed: little or no water reaches the sea other than discharges for environmental purposes and further irrigation development is conditional on reallocation of irrigation supply.

as is often the case, the economic justification for major new irrigation development is itself questionable, then there will be no grounds for undermining customary systems that have proven adaptable to the needs and capacities of the existing populations – both settled and nomadic.

2.2. Pastoral Resources

In contrast to irrigated agriculture, pastoralist systems are more entrenched and widespread; their adaptability to highly variable environmental conditions makes extensive livestock production one of the most appropriate types of land use in the arid and semi-arid regions of Africa.² In the Sahel, the Horn and East Africa, herds of camels and cattle and flocks of sheep and goats (very often mixed herds and flocks) are close herded by nomadic and semi-nomadic pastoralists and (on smaller orbits) by agro-pastoralists from one location to another as they track the seasonal availability of water, grazing and browse. In nomadic pastoralism herds and families are extremely mobile and crop cultivation plays, at most, a minor role; in semi-nomadic pastoralism mobility is on a smaller scale (involving not all people) and livestock husbandry retains social primacy although crop cultivation may be of equal importance to livelihoods; in agro-pastoralism crop cultivation usually takes precedence in terms of both income generation and the allocation of household labour and, although livestock remain socially important, herd mobility may be quite limited – see Sandford (1983) for a more detailed elaboration. In all three systems, key pastoral resources are reserved for particular times of the year, for example in the early rains when there is a flush of nutritious annual grasses on the desert margins and rain water is lying in pools on the surface, and in the late dry season when animals are tied to perennial water sources. The greatest competition for pastoral resources is at the height of the dry season when both water and fodder are scarce. At this time of the year, competition for land and water between different pastoral groups, and between pastoralists and settled agriculturalists is intense; it is generally the pastoralists who tend to come off worse (Appendices 6 and 7).

In Southern Africa close herding of animals on communal land is now practiced only by small groups of agro-pastoralists. For example, in the communal areas of Botswana (Appendix 8) and Namibia, transhumance in the wet season has been increasingly curtailed over the last four decades by the enclosure of the range by commercial interests. For local stock keepers, the normal livelihood mode is now a sedentary one in which animals (unattended by herders) move out daily to pasture from a central ‘cattlepost’ (usually a pumped well and storage tank), to which they return at nightfall for watering and protection in a kraal.

Both north and south of the equator, livestock on arid and semi-arid communal land are now more often coming under stress at the end of the long dry season as a result of rising

² In terms of the UNDP human-development index 2005, 10 of the 32 ‘low-human-development’ countries in the world are African countries with large areas of semi-arid land. Measures of economic performance and human welfare in the semi-arid countries south of the Sahara (i.e. Burkina Faso, the Central African Republic, Chad, Eritrea, Ethiopia, Kenya, Mali, Niger, Senegal, Sudan and Tanzania) reflect the poverty and vulnerability of their large populations of nomadic and semi-nomadic pastoralists and agro-pastoralists.

population, climate change and development pressures (particularly rangeland enclosure). Distances are at a maximum between watering points and the remaining grazing and browse; so also are daytime temperatures. Stephen Sandford (1983), in describing traditional strategies to overcome dry-season scarcity of resources, observes that the conservation of water and grazing at fall-back water points in most grazing areas of tropical Africa where group-based forms of land tenure prevail is beyond the control of the individual stock keeper:

“There is seldom a formal policy imposed by a society's rules, formally agreed on by a community or decreed by a legitimate authority, with community-imposed rewards and sanctions for compliance”.

Resource conservation is thus external to the management strategies of the individual pastoralist, and sometimes also beyond the capacity of the wider group. There is a parallel here with the growing water insecurity on irrigation schemes at critical times of year. In the worst-case scenario, which is currently visited upon the Horn and East Africa, drought results in the decimation of herds and flocks and the impoverishment of their owners.

As Nathalie Gomes (2005, p. 42), based on field evidence from Kenya, Ethiopia and Somalia, concludes:

“Pastoralist livelihoods have always been exposed to the vagaries of climate and harsh environmental conditions. However, in recent years, pastoralists have faced increasing competition for water and pastures in a context of decreased rangeland access.”

The drought fall-back security of agro-pastoralists is deteriorating as more wetland ecosystems along river banks and lakeshores are eroded, as a result, for example, of irrigation development in Somalia (Appendix 5) and demographic pressure combined with climate change (as around Lake Chad). Dam construction poses a further problem, as seen in the case of the River Turkwel hydroelectric dam in Kenya: a third of the Turkana people are dependent, particularly in times of drought, upon a downstream riverine forest served by periodic river flow, and serious concerns have been raised that the dam will destroy their ability to keep livestock, thus forcing them to depend upon food aid (Adams 1992, Hawley 2003). Finally there is a major issue of increasing settlement around dry season wells following the installation of government boreholes and power-driven pumps, which have had a tendency to change grazing and water resources from controlled access to open access (Appendices 5 and 6, and see Thébaud and Batterbury 2001).

3. PRINCIPLES AND EVOLUTION OF LAND AND WATER RIGHTS

3.1. Irrigation Rights

Meinzen-Dick and Di Gregario (2004) propose that property rights are best understood as an overlapping ‘bundle’ of rights, limited not just to use and ownership but also covering ‘control or decision-making’ rights, and they emphasise that there are multiple sources of

property rights. However, colonisation introduced a specific legal dualism to African land rights: the colonial powers imported systems of common and statute law for their own purposes, which they operated alongside existing customary practices. Post colonial states initially maintained this legal dualism: customary law prevailed in some areas of independent African countries' geographical and social space, while statute law and imported common law prevailed in others (Adams and Turner 2005).

With important qualifications, comparable issues also arise in relation to water rights. While land rights can be vested directly in a 'legal person' (an individual, a group, a company, a trust, etc.), a water right in statute law is a legal right to divert and/or impound and use water from a natural source (Hodgson 2004). Typically in irrigation schemes this water right is vested in the scheme's management; the water rights of the individual farmer are subsidiary and derive from ownership of or use of land within the irrigation scheme. The enjoyment of this subsidiary right then depends on the effectiveness of the scheme management; the unpredictable characteristics of water resources require continuing active management if water rights are to be delivered and, even then, water security cannot always be guaranteed (a fact recognised in all irrigation water supply agreements). Moreover, if an individual diverts water directly from a natural source, the individual right is conditional on water of the required quality and quantity being available and thus is also dependent on management of the resource at the basin level.

In the lower Nile Valley, irrigated land long ago acquired the characteristics of relatively secure private tenancies with subsidiary rights to an equitable share of the water diverted by the scheme manager (Appendices 1 and 2). Given also the certainty provided by assured and relatively abundant water supplies, and thus the relative ease of resource and scheme management, statute law has generally prevailed and the main issues in relation to the overall 'bundle' of rights have concerned associated 'control or decision-making' rights. Both in Egypt (at least after 1952) and, especially, in Sudan (under tenancy terms) the rights of farmers were heavily circumscribed with, for example: limitations as to crop choice; imposition of a fixed irrigation service; centralised maintenance of the water distribution system; and constraints on the transfer of land rights. Over time, and to differing degrees, the two governments have sought to ease restrictions so as to allow farmers to respond to market forces and to shift responsibilities for lower-level irrigation operations to water user associations – WUAs (Vermillion 2004). The impacts on production, system performance, financing and equity have differed (Appendices 1 and 2). The main challenge is to preserve relatively secure land and associated water use rights while strengthening and regulating farmer 'control or decision-making' rights in ways that promote sustainable and equitable development.

Similar trends have characterised established irrigation in the closed or closing river basins of northern and southern Africa, but with the added complication that water constraints are intensifying and, in South Africa, there is a political imperative to redistribute past land and subsidiary water rights to the previously disadvantaged black majority. Again, statutory law has in general prevailed but the challenge is greater than in the lower Nile Valley since transfer of 'control or decision-making' rights to farmers and farmer organisations is threatened by increasing water shortages and, in South Africa,

rising tenure insecurity. Moreover, even if land ownership is secure, there can be a sharp decline in land values as irrigation supplies become less certain. Strengthened management of the resource and/or irrigation scheme can offset these problems, but only to a limited degree. Another strategy is that made possible by the South African National Water Act, 1998, which has transformed the way water is controlled from a system of rights based on land ownership (the ‘riparian system’) to one designed to allocate water equitably in the public interest (Republic of South Africa 2004). Such an approach has had some success in Australia, Chile, and the USA, but it has yet to be demonstrated whether it will be adequately regulated in South Africa.

In well established irrigation schemes, statutory rights to irrigated land and subsidiary water rights have usually overwhelmed prior informal or customary practices and entitlements. In contrast, over wide regions of Africa, legal dualism persists and different sets of rights remain active and contentious. Tanzania can be taken as representative (Appendix 9). Typically, colonial regimes acting in the interests of expatriate investors seeking security of land ownership and dry season flows, or independent governments seeking ‘modern’ approaches to land and water management, introduced rights derived from the civil law or common law traditions of Europe. Modern water laws seek to formalise access to water through a permit system, perhaps initially confined to specific water bodies but subsequently generalised throughout the country. Exemption of *de minimis* water use is invariably provided, and there may be in-principle recognition of customary access rights. But the onus is typically placed on formal application and the payment of fees. Not only may informal users be unwilling to apply or pay for what they consider to be their inherent right to water, but they may fundamentally question the legitimacy of the formal system; indeed, it may lie beyond their cultural experience and understanding. As the formal permit system is progressively enforced, the two – or more – sources of legitimacy thus come increasingly into conflict.

Land and associated water sources have an important spiritual value for many African people: land is not merely a factor of production but is first and foremost the medium which defines and binds social and spiritual relations, within and across generations. This cultural attachment to land typically proves resilient and competition for resources is dynamic and sustained. A customary right to use and divert water is regarded as inherent in the land itself. The government may seek to develop the institutions – organisations and procedures – necessary for enforcing a modern rights approach, but these may be ignored or resisted. Small-scale furrow irrigation is, for instance, developed irrespective of formal rights, and informal agreements for sharing low flows between neighbouring furrows and with domestic users persist in the face of formal rights that may give legal preference to large-scale irrigation and other modern uses (Appendix 4).

Recognising informal/customary rights within formal rights legislation is no easy matter, and is further complicated when governments also seek to promote market responses and/or shift irrigation responsibilities to WUAs, that is, when the full ‘bundle’ of rights is taken into account (Vermillion 2004). This calls for caution in the further development of large-scale irrigation where this impacts on customary rights. It also suggests that the primary focus of governments should be on strengthening the management of the overall

resource and of irrigation where it is established (recognising customary rights to the extent that this proves feasible), rather than imposing rigid water rights (permit) legislation on small-scale users.

3.2. *Pastoral Rights*

The vulnerability of pastoralists' land and water rights in the arid and semi-arid savannas of Africa is rooted in the colonial era and the dominance of received statutory law. With the possible exception of hunter-gatherers, nomadic and semi-nomadic pastoralists and agro-pastoralists have probably suffered greater insecurity of tenure than any other land users. Initially, under the colonial-era policy of indirect rule, pastoralists occupying marginal land were left to their own devices. The official position of the British was that customary land rights should be respected, including the traditional land administration responsibilities of local leaders, and similar principles applied in Francophone countries. Tenure arrangements in pastoral areas thus remained largely intact during the colonial period and for some years after.

For example, in Sudan, from the early years of the Anglo-Egyptian Condominium until 1970, a grazer was free to use pasture and free-standing water in any part of his tribal area. Since this area often covered ten thousand square kilometres or more, there was considerable flexibility in the face of low and uncertain rainfall. Boundaries between tribes were defined by the Condominium government and could be crossed only after agreement between the tribes involved. The tribal leaders were charged with arbitration, enforcement of grazing regulations and inter-tribal agreements (Adams 1982). The subsequent breakdown of governance in Darfur was in part a result of a collapse in the local management of land and water resources, firstly on the part of traditional leaders and then that of the 'People's Local Government' (Appendix 7).

Under statutory law, the land and water rights of pastoralists in Africa have generally been ignored. In Sudan, for example, the Titles to Land Ordinance, 1899 recognised only the very small area of continuously cultivated and irrigable riverine land as private property and excluded from registration the vast areas of semi desert and savannah used by pastoralists. These areas were classified as government owned and either (i) subject to no right, or (ii) subject to usufruct rights of tribes. As elsewhere in Africa, usufruct rights were extinguished by government when it wished to set aside land for agricultural production schemes, both public and private (nomadism being regarded as a sociological problem and a threat to both sustainable land use and national security). In the Nile basin, extensive areas of traditional grazing land were ploughed up for large-scale rain-fed sorghum production and for irrigated wheat, cotton and groundnuts, a programme which began before independence (Shazali and Ahmed 1999).

Mid 20th century studies of customary land tenure in Africa revealed important variations in tenure arrangements between the different territories, reflecting the ethnic origin of the population and the prevailing land use systems – and varying particularly between sedentary and migratory systems of land use. One common characteristic, however, was the importance of community control over the means of subsistence, in order to achieve livelihood security and social continuity. Entitlements were retained as a result of the

performance of reciprocal obligations in the community, but communal rights transcended those of individuals and their immediate relatives - a view which was not lost on the colonial government of the day. Indeed, the legal opinion of the Privy Council in 1921 was that African customary tenure admitted no individual property. This became a convenient tool for colonial administrations. Customary land was thenceforth held in trust by the colonial power and designated 'Crown Land', 'Native Reserve' or 'Trust Land'. On attaining independence African governments have held on to this colonial principle, and this has reduced the cost of acquiring customary land for public purposes (Adams and Turner, 2005).

For example, in Kenya, Section IX of the 1963 Constitution permits a modified and rather simplified form of land acquisition for Trust Land (i.e. communal land), referred to as 'setting apart', which may be activated by the Head of State (in effect the Commissioner of Lands) or by County Councils. The vesting of both the title and the control of Trust Land in county councils, coupled with the allocation of administrative control to the Commissioner of Lands, meant that customary land tenure principles were hardly ever respected (Republic of Kenya 2002). Over the years, large areas of land, especially wetlands, riverine areas and other key resource areas, have been set apart for all manner of dubious purposes, very often 'contrary to the provisions of the law' (Republic of Kenya 2004, p. 41).

Given the dominance of statutory law and state control over much of land traditionally used by pastoralists in Africa, it is somewhat academic to dwell upon the group-based principles by which they have traditionally managed their land and water resources. However, these customary arrangements have been well-researched and shown to be often very sophisticated (for example see Niamir-Fuller 1990). Of particular relevance to the present paper is the information on pastoralists' traditional strategies for overcoming shortages of water for livestock that has been brought together from numerous sources by Stephen Sandford (1983):

- The 'investment strategy' is to construct new water sources in water-deficit areas and/or invest in transport of water over comparatively short distances from water source to camp by donkey or camel
- The 'composition strategy' involves the balancing of appropriate species, age and sex composition of herds.
- The 'positioning and conservation strategy' involves two elements: the careful adjustment in space and time of the positions of different species and classes of livestock in relation to water supplies; and the conservation of the water and grazing at or around the most permanent and reliable water points ('fallback' or 'dry-season' water points).
- The 'husbandry strategy' refers to management practices engaged in by livestock owners in order to overcome water shortage, primarily selection of more drought-resistant breeding stock and management of the timing and frequency of drinking.

- Finally, and of most interest in relation to land-water interactions, is the ‘managing and controlling water points’ strategy, whereby ‘managing’ refers to the organization of watering activities and maintenance in such a way that the minimum of time and water is wasted, and ‘controlling’ refers to the regulation of access to a water source, and the restricting of access to the number of people or livestock for which the water and nearby grazing is adequate. The degree of management and control in different pastoral systems tends to vary with the scarcity of water, with the difficulty of extracting it, and/or with the amount of surrounding grass. Where human labour or other resources have been invested in the development of a water resource, then, even if water is not scarce, some nominal control of access is likely to prevail. Control of access to water usually only distinguishes persons with stronger or weaker claims to use a particular water point, and seldom, if ever, imposes formally regulated limits on water use, even in times of scarcity. However, informal limits may be imposed by the increased requirement in times of water scarcity for human labour to extract water and deliver it to livestock.

The ‘managing and controlling water points’ strategy requires a greater degree of coordination and organisation of effort between different individuals or groups than the others, and generally requires some kind of authority structure to ensure observance of the rules and settle disputes. When this strategy breaks down, whether under the impact of rising population, climate change and/or development pressures, the consequences can be devastating (Appendices 5, 6 and 7). This points to the importance of having sound, well-integrated and well-governed land and water rights administration and management.

4. LAND AND WATER RIGHTS ADMINISTRATION AND MANAGEMENT

Except perhaps in Egypt and Sudan where there is a long tradition of integration on the riverine land of the Nile, the administration and management of land and water rights tend to be poorly integrated in Africa. Two other possible exceptions are Rwanda and Uganda, in which responsibility for water, land and the environment are now vested in a single ministry.

4.1. Land Administration and Management

There are no universally agreed definitions of land administration and management. However, as used in this paper, ‘land administration’ refers to *the process of determining, recording and disseminating information about the tenure, value and use of land* (Williamson 2001). It is concerned with land survey, with the ‘incidents’ of land rights and the recording of land transactions, with land valuation, land registration and dispute resolution. ‘Land management’ refers to *the planning and regulation of land as a resource from an environmental and an economic perspective*. It relates to land use planning and/or physical planning, zoning, environmental protection measures and so on.

The land administration systems introduced by most colonial governments were very much influenced by the systems used in Europe – in France, Spain and Portugal – with the major exception of the land administration systems set up in British colonies, which were to a large extent influenced by the Torrens system that had been developed primarily for the colonisation of Australia and for the division of virgin land into parcels. However, the technical demands of most Torrens-influenced registration systems raise the survey cost beyond what is both necessary and affordable for rural African populations. Politicians and officials thus continue to use their discretionary power and influence over land allocation and revocation for political and personal advantage; landowners and land professionals often have vested interests in perpetuating the status quo.

In the former British colonies, the land administration work of departments of ‘lands and surveys’ almost exclusively focused on the survey and registration of land alienated in terms of the received law, and on topographical mapping and frontier delimitation and boundary marking. Colonial land ordinances conferred enormous powers on governments to grant non-African settlers land for agricultural development and for residential purposes in towns.

Following independence, few African countries have tried to expand the formal land registration system to areas under customary tenure, least of all the low value grazing land used by pastoralists. In practice, most sub-Saharan countries have faced tremendous difficulties even maintaining the formal registration system in areas where it is used. Most land ministries struggle to overcome backlogs of thousands of dispositions (applications for land leases, transfers of ownership, subdivisions, etc.). Land administration continues to be seen as a routine public administration function, neither skills-based nor distinguishable from the other functions ordinarily performed by public agencies. Personnel are often transferred across government departments, and hence have no job security by reason of the professional services they provide (Okoth-Ogendo 2002).

Formal land management (i.e. the regulation of land use) is very largely non-existent in Africa. Again, this is a colonial legacy. In the colonial period, if land management featured at all, it was geared to the planning of principal administrative centres, to purposeless rural land-use planning in rural areas by expatriate ‘experts’ (Dalal-Clayton 1991), and to the oversight and control of the ‘native reserves’. The record in this last-mentioned area has been most undistinguished. Okoth-Ogendo (2002, p. 7) points to:

“the disequilibrium of the commons as a social, cultural and economic system upon which the livelihoods of rural communities depend. That has arisen not only from the relocation of radical title to common property resources from communities to the State, but more seriously from the administrative interventions directed at the suppression of customary land law and indigenous technologies of production. This phenomenon is, arguably, at the root of under-development and poverty in much of rural Africa”.

Pre and post-independence, the concern of most authorities has not been “to design, prescribe, enforce and guarantee the integrity of performance standards in land resource

management” (Okoth-Ogendo (2002, p. 2), but to alienate and excise from the commons key resource areas vital to the survival of pastoralists at critical times of the year.

In sub-Saharan Africa over the past decade, most countries have been engaged – at various levels of detail – in evaluating their land policies and laws, especially regarding the relative status of customary and statutory tenure (Okoth-Ogendo 1998 and 2002). With the exception of Kenya (discussed below in Section 5), few of these policies have paid attention to the need for a closer alignment of land and water rights management and administration. In some instances, land policies have called for more direct government control over wetlands but as a resource to be developed and exploited. For example, Rwanda’s land policy calls for ‘marshlands’ to be declared public land and their use subject to government ‘concessions’ (Republic of Rwanda 2005, p. 40).

Many reforms have been proposed but the record of implementation has so far been disappointing. Long delays have surrounded land law harmonisation, institutional change and capacity development. In the struggle for scarce budgetary resources, the land sector has barely featured. The problem is compounded when governments fail to consider, during the drafting phase, the costs of implementing policies and laws and thus do not introduce more affordable options before new laws are promulgated (for example in Uganda, see Bosworth 2003, Hunt 2004). Experience suggests that institutional constraints to the implementation of land policy reform are the most dominant (McAuslan 2003; DFID and Adams 2004; Daley and Hobley 2005).

4.2. Irrigation Water Management

The distinction between land administration and land management also applies to water resources, but with the proviso that, whereas land is immobile, water comprises both a stock and a (variable) flow. Thus, as suggested earlier in this paper, whereas land management is relatively passive, management of water resources must be an active and continuing function designed to satisfy water rights in real time within the limits of the available resource (Hodgson 2004). Water administration is comparable to land administration in that it is concerned with the registration of water permits and related activities. However, there is little purpose in adopting a formal permit administration system if the pre-conditions for effective water management are absent. Management (rather than administration) of the resource is thus invariably the priority. In the absence of a developed water control infrastructure, management is necessarily reactive (though still active), being primarily concerned with the sharing of the water resource during dry periods. Customary (often informal) sharing practices are sustainable at a local level but statutory provisions are required in the broader context, for example in a river basin. However, once significant hydraulic engineering works are put in place, positive management is implied.

Colonial governments generally enforced the operating rules for dams, pumping stations, public irrigation schemes etc. through strong central management. Though they often failed to recognise customary rights and deprived traditional small-scale users of established water entitlements, they were generally effective in meeting the demands of commercial users and sometimes provided them with formal rights (Appendix 8).

Sophisticated management of complex inter-connected water systems, such as that of the Orange-Vaal system of South Africa, also evolved. Within large-scale irrigation commands, the subsidiary rights of landowners were also generally met according to a predictable operational plan.

So long as water remained relatively abundant, resource management and service delivery have remained broadly effective. In the lower Nile Valley, for instance, water control infrastructure has been further developed with the construction of large dams and related structures, of which the High Aswan dam is emblematic, facilitating perennial supplies where previously only seasonal irrigation could be assured (Appendix 1). But in closing river basins, resource management and service delivery must address increasingly uncertain supplies. Though the rhetoric of equitable deliveries may be asserted, in practice there is scope for direct interference by those in an advantageous position – high in the basin, at the head of an irrigation scheme – and for allocation bias by basin and scheme managers. Water allocation and distribution has thus in many cases become less manageable and predictable, depriving those without ‘voice’ of accustomed supplies, even where the control infrastructure appears to be in place. In the absence of control infrastructure, the rhetoric and the practice are typically even more disconnected.

Rather than stepping back and focusing on simplifying and adapting management to attain predictable objectives, governments have too often adopted over-ambitious policies. This has been influenced by the emerging integrated water resource management (IWRM) consensus, and includes approaches that have often only recently been introduced in developed countries with strong administrative traditions. In Tanzania, for instance, a substantive effort has been made to develop organisations at basin level, but rather than focusing on attainable resource planning, management and conflict resolution functions, WUAs have also been assigned the administration of a formal permit system covering all uses including local furrow irrigation. Moreover, their operations are funded from water charges and conflicts have developed (Appendices 4 and 9, and, as is similarly the case in Zimbabwe and Sudan, Appendices 10 and 11). In other countries, the institutions for water resource management are almost wholly absent. In Ethiopia, for instance, Proclamation 92/1994 provided for a water permit system and Proclamation 197/2000 identified the Ministry of Water Resources as the responsible agency. But in practice there is still no institutional capacity either to plan or manage the resource, and the permit system remains defunct.

4.3. The Gap Between Policy and Practice

Past disappointments have reflected the over-optimism of advocates of water policy reform in Africa and their failure to address the particular constraints associated with poor administration. Too often standardised solutions have been imposed without sufficient recognition of local differences in management practices and traditional/customary entitlements, the result of which is a disconnectedness between policy and practice. This applies to both land and water when treated as sectorally separate, as the foregoing discussion has already shown, but it applies even more at the junctures of land and water interactions, with often negative consequences for the water entitlements (and land rights) of poor and marginalised people in Africa. This has been the case, for example, in Sudan

with the expropriation of pastoralist grazing rights during registration of irrigated land (Appendix 2), and in Somalia with the deterioration of longstanding relationships between farmers and pastoralists that were important to both groups' livelihoods (Appendix 5). It is most obviously the case, also, with the development of boreholes in many of Africa's pastoral areas: this is often done with the stated aim of improving pastoralists' access to water, but at the same time tends to be based on false assumptions about the nature of pastoral water and land rights and entitlements which equate traditional group-based 'control or decision-making' rights with the notion that grazing and water are somehow open access public goods. The result is normally the collapse of local management and control and reduced access to the resources on the part of established users, as the examples from Somalia and Niger show (Appendices 5 and 6).

Women's water entitlements and land rights are another commonly cited example of those which are negatively affected by the disconnectedness between policy and practice, as examples from Sudan, The Gambia and Sierra Leone all show (Appendix 3). In these cases the problems arise for women because their rights to land (and to water entitlements accessed through rights to land) are often 'secondary' in Africa, by which is usually meant that they are 'derived' through men. Major resource policy changes have often had very negative consequences for women in terms of loss of entitlements because the nature of the practices through which they obtain access to water and land resources have not always been fully taken into consideration.

A final example of rural water supply administration in Zimbabwe (Appendix 10) also illustrates this point about disconnectedness. Recent efforts to promote the use of water for commercial (chargeable) purposes in the communal land areas are increasing demand for water, yet access to the formal permits that are required for the commercial use of water is tied to having title deeds for land, which most people in the communal areas do not have. In practice, then, access to water for commercial purposes in these areas still relies heavily on customary land and water rights, which include the notion that no-one should be denied access to water because of its inextricable link to livelihoods. Many 'private' sources of water are thus in effect 'public', and water is showing no sign yet of commodifying in the same way as land.³

5. CLOSING THE GAP BETWEEN POLICY AND PRACTICE

5.1. The scope, timing and level of implementation

For the reform of land and water rights to have a significant impact on poverty reduction they must be part of a broader process of political, social and economic change, rather than narrow sectoral interventions. As discussed in section 4 of this paper, many reforms have been proposed but the record of implementation has been disappointing. It is apparent that the pace of reform cannot reasonably run ahead of advances in other related

³ See also Woodhouse, Bernstein and Hulme's (2000) collection of recent studies on the enclosure of wetlands in Africa's drylands, which illustrate the growing commodification of land and the widening gap between winners and losers from the changing terms of access to water and land.

functions, for example the provision of physical infrastructure and technical support services to small-scale farmers, or the control of epizootics in livestock. Nor can it run ahead of the capacity of governments to democratize the administration and management of natural resource tenure and coordinate the process in an even-handed, transparent and efficient manner.

In a review of institutional design for water rights reform in Medium Human Development Countries (China, Indonesia, Mexico, South Africa) and High Human Development Countries (Australia, Spain, USA) the editors (Bruns *et al* 2005, p. 294) conclude:

“.....that water rights reform takes time, and that timing should be carefully considered in reforming water allocation institutions. Efforts to reform water rights may yield little benefit if pushed too soon, too quickly, or without appropriate synchronization between different components of institutional change.”

Further, with regard to customary rights (p. 291-2):

“The formulation of new water laws without understanding of existing systems is particularly problematic, but even codification itself can rigidify and distort customary systems....Mexico required registration within a deadline, or else rights would not receive legal protection. Such deadlines may be included in laws without much thought about their implications for customary rights, and without consideration of alternatives that better protect existing uses and avoid disrupting local institutions for water management. Indonesia’s new water law takes a different approach, recognizing basic rights for small-scale use, without requiring registration.”

It is difficult to avoid the conclusion that, for the great majority of sub-Saharan countries, far-reaching water management reform will not be feasible in the foreseeable future. For many countries, the same disheartening conclusion applies to land tenure reform.

As also highlighted in section 4.3, the review of case studies summarized in the appendices to this paper suggests that land and water rights are disconnected mainly in the national policy arena, as evidenced by attempts to overwrite more flexible customary arrangements with formal approaches. Yet for the livelihood strategies of pastoralists and small-scale irrigators, it is vital that land and water rights are closely linked, just as they were on the banks of the lower Nile over two thousand years ago (Madbouly 2005).

Bruns *et al* (2005) warn that reforming water allocation institutions faces many risks and may get bogged down in policy debate or be stalemated. New laws and regulations may remain unimplemented because they are opposed by powerful stakeholders. Reforms may consume great effort but yield little impact. These problems have their parallel in attempts to reform land allocation institutions. Thus, in promoting new approaches, advocates for

the reform of resource tenure have little alternative but to continue to labour at the coal face – namely at the local level.

5.2. Local-level water management interventions

Potential points of intervention should now be identified that reflect local realities. They should seek to balance the essential role of government in setting policy frameworks that protect the water entitlements of the poor with a much greater sensitivity to local realities than has typified the past, and by utilising alliances with civil society (see Daley and Hobley 2005 for this argument with respect to land).

The case of the SOS-Sahel intervention in Sudan (Appendix 11) which went to court and was decided in favour of the Warshal Water Management Committee provides an example - literally a 'test case' - which has the potential for wider application across Sudan. Some recommendations emerging from the meeting with the State Water Corporation, other government branches, civil society organisations and the judiciary are listed in the bullet points at the end of Appendix 11. The follow-up of such a case could have implications for capacity development of the various stakeholders.

Similar practical lessons could be learned by local-level interventions which serve to protect and strengthen the resource tenure of small-scale irrigators who are vulnerable to dysfunctional centralised decision-making. Efforts should be made to: build on customary systems of dispute resolution; help the poor obtain compensation if water is taken away; enable water titling irrespective of land title; and work with the authorities to vest water rights in WUAs.

5.3. Scheme level

At a scheme level, the functions of water resource management, water service delivery and water administration should be kept distinct. They should be addressed separately and assigned to different organisations. Other related functions (such as those of planning, finance, data and conflict resolution) must be distributed amongst them, for example:

- data collection functions assigned to a resource management entity would comprise monitoring the quantity and quality of the water resource;
- to service delivery entities it would comprise the monitoring of deliveries to individual customers; and
- to water administration the monitoring of flows to ensure consistency with diversion and discharge permits.

Water resource management should be simplified to accord with what is practicable and achievable in a basin and sub-basin context. Strengthen resource data and planning functions as the base for management and incorporate land considerations in water plans. Invest in feasible water control infrastructure to support appropriate and achievable management plans. Decentralise to the extent realistic, for example by building on local conflict resolution and similar practices.

Simplify irrigation service delivery in existing systems, supported by appropriate remodelling of the infrastructure. Decentralise maintenance and management to WUAs in large irrigation schemes. Recognise and strengthen local furrow irrigation organisations. Be cautious in developing new major irrigation schemes, in particular when they impact on customary access by furrow irrigators, pastoralists, non-land-based users etc.

Adopt formal water rights systems only when management is effective. Issue formal permits only to those that can realistically pay water charges. Recognise small-scale users and collective uses without necessarily bringing them into the formal permit administration. Fund resource management either from the budget or from charges on major users such as power companies, public irrigation and urban utilities.

5.4. *Pastoral issues*

The case studies in the appendices, which briefly describe some of the land and water problems threatening the livelihoods of pastoralists across the region, provide little scope for optimism. The current drought in the Horn and East Africa is exacerbating decades of insecurity and armed conflict, to which ill-judged water development projects have contributed. Gomes (2005), on the basis of her survey in Kenya, Somalia and Ethiopia, finds that the most effective strategies to mitigate the adverse effects of water supply infrastructure have been initiated by the pastoralists themselves who are urging their closure. She reports that new directives and policies are coming from development agencies and governments. This would be encouraging but for the fact that these problems were identified in the 1970s in western Sudan, when it was noted that the large number of water points being installed would be disastrous because they undermined long-established grazing agreements and encouraged the mushrooming of settlements and crop cultivation across migration routes. Fortunately within a few years, most of the pumps had broken down due to lack of maintenance.

The great hope for pastoralists is that one day they will be given real control over their own pastoral water sources and the opportunity to create institutions by which these can be communally administered and managed by the users. In the draft Kenya National Land Policy, it is precisely such a measure that is being recommended. All Communal Land, currently held in trust by County Councils, is to be vested in and be held by community-based institutions created by legislation and entrenched in the constitution. Recommended by the Commission of Inquiry into the Land Law System of Kenya (Republic of Kenya 2002), this reform was agreed by the National Constitutional Conference on the 15th of March 2004 and endorsed by the National Land Policy Formulation Process (Ministry of Lands 2005), in which representatives of Kenya's pastoralists participated. If and when the long-awaited new constitution is finally promulgated, the implementation of such a fundamental reform will be closely monitored across the region for the lessons that can be learnt from it for more productive, sustainable and, above all, equitable development of land and water resources.

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Appendix 1: Egyptian Land and Water Rights

In arid Egypt, water ownership is vested in the State and rights to its use are generally determined by rights to land. Lands in the old settled areas of the Nile valley and delta are now predominantly privately owned, though land ownership is hedged by conditions that have varied in response to shifting political and economic priorities (for example with respect to the level and form of land taxes, the size of holdings, the terms of tenure and land use). Lands in new settlements are mainly held as leases of public land.

Nineteenth century land reforms abolished tax farming (i.e. assigning responsibility for tax revenue collection to private citizens), formalised the land tax and adjusted ownership to promote the production and payment of taxes. This was successful in encouraging agricultural output but also led to the emergence of very inequitable patterns of private ownership. The 1952 land reform therefore sought to limit holding size and protect tenant farmers within a centralised (socialist) agricultural policy that largely determined how land and water could be used. While successful in enhancing equity, these changes impacted adversely on agricultural growth and diversification and were partially reversed in the 1990s with the new aims of promoting land markets and easing tenancy restrictions while simultaneously increasing farmers' choices on land and water use; agricultural production responded, but at the expense of some dispossession and of increased insecurity for tenant farmers.

Rights to the use of water from canals constructed by the State have under the Civil Code generally accompanied, and been in proportion to, the land holding to be irrigated and are also transferable when ownership of the land holding changes. However, the State has retained ultimate powers to modify water distribution – and hence accompanying subsidiary water rights – in accordance with national objectives, reflected for instance in priority to urban and industrial users. The distinction between perennial and seasonally-irrigated land was largely ended with the construction of the Aswan dam, but cultivation of rice and sugar is still in principle controlled. In sympathy with Islamic tradition, no charges are made for water as a substance, but differential land taxes have been imposed (for example to reflect the relative water supplies associated with perennial, seasonal and paddy irrigation) and the costs of water delivery are in principle increasingly being transferred to water user associations (WUAs) and urban users.¹

Most land outside the Nile Valley remains in public ownership, and can be alienated to private ownership or control in various ways. Within new settlement areas, this has typically – at least initially – taken the form of long-leases subject to conditions requiring beneficial use, the adoption of water-saving techniques (for example the use of drip or sprinkler irrigation) and the avoidance of high water using crops. However, public land,

¹ The *Qur'anic* view holds that everything on the earth was created for humankind as God's bounty (*ni'amah*) to be exercised with care as a trusteeship (*amana*). The question of individual ownership over water – in contrast to usufruct or access rights - is a matter of Islamic debate. In contrast to classical Islamic theory in which all land is held in trust for the benefit of the community, water rights over individual lands were bought and sold during the Ottoman period, and this continues to this day (UN-HABITAT 2005).

especially in urban and peri-urban areas, has also been alienated more directly to private interests, providing ample opportunities for rent-seeking and other abuses. Land administration in general has proven problematic in Egypt and, although water resource management eased as a result of the control provided by the Aswan dam, political and administrative constraints have severely affected the government's ability to recover the costs of water delivery in both urban and – more particularly – rural areas.

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Appendix 2: Sudanese Land and Water Rights

A dichotomy exists in Sudan between shifting use of the vast rangelands and intensive use of the irrigated lands along the Nile. Traditionally rangelands were held in common, being allocated by tribal leaders for individual usage for sporadic cultivation and/or grazing. Shared access to water (in particular during the dry season) was an integral part of the communal management of land. In contrast, irrigated land involves fixed assets and from the early stages of development came to assume the characteristics of private ownership as riparian rights to water evolved to complement emerging private land rights. At first the colonial government sought to regularise private ownership, as in Egypt. But it became clear that this led to inequities greater even than those in Egypt, as rural people with little appreciation of the value of newly-regularised land sold out to urban and immigrant interests. Constraints were hence placed on private land transfers, rationalised in terms of a desire to support the development of small-scale family farms.

These processes had two main drawbacks. First, formal land registration failed to recognise the subtleties of traditional access by expropriating nomadic rights to grazing, passage and watering points and by undermining traditional social and gender rights. Second, by preserving small family farms, registration limited investment capacity. This drawback was addressed in a unique way that also, however, paid little regard to traditional forms of access. Moreover, a form of management, though termed a partnership between government, private investors/managers and ‘tenant’ farmers, was in practice imposed on existing farmers. Control of land and water was assumed by government and, though land ownership rights were recognised, rents were nominal and larger holdings were in part nationalised. Large-scale irrigation (notably in the Gezira) was developed in a technically-rational manner with each of the ‘partners’ receiving a specified share of profits said to be in line with their contribution to farming costs. The shares were set out in legislation in which the tenants had little if any say. Landholders were given preference in the allocation of tenancies but tenants received a uniform holding irrespective of prior ownership and were required to follow a strict cultivation regime. Once their contractual rights came to an end, the private management entities were then replaced by public corporations.

These arrangements, initially, favoured (overseas) commercial interests and, subsequently, the public sector, and they undermined traditional access to land in specified areas. However, they have also promoted agricultural production and led in due course to the evolution of a relatively prosperous (male-dominated) tenant farming community. Numerous changes have occurred over time to the cultivation regime, the size of tenancies in new schemes and the rights of the different partners - partly in an effort to increase farmer independence and their role in lower level irrigation. Massive investments in irrigation rehabilitation have also been undertaken with ambiguous results. Yet the underlying partnership structure remains to this day and the agricultural surpluses produced, in particular of cotton, have been a pillar of the Sudanese economy.

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Appendix 3: Women's Land and Water Rights in Sudan, Gambia and Sierra Leone

Women's interlinked rights to land and water for productive use have been negatively affected by both state-led and private sector developments in Africa. Water development schemes have often had a negative impact on women's water rights, entailed through an accompanying loss of their land rights, as the examples from Sudan and The Gambia show. However, water investments on other people's land can also pose problems for women, as the example from Sierra Leone shows.

Sudan

At Wad al Abbas village in Northern Sudan, an irrigated cotton and sorghum development scheme established in 1954 reduced women's land ownership and their ability to secure their own livelihoods. In this largely Muslim area men were traditionally the main farmers, but women had land rights and participated in certain agricultural tasks. However, although the scheme incorporated virtually all agricultural land in the village, it was only men who received irrigated tenancies; some women later inherited their husbands' tenancies, but cultural and religious norms prevented most women from farming and managing any land they did have.

Like the more famous Gezira Scheme across the Blue Nile, the Wad al Abbas scheme was based on the assumption that a man's wife and children farmed with him. In practice, however, it resulted in a switch from family farming to the use of hired labour, freeing up men to move into more lucrative activities including, increasingly, labour migration to Saudi Arabia, which by the late 1980s had contributed locally to increasing religious fundamentalism. Meanwhile, the most unpleasant and lowest paid cotton-picking work in the scheme was institutionalised as female work, allowing some (usually poorer) women to earn 'pocket money', but it did not offer most women the opportunity to earn significant cash incomes. As the local economy became more monetised, women thus became more secluded from public life and more dependent on their husbands for cash. Yet, rather than harming them through the loss of their land and water rights, it may be that some women (and men) in Wad al Abbas view the changes triggered by the establishment of the scheme as having freed them up to live a life more in keeping with the tenets of their faith.

The Gambia

In contrast, in The Gambia, where women had traditionally cultivated rice since at least the eighteenth century, irrigated rice development schemes directly reduced women's control of land as male household heads established a tradition of irrigated plots belonging to men. Conflicts over women's land and water rights began in the late 1940s in The Gambia, when colonial interventions to improve access to riverine swamps through the construction of causeways and footbridges doubled the area of tidal rice cultivation; women began clearing swamp land and claiming individual ownership rights, yet land incorporated into rice development schemes was normally leased to men. In response to these conflicts, the 1984 Jahaly Pacharr project set out to register a large number of irrigated plots in women's names; in practice, however, the plots were identified as household land (under men's control) because their husbands' names were

also recorded beside them. As the project absorbed almost all the swamp rice fields in the area, women thus lost their formerly individually owned plots to the household. Mandinka women who had primarily depended on swamp rice cultivation for their livelihoods became a semi-proletarianised reserve labour force, hiring themselves out to work on others' plots in order to earn their own cash; however local Fula, Wolof and Serrahuli women were less affected as they additionally had upland plots of their own.

Sierra Leone

In Sierra Leone modern approaches to water management have altered social relations among the Mende. Mende women have traditional social obligations to manage water for activities such as shallow-water fishing; they make and own scoop-nets and choose how to dispose of their own fish catches (either for consumption or sale), and there is a traditional connection between fishing and female rites of passage. However, legislation allowing mining companies to create artificial reservoirs has left Mende women in affected communities unable to participate in shallow-water fishing while their men continue deep-water fishing using canoes and gill nets; this has transformed gender relations and left women with reduced access to their traditional rights to the water needed for their livelihoods.

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Appendix 4: Indigenous Small-Scale Irrigation in East Africa

There is a broad continuum in African indigenous irrigation from simple adaptation to natural flood patterns in wetland areas to controlled diversion and lift irrigation systems. One example of indigenous controlled irrigation described by Adams (1992) is hill furrow irrigation by the Marakwet on the western side of the Rift Valley in Kenya. Agriculture is combined with pastoralism, with the women responsible for cultivation and the men for both herding and the construction, maintenance and operation of irrigation canals. The water from hill torrents is diverted by brushwood dams and carried by these canals via a variety of structures – canals, wooden aqueducts, and stone reinforced terraces – to the valley floor where irrigation of millets and sorghum takes place by simple flooding. Regular maintenance requires substantial labour, and has therefore come under increasing pressure as young men emigrate for work. Numerous sections of the canals have been repaired or rebuilt with cement structures by various outside agencies, but this has had mixed results.

Another example of indigenous controlled irrigation is the expansion of paddy on the Usangu plains of the Great Ruaha river basin in Tanzania, again as a component of a mixed irrigation, dryland and livestock system. Paddy was introduced in the 1930s by Baluchi settlers in this then sparsely populated area, but was then expanded both by settlers and by aid-funded irrigation schemes that pre-empted the exploitation of land and water by immigrant farmers. Small rivers coming off the escarpment are diverted where they enter the plains, for paddy in the wet season and for domestic use and limited mixed cropping in the dry season. However, brushwood diversion dams must be rebuilt after each flood (perhaps several times a year) and earthen canals require heavy maintenance; this entails cooperation between irrigators, while leakage facilitates regular renewal of sharing agreements between the farmers of neighbouring furrows. In contrast, the concrete weirs of formal irrigation systems can capture the full flow of the river at times of shortage; in principle diversion is managed for equity, but in practice diversion gates are left open thereby diverting the full flow of the river into the canal. The World Bank has also funded the construction of concrete weirs for some local furrows with similar results: concrete weirs require less regular maintenance but when major repairs are required they are beyond the capacity of the farmers who must then depend on government, and local cooperation and water sharing have also been undermined. The local basin agency is promoting the formation of water user associations and sub-basin committees in order to try to manage these problems, but this is being compromised by the concurrent introduction of water permits and water charges (see also Appendix 9).

These government and donor-funded schemes in Tanzania have generally performed poorly and have been a heavy drain on the public purse. In contrast, paddy remains a profitable crop for small-scale farmers, and it is clear that the local system of hill furrows would have expanded in the absence of the public schemes up to the limits of the resource and at no cost to the government. As it is, cultivation has spread at the tail of canals served by concrete weirs, and on drainage flows below inefficient public schemes, and land served by furrows diverting water below the concrete weirs has at least in part been abandoned.

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Appendix 5: Loss of Grazing and Water Rights in Somalia¹

For decades, large internationally-funded water development schemes have been considered the foundation of local development in the predominantly pastoral economy of Somalia. Yet they have also had negative effects for the environment, while their inequities and political manipulation have contributed to Somalia's continuing civil strife.

Along the southern rivers (the Juba and Shebelle), where conditions are suitable for sedentary agriculture, past water investments aimed to develop large-scale irrigated intensive agricultural systems. However, these dispossessed both small-scale Bantu-Somali farmers and Somali pastoralists of critical livelihood assets. Previously, small-scale farmers co-operated seasonally with local pastoralists – pastoral livestock were allowed to access crop remnants and other forage resources, and this helped to clear and enrich the farmers' soils. The new large-scale farming schemes interrupted this relationship, leading to conflict between the two groups. The Agricultural Land Law of 1975, which nationalised all land, also gave the state responsibility for maintaining rivers and canals (taking it away from customary institutions); since 1991 the chaos of civil war has resulted in a suspension of maintenance work and hence major problems for irrigated agriculture, although NGOs have been experimenting with new community-based approaches to irrigation management since 2003. Meanwhile, as the growing number of irrigation canals encroached on the pastoralists' dry season grazing areas and the allocation of leasehold land became increasingly subject to political manipulation under the pre-civil war regime, Somali pastoralists also began to diversify into irrigated riverine agriculture; demand for such land has steadily increased since the 1960s.

In areas of Somalia dominated by pastoral production systems, past water development schemes in the form of borehole development more directly reshaped seasonal land use patterns, increasing overall livestock population density and shifting herd composition from more drought-resistant animals such as camels and small ruminants towards less drought-resistant but more-marketable cattle. Herds – and livelihoods – therefore became more profitable, but also more vulnerable to droughts and market dynamics; at the same time the increasing number of boreholes reduced pastoralists' former reliance on their relationships with the Bantu-Somali farmers of the southern riverine areas. However, the nature of pastoralists' water rights also changed fundamentally with past schemes: on Somali ranges the only public goods, open to all herders and herds, were natural water sources (streams or natural springs), yet new water investments by government, international donors and NGOs were also treated as public goods (based on false assumptions about the nature of pastoral water and land rights and entitlements). Grazing areas that had traditionally been associated with the specific pastoralist group who had control of the local man-made water source then became openly accessible to all herders, creating tensions between different pastoralist groups and between them and the agencies responsible for the particular schemes; water development schemes have often been targeted in Somalia's civil war, while, on the specific request of local communities, many

¹ This appendix was inspired by and draws heavily on material provided by Michele Nori from the EC Marie-Curie-funded *Milking Drylands* research initiative.

water points that have become inoperable have not been rehabilitated by the agencies responsible.

Somalia has meanwhile been plagued with uncertain rainfall for most of the last decade: a flood emergency in late 1997 – affecting up to one million people and causing the destruction of irrigation canals and river embankments, losses of pumps and of livestock and crops (including many banana plantations which were important sources of seasonal work) – was followed by a prolonged period of poor rains. As drought conditions in southern Somalia have intensified, food insecurity has been compounded by the continuing civil strife. Grazing lands and water supplies of pastoralists in south-eastern Ethiopia, north-eastern Kenya and Djibouti have also been affected. The most recent assessment by Oxfam International (February 2006) is that hundreds of thousands of people are now at immediate risk of water shortage in southern Somalia, with some pastoralist families existing on only one twentieth of the recommended minimum daily water supply; the UN estimates that some 1.7 million Somalis are currently affected by the worst drought of the decade.

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Appendix 6: The Tuareg People of Southern Niger¹

The traditional cultivation and dry season grazing area (home base) of the Iullemeden Kel Dinnik Tuareg in southern Niger is relatively well watered, but rainy season migration historically took place in order to access minerals 250 km to the northeast, and to allow for dry season grazing recovery. Except in the case of larger and richer families, demands for labour for crop cultivation meant that it was usually only young men who migrated, leaving other family members to look after the fields. The main constraint on production was thus neither pasture nor drinking water but rather shortage of labour for herding and cultivation, as well as the complex forces in Tuareg social structure which limited the rights of subordinate classes to accumulate livestock and allowed Tuareg 'warlords' to control access to the rangelands.

These semi-nomadic Tuaregs' situation began to deteriorate from the early 1950s, when demographic pressure pushed both cultivating Hausa and nomadic pastoral Fulani northwards into their home base, albeit that this was checked temporarily by the drought of 1968-73; Tuareg livestock numbers themselves fell severely during the drought and local surface water sources deteriorated. From 1960 the then French administration also introduced government-operated and owned boreholes and concrete-lined open wells, which encouraged sedentarization, out-migration and crop expansion; the boreholes provided free access to water (and so to grazing), allowing an enormous influx of livestock, largely but not solely belonging to the Fulani, into an area where Tuareg ascendancy and private ownership of wells (although not of the pastures surrounding them) had traditionally restricted livestock numbers (and Fulani pastoralists). The result of all this was decreasing control of the rangelands, and disadvantage to the local Tuareg, for whom access to water and grazing has thus worsened despite the introduction of the additional water points. By the early 1970s the Tuareg were in some cases requesting the government to close boreholes already in operation because of the disruption they caused.²

By the early 1980s, crop production among the Tuareg had increased because of livestock losses during drought making them more dependent on agriculture, and also because farming helped to maintain land rights in the face of the demographic pressures; the Tuareg had also ceased their rainy season migration in search of mineralised water and pasture and started importing salt instead. Political changes thus led to the collapse of the

¹ This appendix draws extensively on Stephen Sandford's *ILCA Research Report No.8: Organisation and Management of Water Supplies in Tropical Africa* (1983), who draws principally on Bernus' *Touareg nigériens: unité culturelle et diversité régionale d'un peuple Pasteur* (1981) and Eddy's *Labor and land use on mixed farms in the pastoral zone of Niger* (1979). It also draws on Maryam Niamir-Fuller's *CF Note 4: Community Forestry: Herders' Decision-Making in Natural Resources Management in Arid and Semi-arid Africa* (1990), who draws on Bernus' *Possibilités et limites de la politique hydraulique pastorale dans le sahel nigérien* (1974).

² The neighbouring Illabakan Tuareg eventually forced the Niger Government to close down some boreholes so that they could regain their control over the land when the outsiders left the area (Niamir-Fuller 1990).

former system of coping with grazing and water shortages – through both the French suppression of the Tuareg social system, and the pattern of control of access to grazing and water which derived from it, and the opening of new government-operated water supplies. Not only has nothing arisen to take its place, but the Tuareg themselves have since become a persecuted minority in conflict with the government.

Conflict was particularly intense during the early 1990s between the Tuaregs of northern Niger and Mali and their respective governments (there had been anti-French uprisings as early as 1963). A peace agreement was signed in 1995 in Niger but was reneged on shortly thereafter and has been poorly implemented since; after a military coup in January 1996 Tuareg refugees from the north began moving to urban areas in response to famine amid concerns that government-distributed famine relief was being used to squeeze the nomads further. Most recently, some 2.5 million people in southern Niger faced starvation in 2005 due to a combination of poor rains and locust plagues in 2004. From their former ascendancy, the Nigerien Tuareg have thus descended through the twentieth century to being an endangered people today.

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Appendix 7: Conflict over Land and Water in Darfur

The current conflict in Darfur is a prime example of what can happen when land use conflicts between neighbouring communities are allowed to fester. Although it is by now more complex, Darfur's present problems are nonetheless rooted in an inter-tribal dispute over land and water rights between sedentary cultivators and pastoralists. For some sixty years after the 1917 demise of the secessionist Fur Sultan, Ali Dinar, the nomadic and sedentary people of Darfur had lived in relative harmony thanks to a system of local government, albeit imposed by the Condominium of the Anglo-Egyptian Sudan, which was sensitive to local ecology and land use. However, by the 1970s it was apparent that action had to be taken to resolve potential land use conflicts between cultivators and pastoralists as migratory trails were being increasingly blocked by cultivation. There were inevitable skirmishes as the nomads moved southwards to their dry season wells along their traditional routes which were flanked by fields of unharvested sorghum and bulrush millet, but the hierarchy of traditional leaders - sheikhs, omdas and nazirs - normally succeeded in mediating these.

In the 1970s, just as the oil crisis was beginning to bite, the positions of sheikhs and nazirs were formally abolished and 'people's councils' were set up instead. However, the national government failed to deliver the necessary funds and, by the early 1980s, local government in Darfur was bankrupt. A series of local conflicts erupted in the wake of the 1984-85 drought and famine, in which pastoral groups were pitted against farmers in what had become a bitter struggle for diminishing resources. Government intervention was ineffective, so people armed themselves to protect their herds, flocks and crops. Competition over land increased further in 1994, immediately exacerbating the conflict, when the government reintroduced the colonial system of administration, allocating territories to chiefs who were given the authority to allocate land therein.

The critical difference between the period since the 1980s and that prior, is that the mechanisms for dealing with tribal disputes - namely the tribal administration and the police and the judiciary - have been neglected. In addition the Sudanese government has looked upon the issue as residual: something to be dealt with only when it forces itself onto the political agenda as a result of major clashes. As in neighbouring countries, national politicians have also exploited local disputes over land and natural resources for their own political advantage. Any solution must now involve negotiation with all the protagonists, to persuade them to lay down their arms, and the re-instatement of a police force and system of local government in which local people have confidence and which must therefore include efforts to build on the former customary procedures for land and water dispute resolution.

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Appendix 8: Land and Water Rights for Agro-pastoralists in Botswana

Agro-pastoralism based on communal land use and tenure is the predominant production system in Botswana, which supports large numbers of people in the rural areas for whom there are no viable economic alternatives. It makes effective use of a variable environment by mitigating the negative aspects of unreliable rainfall as well as exploiting low land costs. As a result, Botswana is one of the world's lowest cost producers of beef.

Concern has been expressed in Botswana for over 40 years at what is perceived in certain quarters to be the over utilization of pasture resources in the communal grazing areas leading to land 'degradation'. There is, however, disagreement about what constitutes land degradation, and there is a growing body of scientific evidence to suggest that a wide variety of stocking rates are sustainable in savanna rangelands. Government has addressed the issue through a policy of privatising rangelands through the development of private boreholes, initially under the Tribal Grazing Lands Policy (TGLP), which was introduced in 1975. Since 1991, under the Fencing Component of the New Agricultural Policy more communal land is being leased to commercial ranchers.

The available evidence suggests that the privatisation of grazing and water supplies has neither resulted in more productive investments nor superior land management, with most ranches being managed in the same way as unfenced communal land. Moreover, privatisation of rangeland has high social costs. People were displaced under the TGLP and are again being displaced under the Fencing Component. Government has spent large sums of money accommodating displaced people. Rural dispossession, with increasing numbers of people owning no livestock, abandoning arable agriculture and holding no land, is fuelling accelerating rural to urban migration.

The TGLP provided large farmers with a chance to acquire exclusive grazing and water rights and increase their income, but it has thus worsened the lot of the poor. It did not relieve pressure on grazing in communal areas, instead providing only a temporary stopgap whilst cattle herds were still building up in ranches during years with good rainfall; when drought came, overstocking in farms spilled back on to the communal land. There was a view that fencing induced a realisation of the finite nature of grazing resources and hence of the necessity to adjust stock numbers according to the availability of forage reserves. On the contrary, however, occupation of fenced ranches in Botswana has often encouraged stocking rates far higher than those normal for communal areas; when this caused the rapid depletion of grazing on the ranch, the owners simply drove their cattle back onto the communal range. The protests of small farmers in the communal areas, and occasionally of officials, made no impression on this practice.

It is now acknowledged that the great majority of the TGLP ranches have been used as extensions of the communal area - thus as no more than enclosed cattle posts. The assumption that cattle posts in the communal areas could be converted into commercial farms by simply fencing them has not been shown to be correct: their owners' management decisions continued to be driven by the same socio-cultural and economic parameters irrespective of whether their land was fenced or communal. The policy was

directed towards serving the interests of a small minority of large-scale farmers but ignored the needs of the majority of the farming community who have different management objectives.

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Appendix 9: Tanzanian Water Rights

Land and water rights in Tanzania are vested in the State. Apart from minor uses, all rights to 'divert, dam, store and use water' are in principle subject to a permit issued by the appointed Water Officer. A permit may 'be made appurtenant to land' as is normally the case for irrigation. The Water Officer has wide powers in deciding permit terms and, in effect, has always made some allowance for accustomed rights and environmental needs. Water rights formalised under the colonial 1959 Water Ordinance and accepted by the 1974 Water Utilisation (Control & Regulation) Act include those 'derived from native law and customs'. In practice, however, much of the system is moribund and informal/customary use lies generally outside the system. Informal/customary (and usually small-scale) users have seldom been willing to apply under the Act, not just because of the fees incurred but also because in a basic sense they do not recognise the legitimacy of the official system.

Following modern integrated water resources management (IWRM) precepts, River Basin Offices were activated during the 1990s with World Bank support in the two most contentious basins – the Pangani and Rufiji – and, on the initiative of the Basin Officers, registration has been extended to much private and communal irrigation. But it has been almost impossible to collect fees or to enforce the terms of water permits on numerous small-scale users, given objections from the rights holders, constraints and abuses in monitoring and enforcement, and great variability of dry season flows (there is normally more than enough in the wet season). This is true not just of longstanding but also of recent private and communal uses, given that irrigation is largely a fairly recent phenomenon (in the upper Rufiji basin [Usangu] for instance up to 90% of the irrigated area has been developed since the 1959 ordinance). The Basin Offices can fulfil real functions (e.g. in data collection, planning and conflict resolution) but permit administration for small-scale users may be beyond their institutional and financial capacity, besides tending to favour larger users and those applying under the formal system. The 2002 Water Policy upholds the permit system but goes on to state that 'relevant customary law and practice ... will be institutionalised into statutes' (Section 4.11). It is unclear what this means. A revised water law has been drafted but problems in aligning formal and informal/customary means of access to the resource, and in defining informal/customary users under dynamic present day conditions, remain an important factor delaying its finalisation.

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Appendix 10: Water Rights in Zimbabwe's Communal Areas

Zimbabwe's waters were divided into the categories of commercial and primary use at the start of the twentieth century, reflecting the division between commercial (alienated) and communal (customary) land areas and, correspondingly, between European-based formal law and local customary law. Commercial agriculture and the urban/industrial/mining sector account for roughly 75 percent and 20 percent of all water consumption in Zimbabwe; the communal land areas account for only 5 percent. Water in the communal areas is generally underdeveloped due to lack of (formal) water rights/permits, low use of commercial water and irrigation, and the lack of water storage capacity for commercial activities.

The Water Act of 1998 (and accompanying Zimbabwe National Water Authority Act) continued this division and adopted the 'user pays' principle for water for commercial use alongside free access to 'primary water' – water used for domestic purposes in the communal areas. In these latter areas informal local water rights and practices of water allocation persist, incorporating customary notions that no-one should be denied access to water - because it is inextricably linked to the right to a livelihood.

The Water Act vested water solely in the state and required permits to be obtained for all commercial usage. At the same time a main concern of current policy is to promote the use of commercial water in the communal land areas; increasing efforts to develop agriculture and enterprise are increasing demands for water (particularly for horticultural investments, including women's vegetable gardens, and mining (gold-panning and rock-excavation)) and leading to greater formalisation of water use rights. One problem, however, is that access to permits for water for commercial agricultural use is tied to having title deeds for land, which most people in the communal areas do not have, and thus in practice access to water for such purposes still relies heavily on customary land and water use rights.

One recent study of three villages in Mhondoro Communal Land suggests that although recent investments in water might be expected to make the resource an increasingly 'enclosed' one, in fact local norms about free access were sufficiently strong that most 'private' wells and boreholes on individual homesteads were in effect 'public'; water was showing no signs yet of commodifying in the same way as land. For example, a borehole constructed in one village by the Zimbabwe Tobacco Association primarily for tobacco growers had become a common source of drinking water for the whole village; people who could easily obtain land close to a dam for income-generating horticultural activities were also reluctant to pay for water when it was moved to their gardens by pump, even though a technological distinction has now been made between commercial and primary water usage, with water moved by hand as primary (and hence free) and water moved by machine as commercial (and hence chargeable). Questions have also begun to be asked about applying the user pays principle to borehole users as their maintenance and repair has now become the responsibility of the users, but enforcing this is also likely to be problematic.

New institutions of water management in Zimbabwe may thus be intended to make it easier for both small-scale users and large-scale commercial farmers to access local water resources, but they run in parallel to existing and evolving local practices of sharing water freely which link rights to water and land.

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Appendix 11: Who Controls the Water for Domestic and Livestock Use in Sudan?^h

A *hafir* is a reservoir (6000-12,000 cubic metres) fed from rainwater and run-off. In Sudan, these were first constructed by the colonial government using heavy earth-moving excavation equipment, especially in the clay plains of central Sudan where adequate supplies of groundwater were unavailable and hence rainwater and run-off were more valuable resources for economic development. The policy was to provide water in accordance with development requirements, to enable settlement for cultivation, and to extend the availability of pasture during the dry season. By independence in 1956, over 500 *hafirs* had been constructed; on average each one supplied about 1000-2000 people and their livestock during the long dry season (November to June). The programme continued, but by the mid 1970s funds for essential maintenance were scarce and large numbers of *hafirs* in Kordofan and Darfur provinces silted up and fell out of use; the Rural Water Corporation Annual Report for 1981/82 for Kordofan Region identified inadequate funds and poor condition of vehicles and heavy plant as major problems.

During the 1990s, the international NGO SOS Sahel became involved in the construction of *hafirs* in North Kordofan, with NGO staff and local community members building 10 new *hafirs*. The communities provided labour and resources and formed local management committees in order to own and manage the reservoirs once construction was complete. Formal ownership and control was handed over by SOS Sahel to the committees in 1998, which thenceforth charged SD5.00 (US\$0.02) per 10 litre tin of water.

In 2004 the Water Corporation of North Kordofan State passed a new law saying that the management of *hafirs* would in future come under their jurisdiction, regardless of any arrangements made when they had been constructed. The Water Corporation also decided to start taxing the use of *hafir* water. Following a ban in 2003 on taxing agricultural products, tax on water has now become a major source of revenue for the State.

In Warshal village, the Water Corporation then asked the community to pay SD100,000 (approximately US\$400.00) in arrears for their past drawing of water from the *hafir*. A Water Corporation Officer, accompanied by a policeman, also began to visit the village to collect levies on daily water sales. However, the community management committee refused to pay these taxes on the grounds that ownership of the *hafir* lay with the community and not with government, whereupon four members of the community were taken to the provincial capital and asked to pay SD1,300,000 (approximately US\$5,000). They refused and were put in jail. The case then went to court, which ruled in favour of the community: their claim of ownership over the *hafir* was upheld and the four men were released. The Water Corporation has subsequently accepted the communities' management rights and agreed to share income from the *hafir* on an equal basis, allowing SOS Sahel to bring together representatives from the Water Corporation, other

^h This account is principally based upon an article by Mohammed Abdel Mahmoud and Faisal Hasab el Rasoul which appeared in *Haramata* Bulletin of the Drylands: People, Policies and Programmes, IIED (London), 2005, and is reproduced here with permission of Dr Camilla Toulmin (Director of IIED).

government branches, civil society organisations and the judiciary to discuss the problem and draw up recommendations to be submitted to the Legal Reform Committee, the most important of which can be summarised as follows:

- Reinstating the clauses in the Water Law, 1998 which relate to community compensation for contributions to the development of water resources owned by the Water Corporation.
- When, after negotiation and agreement, the Water Corporation takes over ownership of a water resource it must commit to maintenance of the resource.
- The rôle of beneficiary communities should not be forgotten. The government should recognize local institutions. This should be supported with new legislation that defines the rôles, responsibilities, relationships and co-management systems for these institutions.
- The Water Corporation should take into account the history of water sources established by other institutions. This requires new clauses in laws for appropriate management.
- Creation of links between the Water Corporation and civil society organisations to agree rôles/responsibilities where there exists community ownership of rural assets. This requires capacity building and coordination in planning and implementation.

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