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**Irrigation practice and policy in the lowlands of the Horn of Africa** (Final Draft)

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**1. Introduction**

The drought of 2011 and the famine that followed in politically instable Somalia highlighted the vulnerability of the lowlands of the Horn of Africa. It is a story revisited with high frequency – 2000, 2005, and 2008. Climate variability is easily mentioned as the main attributing factor. Clearly it is – but there is also extensive land use change, because of the widespread invasion of invasive species (prosopis in particular) and the decimation of natural wood stands for charcoal production (particularly in Somalia).

2011 was a crisis year – but even in a normal years food insecurity is common. In the Afar lowlands in Ethiopia food aid has become part of the livelihoods, with most of the people dependent on it – including reportedly middle class families. There is a growing realization that water resource development – appropriate to the context – has to have a place in addressing food insecurity in the Horn of Africa.

This paper focuses on irrigation policy and practice in the arid lowlands of the Horn that have been hit hardest and most frequent in the drought episodes. It argues that in the lowlands (1) the option of conventional irrigation is limited to the few perennial rivers – which are in most cases heavily contested (2) other forms of irrigation – based on temporary flows and floods – have more potential but are not developed (3) in parts of the lowlands there is counter-intuitively considerable groundwater potential – but it is challenging to exploit this for irrigation given the depth and the logistics in the area (4) in general there is more scope for water buffer management tied into the agro-pastoralist and pastoralist economy than is currently being developed.

Section 2 of the paper focuses on the current irrigation practice in the lowlands; Section 3 discusses the policy implications.

**2 Current Practices**

**2.1 Perennial Irrigation**

The number of perennial rivers in the lowlands of the Horn of Africa is limited – main rivers are the Awash, Wabi Shebelle and Tana. These rivers were the first to be targeted by public investment. In addition farmer managed irrigation systems have developed along the banks, supplied by gravity or pumping.

**Ethiopia**

The Ministry of Water and Energy has identified 560 irrigation potential sites on the major river basins. The total potential irrigable land in Ethiopia is estimated to be around 3.7 million hectares (without considering the groundwater potential and gently sloping areas). The area under irrigation development to-date is estimated to range between 160,000 - 200,000 hectares for the entire country. Estimates of the irrigated area vary, but still is less than five percent of potentially irrigable land (Awulachew *et al.*, 2007). Area bigger than the current irrigated land is planned to be developed for cane production within the coming five years and considerably large area for small holder farmers. Ethiopia has set itself an ambitious task to achieve an irrigation target of 1.8 million ha for irrigation development (see annex 1 too). The challenges includes amongst others: closing the gap between planning and implementation of irrigation projects; improving the performance of existing irrigation schemes; removing constraints on the scale-up of irrigation projects; and ensuring the sustainability of water resources for irrigation (Awulachew, 2010). Non-functionality is estimated at 17-35%; low-functionality is much larger.

***Irrigation schemes in the Awash River basin***

The Awash River Basin is the most important river basin in Ethiopia, and covers a total land area of 110,000 km2 and serves as home to 10.5 million inhabitants. The Upper, Middle and Lower Valley are part of the Great Rift Valleys systems. The lower Awash Valley is a semi-arid to arid region. In the early 50’s the Koka Dam was built, which served for hydropower and irrigation development downstream. Large-scale state farms were developed since, which produced mainly cotton. The Awash Basin accounts for about half of the national irrigation schemes.

Fig. 1 Awash River Basin, Ethiopia

Currently however, schemes that were operative under public enterprises are transferred to either the communities in the surrounding areas or to private developers. In most cases however, the communities themselves did not use the irrigated land. Therefore, some investors made arrangements with the communities and are currently operating the farms, growing mainly cotton and millet. Though, large areas of irrigated land have been left fallow. The reasons behind this are; lack of capacity at the communities to take over the irrigation farms; lands were claimed by different clans which resulted in conflict; and a lack of capacity at regional governments to implement and control land and water management policies. As a result, also private investors backed away from investing in the development and operation of these farms (Awulachew *et al.* 2007).

In addition to these a large number of new irrigation systems have been developed on the Awash. The ongoing Tindaho Sugar Development Project with 60,000 hectares of land to be developed for cane production is the largest ever on Awash River. The Fantale and Tibila Irrigation Based Integrated Projects are also ongoing projects owned by the Regional Government of Oromia. It is planned to irrigate about 30,000 hectares of land for small holder farmers & more than 5,000 hectares of land have been irrigated so far. Fentale and Tibila Irrigation Projects are also unique in their implementation modality and the ownership and scheme administration arrangements. For their unique nature and successful implementation arrangements these projects are taken as a model to transform the pastoralist areas by the federal government, as mentioned in the GTP.

The launching of these two projects has broken the general notion of undertaking large scale projects only at federal levels. Following these projects the Amhara Regional State launched large scale irrigation project in Beles sub-basin.

By now the Awash River is as good as overcommitted – with no scope for further development. But the construction of additional dams at Kesem and Tindaho help to minimize the water stress that may come through the intensive use of the river water. This does not yet apply for the other major lowland river in Ethiopia – the Wabi Shebelle that is shared with Somalia. It is only recently that resettlement program along Wabi Shebele is intensified. There is ongoing plan to conduct water basin development centered Sedentization program for **51,672** HHS in Somale Region mainly along the main river. The situation is however not far away with several new and existing projects planned.

**Drainage problems**

In a lot of the developed irrigation schemes in Awash River Basin drainage systems were not properly built. This has led to a gradual rise of saline ground water in the Middle Awash region. The salinity of the Awash River increases from upstream to downstream.

Apart from the large farms in Awash River basin, drainage problem in Ethiopia is affecting extensive arable land. The famous wheat fields of the southeastern high lands the central high lands, and the main grain producing areas of Gojam in Northern Plateau are highly affected by drainage. Productivity has declined dramatically; in some years total abandoning of farms is becoming common. In areas like the central high lands a total shift from cultivation of teff and wheat to wild oats has become obligatory. Relief aid is provided on green and wet areas of excess water.

Various extension services, like using BBM, are given to tackle minor drainage problems. But the enormity of the problem and its degree has forced the government to tackle it in a more systematic way. The Oromia Regional State has implemented pilot project to implement modern drainage project that includes use of pipe and development of drainage systems.

**Kenya**

Kenya retains a largely rural population (78%). Kenya relies mainly on rain fed agriculture. Rainfall however, is unreliable in some years. Only a small fraction of the arable land is irrigated (1.8% ≈ 97,200 ha). Kenya’s irrigation potential was estimated up to 1.3 million ha. Of the irrigated land, about 47% is smallholder irrigation; 41% private commercial; and about 12% is government managed (FutureWater, 2011). The main irrigated crops are rice, maize, sugarcane, vegetables, bananas, citrus, coffee, tea, cotton, and flowers.

Water abstraction fees have been introduced to improve scheme water efficiencies next to technological improvement of systems. The state of many irrigation infrastructures is however poor.

Kenya deals with problems in food security as 37% of it population is classified as undernourished. Food security is challenged by climatic conditions, land productivity and the costs of agricultural inputs (Water for Agriculture and Energy in Africa, 2008).

The Tana is the most important river in Kenya in terms of discharge, varying between 90 and 300 m3/s or between 2.7 and 10.2 billion m3/yr.

***The Tana Delta Irrigation Project (TDIP)***

The Tana Delta Irrigation Project of the Tana & Athi Rivers Development Authority (TARDA) is located in Garsen Division, Tana River District. The project focuses on commercial rice production. The entire plan of TDIP covers the net irrigable area of about 12,000ha. Project implementation started in November 1992 and was substantially completed by end of October 1997. In parallel TARDA embarked on double cropping of irrigated rice in 1993. By the end of October 1997 a total of 4700 tone of paddy was produced, which was equivalent to 2800 tons of milled rice, worth Kshs 70 million (app. USD 1 million).

Because of the naturally changing course of the Tana River the scheme has troubles at its water intake. The construction of the embankment and the exclusion of a large area of floodplain from flooding caused an increase of the water level upstream which destroyed the perennial crops of traditional farms. The embankment, in combination with the shift of the dominant flow from the eastern to the western channel, reduced flooding of the forests and lakes to the east of the TDIP (Hamerlynck *et al.,* 2010). However, in late 1997 the El-Nino related floods seriously damaged the project. Since then, the project has managed to carry out many campaigns to restore the system. However the system faces serious constraints, amongst others: a lack of water due to poor irrigation structures; poor condition of farm machinery; unpaid wages; and poor infrastructure (TARDA, 2011).

There is no reason why the rehabilitation of the irrigation schemes should not go hand in hand with investment in environmental infrastructure. Through managed flood releases, part of the irrigation water could usefully re-establish flooding of forests and wetlands to simulate the traditional multi-user multi-functional landscape (Hamerlynck *et al.*, 2010).

**2.2 Spate and Flood Based Irrigation**

Unlike other parts of the world (Iran, Pakistan, Yemen, North Africa) irrigation from temporary flows is not very widespread in the Horn of Africa. In some areas farmers have developed such flood based farming systems and in recent year governments have supported the same.

In spate irrigation people make use of short duration floods, lasting for a few hours to several days. The short duration floods are diverted from the ephemeral river to the land to cultivate crops, feed drinking water ponds, and to irrigate pasture areas or forest land – or recharge shallow aquifers. Moisture conservation is essential in spate irrigation, as the water comes often long before the cropping season and hence needs to be stored. Another challenge is sediment management – with sediment loads up to 10% of the volume. Spate irrigation occurs particularly where semi-arid mountain catchment border lowlands and spate systems are found in many (semi-)arid parts of the world. In the Horn of Africa, Eritrea and Sudan have a relatively long history of at least 100 years in spate irrigation, but elsewhere the tradition is very young. Below we highlight some experiences with spate and flood based irrigation in Ethiopia, Eritrea and Kenya[[5]](#footnote-5).

A related form of water management is flood recession farming – whereby crops are grown on recessional moisture after a flood has subsided. This is very common along perennial rivers – especially in Wabi Shebelle (especially in Somalia), the lower Tana (Kenya) as well as the Omo valley (Ethiopia) and Upper Awash (Becho Plains – Ethiopia).

**Ethiopia**

In Ethiopia at this moment, spate irrigation development is mainly in the midland areas – with systems usually relatively small in size. In the lowland plains spate irrigation is still modest in spread, and often limited to the immediate piedmont areas, where gradients are relatively steep and floods are sometimes more difficult to control than further down the ephemeral rivers.

The investment that has taken place is usually in ‘modernized’ spate irrigation systems. Many of the modernized systems however use designs that are akin to perennial irrigation systems, resulting in severe operational problems - in particular with the management of sedimentation. The extensive lowland system that rely on soil diversion and guide bunds – common in lowlands elsewhere – are not known yet in the Ethiopian lowlands. A review of the spate irrigation systems in Tigray lists the following problems with the improved systems (Haile & Tsegaye, and, in: Van Steenbergen *et al.*, 2011):

* Upstream and downstream users do not share the flood flowing through the river equitably;
* Technical faults in developing local diversion canals triggering changes in the river course;
* Improper secondary and tertiary canals leading to in-field scour and creation of gullies in the fields - which reduces available soil moisture;
* Large amount of sand deposition in the canals and even in the cropped fields.

*Yandefero Spate System*

Spate irrigation in the lowlands in Konso in the South of Ethiopia sustains a mixed cropping system of maize, sorghum and cotton. Farmers are mainly smallholders. The system has 29 flood intakes, of which 11 date back from 30 years or more. The entire area that can in principle be irrigated is close to 4000 ha. Eleven of the flood intakes date back thirty years or more. Most of the remaining ones were developed in the last few years under the food for work formula. Recently the Yanda River has started to degrade dramatically – going down one to two meter in large stretches. This has made it difficult to extend the flood channels and the majority of the intakes are not in use.

**Eritrea**

In Eritrea about 14,000ha cultivated land is present under spate irrigation (estimates show a potential for 60,000 to 90,000 ha). The main areas for spate irrigation are the Eastern Lowlands, the Western Lowlands (Gash Barka), Zoba Afabet and the Northern Region. As in Ethiopia the area under spate irrigation is increasing, supported by various government and NGO-programs.

Traditional spate systems in Eritrea are found mainly in the Eastern Lowlands and in the coastal regions. The traditional systems rely heavily on sand, stone and brushwood spurs and earthen guide bunds. The brushwood used is usually Acacia, with its characteristic fine needles solidly interlocking. This helps to trap sediment and floating material. This protects and reinforces the rather loose and sandy guide bunds in many of the lowland areas. The heavy demand for acacia branches has depleted some areas of these tree stands – making it more and more difficult to collect the material.

Investments in spate irrigation in Eritrea have taken place in the Eastern and Western Lowlands. Development costs for state irrigation in general should be in the order of USD 500 - USD 1500 per hectare commanded. For systems such as Bada (see below) where new head works and other improvements have been built, higher investments can be considered viable. This should be compared with the breakeven limit of USD 5000 considered for perennial irrigation schemes. However, any structures developed within the wadi river courses must be based on good estimates of flood flows and conservative considerations of depth of scour.

*Bada traditional Spate System*

The Bada system is located in one of the most hostile environments of the world, at minus 115 meter below sea level, the Dankly depression – practically on the border with Ethiopia. The climate is arid and in July and August temperatures soar to 50 degrees Celsius, exacerbated by strong dry winds that cause soil erosion and reduce soil moisture. The source of the water for the Bada is the Regali River. The floods originate from the high catchments of Adi-Keih (Eritrea), Adigrat and Edaga Hammus in Tigray (Ethiopia). In a good year Bada irrigates up to an estimated 2000 ha, but much depends on the size of the floods and their succession. If it is possible to do the repairs in between flood events a relatively good harvest is possible. From the diversion structures water is taken to the command area through a network of channels. The field structures are developed in such a way that they can deal with the sudden release of water. Investments in the Bada system resulted in a new headwork being built using gabions. It appeared not sufficiently rigorous as this structure only lasted a few years following a damaging flood event. This illustrates the need for good designs based on improvement of existing traditional developments together with reasonable hydrological estimates.

**Somalia**

Irrigated agriculture in Somalia is largely concentrated in the south, along the Juba and Shebelle rivers. In the extensive alluvial plains there are several types of irrigation systems: (1) lift irrigation systems, small-scale and often family-owned, (2) perennial gravity systems - especially along the Shebelle - some quite small scale and some depending on gated intakes, cultivating maize but also horticultural crops, and (3) a mix of flood recession farming and spate irrigation - particularly in the lower part of the rivers (Van Steenbergen, 2011).

The flood based system in the Juba and Shebelle tracts is a mix of flood recession farming, inundation canals and spate irrigation (FAO, 2008). The total area under flood based irrigation was - in the pre-disturbance period - estimated between 110,000 to 150,000 ha (Basnyat and Gadain, 2009). The specific component under spate irrigation is not clear but is probably not the larger part. There has been considerable damage caused by years of neglect of river embankments, barrages and canals. This caused of drastic decrease in the irrigated area - particularly of the perennial systems - and more uncontrolled flooding. The rehabilitation of the major irrigation, drainage, and flood control infrastructure in Middle and Lower Shebelle and Lower Juba are high priorities, but would ideally require an integrated approach as the water management along the rivers are highly interdependent. Also land disputes stand to be resolved.

In the dryer northern part of Somalia irrigation is more scattered, depending on the local availability of dependable water sources. There is spate irrigation too in these areas but it is not widespread. Floodwater is retained within the streambed or diverted to adjacent fields for sorghum and maize and some cash crops, with a command usually of less than 10 ha.

*Spate irrigation in Togdheer, Somaliland*

In the late 1950’s and 1960’s, a spate irrigation system was introduced in Togdheer (Somaliland, northern Somalia). Rainfall occurring in the Golis Range Mountains to the north of these areas discharges flood water to the said areas through seasonal watercourses (toga). The agro-pastoralists in these areas prefer to grow the short term maturing sorghum variety, maize and pulses. The civil war played havoc with these systems. At Beer, the colonial British administration had constructed a structural weir across the Togdheer toga and diverted flood water to an off-take channel that conveyed water to an agricultural scheme of 600 hectares. The floods were controlled with sluice gates fixed on the weir, the off-take channel and the conveyance canals. The scheme was a pilot project established in a previously completely pastoral region and served 800 households who cultivated the land on cooperative basis.

However, several of these minor systems have fallen (partly) into disuse in the period of civil strife, because the diversion and canals have fallen in disrepair and because tillage capacity was lost due to loss of draught animals and tractors. Also because of the low market price of cereals, the farmers’ preference to agriculture declined making them more inclined to livestock husbandry, charcoal production or a reliance on food aid. In addition traditional sorghum seed varieties have been lost.

**Kenya[[6]](#footnote-6)**

Flood irrigation in Kenya is practiced in different parts of the country, mostly at a private individual level. In traditional flood fed irrigation, water collected in drainage systems flows to low lying areas. In other cases, water from full flowing rivers overflows the banks into depressions and low lying areas. After the water saturated the soil and flowed to other areas or retreated to the streams, farmers in the area start planting. For crops like sorghum the stored soil moisture is adequate to bring the crop to maturity while maize requires extra rain to fully mature. Close to the delta of the Tana flood recession farming makes use of the tidal effect to inundate the river plains several times during the growing season.

Systems basically experience flooding due to inadequate flood protection measures and inappropriate systems to utilize the flood waters without causing disruption and destruction. In the overall, substantial agricultural land is unusable due to seasonal flooding while the after effect of the flooding limits land use. Stored soil moisture is thus in most cases lost through evaporation. Flood magnitudes have increased over the years due to degradation of catchment areas and sometimes because of migration of rivers.

Flood fed irrigation has been in practice in Kenya for many years. Until recently it has not been the focus of irrigation development. Natural flood outlets from main drainage systems have been developed into intakes for controlled irrigation by lowering abstraction levels. This allows flood flows into equally low or even lower areas outside the immediate flood basins. As well large scale irrigation projects have been planned to allow gravity irrigation in areas of low embankments where natural floods occur within the immediate vicinity.

**2.3 Groundwater irrigation**

Counterintuitively, given the aridity in the Horn, there are several areas with promising groundwater potential in the Horn of Africa: the border region between Somalia and Ethiopia, the Borana lowlands in Southern Ethiopia and some of the aquifer systems in the lower Tana. Much of the groundwater potential is not mapped however. In addition to the medium-depth groundwater resources, there is a shallow groundwater to be used alongside the semi-perennial and perennial rivers, using basic manual drilled shallow tubewell technology but this low cost technology is as yet not widespread.

Groundwater development in the Horn of Africa is limited to drinking water and livestock water. There is potential to develop the deeper groundwater for agriculture but this also requires a shift in farm management and logistics – making it more conducive to agri-business that to local small scale farming.

2.3 **Groundwater irrigation**

**Introduction**

Counterintuively, given the aridity in the Horn, there are several areas with promising groundwater potential in the Horn of Africa: the border region between Somalia and Ethiopia, the Borana lowlands in Southern Ethiopia and some of the aquifer systems in the lower Tana. Much of the groundwater potential is not mapped however. In addition to the medium-depth groundwater resources, there is a shallow groundwater to be used alongside the semi-perennial and perennial rivers, using basic manual drilled shallow tube well technology but this low cost technology is as yet not widespread.

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**Groundwater as emerging source of irrigation water in the lowlands**

The lowlands of the horn of Africa particularly that of Ethiopia have groundwater potentials that can be utilized for various purposes, including irrigation. These areas are receiving the runoff and the soils with their fertility from the extensive highlands. The degree of degradation of the high lands can tell us how much have been accumulated in those dry plains. On the other hand the lowlands are lacking adequate overhead precipitation that can support crop cultivation. Due to the increasing climate variability and other factors these areas are becoming difficult even for pastoralist livelihood. The warm climate condition in addition to available fertile soil and adequate ground water could have been favorable situation to transform the lowlands. Despite their potentials these areas are suffering repeated drought and at this very moment the worst famine.

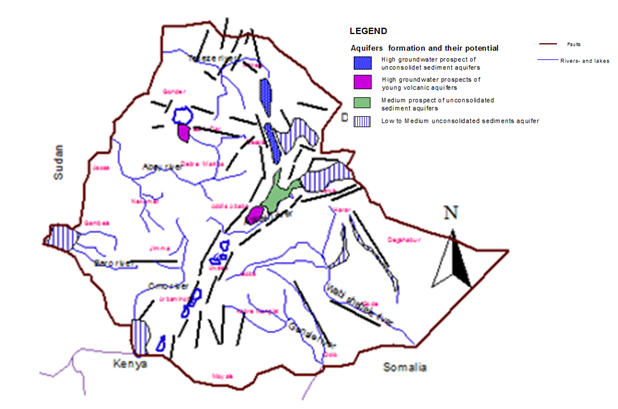


Fig.2: Schematic diagram of some of the ground water prospective sites (Mesfin A, Engida ZA 2004)

As a country with 84% of its population living in a much dispersed rural villages, Ethiopia should have given due attention to its groundwater resources to supply potable water, irrigation and other purposes. Estimates show that almost 70% of the existing rural water supply to be from the groundwater. The share of groundwater in Addis Ababa water supply is increasing. Major towns of the country like Dire Dawa, Harar, Debrezeit and Modjo are getting their total water supply from groundwater. Despite all these contribution groundwater issues were not in the list of priorities, even for the water sector itself. But it is always sought in times of crisis after all possible options are exhausted.

But at present, the current administration has created a great leap in giving attention to the water sector and particularly to groundwater. The need to reverse the poverty situation and

Fig.3 : One of the exploration wells drilled for groundwater assessment with large artesian yield



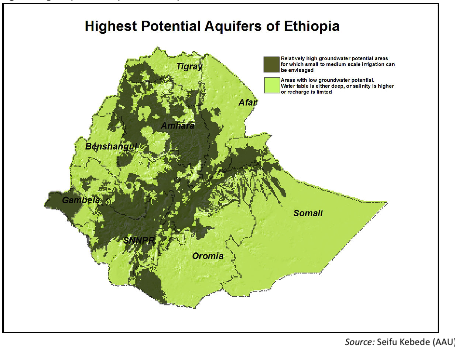
creation of food self sufficient society has forces the current administration to aggressively work on groundwater assessment. The encouraging assessment results have put groundwater in the minds of the highest decision making bodies.

**Current Groundwater development efforts in Ethiopia**

Since the past five years groundwater is sought to solve the food security problems and change the scenarios in the drought prone lowlands of Ethiopia. At present groundwater is sought not only for potable water supply. Large regional aquifers that can be used to irrigate the fertile lowlands are being assessed and irrigation projects have been launched. The historically known Raya\_Kobo\_Girana Valley for its chronic famine and recurrent drought was the main target. A detailed groundwater assessment work has been done to evaluate the quantity and quality of the resource. Raya and Kobo valleys development projects are that are planned to irrigate thousands of hectares are fully groundwater based ones.

The Oromia Regional State, one of the regional states under the federal arrangement, has done detailed groundwater assessment project in Borena and Hararge Lowlands. Based on results of the assessment report large scale water supply projects have been implemented and further use of the available water for irrigation has been considered. In Somale Regional State pilot project has been launched on one of the countries high groundwater potential area. The groundwater assessment projects like Alaydege Plain and Teru areas in Afar Regional State are launched with similar objectives.

Figure 1 is a general overview of the high potential areas for shallow groundwater irrigation. Moreover with successful land management programs in parts of Ethiopia – most notable in Tigray – groundwater tables have come up, making self supply for drinking water and irrigation possible.



**2.4 Water buffer management**

In addition to spate/ flood based farming and groundwater development there is also scope to better retain, recharge and reuse surface run-off in the lowland, however sporadically it comes. Obviously this should be integrated into the agro-pastoralist livelihood systems that prevail in the lowlands.

In other arid lowlands in the world opportunities are developed that as yet do not exist at a large scale in the lowlands of the Horn of Africa, such as:

(1) Encouraging improved rangeland management - selective closure and block management for intensive controlled grazing – causing more rainfall infiltration and creating more biomass

(2) Investment in local water storage and better soil moisture retention: subsurface dams, sand storage dams, cascading check dams, cascade check dams, subsurface dams, terracing, trenching, gully plugs, rainwater infiltration ponds, rooftop system and others

(3) “Regreening’ and commercial local agro-forestry – catering for local and urban demand – through fostering local indigenous tree plantations (for timber, charcoal production, fodder and other purposes) and reforestation. Now in Ethiopia for instance the cutting of live trees and the sales of charcoal is forbidden in large areas – leading to illegal trade and no regeneration

(4) Better local regulation – controlling sand mining from local rivers to avoid floods and loss of groundwater recharge, the protection of recharge zones and streams, and the development of watering points on stock trade routes

Box 1 gives an overview of five sub-catchment plans recently developed for the lower Tana by so-called Water Resources Users Associations (WRUAs). These are local organizations that are tasked with water resources protection and development in their respective sub-catchments. , in cooperation with the Water Resources Management Authority but also other organizations such as Kenya Wildlife Service, Kenya Forest Service and the like. These plans give a good insight in local priorities. In addition to these there are other techniques that are as yet not wel-known.

Box 1: Proposed activities in the SCMP in ASALs (Arid and Semi Arid Lands)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Aspect | Budgetted activities | Garissa | | Kitui | | |
| Kenyatta | Madogo | Mathauta | Kitimui | Nzeeu |
| Catchment Characteristics | Baseline survey: Water resources & socio economic status | • |  |  |  | • |
| Map catchment (GIS): Hot spots, swamps ,lakes, land use etc. | • |  |  |  |  |
| Management approach | Map sub-catchment zones : Ecological, livelihood and commercial | • |  |  |  |  |
| Awareness raising on WRUA existence & roles and responsibilities |  |  |  |  | • |
| Water Balance | Establish ground and surface water use potential | • | • |  | • | • |
| Awareness creation |  | • |  |  |  |
| Water Allocation | Water abstraction survey | • | • | • | • | • |
| Preparation Water Allocation Plan (WAP) | • | • | • | • | • |
| Sensitization meetings : water use and equitable water allocation | • |  |  | • | • |
| Awareness creation on permit conditions & water charges | • |  |  | • | • |
| Closure of illegal abstractions | • |  |  |  |  |
| Enforcement water laws | • | • |  | • | • |
| Resource Protection | Conduction pollution survey | • | • |  | • | • |
| Sensitization on water conservation, storage and management |  |  |  |  | • |
| Holding public meetings on water pollution | • |  | • |  | • |
| Control sand harvesting | • |  | • |  | • |
| Enforcement law on pollution, sand harvesting & encroachment | • | • |  |  | • |
| Establishment & sensitization proper sanitation facilities | • |  | • | • |  |
| Wetland restoration | • |  | • | • |  |
| Spring protection |  |  |  |  | • |
| Pegging the river line |  |  | • | • |  |
| Catchment Protection | Establishment of tree nurseries | • | • | • |  | • |
| Tree planting on public land and water sources & sensitization | • |  | • | • | • |
| Sub catchment delineation and development |  | • |  |  |  |
| Pegging the riparian areas & sensitization | • | • |  | • | • |
| Construction/Improvement/workshops on SWC-structures | • | • | • | • | • |
| Enforcement of the law | • |  | • | • | • |
| Institutional Development | Awareness raising on WRM and WRUA – activities | • | • | • |  |  |
| Publication of WRUA activities (by posters/billboards) | • |  |  | • | • |
| Training management committee on O&M | • | • | • |  |  |
| Review WUA constitution and SCMP |  | • |  |  | • |
| Educational tours | • | • | • | • | • |
| Construction WUA Office |  |  |  |  | • |
| Infrastructure Development | Construction modern roof water harvesting systems | • | • | • | • | • |
| Construction earth pans | • | • |  |  |  |
| Construction earth dams |  |  | • |  |  |
| Construction & rehabilitation of sand dams | • | • | • | • | • |
| Construction of stabilization gabions |  | • |  |  |  |
| Desilting and rehabiliation reservoirs | • |  | • | • |  |
| Drilling & equipping boreholes |  | • | • | • |  |
| Rehabilitation, development & protection springs / shallow wells |  |  | • |  |  |
| Rehabilitation and protection of intakes |  |  |  | • |  |
| Construct cattle troughs at convenient places |  |  |  | • |  |
| Rights Based Approach & Poverty reduction | Training community: Ways and means of poverty reduction | • |  | • |  | • |
| Training community: Farming methods, water conservation, and economic use of water resources | • |  | • |  | • |
| Training WRUA members: Water rights & distribution of resources | • |  | • | • | • |
| Training: proposal writing for funding and agricultural business |  |  | • |  | • |
| Rehabilitate Wildlife Migration corridors and *malkas* |  | • |  |  |  |
| Provision of facilities to vulnerable groups | • | • | • | • |  |
| Acquire land for construction of water facilities | • |  | • |  |  |
| Monitoring & Information | Analysis water quality | • | • | • | • | • |
| Improve water quality monitoring and information system (GIS) | • |  |  | • |  |
| Training WRUA on data collection and monitoring | • |  |  | • | • |
| Awareness community on required water quality per use | • |  | • |  |  |
| Establishment metrological station | • |  | • |  | • |
| Establishment Rainfall Gauge Stations | • | • |  |  |  |
| Installation flow measuring device |  |  |  |  | • |
| Financing & Implementation | Start income generating activities /projects | • | • | • | • |  |
| Fundraising to implement the activities | • |  |  |  |  |
| Capacity building WRUA financial management |  |  |  |  | • |
| Incorporate self-help groups within WRUA catchment |  |  |  | • |  |
| Review membership fee and annual subscription |  |  |  |  | • |

**3. Current irrigation policy for the arid lowlands**

Lowland development is a high priority in the more stable part of the Horn. It is the explicit priority area in the new Growth and Transformation Plan of the Government of Ethiopia and an amount of 500 M USD has been set aside from the national budget for water-centered pastoralist development. Similarly in Eritrea the development of spate irrigation is a main component in the agricultural development policy. – a range of option from civil engineering to river engineering are tried. In Kenya the lower Tana – especially the area around Garissa – is viewed as a next spot for intensive agricultural development – the attention however very much on the perennial water resources.

There are a number of observations on the policy:

(1) There is a need to expand the range of options for lowland water resource management – be it spate/ flood water spreading, groundwater development or water buffering. These options hold considerable promise but as yet they are not common place or in some cases known at all. In flood plains basic techniques of retention bunds, shallow tubewells or fingerponds may add greatly to productivity. In spate irrigation the use of long soil dykes and guide bunds in alluvial areas or bed stabilizers and gabion structures to avoid water going to low flow areas could make a large difference – if introduced gradually and in tune with the needs of agro-pastoralist livelihood systems. There are however already successful areas – such as Ala’aba in Northern Afar. Another option to be explored is to make use of flood releases from reservoirs. These now come unexpected and are left unused.

(2) There is in general a need to work hard on improving the capacity to deliver services in irrigation development. The high non-functionality and low-functionality of systems was mentioned earlier. Annex 1 is a summary of an assessment of technical and managerial capacity in irrigation development in Ethiopia – undertaken in the run-up to the multi-donor Agricultural Growth Project. The numerical and qualitative shortfall needs to be addressed on a priority basis – the more so for the lowland areas where the capacity is even less and the techniques to be used are less familiar.

(3) There is also a need to work on different models of irrigation development for the lowlands. A successful program that may serve as a source of inspiration was the bulldozer program for the lowlands of Pakistan and Yemen. These bulldozers have been used by local farmers – often against subsidized rates – to put in place major water spreading structures using soil diversion and water guiding bunds. Such program – that put farmers in the driver’s seat – may be emulated.

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| **ANNEX 1** | **ISSUES AND BOTTLENECKS IN SMALL SCALE IRRIGATION DEVELOPMENT IN ETHIOPIA** |
| **Governance &organization** | **Bottleneck** |
| **Coordination** | No formal linkages and coordination mechanisms established between institutions involved in irrigation: BOWR, BOARD, CPB and research) leading to inadequate coordination between:   * Research and extension services - leading to lack of information among farmers * Research institutions - lack of research on irrigation management and low cost technology * CPB and BOWR - no systematic support to institutional capacity of the WUAs * PB and BOARD - leading to shortfall in training of WUA in input, marketing and O&M. * BOARD and BOWR at catchment level - prohibits s streamlining efforts of BOARD with BOWR |
| **Capacity** | Lack of transportation facilities for support staff   * + Limits extension services to field   + Lack of monitoring and evaluation of SSI schemes and performance of farmers and field staff   Sub-optimal institutional learning and experience within all irrigation institutions   * + Caused by continuous restructuring and reorganization, with high staff turnover rates   + Minimum in-service training   + No practical training |
| **Legislation** | Inadequate legislation to improve performance of SSI schemes   * Still no guideline on tariff structure for water services, although mentioned in EWRMP and strategy documents (pp. 63); * Lack of institutions guiding and enforcing water rights   Lack of legislation, and mandate, of WUAs - explaining failure to enforce fee collection for example |
| **Implementation** | |
| **Design** | Preference for designed systems   * 92.4% of the SSI schemes is of traditional type consisting of poorly performing canal networks and temporary diversion structures * Only 7.6% of the irrigated area in 2008/2009 has well designed irrigation infrastructure   Inadequate integrated design methods, not using a basin perspective, of surface water schemes:   * + Leading to inefficient, short-life time and even abandoned schemes   + Upstream/ downstream water users were not considered, river flow dynamics not studied, through which schemes could not be used or only a portion, or performance in other schemes decreased, inducing conflict   Inadequate design of irrigation infrastructure   * Very small part of budget is dedicated to design of system – prohibits good work and meaningful interaction with farmers   + Design errors - leading to excess sedimentation in canals, inefficient water distribution and break down of infrastructure   + MUS never factored in – leading to missed opportunities and breakage |
| **Engineering and scheme development**  **)** | Inadequate construction of irrigation infrastructure   * + Leading to expensive and poorly performing schemes   + No cut-off drains (sedimentation), instable site slopes of main canal (collapse), poor weir design (no diversion to intake), no measuring structures included (non-uniform water distribution)   Sub optimal site slection   * + Construction on difficult vertisols and not using local available clay, making SSI schemes more expensive [[7]](#footnote-7)   + Command areas on poorly drained soils, delaying land preparation for wet season   + Construction of houses, coffee processors and schools, school in vicinity of irrigation canals, demolishing them   Inadequate design/ consutruction of groundwater infrastructure (wells)   * + Leading to unsustainable ground water use   + Too narrow spaces between wells, no groundwater recharge structures designed with wells   + Instability of side walls; inappropriate selection/purchase of pumps |
| **Performance** | |
| **Institutional Capacity** | * Weak institutional capacity of the WUA,   + Caused by lack of legislation, lack of attempts to strengthen them and weak institutional capacity (Institutional and physical) of extension services * Lack of insight at federal level to distinguish WUA/WUC |
| **Economic and Financial** | * Poor fee collection rates and no established mechanism for the users to pay fee for future O&M works * Community contribution is 10% of project costs, only 5% is collected on average * Modest performance in marketing strategies of cooperatives / WUCs * Still need to improve cooperative establishment and capacity to buy cheap inputs and negotiate high output price. Prices for rice are sub-optimal due to transplanting at same time (pp. ix and 32 * The regional land administration and use proclamation put max. of 0.5 ha/family in Oromia, Amhara and SNNPR |
| **O&M/ field water management** | * Water planning often poor - cropping calendar not synchronized with peak water availability * Water delivery - duration of irrigation depend on land size, rather than crop type and crop stage. (pp. viii) * Water rights are not enforced, upstream users using more (pp. 41) * Poor maintenance of irrigation infrastructures, leading to poorly performing canal networks and temporary diversion structures * Oversized land-holding in irrigation schemes (pp. 28) , leading to poor O&M of the irrigation infrastructure |
| **Agronomic practices** | Crop choices   * 45.– 75% of the area in SSI schemes not cultivated with high value crops * Only 1.3% of the irrigated land planted with improved seeds. * Farmer strategy give priority to rain fed part of their farm   Agronomic practices   * Poor crop rotation inducing disease and pests * Planting overgrown seedlings * Under fertilization by farmers   Poor water management   * Leading to salinity (Awash valley) * Over-irrigation (too much an too long), reducing yields; too less irrigation water leading to moisture stress |

Source: Leul Kahsay Gezehegn (2009). Assessment Of Small Scale Irrigation In Selected Project Areas And Menu Of Services

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5. Extensive background material on experiences in spate and flood based irrigation can be found on the website of the Spate Irrigation Network: <http://www.spate-irrigation.org> [↑](#footnote-ref-5)
6. This section is based on Muthigani (2011) [↑](#footnote-ref-6)
7. * Improvement of SSI schemes is generally expensive, lack of research on low cost technologies is not supporting to this

   [↑](#footnote-ref-7)