



Subsurface dam for a pastoral environment

Chris Print, Somaliland



THE USE OF small dams and barriers to check and harvest surface flows can be traced back to antiquity, and are evident today in many arid areas world-wide. Evidence of recent development programmes in sub-Saharan Africa suggest the positive impact that small scale sub-surface dams can have in increasing pastoral water security during the prolonged dry season (Nilson, 1988).

Somaliland is a mostly arid region in the Horn of Africa and there are no perennial rivers flowing through. In socio-historic terms, conflict and co-operation over pasture, wells and open pond catchments has long been a part of the traditional Somali pastoral dynamic. In spite of the fact that large areas of Somaliland are mostly arid, conditions in many areas are favourable for the development of its scarce surface and shallow groundwater resources by means of simple technology (Faillace and Faillace, 1986).

Water harvesting

In western Somaliland average rainfall is 430 mm per annum and potential evaporation is around 1300 mm per annum. There is long extended dry season ("*Jilal*" which literally translates as drought) that lasts from November through March, during which time surface catchments usually dry up. *Jilal* is generally followed by flooding within a space of days as the first rains come.

At present rainwater harvesting is underdeveloped. In town there is a lack of guttering, in rural areas spate run off is to the wadis or togga that incise the region and thereafter mainly to the Gulf of Aden. There is a need to develop more harvesting resources that exploit the available rainfall resource, and conserve rainfall more efficiently from the wet period into the dry. Ineffective water shed management is also contributing to fluvial erosion, so in the rural areas harvesting must be related to management of the environment in a way that the negative impacts are minimised.

Effects of the war

Somaliland is recovering from the effects of civil war. The wartime destruction of wells and "*berkad*" (groundwater collection tanks), and especially the looting of bore hole generators and well-pumps, was a common rural and urban experience. Now rehabilitated, major water points are working but maintenance remains a recurrent problem. In the rural areas much infrastructure remains damaged by the war.

The breakdown in central government, state and civil institutions has also led to a return to reliance on tradi-

tional elders based institutions. The loose federal clan structure is empowered to deal with traditional justice, as well planning and management of localised aid investments.

Caritas Switzerland have been active in supporting local initiatives to rehabilitate and develop community based water infrastructure. The aims of the programme are to improve water security and quality in the rural areas, working through and supporting local institutional frameworks. Further aims are to provide reintegration opportunities for demobilees, improve the rural pastoral livelihoods where possible, and promote South-South technology transfer. The programme is seen as part of an integrated, holistic approach that complements the work of other international organisations working in the region, such as VetAid, Oxfam, IUCN, UN agencies, etc.

Pastoral communities and sub-surface water harvesting

The major industry is livestock production. Livelihoods are based on pastoralism, with small areas of irrigated crop production and some dry land farming. The rural population of Somaliland is estimated at around 900,000 people with pastoralists accounting for around 75 per cent of the rural population and 25 per cent agro-pastoralist/sedentarised (Holt and Lawrence, 1992). Pastoralists in particular show confidence in traditional institutions since they have, for generations, been active in regulating social and economic interaction. In the current post war climate, where there is an established need to regenerate the economy, working with pastoralists institutions thus assumes primary significance. However, traditional pastoralists remain amongst the most difficult group to assist with development aid.

In Somaliland dry seasonal migrations bring large numbers of pastoralists into contact with the sedentarised agro-pastoral population at certain sections of togga where sub-surface water is abstracted through basic hand dug shallow wells. This water is used for livestock and human use. These seasonal togga reservoir act as key resource patches for pastoralists, as they also provide fodder, pasture and a meeting place for social interaction, which are by products of the local environmental conditions. At the bed of the togga there is a more or less impermeable "*malas*" layer, which is irregular in profile. During dry periods the sub-surface water lies in discontinuous series of sub-surface basins and there is probably no continuous sub-surface flow throughout the year. Downstream overflow from basin to

basin occurs only during spates (Hunt, 1955). It was therefore recognised that locating and raising the reservoir capacity of selected basins by building sub-surface dams at the downstream end of the basins would conserve water in subsurface sand, just away from excess evaporation and salination (Nilson, 1988). It was also recognised by the pastoralists that stored water is less open to pollution, or the breeding of mosquitoes. Increasing reservoir capacity would also provide some measure of “drought proofing” through working with the established pastoralist’s movements.

“New” thinking in pastoral development

Pastoral Development Programmes have proved to be amongst the least successful aid sponsored projects in sub-Saharan Africa and consequently a new approach to pastoral development has emerged from a better understanding of the pastoral mode of production and way of life (Scoones et al, 1994). It incorporates the new paradigm “Natural Resources Management” (NRM) which is a way of looking at how natural resources (vegetation, water, wildlife and soils) can be used, managed and improved in a sustainable way, combining physical and social considerations. The new approach to pastoral development has been tried in places such as Niger, Burkina Faso, Sudan and Senegal with some success although time is necessary before the full impact can be seen. (UNSO et al, 1994).

New information on the ecology of arid areas has prompted the shift in the perception of pastoralism. Once considered inefficient and anachronistic, nomadic pastoralism is seen to be an efficient and appropriate system of production for arid range land environments. The various components of the production system are adapted to the variable climate and ecology of that environment. It is no coincidence that pastoral systems across the sahel from Mali to Somaliland display similar characteristics. Rather than being seen as problematic, requiring change, these activities are now seen as essential and should be strengthened.

It is widely accepted that in arid environments rainfall is more variable and less predictable than in sub-humid or humid environments (Agnew and Anderson, 1992). In ecological terms arid areas are classified as non-equilibrium environments where rainfall is the critical limiting factor since the quality and number of plant life is determined by rainfall and soil fertility rather than livestock grazing pressure, ie. more variable distribution of rain in space and time equates to more variable vegetation growth. There is thus a need to recognise mobility and flexibility of livestock as a key factor in pastoralists success and to concentrate on key resources, in relation to rainfall. This goes against “old” pastoral development policies, largely based on paddocking and planned movement of livestock on fenced ranges, which were based on classic equilibrium models of climax vegetation and plant succession. In equilibrium environments rainfall is not considered a critical factor since quality and number of plant life are

related to livestock numbers, a critical error if applied to drought prone areas (Scoones et al, 1994).

Application of the “new” thinking to the Somaliland programme

The Caritas programme has sought to integrate the new thinking by:

- Setting objectives that focus on pastoral development and livelihoods rather than setting objectives that focus on commodity production and livestock development.
- Recognising that traditional mobility has to be maintained and encouraged with a focus on key resource patches in range management, versus paddocking and restrictive movement through enclosure fencing.
- Employing flexible adaptive planning based on local involvement and a recognition of uncertainty rather than “blueprint” development planning.
- Recognising the key role of pastoral organisations in managing local issues, with extension workers acting as “institutional organisers” rather than encouraging a service delivery package through centralised extension services.

Of particular interest to the water worker are that the programme has sought to integrate the new thinking by:

- Emphasising drought “proofing” and safety net provision rather than separating “normal” year development and drought relief programmes.
- Recognising that in highly dynamic, non-equilibrium environments land degradation is not the major issue it was once assumed. Therefore bore holes and permanent water points continue to be a priority in areas where water is a limiting factor. The cost of bare “sacrifice” zones immediately surrounding each bore hole is usually far outweighed by the benefits of more efficient fodder use and higher livestock populations. However it must also be recognised that, indiscriminate creation of very high densities of public water points has adverse environmental consequences in that there is a decreased resilience of the system as the patchy nature of the environment is degraded. Also, change in resource access following investment in new public access water points can also have adverse socio-economic consequences. Clearly therefore, bore holes, etc. have a significant and positive role to play, but there is equally a strong case for upgrading traditional water security mechanisms in a way that promotes water conservation and encourages social self reliance and mobility.

Sub-surface dams

It is surprising that, apart from one or two known sub-surface dams that were successfully built to provision refugee camps during the 1980’s, there is no known history of building sub-surface dams in the region.

A pilot project was thus initiated by Caritas Switzerland and IRC (Islamic Relief Committee) local NGO at Hareed togga site in 95/96 which has demonstrated the effectiveness of subsurface dams in raising the reservoir capacity of a togga site that is used seasonally by pastoralists on migration. IRC, acting as extension agents, were active in working with the local community and institutions to establish workability of the idea and to ensure that the project had the backing of both the permanent and transient beneficiaries; a local water committee was thus activated. The aim was to introduce a pilot dam as a community based project that relied on:

- Demonstration.
- Visible and positive results monitored and evaluated overtime.
- Community willingness to contribute to conserving water.

Of additional concern were efforts to ensure the sustainable quality of the local environmental conditions at the dam site, and downstream of it, by setting indicators relating increased water quantity to vegetation cover, soil and embankment erosion, and fodder production, etc., which can only be monitored over time.

The pilot dam was designed according to the limited available hydrological data and surveyed and built to standard procedures developed in semiarid Kenya (Nissen-Petersen, Lee 1990). The dam is 40m long by 3.1m deep rubble stone retaining wall, plastered on the upstream face and set on a 50mm mortar and sand bedding, built for a cost of approximately \$5,000. The dam project was able to employ the services of approximately 60 persons, many of them demobilees, and has raised the reservoir capacity of the upstream wadi by an estimated minimum 1,200m³ water. This compares favourably in cost with the building of new *berka* which, at approximately \$6,000 per installation typically provide some 300m³ of storage. In addition, and within 1km of the dam, three concrete lined shallow wells were built as potable water supplies, in preference to the traditional hand dug wells. Parallel with the construction a community based health awareness programme was advocated to ensure the health benefits of improvements to water supplies are made known.

According to the elders the dam works, to the extent of "the first time they have permanent water through the dry season" (Alpman, 1996). The outcome of the pilot project was a logical extension of the programme which has proved possible through recent funding by the European

Union. The model of Hareed is now being iterated at other sites in Somaliland, with improvements being made on the basis of addressing; reducing costs, attention to sustainability and maintenance, awareness raising campaigns for water quality, and environmental issues by ensuring closer links to complimentary NRM programmes involving soil conservation, etc.

Concluding remarks

As has been proven elsewhere in Sub-Saharan Africa small scale sub-surface dams are an effective way of harvesting water. In Somaliland they are being introduced to increase water security for pastoralist, particularly in the extended dry season. Although of limited impact in critical drought periods, sub-surface dams are unobtrusive and appropriate technologies that require little maintenance if well built. They have been introduced with the cognisance on "new" thinking on pastoral development, which strongly supports community participation, and as complimentary to a the wider "Natural Resources Management" paradigm which is appropriate for the region.

References

- AGNEW and ANDERSON, 1992, Water Resources in the Arid Realm.
- ALPMAN, C., 1996, Technical study for the rehabilitation of the water supply in the Awdal, W.Galbeed, Togdheer and Sanaag regions in Somalia. EU Somalia Unit.
- FAILLACE and FAILLACE, 1986, Water quality data book of Somalia - Hydrogeology and water quality of Northern Somalia, Vols 1 and 2. GTZ.
- HOLT and LAWRENCE, 1992, A survey of rural Somaliland. SCF UK.
- HUNT, J., 1955, Survey report for a sub-surface dam at Hargeisa, Somaliland.
- HMSO NILSON, A., 1988, Groundwater dams for small scale water supply. IT
- NISSEN - PETERSEN and LEE, 1990, Harvesting rainwater in semi-arid Africa, Subsurface and sandstorage dams. ASAL.
- SCOONES et al., 1994, Living with uncertainty: new directions in pastoral development in Africa
- UNSO, 1994, Out-take from material of the local-level natural resource management programme, UN Sudano-Sahelian Office.

C.R. PRINT, Delegate Water Engineer, Caritas Switzerland.
