SAND DAMS: A CONCEPT PAPER

THE TWO ORGANIZATIONS

Utooni was begun in l978 in Machakos District, as a simple six-family initiative based on the traditional ‘mwethya’ (work group). In 1980, Utooni built the first sand dam. It was used to irrigate a vegetable nursery for the expanding group. It also provided water for livestock so as to release community labor from trekking-for-water. To date the Utooni group has built 750 dams.

Subsequently, three development consultants launched Sahelian Solutions (SASOL) in 1990, in Kitui District--adjoining Machakos District--for they were convinced that water was the most limiting factor in dry zone development. They had seen the impact effected by the Utooni initiative. Kitui District is drier than is Machakos District. To date SASOL has also built 750 dams! Both organizations and their respective staff have been involved in African countries as varied as Ghana, Tanzania, Ethiopia, Somaliland Mozambique, Zimbabwe, Cameroon, Uganda, and Eritrea etc.

A SAND DAM AND ITS ADVANTAGES

A sand dam consists basically of a weir constructed across an ephemeral river, which stores sand. Water is held in the spaces between the sand granules. This space varies form 20 to 45%, depending on granule sizes. Sand dams make it possible to capture and store large quantities of water in drylands where rainfall, when it does come, is usually limited to brief storms. Further, water thus stored in sand is not lost to evaporation as is the case with open dams. In areas where ground water is saline, sand dams ameliorate salinity. Initially, Utooni built isolated, ‘stand-alone’ sand dams. Early on SASOL recognized the possibility of regenerating rivers and systematically recharging ground water by situating all their dams in ‘cascades’, i.e., a series of sand dams, located typically at 1000-metre intervals along an ephemeral riverbed. Utooni has followed suit with this practice. Sand dam cascades facilitate the regeneration of ecologies and rivers, recharged ground water and reliable water supplies.

Clean water can be drawn off channel wells, typically situated in some proximity to the sand dams.

COMMUNITY PARTICIPATION IN BUILDING SAND DAMS

As facilitating agencies, both SASOL and Utooni engage systematically and intimately with local communities for purposes of constructing the dams. Community members collect the building stones, sand and water. This activity constitutes approximately one half of the construction cost of a sand dam. Such community contribution creates a sense of ownership and counters the perception that sand dams—as development projects—are owned by donors and thus should be maintained by the donor/owner. Further, it has been demonstrated that cross gender and age relationships improve if a community struggles with building, maintaining and utilizing a sand dam.

Organizing communities for participation in sand dam construction is an expensive undertaking. Within the donor fraternity, this cost is perceived to serve as a limitation to 'scaling up' [i.e., building many dams over a large area]. Typically donors do not provide finance to facilitate community organization. Both SASOL and Utooni strongly support community participation for purposes of long-term dam maintenance as well as the prevention of cascade pollution.

SITES, DESIGNS, MATERIALS, CONSTRUCTION, FILLING UP AND EROSION

There are indications that sand dams were in existence as early as 4000BC. Some were built in Namibia and Eritrea, early in 20th century. In colonial Kenya, sand dams were built on rock outcrops, straddling rivers, and thus did not function to recharge ground water. Documentation with regard to best sites, designs (especially wings and spillways), construction techniques (whether using concrete, rubble stones or formwork), and multi-season construction (to allow sand filling in stages, thereby negating mud fills) has been sparse. Both Utooni and SASOL have demonstrated that the argument for staged construction is spurious. Utooni uses formwork. SASOL uses river rubble

stone. Both have rejected the use of poured or ‘pure’ concrete because of the prohibitive cost. Long wings are featured in the dam design to increase storage, to expand ground recharge and to limit erosion. Designs for optimally functioning spillways have been researched and designs limiting backwash are in place. The key variable in effective construction is excavation to the bedrock to which the sand dam is anchored by means of well-embedded iron rods. This construction feature is absent from most of the written sand dam materials making the rounds in the Internet. To strengthen research and documentation facility, SASOL has partnered with TU Delft and other universities in the Netherlands, with diverse NGOs and even with the Amsterdam Water Company to undertake diverse, relevant research on sand dams. Scientific data thus generated is robust and helpful [SASOL has learned how to site dams using open satellite data!], but, to date, no clear solutions have been identified for the construction of sand dams on black cotton soils! This scientific work has attracted researchers working on the premise that sand dams could/might serve as a coping mechanisms in the context of climate change.

IMPACTS

Sand dams transform dry ecologies to wetter and thus much more productive ecologies. They release water-fetching labour for more productive activity. They provide higher quality water than is typically available in the semi-arid regions. They trigger new on-farm and off-farm production and provide for better nutrition leading to improved health. They bind communities together in new and novel ways, stimulating innovations in farming systems, trade and social solidarity.

PROBLEM OF SCALING UP

Both Utooni and SASOL work at the community level. Typically, they have been asked by church-related groups or very small community-based NGOs to introduce the sand dam technology. Both organizations are convinced that countries seeking to enlarge and secure rural water supply systems, while at the same time mitigating climate change, would be well advised to adopt this technology as one of the effective strategies of securing water resources. To

date this technology is not taught in water engineering institutions. Nor does it feature in formal water or climate change studies. Urgently required is funding which would facilitate a consortium of NGOs, universities, state and international water and climate change institutions to develop policies and to implement sand dams on large scale. On their own, sand dams will not solve Africa's water problems. But on the basis of extensive experience generated to date by Utooni and SASOL, it is clear that sand dam technology offers the possibility of making a significant contribution to Africa's future water resources.

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