PRODUCTION WATER AS UKAMBA DEVELOPMENT STRATEGY

A. INTRODUCTION

Many controversies exist and will continue on the strategy for Ukamba development. My own research since 1970 shows that lack of water impedes ASAL development. More specifically production water is the prime obstruction to Ukamba development. Ukambani is basically dry (Zone 4-6). Global warming will exacerbate this. The hill massifs (Zone 3) form a small part. Their carrying capacity was exceeded by the middle of the last century. That fact explains the migration to the drier areas over the past fifty years. **Therefore, the strategy for Ukambani development is to generate production water first and then to supply growing urban centers. Production water is defined below and the various technologies evaluated. An action plan is proposed.**

B. PRODUCTION WATER DEFINED

Production water is water harvested to impact on production. Production water releases labour from water gathering chores. The released labour is then available for use in better food and commercial activities. Harvested production water impacts on, ground water, soil structure and the environment. ASAL soils do not absorb enough water from the meager rainfall for the dry seasons leave them compacted. Since such rainfall does not percolate, ground water is not recharged. The natural environment does not regenerate for lack of soil moisture. It is over-exploited by the large population, which does not allow fallow or natural restoration time.

PRODUCTION WATER HARVESTING

The simplest form of water harvesting is to let land lie fallow so as to allow natural regeneration. This is no longer possible in Ukambani given current population. The next technique, in complexity, is to terrace land. It is estimated that only about 20-30% of Ukambani is terraced. Grazing land is not terraced. The third level of complexity is sand dams (*core, mingeto, ngome etc*). These are structures built on land or ephemeral rivers to hold water in the ground or in sand. The simplest sand dams can be built on farming land to retain runoff on agricultural land. In this they act like other water harvesting techniques like cutoff drains or bench terraces. Their advantage would be that dams last longer. They can be built by burned bricks, stones or compacted soil if very small. The typical sand dam is built in matwiku, small ephemeral rivers or large rivers. Such construction changes the river morphology by storing water and sand. Water moves from surrounding lands after the rains into the land or the river channel and then moves underground to recharge the ground water other than rushing to the Indian Ocean.

ADVANTAGES OF SAND DAMS

1. Sand dams are low tech and can be built by most people. The Colonial Welfare Development Fund built the first ones in Ukambani for water supply in the fifties. They still exist. Examples are in Kisiio River in Kitui and Wamunyu River in Machakos. From mid 1970, Utooni village in Kalama location started building them on *Mwethya* basis. To date they have more than 350. MIDP built some in Machakos during the eighties. USAID build some in Kitui, which, like the DANIDA ones in Mutomo, were washed away because of poor construction and siting. The Catholic Church built many in Kitui over the past thirty years. ACTION Aid and CARE have a few scattered in Ukambani. SASOL is the global leader in this technology with 900 dams in Kitui, other districts and countries.
2. Stored water recharges ground water proximate to dams. They create wetlands if sand dams are constructed in cascades. These re-generates natural revegetation and enable growth of high value crop trees for timber, fruits etc.
3. Sand dams have practically no maintenance, long life and operating costs unlike earth dams and boreholes.
4. Sand dams are cost effective for they are built with local river stone and sand. Purchases are cement and labour. Where labour is community contribution, it reduces costs dramatically. Community labour, river stones, sand and water typically account for fifty percent of SASOL sand dams costs. They are sustainable from an economic point of view and typically have better water quality unlike boreholes and earth dams.
5. Returns from sand dams are from the first year. In Kamale, local youth have been able to kick up their annual average incomes from Ksh. 2,000 to above Ksh. 250,000 by growing tomatoes by bucket irrigation. It is noticeable that vegetables are available now in all towns in Greater

Kitui from sand dams. These returns would make most families have surplus funds for all sorts of investments ranging from improving housing, fees, and trade.

6. Sealed wells next to sand dams assure communities of reliable and uncontaminated water and thereby good health.
7. Landowners in Greater Kitui and Machakos are building individual sand dams on their pieces of land.

C. WATER SUPPLY FOR EMERGING URBAN AREAS

Long distance pipelines supply the large urban centers of Athi River town, Machakos town, Kitui town, Mwingi town, and Kyuso town. Athi River enjoys both Kilimanjaro and Nairobi pipelines. Machakos was supposed to get Kilimanjaro pipeline but it rarely does so. Kitui used to have supply from the Matuu canal but currently pumping from the power dams on Tana River now supplies it together with Mwingi and Kyuso.

Supply to Wote is deficient. So is supply to other emerging towns like Tseikuru, Kangundo/Tala, Mutito, Kyamatu, Mutomo, Ikutha, Kanyangi, Sombe, Mwitika, Mutonguni, Kathonzweni, Masii, Kambu, Sultan, etc. Large dams on rivers like Tiva, Tyaa, Kaiti, Kibwezi, Kiboko, Mwita Misyi, Thua, Muvuko, Mui, Thwake as well as Tana can most efficiently supply these and some divisional headquarter towns. Supply from Athi main channel should be discouraged for it not only has Nairobi and Athi River sewage but more dangerous is the lead, cadmium and arsenic, DDT and other agro chemical found in the river. To date urban water has essentially concentrated on boreholes. These are not high yielding typically and will not be sufficient for the long run. They can be used for supplementation but the core supply will have to be large dams in the branches of the Athi and Tana. High yielding boreholes are found on the old Athi channel, overlaid by the Yatta Plateau and should be considered other than the air brained proposal to pump up contaminated Athi water to the plateau.

D. WATER FOR LARGE SCALE IRRIGATION

There is need to institute large-scale irrigation to take care of the large population and to increase production. The main concentration of large-scale irrigation in Ukambani is at Matuu and Kibwezi. Matuu canal gets its water from Thika River. It is estimated that upstream users of Thika River will take more than 90% of its water in the next ten years thereby marginalizing any extension of the Matuu irrigation system, not to speak about limiting its utility. Soils are also getting saline because of inappropriate irrigation techniques.

The best potential for large-scale irrigation is the Adams Falls dam on the Tana for it can be justified both for power generation and irrigation. JICA has held public meetings on this dam in the past. The issue was whether to develop the dam for power only or power and irrigation. Pressure should be applied for this later strategy for Mwingi, Kyuso, Kitui and Mutomo can benefit tremendously if the dam is built to also supply irrigation water.

Munyu dam on the Athi was identified and designed in the seventies. It is not viable given the contamination of Athi water, unless the long-term poisoning of the population is ignored. The partly implemented canal for irrigation of Mbiuni, Mwala etc is also not viable from a contamination point of view. Kibwezi River offers good possibilities for expanding large-scale irrigation if the underground streams are harnessed. So do Kiboko and Kaiti and their branches if dams are built in the highlands so that water may flow by gravity to the Makueni lowlands. Therefore if large-scale irrigation is to be developed in the Athi basin, its main branches, Thwake, Kaiti, Kiboko and Kibwezi Rivers will have to be the sources. Ikoo dam was identified in 1977 and ignored. This is an important large dam for it will have the possibility of taking water by gravity to not only Kitui town but to Sombe, Makongo Endau and Damsa on one hand. On the other, it can also send it to Mwitika, Kyamatu, Voo, Mutha and Mutomo. Large-scale irrigation possibilities are good on the Tiva if first dammed before confluence with the coexisting contamination of Kitui town delivered by Nzeeu and Kalundu. Downstream it can be dammed for Ikutha and Mutomo water supply for the biological contamination of Nzeeu and Kalundu would have been naturally processed.

E. BOREHOLES

A recent study of all boreholes in Ukambani shows that 61% are saline. Some are so saline hat even animals cannot use the water. However, there is good potential on the old Athi Channel as shown by the Katangi borehole. Borehole operations are expensive thereby vitiating them from being useful in community water supply. However, there is an urgent need to use boreholes for supply of all divisional centers.

F. ACTION PLAN

1. Large scale dams on Ikoo, Ngwane/Kaiti, Thwake and Tana for supply to District Headquarters and Irrigation
2. Financing expansion of sand dams in all districts by CBOs and NGOs.
3. Drilling of boreholes in all divisional headquarters.
4. Political and administrative leadership by the Ministry of Water on sand harvesting which is drying rivers in Kajiado, Machakos, Makueni, Yatta, Kitui and Mwingi.
5. Political and administrative leadership by the Ministry of Water on cement and coal mining in Mwingi, Kitui and Mutomo. If badly done it will drain ground water of these and adjoining districts.

Mutiso25/06/08