ANALYSIS OF WATER USE TRADE-OFFS BETWEEN CROP AND LIVESTOCK IN KALACHA SETTLEMENT, MARSABIT DISTRICT, KENYA.

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Abstract

Oasis ecosystems provide essential services to desert areas. These oases are under threat due to fundamental transformation of land use changes in the recent years. These newly established land uses have resulted in new demands for water. Against these backgrounds water related conflicts have arisen. In this study the ramification of converting flexible land use system into static ones, are investigated, in the perspective of water use between sedentary irrigation against nomadic pastoralism. This paper introduces the generally bleak picture of the world's fresh water resources, and the predicaments facing Kenya as a country. It focuses on Kalacha, an oasis settlement caught up in the nexus of change, on whether to embrace a potential better use of its water by irrigation at the expense of traditional dry season livestock refuge area. The problem of the study is whether Kalachas' choice, of what to undertake is rational, is hampered by lack of information. To address these, the study investigates water balance of Kalacha settlement, the optimal balance in water use between livestock and crop needs, the suitability of water for irrigation purposes. The methods used included a flat plate weir to measure Water flow rate, Water quality was measured by standard laboratory practices, Crop water requirements were calculated from evaporation data, then ranked in respect of quantity of water used, Animal water requirements were calculated as-(a) that based on maximum stocking density, (b) the stock dependant on forage produced by irrigated crops, (c) those counted by past aerial surveys, Simulation and optimization methods were used with respect of either livestock or crop to provide nutritional needs of residents and in the establishment of tradeoffs in water use. The study results showed that available water supply was 795,000 liters per day, while Human demand was 28,700 liters per day, Wildlife demand was 26,475 liters per day, Livestock demand ranged from 7 to 552,225 liters per day, Crop water demand from 95,040 to 319,680 liters per day, Water balance ranged from -259,505 to +644,778 liters per day, Water quality was unsuitable for irrigation due to high chloride level of 332.61

mg/l. The study showed that all the sources of water were unsuitable for human consumption due to high potassium, sulphates and chlorides (Borgeson, 1983, WHO), All sources of water were beyond threshold for livestock requirements with respect to sulphates (Mc Cauley in Lusigi, 1984, Bake 1994), and all were unsuitable for irrigation due to high level of chlorides, except for artesian waters the rest of waters pH was limiting or marginal (Richards 1954, FAO, 1985). In the study crop simulation, Intensive cultivation is recommended as the area required by resident population, 39 Ha is higher than topographically available 7.2 Ha. High energy producing crops were of generally long growth periods which are in competition with livestock. Crops with short growing period provide livestock with an opportunity window as a tradeoff, Competition was noted in crops with great biomass yield and water economy features as they produced toxins to livestock. Crops with high biomass yield for livestock and energy for human needs were inefficient water users and were unable to satisfy community energy requirements despite intensification. Crops produced more nutritional energy on weight basis of water used than livestock. The study's results on Livestock simulation showed that 537 goats were necessary for milk production to meet the community annual energy requirements or 103 cattle were needed if meat is used to meet community's annual energy needs. Whereas number of shoats, were within those of aerial surveys, those of cattle (103 versus 180) were too close implying slaughter of cattle as being unsustainable. Sheep were the most efficient users of water for each weight gained (98.05kg/m3) followed by camel (77.7kg/m3), goat (42.575 kg/m3) and cattle(11.327kg/m3) in that order. For each lactating animal, camels produce more milk per kg of water used (0.11 to 0.46kg/kg), followed by shoats (0.025 to 0.2075 kg/kg), then cattle. Under hydrological austerity, goats produce more milk followed by sheep then camel and cattle for each unit of water consumed. Shoats have the lowest water capital cost for milk production (81 to 223 kg) followed by camel (717 to 5438) and cattle (1788 to 1998kg) in that order. The above figure show that each stock performs efficiently during certain part of the season. Over long periods camels are good but for short season of good rain, small stock are better producers, while for length of production, cattle are excellent. Each livestock species occupies a special niche with respect to the temporal and spatial variability of the dry lands pastoral production system.

In Conclusion, the Water quality of Kalacha artesian waters was generally unsuitable for use by irrigation, livestock and human beings. If the pastoralists use the range to maximum capacity, the water will not be sufficient to meet irrigation and livestock needs. There is sufficient water supply when stocks are those of aerial counts and those raised on fodder generated by crop agriculture. By selecting salt tolerant crops, irrigation has some prospects in kalacha. Due to locomotion capacity of livestock, temporal and spatial variable rain, pastoralism in the overall regional system is a better performer than crop agriculture. Further research is required in determining the practicality of hoisting heavy grains by pastoralists as they move in search of water and also on the impact of irrigation on the overall pastoral production system. Simulation cycling around biomass needs with respect to milk and meat, points towards measures to increase forage production rather than water availability. Therefore suitable methods of reclaiming the Chalbi desert for forage production should be explored. Vitamin supplements are necessary to counter vitamin deficiency syndromes irrespective of crop or pastoral system.