

WATER SUPPLIES IN LESS DEVELOPED

COUNTRIES: some fallacies

Because of great pressure on space we were unable to print the following notes by Dr. Matthew Dagg\* and Dr. Michael Gwynne\* in the last issue of the Bulletin.

I) Boreholes in Tropical Rangelands

Boreholes are often advocated as being the ideal way of supplying water for livestock and wildlife in semi-arid areas as they enable the ground water resource to be tapped. Their use in developing countries in the tropics has, however, severe practical limitations.

Too often boreholes are put in before a rational dry season watering policy has been worked out in terms of livestock numbers and the animal walking distance between the watering point and grazing grounds. Rotational grazing means moving from one watering point to another because the plant productivity of semi-arid rangeland is not usually sufficient to enable one borehole to be the centre of a complete rotational cycle for a herd of economic size. Thus a number of water points must be established in order to ensure the success of the rotation. This in turn means that some boreholes in the system are closed while the herds move on to water at others within range of the new grazing. This is a relatively simple procedure on ranches where the managerial discipline is sufficiently strong to ensure that the taps are turned off and remain off. Owing to the very strong water laws and customs among pastoral peoples, however, the opening and closing of boreholes may cause very great social stress and lead to the

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destruction of the borehole by the very people it was meant to help. A better system is to resort to a series of carefully sited small surface or sub-surface dams that fill from rainfall runoff and empty by God's Will (and the scale design of the engineer). These can be so placed that they will dry out in rotation and so ensure an adequate "natural" grazing cycle in free range areas. This also eliminates water pump fuel costs and the very heavy borehole depreciation losses as well as the difficulties caused by water shortage when the borehole breaks down; such break-downs often take a very long time to repair.

Boreholes sited in open rangeland outside fenced grazing schemes invariably attract pastoralists and their stock causing them to settle more or less permanently around the water point. This concentration of livestock leads to rapid local destruction of the habitat with a wide area being stripped of its vegetation and the soil trampled and cut leading to severe erosion. Eventually the grazing is pushed back beyond the maximum distance that livestock can walk between grazing and water. The people then either move away or remain on famine relief.

A similar situation arises when borehole fed permanent water points are installed in National Parks for the use of wildlife. These quickly attract large resident populations of animals and lead to the breakdown of the habitat around the water point causing the eventual, and often permanent, dispersal of the animal population it was meant to attract. This is particularly true where elephant feature in the local fauna and is evidenced by the problems faced by hotels in East Africa that are dependent for tourist attraction on permanent artificial water points to bring animals to their immediate vicinity.

## II) Forests and Water Resources in the Tropics

The interpretation of results of catchment area experiments in temperate zones has led to a firm belief that a continuous forest cover is the best form of land use for the conservation of renewable water

resources. This is perhaps justifiable in temperate climates because any extra loss of water by transpiration from evergreen trees in the cold dormant season for crops is more than compensated for by the regulation of the seasonal flow of the rivers from forested areas. This advantage is due to a number of factors but the most important is often the reduction of the rate of snow melt under trees in relation to that on open ground: within the tropics this is rarely a vital consideration. Moreover, in many tropical countries, the dormant period for crops is the dry, not the cold season. Annual crops and grasses use little water in this period but deep rooting evergreen forests transpire very large amounts of water throughout the dry season with the result that the water yield from cultivated areas is often more than twice that from forested areas.

Certainly damaging spate flow peaks are held to a minimum from forested catchments and the highest level of soil conservation is attained: any intensification of land use involves some risk to soil stability. But alternative land uses are almost always of more immediate economic benefit than forestry (especially in high rainfall, high potential areas). The denial of potential economic return in addition to the reduction in free water resources in the tropics, consequent on the retention of forests, may be an unreasonably high price to pay for soil preservation and "land bank" policies adopted and adhered to against the day when more sophisticated cultivation practices can be assured to conserve soil effectively.