Animal traction and sustainable soil productivity in Kenya

by

Isaiah I C Wakindiki

Appropriate Technology Centre, Kenyatta University, PO Box 43844, Nairobi, Kenya

This paper is published in: Starkey P and Kaumbutho P (eds), 1999. *Meeting the challenges of animal traction.* A resource book of the Animal Traction Network for Eastern and Southern Africa (ATNESA), Harare, Zimbabwe. Intermediate Technology Publications, London. 326p.

Abstract

In the process of developing previously uncultivated land into permanent cultivation systems it is necessary to consider soil and water conservation measures. This paper describes the role of vegetative strips, trash lines, stone bunds and terraces as soil and water conservation techniques, and concludes that there is vast potential in Kenya to use animal traction in such indigenous soil and water conservation measures, especially on smallholdings in moisture-deficient areas.

Background

Land degradation is a widespread problem in Kenya, and a problem which is becoming worse as marginal lands continue to absorb the growing population (Stahl, 1994). Land that previously was able to sustain its inhabitants, and even produce a surplus, is now derelict.

Environmental assessment by the World Bank (1992), the United Nations Environment Programme (UNEP, 1992), the World Watch Institute (World Resources Institute, 1992) and the World Conservation Union (IUCN, 1992) questions Africa's ability to halt its environmental degradation and sustain livelihoods by the end of this century. This paper discusses land degradation in the context of indigenous soil and water conservation for sustainable soil productivity, and explores the possibility of employing the animal traction in this respect.

Traditionally, soil conservation has been perceived as a physical problem caused by inappropriate farming practices. Conservation projects did not analyse the problem from the farmers' perspective, so proposed solutions were often socially unacceptable, economically not viable or ecologically unsound (Fones-Sundell, 1989). Indigenous conservation is now gaining popularity among researchers and policy makers alike, who concede that the farmers themselves have a better understanding of the processes of ecological change, slope dynamics and biological regeneration (Zurick, 1990).

Unfortunately, the change in tillage practices from the traditional hoe to mechanised (tractor) plowing has meant that most indigenous soil conservation techniques are no longer used. However, agriculture in Kenya is currently characterised by an increase in the number of impoverished smallholder farms which are experiencing increased soil erosion and decreasing soil productivity (Kiome and Stocking, 1993). Tractor use is no longer an option for small-scale resource-poor farmers. Animal traction therefore remains a suitable technology if it can be developed alongside the indigenous soil conservation techniques to alleviate labour drudgery.

Indigenous soil and water conservation techniques

Vegetative strips

Vegetative strips are usually narrow grass strips grown across the slope. The grass acts as a barrier to run-off, and encourages the deposition of sediment, eventually leading to terrace development. *Imperata cylindrica* is commonly planted: other popular grasses include *Vetiveria zizanoides* and *Pennisetum purpureum*. Species such as *P. purpureum* may also be fed as fodder to draft animals and other livestock.

A modification of vegetative strips is live fencing surrounding cultivated fields (Thomas, 1988).

Trash lines

Trash lines range from simple bunds of cereal and legume stover (as applied in Embu, Kenya) to more sophisticated pegged brush lines (Gichuki, 1992). Apart from impeding run-off and enhancing infiltration, trash lines may also improve soil fertility and increase soil organic matter if they are incorporated into soil during plowing. Trash lines

are extensively used in the Tharaka area of Kenya (DAREP, 1994).

Stone bunds

Stone bunding is the most common indigenous soil and water conservation technique in areas of Kenya where stones are abundant, especially in the eastern drylands. Lines of stone are laid out in parallel lines or a grind pattern on compacted denuded land to increase infiltration and capture soil blown by the wind. Stone bunds present a semi-permeable barrier which allows the passage of excess run-off while trapping sediment. In Embu Region, Altshul (1995) reported quite sophisticated stone bund systems where cultivation on the inter-bund areas led, over time, to the formation of natural ridges.

Terraces

Levelled bench terraces and earth bunding on existing slopes are the two main types of earth terrace structure common in Kenya. Sometimes, especially in the highlands, steps are constructed across the hillside when strips of crop residue are covered with soil dug from above. The resulting incorporation of organic matter increases soil fertility and enhances infiltration (Thomas, 1988).

The *fanya juu* earth bunding system in Kenya has become a "modern tradition" (Critchley, Reij and Willcocks, 1994). The *fanya juu* terrace is a back-slope bench terrace designed to trap run-off and suspend sediment. It is formed by digging the trench and throwing the soil up-slope to form an embankment. These terraces have a reputation for being very effective, and there is evidence that crop production is increased. However, their construction and maintenance demand considerable labour input (Kiome and Stocking, 1993).

The role of animal traction in indigenous soil and water conservation

Earth-moving animal-drawn equipment can be used to construct terraces and earth bunds, thus saving on human labour. The mouldboard plow is common in Kenya, but it is rarely, if ever, used for this purpose.

Gathering stones to construct stone bunds is equally time-consuming and labour-intensive. Animal-drawn raking equipment that can gather and move surface stones can greatly promote this approach to soil and water conservation, but nowhere in Kenya is this opportunity being taken.

Vegetative strips (and modifications of this technique) are compatible with livestock systems because of their dual role: as a conservation measure and as a source of fodder. However, animal-operated forage harvesters and choppers are not well developed. Some grasses used in the strips may also pose a weed problem. Therefore, it is urgently necessary to develop specific animal-drawn weeding equipment. Planters that can be used to plant both the grasses and the crops also need to be developed.

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