

## Improving animal traction technology

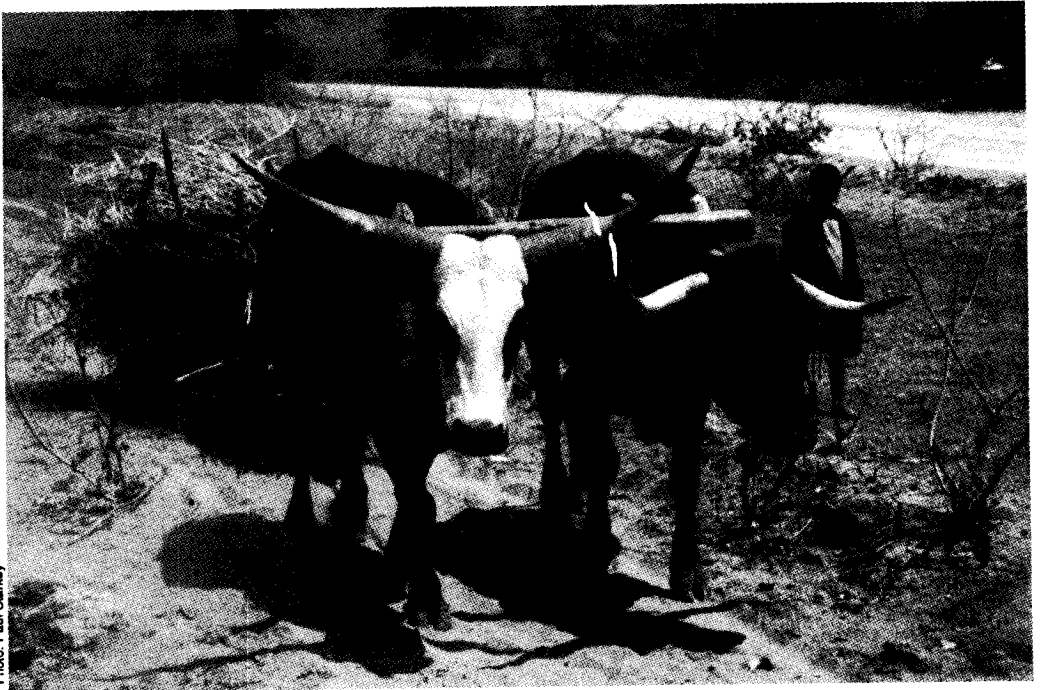
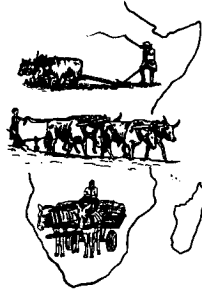


Photo: Paul Stantey

## Country experiences and constraints

# Development and transfer of animal traction technology in Ethiopia

by

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## Abstract

*Development and transfer of animal traction technology is the key to technological development of Ethiopian agriculture, avoiding the inefficiencies of existing practices which restrict yields and work output and also increase the time needed for seedbed preparation and sowing. The modified Getema plow provides an illustration of how animal traction can improve efficiency: seedbed preparation with this implement takes only about 25 hours/ha, compared with the 160 hours/ha needed to achieve a similar quality of land preparation with the local maresha; and wheat yields from plots plowed with the modified Getema are twice those obtained from plots plowed using the local maresha. The common maresha is an inefficient and inadequate tool for land preparation as the seedbed produced is of poor quality. In the absence of sowing equipment, broadcast seeding is widely practised, resulting in inefficient use (poor positioning and spacing) of seed.*

## Introduction

Ethiopia is a large country with a surface area of 1.22 million km<sup>2</sup> and a human population of 52 million. The country has the largest livestock population in Africa, and the ninth largest in the world.

Agriculture (defined to include crop and livestock production as well as forestry) is the mainstay of the economy; it engages over 85% of the population and accounts for about half of GDP and nearly 90% of exports.

Although about 80 million ha (65% of the land area) are considered suitable for agricultural purposes, only 13 million ha are actually used for agriculture, and only about half of this area is used for crop production in any one year. Almost all cropping is rainfed and of a subsistence nature; the major crops are teff, barley, wheat, maize and sorghum. The total annual production from the cultivable area is about 6.5 million tonnes—an average yield of only 1 t/ha. This low productivity is mainly attributable to the primitive traditional methods of cultivation, which have remained unchanged for centuries.

## Review of existing practices

The *maresha* ard is cheap to produce using local skills and materials, and is light enough (11 kg) to be carried easily to and from the fields, or dragged along the ground behind the oxen. The wearing parts have a life of about five years and so the operating costs are low. Seedbed preparation can take up to six passes of the *maresha*, depending on the type of crop to be sown, and this may require up to 150 ox-team-hours/ha. Seed is normally broadcast by hand but occasionally maize is planted in rows using a rope as a marker. Teff seed, because of its small size, is driven into the ground by walking animals over the field.

Weeding is mainly done by hand (a time-consuming operation), except in robust crops like maize where the plow is driven through the crop. Ministry of Agriculture trials have shown that hand weeding consumes 140 labour-hours/ha but that yield increases of up to 40% can be obtained as a result of weed control. Harvesting is done with a sickle, and threshing is carried out either by hand beating or by animals trampling the crop. The threshed straw is removed with a forked stick which is also used for winnowing. The mixture of grain/chaff is partially winnowed in the field and then sacked and taken to storage by pack animals.

## Improved farm implements

Several private and governmental organisations are concerned in the development, import and manufacture of agricultural implements in Ethiopia.

Almost 100 different types of agricultural implement are used for soil preparation, crop handling, transport, storage and other agricultural operations in Ethiopia. Of these, 21 are animal-drawn plows; eight of them have been locally tested and developed, but little improvement work has been done on the others.

An extensive programme of development and testing of a range of harrows, planters, threshers, carts, seed cleaners, grain storage systems and other

equipment was undertaken locally by the Arsi Rural Development Unit (ARDU), the Institute of Agricultural Research (IAR) and the Rural Technology Promotion Department (RTPD). Most of the implements either did not perform satisfactorily or were not promoted to the farmers. Those that did promise success, and were further developed, manufactured, tested and distributed to farmers by RTPD, are described below.

#### *Getema mouldboard plow*

The *Getema* mouldboard plow was developed by RTPD based on the French *Ebra* model. It is simple to manufacture and the results of field tests were encouraging. Following suggestions from farmers, the plow was modified by replacing the two handles by a single one and the pulling chain by a wooden beam. Provision was also made for depth control. Up to 1991, 768 plows had been produced, and 665 units had been distributed to farmers and governmental and non-governmental organisations.

The main advantage of this plow is that it can prepare a good quality seedbed in less than one-sixth of the time needed using the local *maresha* (25 vs 160 hours/ha). The main disadvantage is that it requires a much higher tractive effort than the *maresha*, particularly in heavy black clay soils.

#### *Harrow*

The ARDU harrow, a triangular wooden frame with 18–24 steel spikes, was modified by providing a handle on the frame to control the movement of the animals and the working depth. As a result, a fine seedbed can be prepared much faster than with the earlier model. The new harrow also has better seed covering characteristics, and is cheaper, than the old one. It has been widely accepted by farmers.

#### *Planter*

A prototype batch of ox-drawn maize planters has been produced; trials are still underway.

A row planter and a seed drill have been imported. Tests on farmers' fields show that neither implement improves labour productivity compared to broadcasting by hand, but both increase production.

#### *Weeding*

Ministry of Agriculture research data show that good weed control can increase crop yields by up to 40%. Farmers are well aware of the weed problem, and make considerable efforts to overcome it. An animal-drawn weeder, which should reduce the time needed for weeding, is still on trial.

#### *Rural transport*

Manual transport of seed, fertiliser, farm tools, market produce, etc. between fields, the home and the market is tiresome and inefficient and absorbs unacceptable amounts of rural women's time. To alleviate these problems, comprehensive efforts have been made to develop, manufacture and distribute horse, ox and donkey carts as well as wheelbarrows. The carts, of which 1100 have been distributed in different parts of the country, have wooden or metal frames and either metal wheels or 16-inch pneumatic tyres.

### **Constraints to development and transfer of animal traction**

The main technical and socioeconomic constraints that limit the development, manufacture and widespread adoption of improved implements and equipment are:

- identifying and developing farm implements that are best suited to the needs of the farmers
- shortage of raw material (steel) and spare parts due to lack of foreign exchange
- lack of technical skilled manpower
- limited purchasing power among smallholders
- lack of coordination between government and other organisations engaged in developing, manufacturing, marketing and promoting animal traction
- the prevalence of tsetse flies in lowland areas and also lack of strong draft animals
- shortage of transport, and hence limited opportunities to visit farmers' fields
- limited training facilities for both extension agents and farmers
- inadequate infrastructural development.

### **Conclusion**

Development and transfer of animal traction technology is taken to mean the application of animal-drawn implements (improved plows, harrows, planters, cultivators and rural transport) in the agricultural production process, with the aim of promoting labour and land productivity. Ethiopia has recently given due attention to development, manufacture, distribution and promotion of improved animal draft technology. The estimated six million smallholders use primitive tools and implements which are also in short supply. Thus there is a potential to increase labour and land productivity by using better improved agricultural implements.