

Paul Starkey

# Harnessing and Implements for Animal Traction

An Animal Traction Resource Book for Africa

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# Foreword

This resource book was planned as a revised edition of the first animal traction handbook published by GTZ in 1981. It presents further technical information on Animal Traction and also reviews practical experiences during the last decade in many developing countries. The lessons to be learnt are manifold, but one aspect seems particularly important: those working with animal traction should avoid losing their perspective and objectivity by promoting Animal Traction with an ideological bias. Animal Traction, like other technologies, is only one means to the end of improving, on a sustainable basis, the livelihood of rural people. It is a link on a chain stretching from human labour to full mechanization, one stage in a long process. Some failures and disappointments in promoting Animal Traction teach us to see the technology in the broad context of the prevailing social, economic and farming environment. Only if we can thoroughly and intelligently assess and appraise the human and natural environment will we be able to come up with successful strategies and solutions.

In stark contrast to many developed countries where agriculture accounts for a small proportion of the economy, agriculture plays a

major role in the economies of most developing countries. The role of agriculture in development requires much greater care and attention. The importance of agriculture not only for the well-being of the people, but also for the entire developing economy is often seriously overlooked. Such neglect has slowed development and presents major difficulties to governments and donors trying to improve this sector.

This book highlights some of the problems and possible solutions of a small but vital area of agriculture. It aims to present Animal Traction in the context of the prevailing environments and farming systems. If this edition can provide development workers and decision makers with a constructive perspective on animal traction, then we will have achieved a great deal.

We at GTZ, together with the author and collaborators, sincerely hope that this book will reach those who are capable and willing to use the information presented. We hope they will be able to transform the ideas into intelligible action that can benefit and improve the livelihood of the rural poor in developing countries.

**B. Kehr**

# Map of Africa

This map was kindly provided by the International Livestock Centre for Africa (ILCA). It is designed to show the approximate positions and sizes of African countries. It is included

for the convenience of readers only, and does not imply any expression of opinion concerning the delimitation of boundaries, territories, jurisdiction or legal status.





# Preface

In 1978 an interdisciplinary team started to prepare the manual "Animal Traction in Africa". This was intended as a guide to assist planning and decision-making for development projects in Africa. The first version, in German, was published in 1981, followed by the English and French editions in 1982.

The "Animal Traction in Africa" manual was prepared mainly from an intensive literature analysis. At that time few publications were available so that perhaps undue authority had to be ascribed to old material, some dating back to colonial times. GTZ had begun to have experience with projects to promote draft animals in Africa, and this "early stage" knowledge was included, together with information derived from other national or international organizations and aid agencies.

Since 1978, nearly all African countries have started new development projects involving the utilization or promotion of draft animal power as a means to small-scale farm mechanization. External support for such projects has come from numerous sources. Since the publication of the first edition, several workshops have taken place at international, regional and national levels in order to improve information exchange in this neglected area. An international "expert consultation" on draft animal power was convened in 1982, and regional workshops have been held in west Africa (1985, 1986, 1988) and southern and eastern Africa (1983, 1987). The West Africa Animal Traction Network has now been formed and the International Livestock Centre for Africa (ILCA) is currently developing an Animal Traction Research Network.

As one consequence of this greater availability and exchange of information and worldwide experience, some of the views and statements expressed in "Animal Traction in Africa" began to seem dated, and occasionally misleading. Thus at the end of 1986 a proposal was put to GTZ to review the first edition and prepare a new one.

Following discussions between Burghard Kehr, Klaus Lengefeld, Henriette Mende, Ingeborg Reh, Paul Starkey and myself, it was decided to produce a series of specialized texts instead of one voluminous book. These "Animal Traction Resource Books" will aim to include information and experiences from around the world, but with special emphasis on, and reference to, Africa. Three thematic books are envisaged and these are intended to be used in close conjunction with the "Animal traction directory: Africa", already published in the same series. The themes will be:

- Harnessing and implements
- The working animal: selection, training, husbandry and nutrition
- Draft animal power: economic, social and environmental aspects

In this present book, Paul Starkey has used a stimulating and fresh approach to combine a detailed understanding of the practical problems encountered in the field with a comprehensive review of published information. In this way the objectives of the revision have been thoroughly met in regard to the two important topics of harnessing and implements.

**Peter Munzinger**  
*February 1989*  
Siavonga, Zambia

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Despite the help received from these and other people, it seems inevitable that there will be some inaccuracies or errors in the text. For these the author has to be responsible himself and he apologises in advance for any incorrect statements or impressions given. Should errors be noticed, the author would welcome factual corrections. He would also be happy to receive comments, observations and additional information on the topics covered. This would be particularly useful should any updated or translated edition be planned.

Various colleagues kindly allowed information from unpublished studies to be quoted.

Particular thanks go to Peter Howell of AFRC-Engineering, Dominique Bordet and Gérard Le Thiec of CEEMAT, Peter Lawrence and Anne Pearson of CTVM, R. K. Bansal of ICRISAT and Projet Aridoculture, Michael Klaij of ICRISAT, Niger and Joachim Betker of the University of Hohenheim.

The author is very grateful to all the organizations, institutions and individuals who provided photographs or line drawings. In order to give credit in the appropriate context, the illustrations have been acknowledged on the pages where they have been reproduced. In cases where illustrations have originated from other publications, a short form of the reference has been cited which will allow readers to obtain the full details of the publication concerned from the list of references (Chapter 12). In many cases, the illustrations used here are "original", in that they have never been published before in their present form. Nevertheless if similar illustrations from other publications were used in the conceptualization, design, development or realization of the drawings, that source has been fully acknowledged with the word "after".

All sources of illustrations are gratefully acknowledged. Particular thanks go to the following organizations or individuals for the assistance they provided in supplying photographs or line drawings:

- Agricultural Engineering Training Centre (AETC), Zimbabwe
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- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

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**Paul Starkey**  
March 1989

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### *A note on desk-top publishing*

This book was created by the author using "desk-top publishing" (DTP) techniques. With the proliferation of computers within agricultural ministries and development projects, DTP is likely to become increasingly employed in the preparation of animal traction manuals and reports. For this reason some details of the steps and programs involved in the production of this book are provided for people interested in this technology.

The personal computer used for the DTP was an "IBM-AT-compatible" (made by Dell). The text was entered into a conventional word-processing program (Multimate). Some of the line drawings were created directly with a graphics program (Publisher's Paintbrush). Drawings from other sources were brought into the same graphics program using a Canon flat-bed scanner, and were then edited as necessary. Text and graphics were integrated within a specialized DTP program (Xerox Ventura Publisher), and printed by a Hewlett Packard laser printer (12 pels per mm or 300 dots per inch). This laser-printer output of laid-out text and drawings was used as the "camera-ready-copy" required to make conventional offset-printing plates at the printers. The original photographs were also scanned to produce computer graphics images that could be scaled and positioned within the DTP program. A printout of the page layout including the photographic images at relatively low resolution (300dpi) was submitted to the printers. This enabled them to make correctly-scaled high-resolution photographic plates from the original photos. The photographic plates were positioned in the offset plates in the appropriate gaps left in the "camera-ready copy". Final printing (on recycled paper) and binding were carried out by the printers using conventional techniques.

*Plough or plow; draught or draft?*

For those interested in the evolution of languages, it may be noted that while standard English spellings have been used in this text, with each of two commonly used words draught/draft and plough/plow the simpler of the alternative spellings has been adopted. All four spellings have been used in the English language for several hundred years and there are numerous ancient and recent precedents for the shorter, simpler versions. Current North American standards arose from the adoption of the simpler variations of the alternative spellings that were in use in English-speaking countries two to three hundred years ago. Although the “ugh” spellings have predominated in British publications for the last century, it would simplify terminology greatly if international publications used one spelling. Since the simpler alternatives have been used and accepted many times in the past, there seems little justification for maintaining the “ugh” spellings. Thus, in a continuation of the precedent set by other books in this series, “plow” and “draft” have been adopted here.

# 1. Introduction

## 1.1 Resource book objective

The subject of harnessing and equipment for animal traction is broad. It is important to people from diverse backgrounds with different levels of experience and education. Programme planners, extension workers, farmers, researchers, lecturers and students all have need for information on the subject, but while some need to start with very basic information, others require concise yet detailed technical content. Ideally there should be many different texts to meet these diverse requirements, ranging from simple extension manuals, filled with drawings of how to use and adjust animal-drawn implements, to specialist papers on implement working parameters or construction details. Luckily such an "ideal" situation does exist, the problem is that few people are aware of it! As should become apparent, there are very many useful documents, some widely disseminated and others little known, which together cover all the required levels of complexity. This book is not designed to replace these, but to lead people to them.

In past years there has been insufficient liaison between people working on harnessing and animal-drawn implements. As a result, there has been much unnecessary repetition of similar work, and limited opportunity to build on the experiences of others. Many misconceptions have arisen as to which equipment and techniques farmers have used successfully, and which implements farmers have found inappropriate. For this reason this book is intended to lead readers not only to printed sources, but to people and organiza-

tions with experience of the various topics discussed.

It should be clear that this book has not been conceived as a technical manual, for this would have inevitably fallen into the trap of being too simple, too complex, too general or too specific to be of wide-ranging value. Rather this book is intended as a resource document that can stimulate greater exchange of information between workers of many different levels and backgrounds. The objective has been to provide a thorough yet readable "state of the art" review, that informs people not only of further appropriate reading, but also makes them aware of organizations that may have relevant experience in the various subjects discussed.

## 1.2 Context and approach

In the earlier GTZ book *Animal Traction in Africa* (Munzinger, 1982) some very useful advice was given on harnessing and animal-drawn equipment (Viebig, 1982). Another widely used source of practical information was compiled by French workers in the 1960s and was published in French by CEEMAT as *Manuel de la culture avec traction animale* (CEEMAT, 1971). This was subsequently translated by FAO and published in English as *The employment of draught animals in agriculture* (FAO/CEEMAT, 1972). Both the GTZ publication and those of CEEMAT/FAO are still thoroughly recommended to the reader, and they are cited on several occasions in the following sections. Nevertheless it must be remembered that these books were the product of their times, and some of

the emphases and approaches may be less applicable today than when they were written. For example the CEEMAT/FAO publication discussed and illustrated several very heavy items of equipment that had been widely used in Europe. These have proved to have little application for smallholder farmers in tropical Africa. The previous GTZ animal traction book also illustrated some of these applications, and went on to emphasize more recent designs of equipment developed by researchers in Africa. As it transpired several of the illustrated designs (such as the TAMTU harrows and double plows) subsequently proved unacceptable to farmers, often because they were too heavy, too complicated or too expensive (Kjærby, 1983).

One objective of this present book is to give a more realistic impression of the *actual situation* with regard to animal traction in developing countries with special reference to Africa. It is also intended to provide ideas on future options. It is a specific intention to counteract the tendencies of many of those involved in animal traction development to present over-optimistic and rather euphoric views of the application of draft animal power, and various wonderful "new" techniques and designs. The problems of development are seldom that simple. The strong element of caution (considered by the author as "realism") may well be interpreted by some as pessimism. This is certainly not the intention as the author himself is both optimistic and enthusiastic about the potential for draft animal power. However in the past decade excessive optimism has often given way to great frustration among policy makers, researchers, extension workers and farmers. Such damaging disappointments could often have been avoided had a more realistic approach been

adopted, based on existing knowledge and previous experiences.

This background whereby unguarded optimism has led to disappointments should be borne in mind in the interpretation of each of the following chapters. It is **not** intended to dampen existing enthusiasm, but it is hoped that, by highlighting the potential problems, the resources and human energy available will be channelled in more constructive ways.

Should anyone read this book from cover to cover, they will inevitably be aware of repetitious themes. In practice few people read resource books so comprehensively: most people gather a general impression from the illustrations and captions, and then read only those sections of particular interest. For this reason key points and key references have sometimes had to be included in several sections. One recurrent theme will inevitably be that technical excellence is only one of many criteria to be used when assessing equipment and harnessing; farmers require materials and techniques that are affordable, sustainable and usable within the realities of their farming systems.

Finally, in the following chapters and appendices some implements have been referred to by trade names and mention has sometimes been made of specific manufacturers. The use of such names, and the provision of some addresses, is fully in line with the overall "resource book" objective of this publication. However it cannot be too strongly stressed that the mention of names should **not** be interpreted as approval or endorsement of any specific manufacturer or any particular implement design. Similarly no significance whatsoever should be drawn from the lack of mention of any manufacturer or design.