



# Rural structures in the tropics

DESIGN AND DEVELOPMENT

$$d = \sqrt{\frac{4 \times 57}{\pi}}$$



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## About CTA

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# Preface

There is a growing awareness of the need for better rural structures and services in many developing countries. For many years, rural buildings and structures in numerous countries have been built either traditionally with few improvements, or in an inadequate and often overly expensive way, guided by people with insufficient knowledge of the special technical, biological and socio-economic problems involved.

Rural buildings and structures have become an important part of integrated rural development programmes. As a large proportion of the food grain produced in Africa is stored on-farm, it is very important to develop effective storage methods and structures, especially for the modern, high-yielding grain varieties being adopted by farmers, which are more susceptible to pests than traditional types.

Improved management and breeding programmes to increase livestock production have also created a need for more appropriate animal housing.

The subject of rural structures and services needs to be included at all levels of the agricultural education system to assist the rural population still further in raising their standard of living. Specialists in rural structures and services need to have a thorough knowledge of farming systems, crop and livestock production systems and climate factors, as well as a genuine understanding of rural life and the farmer's social and economic situation. They should also be familiar with the full range of building materials and types of construction, from traditional indigenous to industrially produced, as they apply to rural structures. They must be able to select appropriate installations and equipment for rural buildings.

This knowledge will enable them to produce specifications, in cooperation with the farmer, for functional building designs that provide a good environment and durable construction, thereby contributing to efficient and economically sound farm operations. Further important tasks for specialists in rural structures and services are interpreting and explaining the drawings and technical documentation to farmers, as well as supervising the construction work. However, they should be aware of the need to consult other specialists in related fields where necessary.

This book is an effort by FAO to compile an up-to-date, comprehensive text on rural structures and services in the tropics, focusing on structures for small- to medium-scale farms and, to some extent, village-scale agricultural infrastructure. The earlier edition, entitled *Farm structures in tropical climates. A textbook for structural engineering and design*, was published in 1986, and was based on material developed as part of the FAO/SIDA Cooperative Programme: Rural Structures in East and South-East Africa. The programme was established to help member countries to develop functional, low-cost rural structures using locally sourced construction materials and skills wherever possible.

For over two decades, the earlier edition has been used as a standard textbook for teaching undergraduate and postgraduate courses on rural structures and services in universities throughout sub-Saharan Africa. As part of its normative programme on rural infrastructure development, the FAO Rural Infrastructure and Agro-Industries Division (AGS) commissioned a team of three professional engineers who participated in teaching courses on rural structures and services to review and rewrite the earlier edition, whilst examining the socio-economic and technological developments that have taken place over the past 25 years. This team, which worked during the period 2010–2011 under the direct supervision of former AGS Director, Professor Geoffrey C. Mrema, comprised Professor Lawrence O. Gumbe and lecturer Januarius O. Agullo from the University of Nairobi, Kenya, and Dr Hakgamalang J. Chepete from Botswana College of Agriculture.

We trust that this second edition will help to improve teaching – at all educational levels – on the subject of rural buildings in developing countries of the tropics and that it will assist professionals currently engaged in providing technical advice on rural structures and services, from either agricultural extension departments or non-governmental rural development organizations.

We also trust that this book will provide technical guidance in the context of disaster recovery and rehabilitation, for rebuilding the sound rural structures and related services that are key to development and economic sustainability.

While this book is intended primarily for teaching university- and college-level agricultural engineering students about rural structures and services, it is our hope that resources will be made available to produce textbooks based on this material for teaching at other educational levels. Although parts of the background material relate specifically to East and Southeast Africa, the book's principles apply to the whole of tropical Africa, Latin America and South Asia because, while building traditions may vary, the available materials are similar.

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Prof Geoffrey C. Mrema, holds a B.Sc. degree in Engineering (Hons) from the University of Nairobi, Kenya; an M.Sc. in Agricultural Engineering from the University of Newcastle-upon-Tyne, UK; and a Ph.D. in Agricultural Engineering from the National University of Ireland. From 1973 to 1984, he lectured at the Department of Agricultural Engineering and Land Planning of the Faculty of Agriculture of the University of Dar-es-Salaam, Morogoro, Tanzania. This Faculty of Agriculture became, in July 1984, the Sokoine University of Agriculture (SUA). In addition to advancing from Lecturer in 1979 to Professor by 1987, he also was head of the Department of Agricultural Engineering and Land Planning (1979–1987) as well as Associate Dean of the Faculty of Agriculture (1985–1987) until he was appointed the inaugural Dean of the Faculty of Agriculture of the University of Botswana and Professor of Agricultural Engineering, where he served during the period 1987–1995. From 1995 to 2001, he was First Executive Secretary of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) in Entebbe, Uganda. In 2001, he joined FAO as Director of the Agricultural Support Systems Division at FAO Headquarters in Rome, Italy. During the period 2005/06 he served as the Subregional Representative of FAO in Eastern and Central Africa based in Harare, Zimbabwe. He returned to Rome in August 2006 as Director of the Rural Infrastructure and Agro-Industries Division (AGS), and he held this position until 31 March 2011, when he retired from FAO service on reaching the UN mandatory retirement age. He is now based at the Department of Agricultural Engineering and Land Planning of SUA, where in addition to lecturing he undertakes consultancy missions for international and national agencies.

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