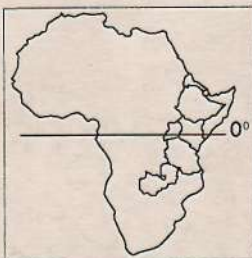
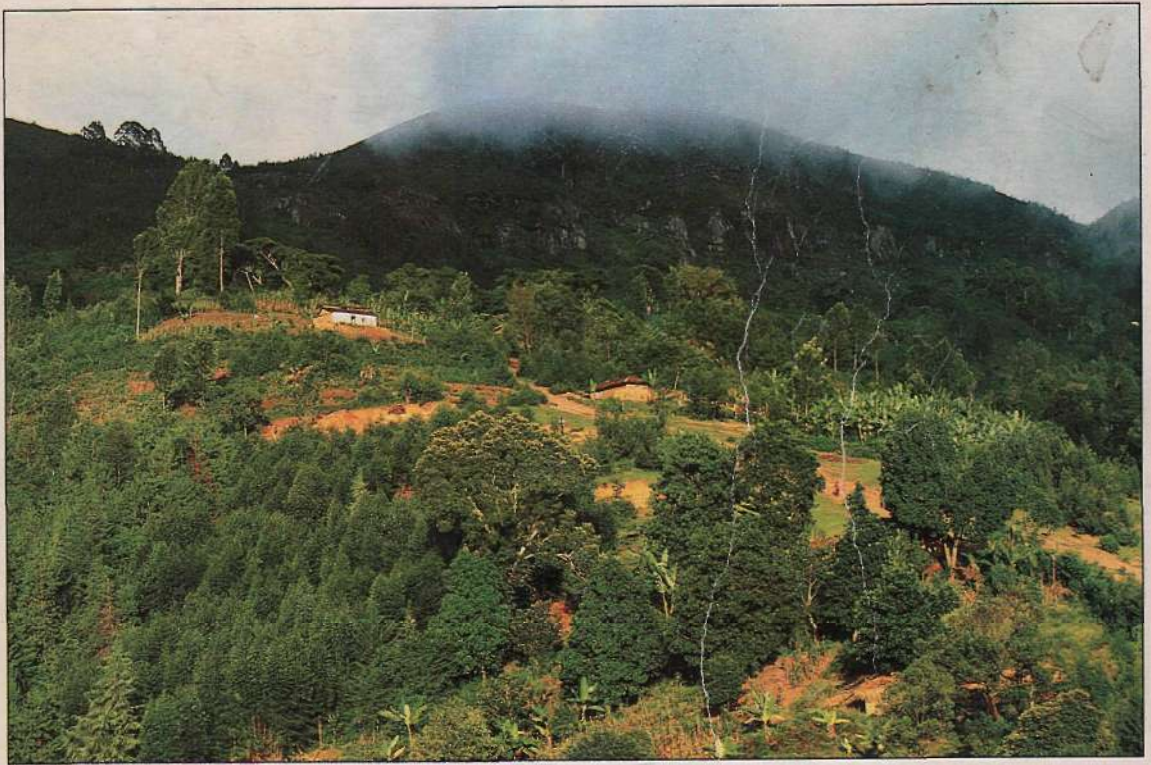


USEFUL TREES AND SHRUBS FOR TANZANIA

**Identification, Propagation and Management
for Agricultural and Pastoral Communities**



**L P Mbuya, H P Msanga, C K Ruffo,
Ann Birnie and Bo Tengnäs**

Regional Soil Conservation Unit/SIDA

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Bo Tengnas

REGIONAL SOIL CONSERVATION UNIT (RSCU)
SWEDISH INTERNATIONAL DEVELOPMENT AUTHORITY
1994

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Front cover photo:

Uluguru Mountains and a village, Tanzania

Photo: Charlotte Thege

Published by the Regional Soil Conservation Unit (RSCU)
Swedish International Development Authority (SIDA)
Embassy of Sweden
P.O. Box 30600, Nairobi, Kenya

Printed by English Press, P.O. Box 30127, Nairobi, Kenya

Editor of RSCU series of publications: Paul Rimmerfors/RSCU

Cataloguing-in-Publication Data

Useful Trees and Shrubs for Tanzania. Identification, Propagation and Management for Agricultural and Pastoral Communities/ By L.P. Mbuya, H.P. Msanga, C.K. Ruffo, A. Birnie and B. Tengnas-Dar es Salaam and Nairobi: Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA), 1994.
(Regional Soil Conservation Unit, RSCU. Technical Handbooks Series; 6)
Bibliography:p)

ISBN 9966-896-16-3

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The Technical Handbook Series of the Regional Soil Conservation Unit:

1. *Curriculum for In-service Training in Agroforestry and Related Subjects in Kenya*
Edited by Stachys N. Muturi, 1992
ISBN 9966-896-03-1
2. *Agroforestry Manual for Extension Workers with Emphasis on Small Scale Farmers in Eastern Province, Zambia*
By Samuel Simute, 1992
ISBN 9966-896-07-4
3. *Guidelines on Agroforestry Extension Planning in Kenya*
By Bo Tengnas, 1993
ISBN 9966-896-11-2
4. *Agroforestry Manual for Extension Workers in Southern Province, Zambia*
By Jericho Mulofwa with Samuel Simute and Bo Tengnas, 1994
ISBN 9966-896-14-17
5. *Useful Trees and Shrubs for Ethiopia: Identification, Propagation and Management for Agricultural and Pastoral Communities*
By Azene Bekele-Tessema with Ann Birnie and Bo Tengnas, 1993
ISBN 9966-896-15-5

Publisher's Preface

In 1991 the Regional Soil Conservation Unit (RSCU) initiated a series of technical handbooks on useful trees and shrubs in eastern Africa. The aim of the series is to provide information for subject-matter specialists, extension workers and farmers on the trees and shrubs that have a production and conservation potential for small farmers in the region.

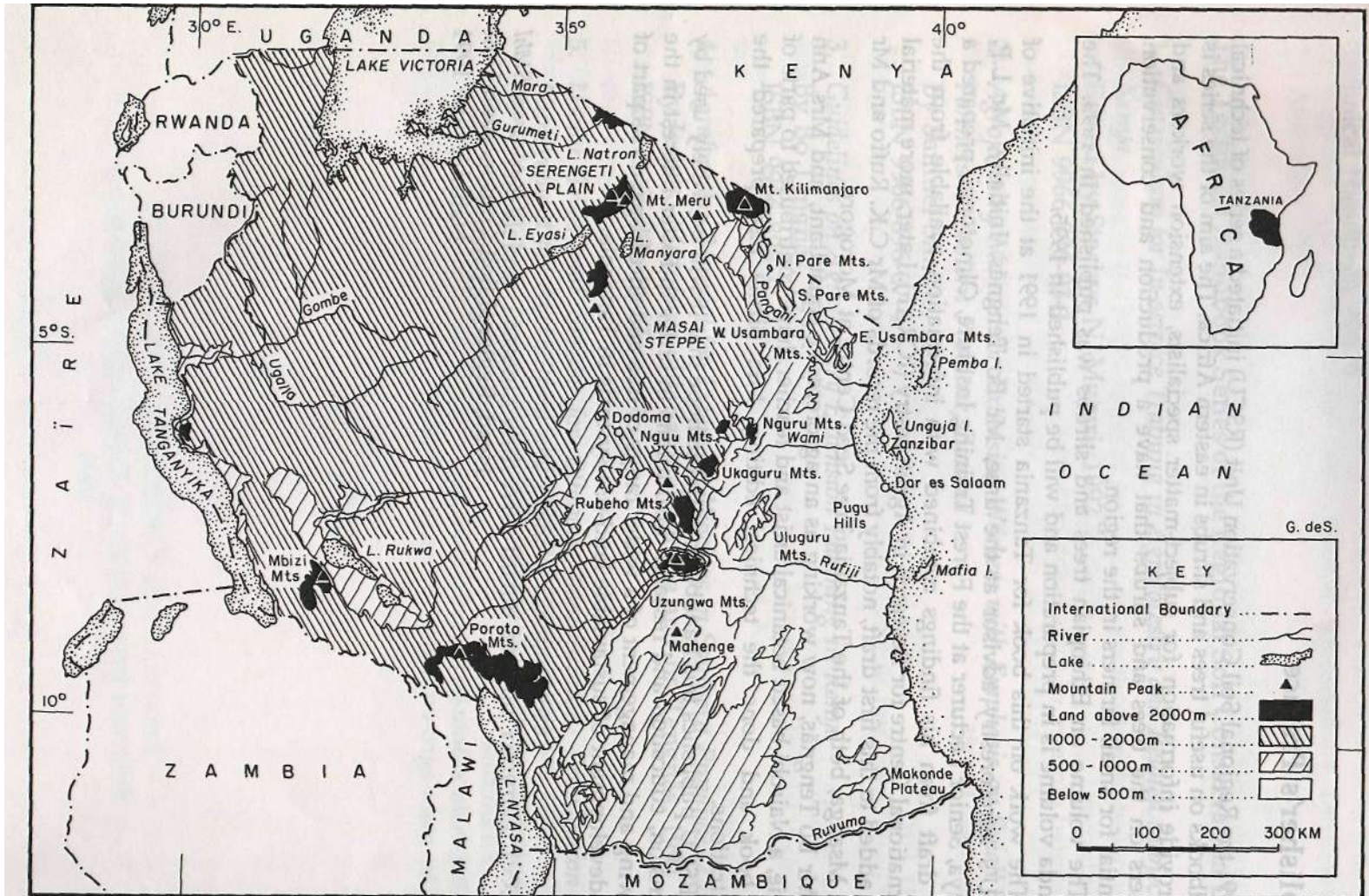
The volume on Ethiopian trees and shrubs was published in 1993. The Uganda volume is in preparation and will be published in 1995.

The work on this book for Tanzania started in 1991 at the initiative of RSCU's agroforestry advisor at the time, Mr Bo Tengnas. Initially, Mr L.P. Mbuya, Senior Lecturer at the Forest Training Institute, Olmotonyi, prepared a first draft from his findings combined with information available from the International Centre for Research in Agroforestry (ICRAF). Later, more material was added to this first draft, notably from the records of Mr C.K. Ruffo and Mr H.P. Msanga, both of the Tanzania Tree Seed Centre at Morogoro.

Mr Bo Tengnas, now working as an agroforestry consultant, and Mrs Ann Birnie, a Nairobi-based botanical artist and teacher, have contributed to parts of the book and done the technical editing. Mrs Birnie also prepared the illustrations.

RSCU publishes this handbook with the hope that it will be widely used by extension, education and research institutions in order to foster interest in the growing and management of a wider range of tree and shrub species as part of the development of sustainable land-use systems in Tanzania.

Dr Michael Stahl
Head, Regional Soil Conservation Unit
Nairobi, June 1994



Map 1. The main physical features of Tanzania

Acknowledgements

The initial material for this book was gathered by Mr L.P. Mbuya of the Forest Training Institute, Olmotonyi, during a period of extensive travel in Tanzania. Discussions were held with people knowledgeable on trees and shrubs, among whom were many farmers and pastoralists. In fact, most of the information in this book derives from rural people in Kenya and Tanzania who have enthusiastically shared their knowledge with us.

Special thanks go to the Principal of the Forest Training Institute, Mr E.N. Ntumbo, and the then Director of Forestry, Mr E.M. Mnzawa, for allowing Mr Mbuya to be released for a period of four months to devote his time to the data collection.

The book is also partly based on *A Selection of Useful Trees and Shrubs for Kenya: Notes on Their Identification, Propagation and Management for Use by Farming and Pastoral Communities*. Several people contributed to the production of that book and we acknowledge their contributions to this volume.

Researchers at the Silvicultural Research Centre at Lushoto also reviewed the first draft and made important corrections and additions. Thanks are due particularly to Mr S.T. Mwihomeke (Agroforestry), assisted by Messrs C.K. Mabula (Botany and Herbarium) and I.M. Shehaghilo (Seeds and Nursery).

Information on tree-seed characteristics was obtained mainly from the National Tree Seed Centre at Morogoro, but additional information was obtained from the Forestry Tree Seed Centre at Muguga, near Nairobi, and from the *Tree Seed Handbook of Kenya* edited by J. Albrecht.

Illustrations

The majority of the plant illustrations are original drawings by Ann Birnie, primarily from *Trees of Kenya* by T. Noad and A. Birnie. Other drawings were made specially for this book, both from fresh material and from dried specimens in the East African Herbarium, Nairobi. A few drawings have been taken from *Plants in Zanzibar and Pemba* by R.O. Williams and *Kenya Trees and Shrubs* by I.R. Dale and P.J. Greenway. We also acknowledge with thanks the Royal Botanical Gardens, Kew, for permission to use some illustrations that appear in the published family volumes of the *Flora of Tropical East Africa*. A few further illustrations have been taken from the following sources:

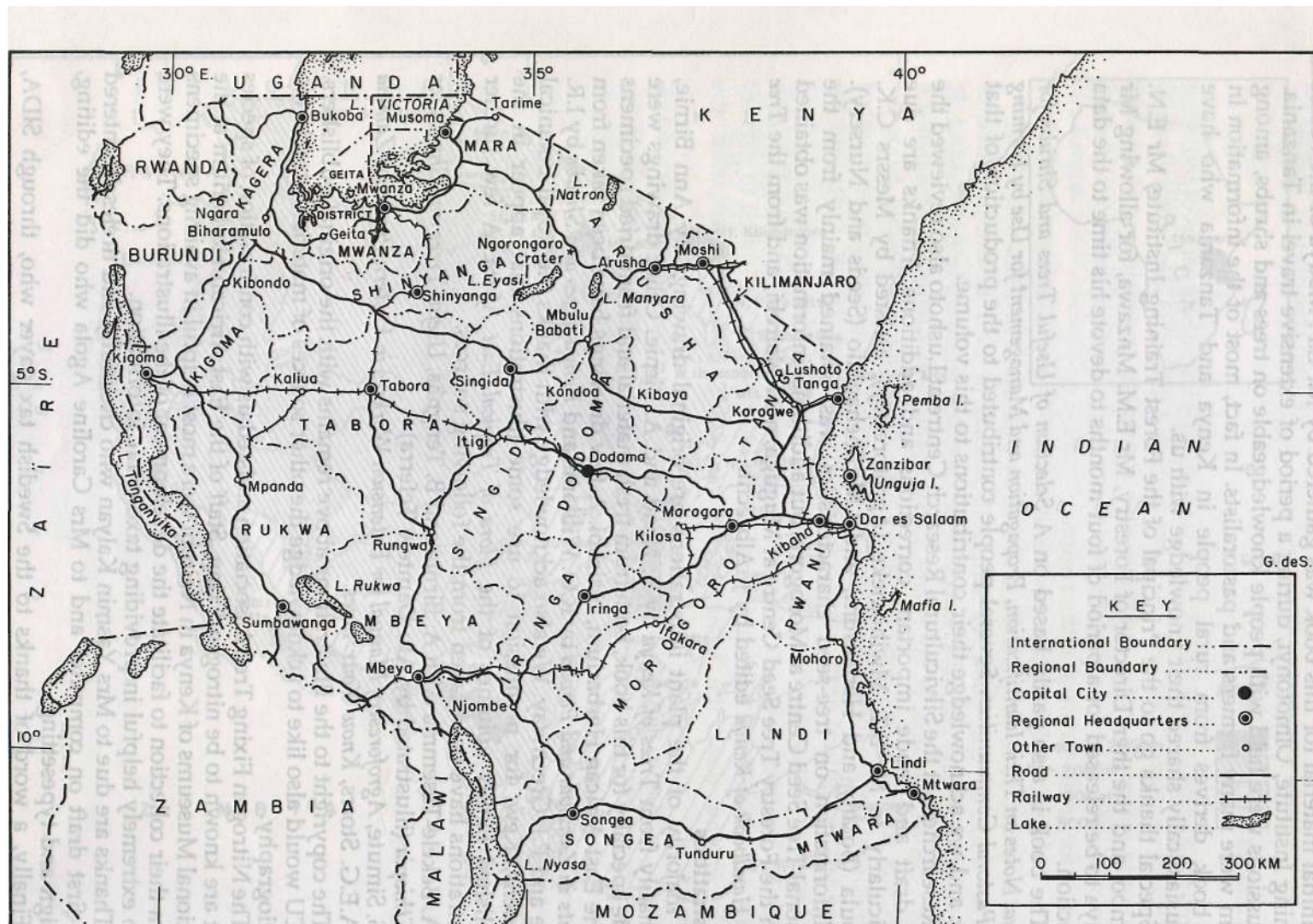
- A. Bekele-Tesemma with A. Birnie and B. Tengnas, *Useful Trees and Shrubs for Ethiopia* (illustrated by Ato Damtew Teferra)
- S. Simute, *Agroforestry Manual for Extension Workers in Eastern Province, Zambia*
- A.E.G. Storrs, *Know Your Trees*.

The copyright to the illustrations above remains with the original publishers. RSCU would also like to acknowledge the other sources of material listed in the bibliography.

The Nitrogen Fixing Tree Association assisted us with confirmation of species that are known to be nitrogen fixing. Staff of the East African Herbarium at the National Museums of Kenya in Nairobi were most helpful in availing specimens from their collection to facilitate the development of the illustrations. They were also extremely helpful in providing taxonomic information.

Thanks are due to Mrs Yasmin Kalyan who cheerfully and tirelessly entered the first draft on computer and to Mrs Caroline Agola who did the editing, design and typesetting.

Finally, a word of thanks to the Swedish tax payer who, through SIDA, provided the funds necessary for the production of this handbook.



Map 2. The administrative regions and main towns of Tanzania

Introduction

Tanzania has a very rich tree flora. To a large extent this richness is a result of very varied physical and climatic conditions. In some areas at higher altitudes the rainfall is reliable, temperatures are low and the vegetation is lush, whereas lowland areas are generally hot and arid. Along the coast and in the basins near the big lakes the climate is both hot and humid. This wide range of ecological conditions provides the environment for very many species of plants and animals.

Among the people of Tanzania, traditions also vary significantly from one part of the country to another. There are a large number of ethnic groups, all with their own languages. Land-use practices also differ a great deal, not only because of different ecological conditions but also due to socio-cultural differences.

In the late 1970s the age-old practices of agroforestry and community forestry began to be given due attention in development efforts worldwide. During those years, and up to the mid-1980s, most efforts were concentrated on trying to alleviate the fuelwood problem by intensified tree planting. In Tanzania, there was emphasis on planting community woodlots, mostly of *Eucalyptus* species.

Gradually, however, officers in development projects as well as researchers came to realize that the priorities of farm families are often different from the ones the project designers anticipate. It is now felt that development agenda should be worked out with the rural people concerned if projects are to lead to sustainable results. Methods such as D&D (diagnosis and design) and RRA (rapid rural appraisal) were developed by ICRAF, and later PRA (participatory rural appraisal) was promoted by the International Institute for Environment and Development. All these methods are based on development workers' awareness that the local people always have a wealth of knowledge that needs to be the focal point of efforts to improve agroforestry or tree growing in general.

All too often development workers, whether foreign or national, do not communicate effectively with local people on issues related to trees. There is often a language barrier if the two groups do not have a common set of names for the trees and shrubs that they deal with. In Tanzania, even if Swahili or English are well understood by many people, there are obvious limitations to communicating in these languages when discussing the details of a land-use system. Recognition of this communication gap between extensionists and farmers, the need to regard local farmers' experience as a focal point in any efforts to improve land use, and the importance of utilizing and preserving tree biodiversity in Tanzania were the underlying concepts for this book.

Up-to-date literature on trees was available to few people in Tanzania during the colonial period, and later books tended to cover a limited number of

species. So it was felt that a more comprehensive handbook would be useful for a large number of people such as extensionists, teachers, students and land-use managers of various kinds. An effort has been made to avoid technical language so as to make the book accessible to as wide a range of readers as possible.

The handbook is divided into three main parts:

- A list of vernacular and English names (where available) of the trees and shrubs covered
- A main section that describes the species and gives their vernacular names, ecology, uses and methods of management and propagation
- A summary table of the species and their uses.

Selection of the species to be included

Determining which of all the tree and shrub species found in Tanzania should be included and which omitted was a difficult task. During extensive field visits and consultations with local people certain species emerged as being important to many groups of people. During the selection process both indigenous and exotic species were considered, and it was also decided to include *Agave sisalana* and bamboos because, although they are not trees or shrubs by the strictest definition, they are woody perennials that have important uses in many areas.

Undoubtedly not all the species that could be covered in a handbook such as this have been included. Some species may be very important locally but not well known in other parts of Tanzania. Hence the final selection of species was a compromise. One of the objectives of this book is to stimulate an interest in trees, and if this objective has been met we hope that interested readers will use the feedback form at the end of the book to suggest additional species for inclusion in a future revised edition or provide additional information on species already included.

Vernacular names

The average farmer in Tanzania seldom uses the English or Latin names for the trees and shrubs that he is familiar with, and even though Swahili is now widely spoken, local languages are still the most commonly used and will continue to be for a long time. Old people often have much more knowledge about the trees and shrubs of their areas than the younger generation. It is therefore important that researchers, development workers and extensionists wishing to elicit information about local plants use the local vernacular names that will be familiar to the older people in the community. When this handbook was developed, therefore, it was decided to include as many vernacular names as possible. But there are areas of Tanzania that, in this respect, have been poorly covered so far and where further research needs to be carried out. This applies to the Ha, Ngoni, Yao and Makonde languages, for example.

Ecology

Under this heading a brief description of the origin and present distribution of the species is given, followed by an indication of where it grows in Tanzania, together with the altitudinal range, preferred climatic and soil conditions, etc.

Uses

Trees and shrubs provide a wide range of benefits to man, both in terms of products such as timber or medicine and services such as shade or soil improvement. Such information has been summarized for each species under this heading. It must be stressed, however, that these are *reported* uses, i.e. what the local people say they use these plants for and it has not been possible to verify the accuracy of all such reports. In addition, the known uses of a particular species may vary from one country to another or even from one community to another and therefore it is always necessary to verify these uses with the local people.

It must also be understood that the species cannot be grown for all of the uses simultaneously. On the contrary, management of a species often aims at optimizing or maximizing a specific product or service.

Description

For each species there is a general description followed by a detailed description of habit, bark, leaves, flowers and fruit. As far as possible, technical botanical terms have been kept to a minimum. The features in bold type indicate the special points to look for when identifying a species. It may not always be possible to identify a species from the descriptive text alone, but it is anticipated that, together with the illustrations and the vernacular names, the descriptions will prove a practical guide to species identification in the field.

Propagation

Wherever information on suitable methods of propagation is available it is given under this heading. "Seedlings" indicates that a relevant propagation method is raising seedlings in a nursery, either on farm or in a central or group nursery. "Wildings" indicates that it is known that farmers propagate a certain species by collecting wildings and transplanting them at the desired site. Other species may be propagated by direct sowing of seeds at the desired site, and vegetative propagation by cuttings is recommended for others. Coppicing is a management practice rather than a method of propagation, hence coppicing ability is indicated under "management".

Seed information

When relevant, information on number of seeds per kilogram, whether seeds can be stored or not, and suitable pre-sowing treatment is given. Normally, storage of seeds is to be avoided. The storage periods indicated are deliberately imprecise because there is no fixed period during which seeds can be stored without harm and after which they all lose viability. Loss of viability is a gradual

process, and its speed depends on many factors, mainly the storage conditions. Hence, only approximate indications of acceptable storage periods can be given.

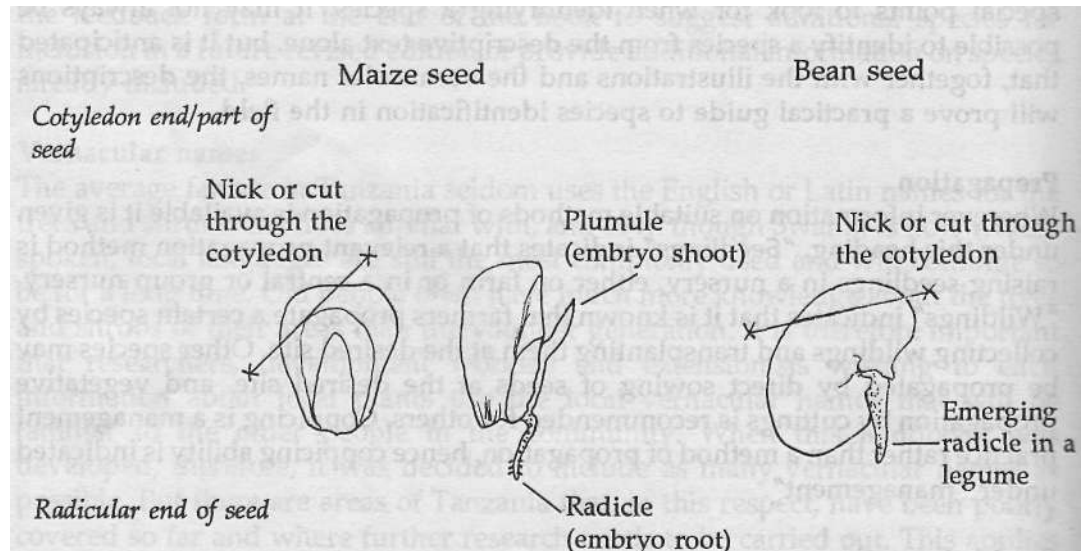
If seeds are to be stored for some time it is always best to keep them in a cool, dry and insect-free place.

Seed pre-treatment to render viable but dormant seeds fit for germination can be carried out in a number of ways. The methods mentioned in this book are the simple ones that can be applied under field conditions without the use of sophisticated equipment or chemicals.

Seed treatment is not needed for all species. For many, however, treatment may enhance both the rate and the speed of germination. The most common methods are soaking in hot or cold water, nicking, and de-winging. In addition, floatation can be mentioned as a simple way of separating bad (empty and thus light and floating) from good (heavy and sinking) seed.

Soaking in water is recommended for many species and, where these are known, details of temperature and time are indicated.

Nicking can be done by removing small pieces of the seed coat at the distal (cotyledon) end of each seed using a sharp tool such as a knife or nail clipper. Removal of the hard coat next to the storage tissue of the seed speeds up the absorption of water and hence the growth of the embryo. Nicking is time consuming if it is to be done to a large number of seeds, and soaking is often a more convenient alternative. Furthermore, nicking must be done with care in order to avoid damaging the vital part of the seed, i.e. the embryo itself.



The cotyledon and radicular ends of a seed and how to nick the seed

Winged seeds should normally be de-winged before sowing (e.g. *Combretum*, *Terminalia*, *Tipuana tipu*).

In some species germination is enhanced if the hard seed coat is cracked. This is a delicate operation as it is easy to damage the embryo within the seed.

As a general rule, fruits with a fleshy pulp surrounding the seeds will germinate better if the pulp is removed and the seed cleaned before sowing. Seeds of this kind often cannot be stored and should be sown soon after collection and cleaning.

Management

Different management techniques allow tree growers to maximize the production (both products and service functions) from trees and shrubs. Management may also be applied in order to reduce negative side effects from the presence of trees or shrubs, e.g. shading effects on adjacent crops.

The most common management practices are coppicing, lopping, and pollarding. Whenever a certain management technique is known to be feasible for a certain species this is indicated. Under this heading information on growth rate is also given.

Remarks

Any other useful or interesting information that is not relevant for inclusion under the other headings is given under "remarks". Information on medicinal uses of the plants is given here. It is wise to check dosages, methods of administration, etc., with locally knowledgeable people before putting these reported uses into practice.

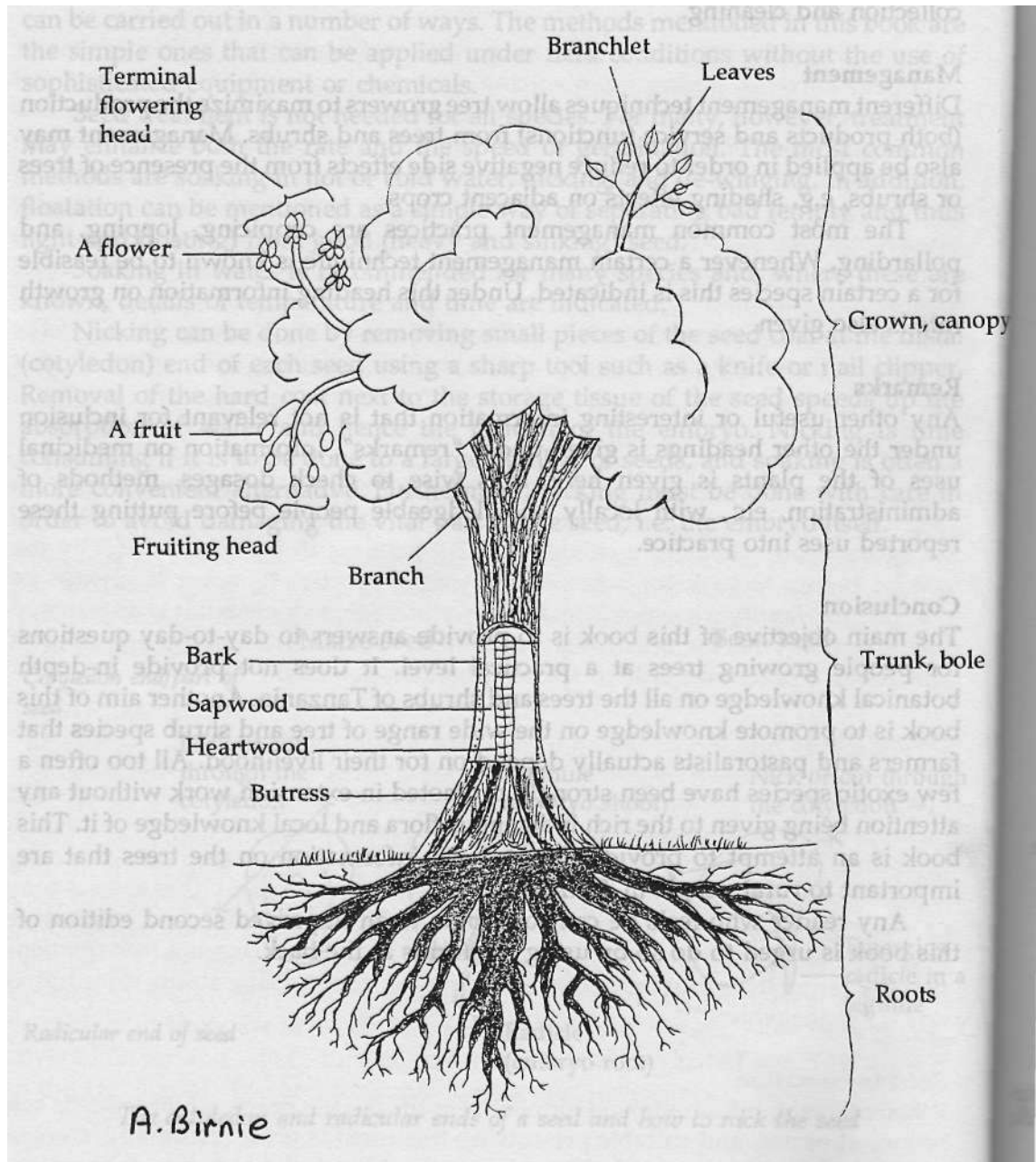
Conclusion

The main objective of this book is to provide answers to day-to-day questions for people growing trees at a practical level. It does not provide in-depth botanical knowledge on all the trees and shrubs of Tanzania. Another aim of this book is to promote knowledge on the wide range of tree and shrub species that farmers and pastoralists actually depend on for their livelihood. All too often a few exotic species have been strongly promoted in extension work without any attention being given to the rich indigenous flora and local knowledge of it. This book is an attempt to provide the essential information on the trees that are important to rural people in Tanzania.

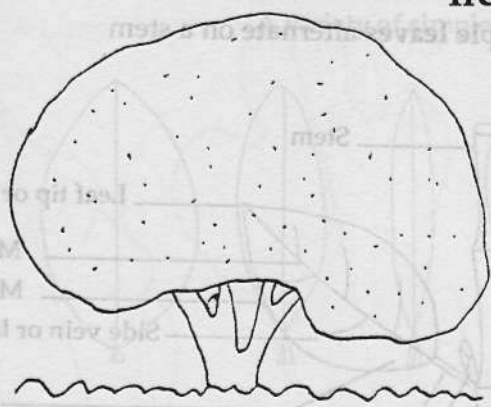
Any reader who feels he can contribute to an improved second edition of this book is urged to do so by using the forms at the back.

ILLUSTRATED GLOSSARY OF SOME BOTANICAL TERMS

The parts of a typical tree



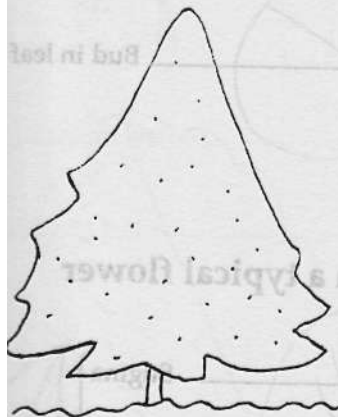
Tree shapes



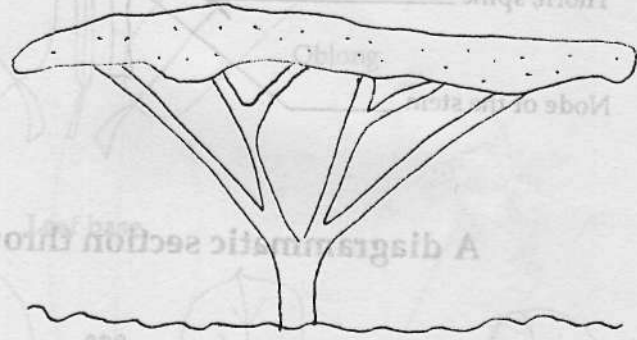
Rounded crown, dense, shady canopy



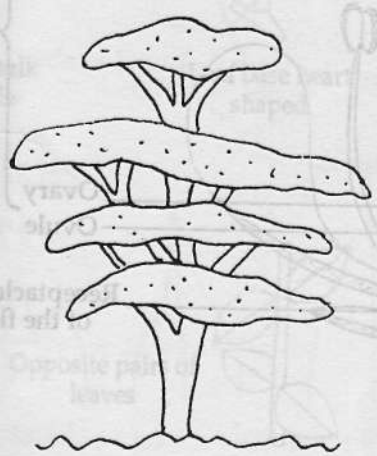
Narrow open crown, light shade



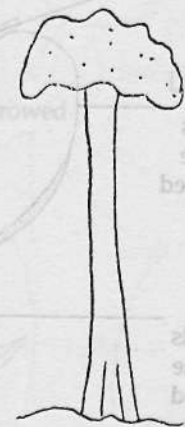
Conical crown



Flat-topped, spreading crown



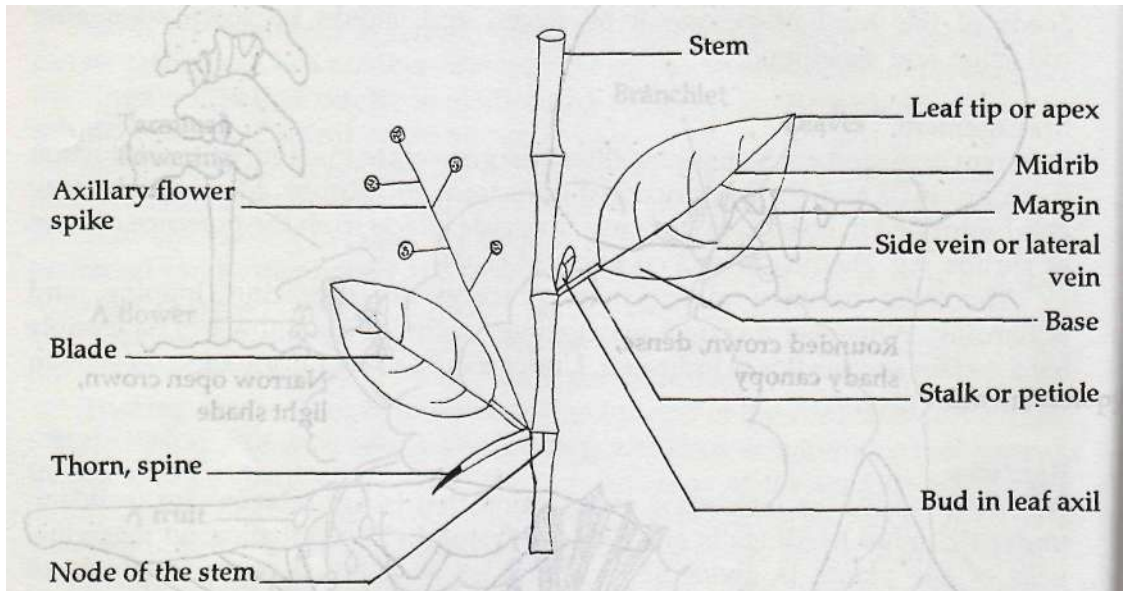
Canopy in layers



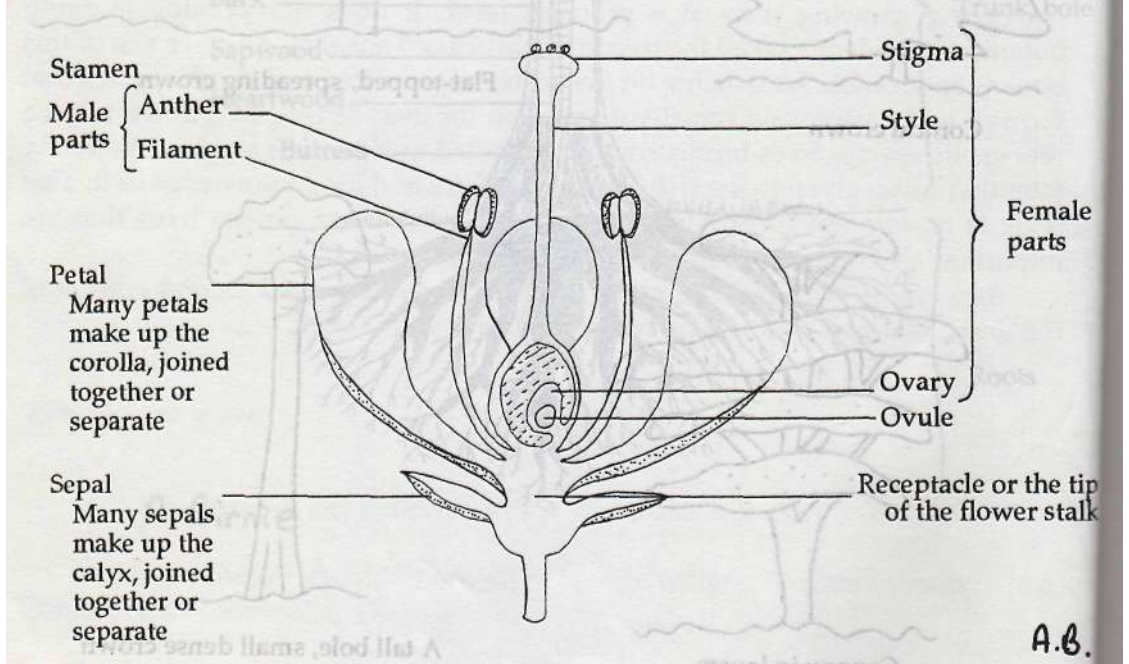
A tall bole, small dense crown

Leaves and stems

Diagram showing two **simple leaves** alternate on a stem



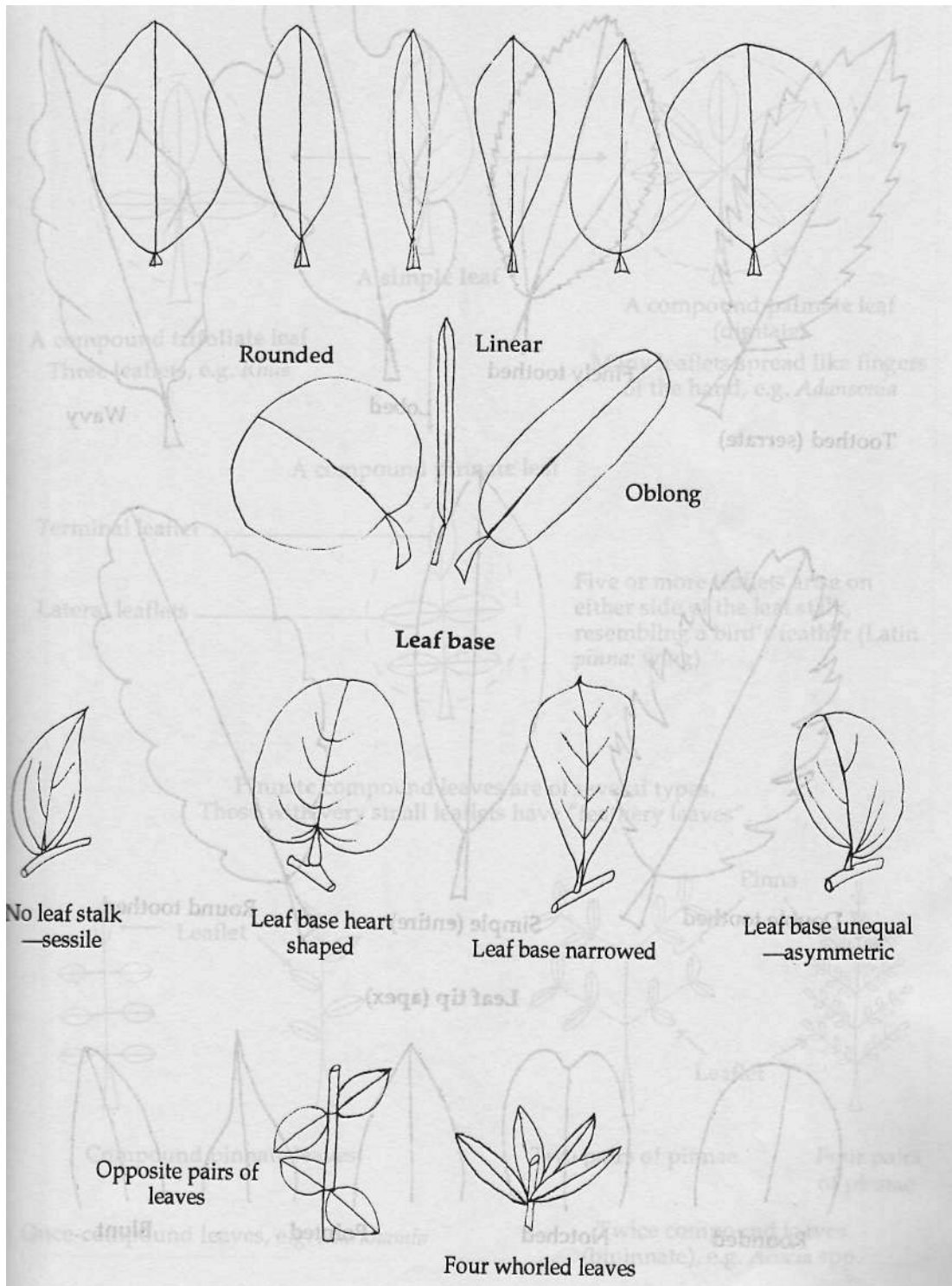
A diagrammatic section through a typical flower



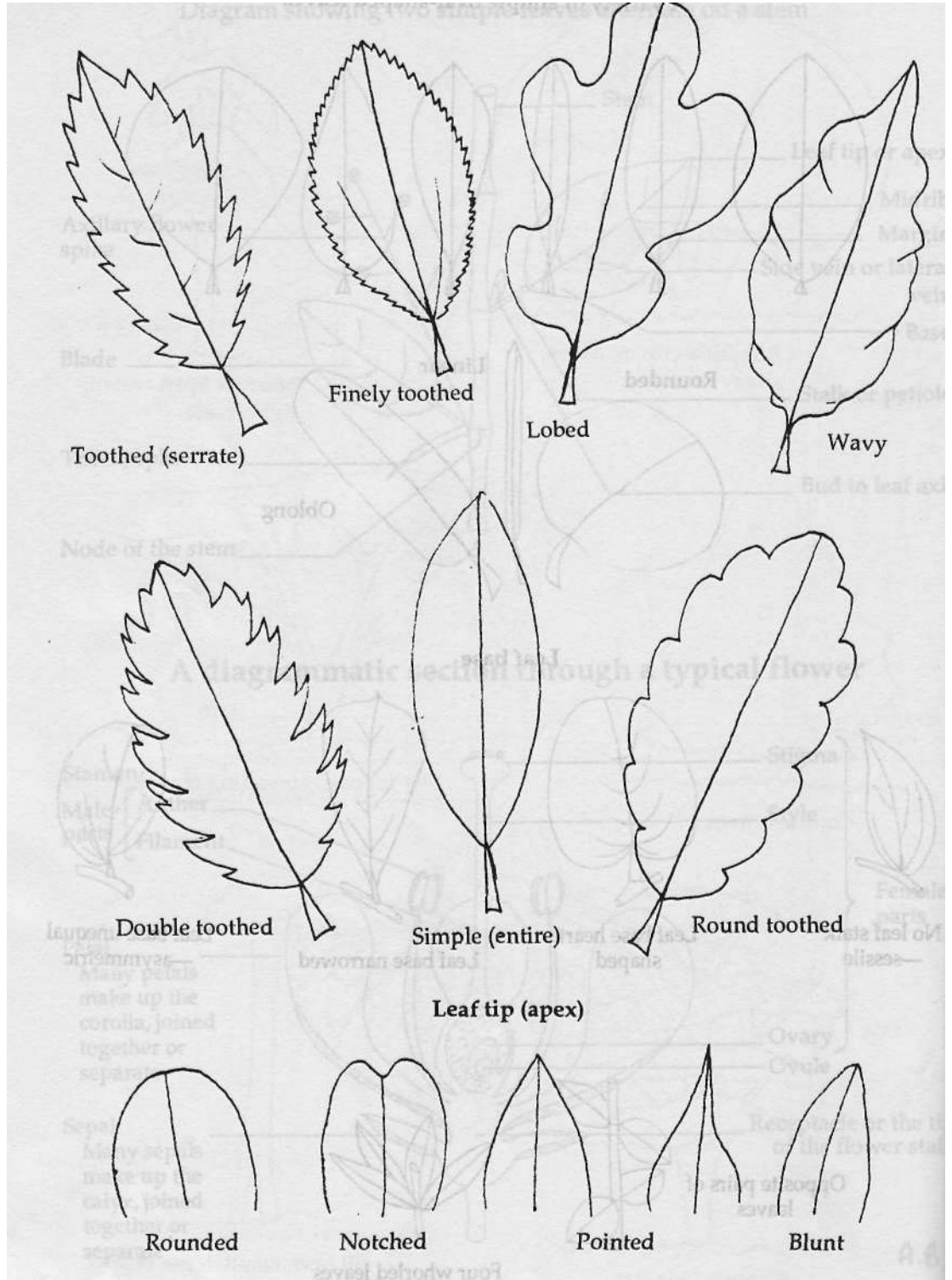
A.B.

Leaves

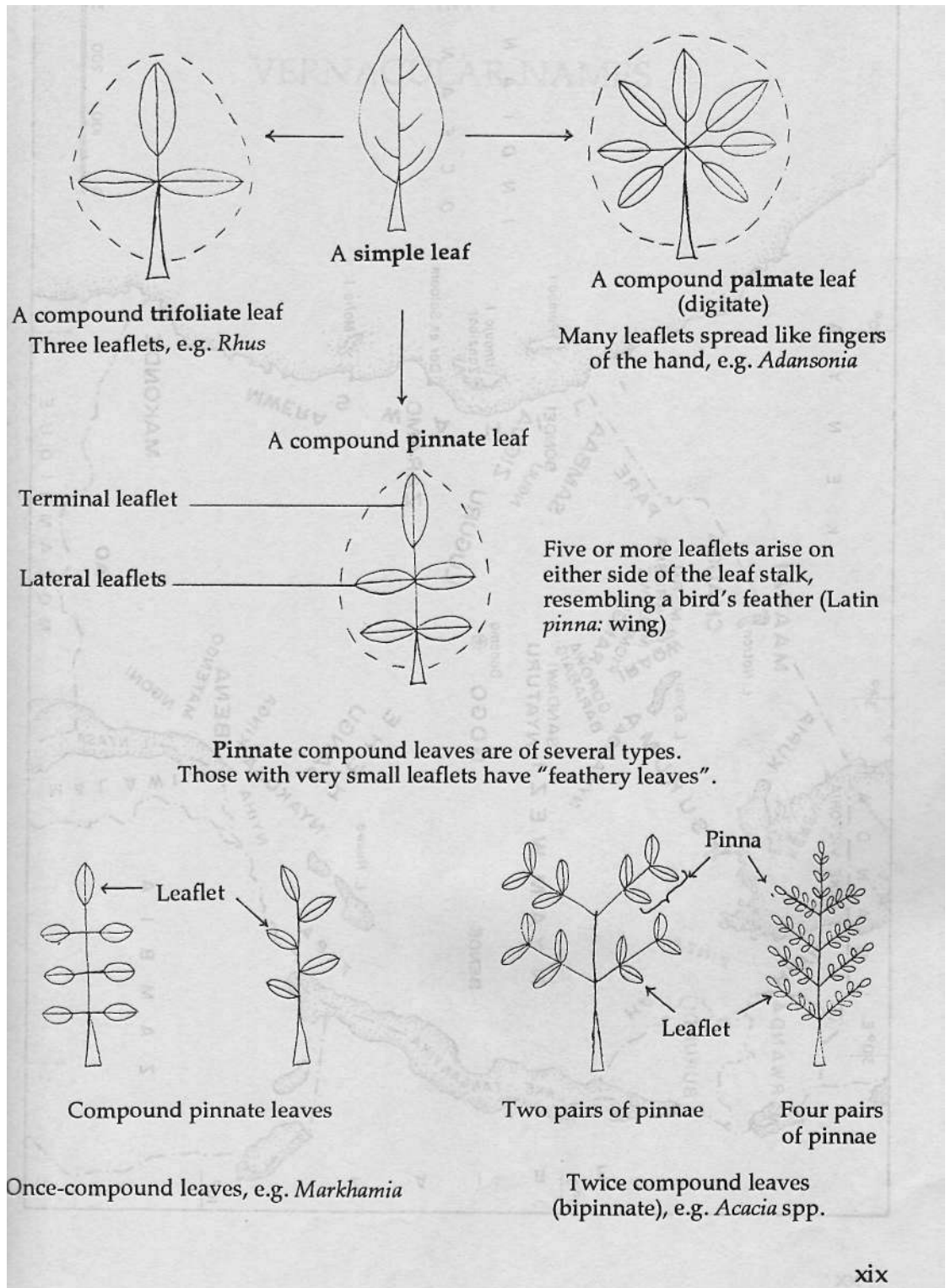
A variety of simple oval-shaped leaves

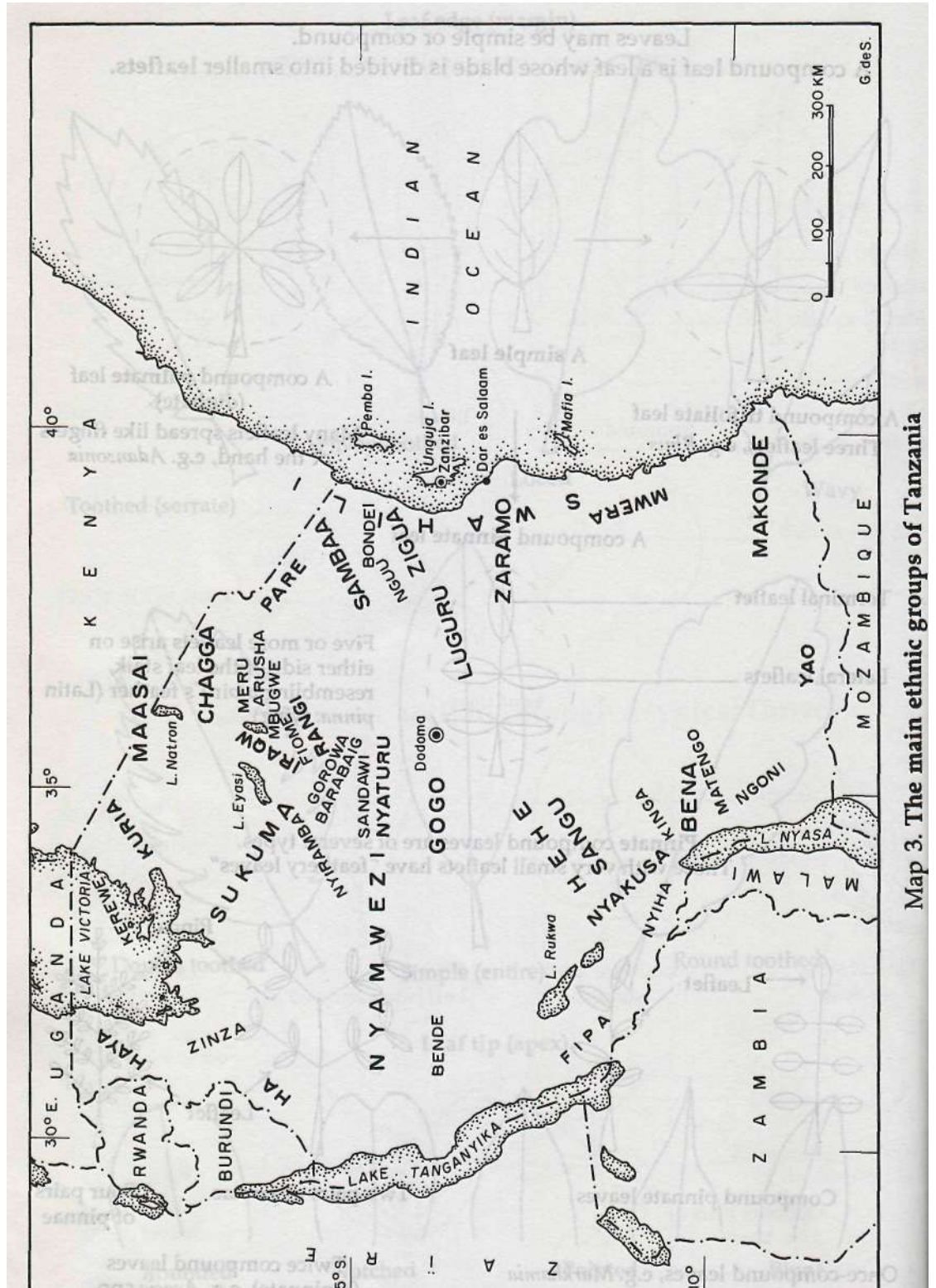


Leaf edge (margin)



Leaves may be simple or compound.
 A compound leaf is a leaf whose blade is divided into smaller **leaflets**.





Map 3. The main ethnic groups of Tanzania