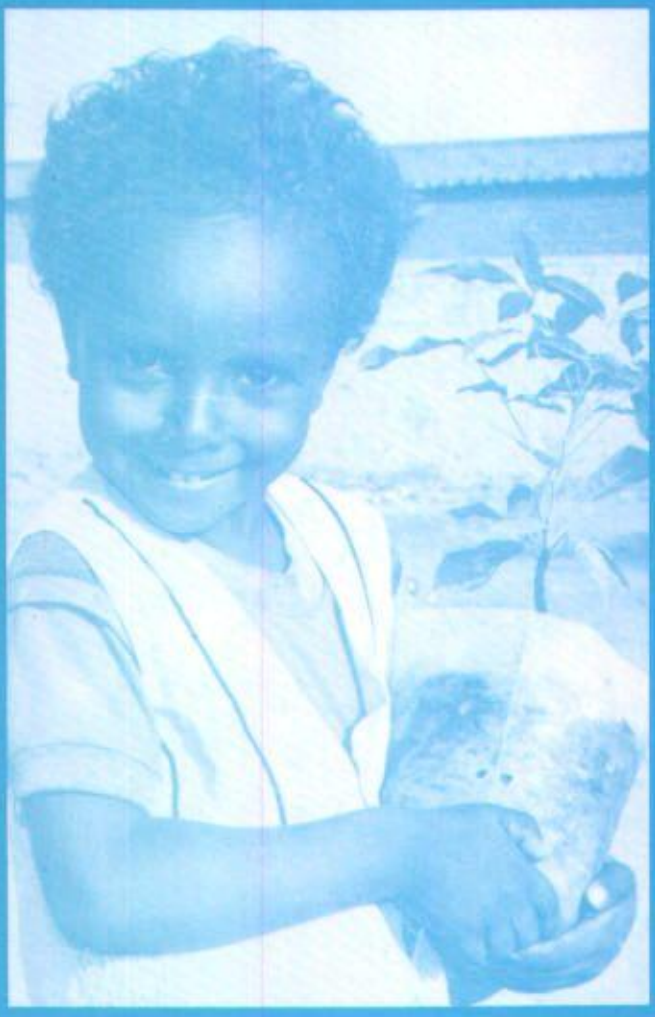
Changing forest management strategies in Sudan, a challenge for forestry educational systems



Mahir Salih Sulieman

Propositions

1 Many things decrease when shared but knowledge does not.

2 Although the work going into a Ph.D. thesis is shared, the degree is not.

3 My learning experience in the Netherlands is that in order to catch-up with life many people forget their lives.

4 You need a student to have a lecturer; this is something some university lecturers fail to realize.

5 The challenge for professionals is to break down the artificial barrier between them and rural communities and to begin realizing that we are all experts in one way or another.

6 "If we believe in one absolute truth, disagreement can only mean negation. If there are multiple realities, disagreement means negotiation .." (Maturana in Röling, 1994: 126)[1].

7 "Conflict does not have to follow from people accepting different meanings. The greatest threat of conflict or violence comes from someone who claims his view is true, and so tries to suppress other views", (Pretty, 1994: 40)[2].

8 Religious maturity is best expressed in accommodating other religions.

9 The one thing I have learnt during my professional transition from natural to social sciences is that confusion is an essential part of a learning process.

10 "To understand an illness, it is better to ask someone who experienced that disease than to ask a doctor", (a Sudanese saying).

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[1]Röling, N. (1994). Communication support for sustainable natural resource management. *IDS Bulletin*, vol. 25 no 2.

[2]Pretty, J. (1994). Alternative system of inquiry for a sustainable agriculture. *IDS Bulletin*, vol. 25 no 2.

11 To my Dutch friends I say, that anyone who does not have the elderly to advice him should better find himself one.

12 Human systems (actions) are so complicated that they can never be completely managed by computers.

13 The Dutch say: "Flowers make people happy", but I would restate this as follows: "Flowers make people happy when they are not hungry"[3].

14 Foresters see resource management as an activity to be organized by institutions and organizations, whereas villagers see it as a normal every day activity whereby various categories of people try to meet their needs for forest products (this dissertation).

15 Villagers do not have research stations or laboratories, but instead they make use of the totality of the environment in their surrounding. Moreover, among rural people there is no one whose job is to do research, but everyone is a (re)searcher. (Re)searching for villagers is not a profession, but rather it is a survival strategy (this dissertation).

16 Appreciating the diversity and variation between each one's situation, villagers do not try to reach consensus and uniform solutions (this dissertation).

Propositions presented with the doctoral dissertation

Changing forest management strategies in Sudan, a challenge for forestry educational systems

to be defended by Mahir Salih Sulieman on Tuesday, February 20, 1996
16.00 hours, at the 'Aula' of Wageningen Agricultural University

[3]Of course, unless these flowers are edible.

CHANGING FOREST MANAGEMENT STRATEGIES IN SUDAN, A CHALLENGE FOR FORESTRY EDUCATIONAL SYSTEMS

Mahir Salih Sulieman

Promotoren: Dr. Ir. Wout van den Bor, hoogleraar onderwijskunde, in het bijzonder m.b.t. het agrarisch onderwijs

Dr. Ir. Niels G. Röling, bijzonder hoogleraar m.b.t. landbouwkennissystemen in ontwikkelingslanden

CHANGING FOREST MANAGEMENT STRATEGIES IN SUDAN, A CHALLENGE FOR FORESTRY EDUCATIONAL SYSTEMS

Mahir Salih Sulieman

Proefschrift
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in de landbouw - en milieuwetenschappen
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Dedication

To the village women and men, who contributed generously to this work. And to my beloved wife (Badria), who shared with me all the sweet and bitter experiences throughout the period of the study. I dedicate this work.

Mahir Salih Sulieman

Wageningen, 11 pm; The seventh of January, 1996

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List of Figures, Tables and Annexes

List of abbreviations and names of trees

ARC:	Agricultural Research Corporation
CIDA:	Canadian International Development Agency
FAO:	Food and Agriculture Organization
FDES = FDS:	Forestry Development Project in Sudan
FINNIDA:	Finnish International Development Agency
FKIS:	Forestry Knowledge and Information Systems
FNC:	Forests National Corporation
FRC = FR:	Forests Research Centre
GAC:	Gum Arabic Company
GDP:	Gross Domestic Product
GO:	Governmental organization
ILO:	International Labour Organization
KIS:	Knowledge and Information system
Ls:	Sudanese Pounds
LSRO:	Land Settlement and Registration Ordinance
MAKS:	Management of Agricultural Knowledge Systems
NCR:	National Council of Research
NGO:	Non-Governmental Organization
NTFP:	Non Timber Forest Product
PRA:	Participatory Rural Appraisal
PRRA:	Participatory Rapid Rural Appraisal
PTD:	Participatory Technology Development
RD:	Research and Development
SMS:	Subject Matter Specialist
SSM:	Soft Systems Methodology
SUST:	Sudan University of Science and Technology
UNDP:	United Nations Development Project (or programme)
U. of K.:	University of Khartoum
WSARP:	Western Sudan Agriculture Research Project

Names of trees

Abanos:	Dalbergia melanoxylon
Arak:	Salvadora persica
Ban:	Eucalyptus spp
Bo:	Daniellia oliveri
Darout:	Terminalia laxiflora
Deleib:	Borassus aethiopum
Dom:	Hyphaene thebaica
Gimbeel:	Cordia africana
Gudeim:	Grewia tenax
Habil:	Combretum spp
Haraz:	Acacia albida
Hashab:	Acacia senegal
Hijlij:	Balanites aegyptiaca (the product is laloob)
Humeid:	Sclerocarya birrea
Kitir:	Acacia mellifera
Kuk:	Acacia sieberana
Laot:	Acacia nubica
Mahogani:	Khaya spp
Marakh:	Leptadenia pyrotechnica
Mukheit:	Boscia senegalensis
Nakhal:	Phoenix dactylifera
Neem:	Azadirachta indica
Sahab:	Anogeissus leiocarpus
Sallam:	Acacia ehrenbergiana
Sesaban:	Parkinsonia aculata
Shubahi:	Acacia laeta
Sidir:	Ziziphus spina-christi
Sunt:	Acacia nilotica
Talih:	Acacia seyal
Targ tarag:	Boswellia papyrifera (the product is luban)
Tartar:	Sterculia setigera
Teak:	Tectona grandis
Tebeldi:	Adansonia digitata
Tundob:	Capparis decidua
Usher:	Calotropis procera
Vuba:	Isoberlinia doka

Arabic glossary

Ageed:	a position in the tribal administrative system
Asida:	sorghum or millet porridge
Bilad:	cultivable land
Bildat:	plural of bilad
Dahara:	up land or away from river
Dokhan:	smoke
Fajir:	the early morning prayer
Farig:	a village section
Fatur:	breakfast
Fawda:	chaos or anarchy
Feddan:	4 200 square meters
Feki:	teacher at koranic school
Garaha:	insect fly associated with gum trees
Gerif:	fertile land beside rivers
Ginaina:	garden
Ghabah:	forest
Ghifar:	virgin land
Gorairah:	fertile clay soil
Gutati:	huts
Hakuma:	government
Hatab:	wood
Hawasha:	a unit of cultivable land in irrigated schemes
Hey:	a section in a village
Ilim:	science
Isha:	the last daily prayer
Jabana:	local coffee
Jebel:	hill
Kerkadeh:	hibiscus (rosella)
Khalwa:	koranic school
Khalwa:	men's saloon
Khawagat:	european or western people
Khors:	depressions or water courses
Kisra:	sorghum or millet pancake
Mashakil:	troubles or problems
Matara:	well close to river
Mukhammus:	7 400 square meters
Mullah:	sauce

Myaa:	seasonally inundated land
Nafir:	reciprocal work-sharing
Nazir:	head of a native administrative unit
Quz:	sand dune
Rakoba:	open-sided shed
Sandogue:	savings society
Sheiba:	bi-forked wood stick
Sheikh:	village (section) head
Sunki:	instrument for gum tree tapping
Umda:	head of umudia
Ummar:	village elders
Umudia:	native administrative unit
Usra:	family
Welli:	holly religious man
Zaaf:	palm tree leaves
Zamlaa:	animal like donkey or camel
Zariba:	fence

ACKNOWLEDGEMENTS

To me, this research was like a journey during which one meets many people at various times and locations.

The journey with this project started at Wageningen in October 1992 and continued in Sudan in the period between March 1993 and April 1995. In May 1995, I came back to Wageningen to complete the thesis writing. Throughout this long journey, many persons and institutions contributed generously to the completion of this study. I might need a whole volume to acknowledge and list the names of all people who contributed to the successful completion of the study. I am sure that most of them are sharing with me the feeling about how difficult it is to remember all the names at this moment when part of my feelings have already started to go back to Sudan where my children, parents, and friends are waiting for me to come with a new title.

To all who have contributed in diverse ways towards the completion of this journey but have not been specifically mentioned here, I would like to express my sincere appreciation and gratitude, and hope that this product will be of some use to all of them.

The contribution of others were so specific that I can hardly avoid remembering them even at a moment like this. My supervisors: Prof. Dr. Wout van den Bor and Prof. Dr. Niels Röling have had all the trouble to guide me to the successful end of this project. The fruitful discussions and their critical, but useful comments and encouragement are very much appreciated. The visit of Prof. Wout van den Bor to Sudan during the field work and his keenness to make sure that everything goes well is appreciated, not only by me, but also by my colleagues and the senior staff in Sudan.

It is not unusual to face some difficulties when one lives in a foreign country, but not everybody is lucky enough to find people who are always prepared to help. In my case, the staff of the following departments have contributed very much in creating a good environment for the study:

The Department of the Agricultural Education: in particular to Hermien, Aukje,

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In conclusion, I wish to say a few words to my partner during the whole process; my beloved wife (Badria), who shared with me all the sweet and bitter experiences throughout the period of the study. In our society we say that, "The few words of thanks might fail to convey the feelings". So the only thing I can do is to look into her face and say, "Badria, at last we are going back to our children, and only our hearts can express my feelings and appreciations to you".

1 FOREST RESOURCES IN SUDAN: THE BATTLE-FIELD

1.1 Introduction

This study is about the way different categories of people go about the management of tree and forest resources in Sudan. By providing an overview and a description of the motives, patterns, perceptions, and management strategies of various people, we[1] are trying to contribute towards the creation of a framework for decision making by the people involved in resource management. We hope using such insights will facilitate educators at forestry educational institutions to see how they can better restructure their educational programmes.

For decades people in the vicinity of forests have been looked upon as trouble-makers. Some special characteristics of forest resources, such as the long term nature of investment and its macro and micro-level environmental effects, led foresters to believe that forest resources could better be managed by central authoritarian forest services (Wiersum, 1992a). The very nature of foresters' professionalism has motivated them to see forestry as what foresters practise. The nature of their technical training, which has its origin in the 'positivist' (Pretty, 1994) tradition of science, blinded them from seeing lay people other than as an "end-of-pipe problem" (Röling, 1994a: 126). From such a perspective, forestry scientists continued to develop technical solutions for forestry problems, forestry authorities issued policies and laws to be enforced by foresters at the grass-roots level. Many villagers were fined or imprisoned for breaking forest laws. Apart from carrying out research to obtain his Ph.D. degree, the author has been motivated to carry out this study in order to contribute to solving such conflict situations.

The author is one of those who joined the forestry profession at a time when the Forest Department in Sudan was shifting its main concern from the conventional forestry tradition, where villagers were denied their rights to

[1] Throughout this document 'we' is being used to refer to the author as an appreciation of the role of others (including his supervisors) who participated in developing his way of thinking.

manage forest resources, to the social forestry tradition[2]. Witnessing such a transitional period allowed him to develop rich views of many conflict situations between villagers who saw themselves being deprived of their means of livelihood, and forest guards and officers who were trying to do their jobs in keeping villagers away from 'state' forests.

This study derives its relevance from the fact that it is launched at a time when there are a lot of discussions within the forestry profession and the domain of rural development about local people's participation in the management of natural resources. At the academic level, for a long time foresters have been dealing only with the very technical aspects of forestry resource management and very little has been done in terms of social aspects of forestry. They have been taught how to deal with trees, but not with people. And at the field level, foresters are following trial and error techniques in an effort to drag 'others' into forestry activities, but still using villagers as 'guinea-pigs' in trying out their ever-changing approaches.

The author comes from a technical forestry background. Having worked for a few years in the field of forestry extension, the author joined the Forests Division of the Khartoum Polytechnic (now, the Sudan University for Science and Technology). He was asked to teach the newly introduced forestry extension course. At that time the main challenge to him was: what to teach and how to teach this new, and somehow strange, course. In 1990 he got the chance to participate in the Management of Agricultural Knowledge Systems (MAKS) M.Sc. course at Wageningen University in the Netherlands. During the study period he started to realize the limited role extension could play in the absence of other supporting elements. The new orientations in forest resource management approaches require more than just adding one or two subjects to the existing curricula of forestry educational institutions. The author is developing an opinion that some kind of revolution in forestry education is most needed. The new orientations in forest resource management strategies necessitate revision of curricula of forestry educational institutions.

Through this study we would like to contribute to better understanding of the social aspects of forest resource management, in the hope that it might complement the technical knowledge and encourage forestry educational institutions to play more effective roles.

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[2] The term 'social forestry' is used in this book for any forest resources management situation where villagers are closely involved in forest/trees establishment and management activities, for which villagers assume at least part of the responsibility, and from which they derive a direct benefit through their own efforts (Wiersum, 1991).

The specific objectives of this study include:

(1) Investigation of how people interact with forest resources in an era of rapidly changing conditions.
(2) Gaining a better understanding of how changes in management strategies are influencing, and are influenced by knowledge processes.
(3) Analyzing present curriculum of forestry education.
(4) Explore possibilities of incorporating what we learn in this study to propose a model for forestry curriculum development.

We would be very satisfied if this piece of work contributed to the starting of such kind of debate which precedes great changes in curriculum development.

We have opted to look into changing management strategies as a base for enriching our knowledge prior to investigating the roles of forestry education. We are of the opinion that changes[3] representing points of discontinuities in people's behaviours are the most suitable for understanding their differential responses to 'internal' and 'external' stimuli. Strauss and Corbin (1990) argue that use of the 'changing' notion brings time and movement into analysis.
This dissertation is written on the basis of empirical data collected from various individuals, groups and institutions involved in forest resource management in Sudan. Moreover, one cannot avoid declaring that our world-view[4], which has been structured by our career/personal experiences, has contributed to such understanding needed for writing this dissertation.

This dissertation consists of eight chapters. **This chapter**, after introducing the study, proceeds to present an overview of forest resources in Sudan, their socio-economic values and the historical development of the forestry sector. The chapter also gives a detailed description of the study area, earlier to presentation of the research problem and research questions.

In the **second chapter** we present the 'state of the art'. Our intention is to discuss the concepts pertaining to the understanding of the text and to show how our own perspectives have been structured. Towards the end of the

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[3] By the term 'change', we mean a change in conditions which is sufficient to bring about a corresponding change in action and/or interaction strategy, which is carried out to maintain, obtain, or achieve some desired end (Strauss and Corbin, 1990).

[4] A world view has to do with the meaning people attach to words, the way they interpret their situations, and the way they see their future. Hence, 'world view' is a dynamic construct that has historical, cultural, social, and personal dimensions (Wals, 1991).

chapter, and in the light of the literature review, we revisit our research questions.

Chapter three has been devoted to the explanation of reasons for selection of the research area and research population. Furthermore, the chapter discusses the methodological approaches and research instruments used during the data collection process.

Chapter four, entitled "Changing forest management strategies in Sudan", will take us to the core of our study. Enjoying the typical Sudanese hospitality, we lived for some time together with our research participants; discussing and observing carefully how they are changing their management strategies in relation to management of tree/forest resources.

Life is more complicated than one would imagine. During our stay with research participants, we have seen how they are struggling to make sense of 'their' forest resources. To find suitable places for 'their feet', people deploy various kind of weapons. Knowledge is but one of these weapons. In **chapter five** we discuss knowledge processes in relation to management of forest resources.

We have already indicated that one of our main motives in launching this project was to see what kind of challenges our forestry educational systems face. We will discuss this issue in **chapter six.**

For us, the whole research process has been a kind of a continuous learning process. Exchanging experiences is one way to enrich the body of our knowledge. Believing that 'big oceans are no more than minute drops of water', we decided to share with the readers of this text, the little things which we have learned through proposing a model for forestry curriculum development. This is discussed in **chapter seven.**

The general conclusions and recommendation of the study are presented in the **last chapter.**

Before going deeper into our subject, it is necessary, for the sake of those who are not familiar with Sudan, to begin by presenting some general background information.

1.2 General background information

In this section we present some general information about Sudan, forestry resources and their socio-economic values. This section ends with an exposition of the historical development of the forestry sector in Sudan.

1.2.1 The country: Sudan

The Sudan has an area of 2,505,813 square kilometres. Its territory stretches from 21 N to 4 N and from 22 E to 38 E. Despite its large size, the Sudan has a simple physiography and its climatic zones (and to an appreciable extent those of soil and vegetation) tend to be stratified in belts extending across the country from east to west roughly parallel to latitudes. The major zones include:

(1) the arid-zone (less than 100 mm rainfall);
(2) the semi-arid zone (100-200 mm rainfall);
(3) the low rainfall woodland savanna or Acacia short grass savannah (200-450 mm rainfall);
(4) the high rainfall woodland savanna or Acacia tall grass savannah (500-700 mm rainfall);
(5) the flood region or mixed deciduous fire-swept forest (800-2000 mm rainfall); and
(6) the montane vegetation (500-1000 mm rainfall).

The arid and semi-arid zones form about 30 percent of the total area of the Sudan.

According to the 1993 census, the population totalled 25 million with a rate of growth of nearly three percent annually. Ethnic groups include Arabs of mixed origin in the north and central parts; and Nilots, Nilohamites, Sudan-Negroes, and Nubians in the southern parts. In total, ethnic categories include 19 major groups and 597 ethnic sub-groups with 115 different languages (Marks, 1986). Northern and central Sudan are predominantly Moslem, while southern Sudan is mainly Christian or of mixed religions.

Population density on the whole is low; in the north due to unfavourable climatic conditions; and in the south due to political unrest. However, relatively densely populated areas exist along the Nile and its tributaries; in the central plains, where most of the irrigated agricultural schemes are; and in areas with potable water-supplies.

The population is predominantly rural, for the most part engaged in subsistence level rainfed farming or pastoralism, and to a lesser extent in mechanized rainfed and irrigated agriculture. About 80 percent of the population and 70 percent of the labour force depend on agriculture. Hence, agriculture constitutes the most important sector in the Sudanese economy. It accounts for approximately 40 percent of the total Gross Domestic Product (GDP) and about 89 percent of the total value of all commodity exports (Marks, 1986).
The major irrigated crops are cotton, groundnuts, sorghum and wheat, whereas the crops grown in rainfed areas are sorghum, millet, sesame, groundnuts and short staple cotton.

1.2.2 Sudan forests: the resource

Sudan was home to great coniferous forests that covered the soils of the Nubian and Western Deserts in the remote geological past. Badi (1989) adds that tropical forest conditions continued in Northern Sudan until recent history. Older people who lived during the thirties and early forties speak of thick forests that existed around their dwellings (Badi, 1989). Moreover, during an earlier study older people in the Eastern Gezira of Sudan told us "you could hear a person talking but you could not see him because of all the trees" (Mahir, 1990: 132).
The natural forest area was estimated at the time of inception of the Forest Department in 1901 as covering 40 percent of the total land area (Abdulla and Holding, 1988). In 1994, Abdel Nur reported the reserved forest area as 2.9 million feddans[5], in addition to about 2 million feddans which were under reservation process. Moreover, in September 1993, a Presidential Decree was issued declaring an additional 9.5 million feddans as reserved forest raising the total percentage of reserved forest area to 2.2 percent of the country's land area (Abdel Nur, 1994).
Gad Alla (1990) describes Sudan forest resources as consisting of the following tree species.
In the Arid zone, and away from the Nile, the vegetation is very scanty and restricted to depressions and almost permanently dry watercourses. Woody species are practically absent. However, one can find species like Phoenix dactylifera, and Acacia albida. Moreover, in seasonally flooded areas, A. nilotica, A. seyal, and A. ehrenbergiana are found.

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[5] One feddan = 0.42 hectare.

In the Semi-arid zone, shrubby Acacia spp. dominate the vegetation.

The Low Rainfall Woodland Savanna is perhaps the most important forest region (according to foresters). Generally, this zone is characterised by the Acacia spp.. Other species like Anogeissus leiocarpus, Combretum spp., Terminalia spp., Boswellia papyrifera, Sclerocarya birrea, Hyphaene thebaica, and Borassus aethiopum attain dominance only locally. This zone hosts a large portion of the riverine Acacia nilotica (*Sunt*) and the Acacia senegal (*Hashab* or gum tree) forests.

The High Rainfall Savanna was the biggest producer of sawn timber in Sudan. The most important species include; Khaya senegalensis, K. grandifoliola, Daniellia oliveri, and Isoberlinia doka. Tectona grandis has also been introduced as a plantation species since 1932.

The Montane vegetation varies with the location of the mountain ranges, the altitude, and the amount of precipitation. The Imatong is the most important range in the High Rainfall Woodland Savanna zone. This is one of the only two locations where softwood species are found. The other location is Jebel Marra, which belongs to the same vegetational zone. Species like Juniperus procera, Cupressus lusitanica, C. arizona, C. macrocarpa, Pinus patula and P. radiata produced encouraging results in these areas.

According to foresters, the Flood Region does not bear any forest trees of importance.

An inherent problem in connection with forest resources in Sudan is the fact that the resources are unevenly distributed over the country. Abdel Nur (1994) indicates that whereas 72 percent of the population live in the North with only 32 percent of the forests resources, 68 percent of the resources are found in the South.

1.2.3 Economic and social value of forests in Sudan

Bayoumi (1990) reports that when the conventional national accounting methodology is used for measuring the contribution of forestry to the economy, Sudan forests contribute (just) one percent of the GDP. He indicates that this refers solely to the quantified value of traded forest products, mainly timber from government forest reserves. However, giving consideration to other forest

products, Abdulla and Holding (1988) report a contribution of seven percent of the GDP and 16 percent of the agricultural sector. In addition, forests supply the country's requirement for building materials, furniture, round wood and poles for various local purposes. A recent study (Anon., 1994) shows that Sudanese forests provide 84 percent of the country's energy requirements in the form of wood-fuel (the World Bank, 1986, gives a percentage of 82). According to the World Bank (1986) the value of charcoal production alone in kerosene equivalent terms was estimated as US $ 570 million or about 20 percent of the total imports. Forests also provide gum arabic (a product of Acacia senegal trees) with an export value of about US $ 65 million in 1984. Moreover, forests provide direct employment for about 170,000 people excluding self-employed people engaged in collection of fuel-wood and poles (World Bank, 1986).

Trees also provide other direct and indirect benefits. Animals browse from shrubs and trees, which are estimated to provide about 30 percent of the dry weather feed for 60 million heads of domestic animals (Bayoumi, 1990). Other products of importance to rural communities include: honey, fruits, fibres and medicines. Trees also provide shade and protection for rural people and their animals.

As an illustration of the influence of trees on agricultural production, Bayoumi (1990) reports an increase of 15 percent in crop production as a result of the use of shelter-belts. Also Kuchelmeister (1989) reports an increase of 60 percent in the yields of vegetables, as observed by villagers from the Seheimap village of Sudan.

In relation to the role of forests in improving microclimates and protecting soil and watersheds from wind and water erosion, Badi (1989) shows that precipitation decreased with increasing deforestation in five Sudanese villages during the period 1930-1979.

1.2.4 Historical development of the forestry sector in Sudan

As far as history can tell, the early people of Sudan used their natural forest resources in an individual, or communal private way. They obtained from their forests food, fodder, fibre, medicine, tanning materials, dyes, gums, building and fencing posts, fuel wood. However, the officially documented history of forestry started in the beginning of this century. In 1901 the British Government in the Sudan created the Forests Department as one of the first departments. Its main purpose was to secure a good supply of fuel wood for the steamers plying

the River Nile (Khalifa, 1989). The forests department was renamed the Department of Forestry and Agriculture after the development and with the increasing importance of large-scale commercial agriculture. The word "forestry" completely disappeared from the title in 1965 when the Ministry of Agriculture was established, which later became the Ministry of Agriculture, Natural and Animal resources. The Forests Department became one of the departments of this ministry.
Although the Woods and Forests Department started its activities in 1902, a clear forest policy was not stated until 1932 in the Central and Provincial Forestry Law. The law stipulated the reservation of 15 percent of the total land area as forest reserve. In 1986 the policy was revised and 20 percent of the total land area was stipulated as forest reserve. In 1989 a new forest law was approved together with the Forestry National Corporation Bill which legalized the transformation of the Forests Department into the Forests National Corporation (FNC) (Gad Alla, 1990).

Forestry Research (FR) in the Sudan started under the Forest Department. However, in 1975 it was transferred to the Agricultural Research Corporation (ARC), which is run by a council or management board that is directly responsible to the Minister of Agriculture.

Like forestry research, education of foresters also started as a kind of vocational in-service training which was under the supervision of the Forest Department. In 1946 the Forest Rangers School was established (now the Department of Forestry Sciences and Wood Technology of the Sudan University for Science and Technology). Prior to 1975, the training of professional level foresters had been carried out abroad. In 1975, the Department (at present the Faculty) of Forestry of the University of Khartoum was established. At present, professional forestry education is also given at other universities. Now, the main part of formal forestry education is under the Ministry of Higher Education and Scientific Research.

1.2.5 New trends in official forest management

Until the mid-1980s forestry programmes concentrated on afforestation, reforestation and reservation of existing forest resources, in most cases without involving the local population. As well, the Forestry Department used to organize some awareness campaigns from time to time through its Information and Public Relations Section. Now, there is an increasing realisation of the need

to involve villagers in forest resource management, hence an extension section has been established. Moreover, some of the forestry educational institutions have decided to add extension as a subject to their existing curricula.
Further, the Forest Department itself has been replaced by the Forests National Corporation (FNC). Moreover, the new Forest Policy and Laws (the policy of 1986 and Forest Bill of 1989) give consideration to communal and private forests. The 1989 FNC Act includes the following functions of the corporation (FNC): (Anon. in Mahir, 1992: 44).

(1) To create awareness among officials, local people and investors about forests and trees.
(2) To intensify tree planting for protection and production purposes and to attract voluntary efforts.
(3) To encourage establishing forests and make available seedlings and technical assistance.
(4) To promote production of gums, especially gum arabic, and to give more attention to other 'minor forest products'.

In order to create more linkages with other governmental institutions involved in managing forest resources, the FNC is headed by a board of directors in which representatives of other institutions are members (including forestry education and research).

1.3 The study area

The core of this study was focused on two locations: Tendulti and Sennar-Singa areas.
In the following sub-sections we invite readers for an excursion to our study area.

1.3.1 Tendulti area

Geographic and socio-economic description
Tendulti town is about 500 kms south of Khartoum. The area is on the border between the Central and Kordofan states.

The topography of the area is characterised by gently undulating to nearly level uplands, interspersed with huge *Khors* or water courses such as Khor Abu Habel or *Elneil* as villagers call it in the south. The northern part of the area is

characterised by vast stretches of sand dunes (*Quz*) varying from almost levelled transported sands to dunes up to 20 m high.
According to Saleem and Suliman (1984) soils of the area are classified as various desert soils and stabilized sand dune soils or yermosols and yerosols respectively. The northern part of the area is characterized by sand sheet in the quz with deep sandy soils, while the southern part is characterized by heavy clay soils that annually are enriched by transported silt carried by Khor Abu Habel.

Rainfall pattern in the area is typical of the monsoonal regime, which dominates most parts of the Sudan. The average annual rainfall ranges from 250 to 350 mm which comes during the short rainy season from June to September. However, the rainfall in the study area is often meagre and uncertain both in amount and time of occurrence. During the short rainy season, drought periods of up to four weeks are not uncommon.

All over the area the temperature is very high, and the relative humidity is low throughout the year, except during the short rainy season (Hirvonen, 1988).

The area is inhabited by both settled and nomadic populations. The settled population consists mainly of traditional farmers whose main occupation is farming. Nomadic tribes in the area are mainly cattle herders. Traditionally, nomadic tribes cross the study area twice a year. During the dry season in February they go southwards and then return to the north in the beginning of the rainy season in June.
The biggest nomadic tribe in the area is Beni Gerrar. Other tribes, such as Selim, El Ahamda, Kababish, Kawahla, Hassania, Hawawir, and Shanabla visit the area.

Villagers live in *Gutati* or huts. The normal house consists of three huts (rooms) and two *Rakoba* (shade next to the rooms). Huts and rakobas are made from the straw of dura (sorghum) and millet. Moreover, boundaries of compounds are delineated by *Zariba* fences (thorny bushes). A household (a family or arabic *Usra*) consists of a group of related people who live in the same compound and share their living expenses. Normally, this constitutes the husband, the wife, unmarried sons and daughters and the husband's father and/or mother particularly if they are very old or one of them dies leaving the other alone). The average size of an *Usra* or a household is eight persons.

Production systems are focused on traditional rainfed agriculture, forest products and livestock raising. The former two economic activities are practised solely by settled population, while the latter activity is practised by both nomads and settled.
Rainfed crop production is the dominant economic activity practised by the villagers. Villagers earn most of their income from crop production. The main crops produced in the area are: sorghum, millet, sesame, *Kerkadeh* (hibiscus) and groundnut. Together with these major crops, farmers grow quick maturing varieties of okra, water-melons and beans.
Women participate in all agricultural activities including afforestation programmes. Normally, they prefer working alone on their own fields, which are usually smaller than those of men. They prefer cultivating together with fathers or brothers rather than husbands to avoid what they describe as *Mashakil* or troubles. Yet when they harvest their cash crops, they are often compelled to allow their husbands to sell them, since women are barred from selling in the market (Hisham et al., 1991).
Due to climatic changes, crop raising is becoming a less reliable economic activity in the area. Consequently a large part of the population migrates seasonally to Gezira and areas of mechanized rainfed agricultural production. Hirvonen (1988) indicates that the number of migrants varies from village to village, some of the villages being nearly unmanned during the dry season: only the old men, women and children are left. The migration flow starts mainly in December and people stay away for the dry season and come back in May-June, in the beginning of the rainy season, to cultivate their fields. The main reason for the migration is to obtain money to buy enough food for the family during the dry season.

One of the most serious problems in the area is the lack of water. In some villages like El Milaih there is virtually no source of drinking water. Many people say: "It is nonsense to speak about trees when we ourselves are thirsty".

A day in a village
As is typical in moslem areas, the day starts rather early. Men and women get up around 4:30 am to pray *Fajir*. Men might go to the mosque to pray, while women pray at home. Soon after praying, women start house cleaning and preparing tea. When the men come back from the mosque, the morning tea is served for the whole family between 5:30 and 6:30 am. After having tea, each family member goes to work. Men go to their farms; children go to school; and women resume their daily routine of household activities. Every day, women

and children (mostly young boys) go to the wells to bring water. After completing their household activities, most women join their men (husbands and sons) on the farms. Men will continue working up to eleven o'clock, while women return home a little earlier to prepare the breakfast (*Fatur*). On their way, women might collect firewood. Presently, villagers use the wood of a shrub locally known as *Usher* (Calotropis procera) as the main cooking fuel. It is not the preferred or ideal source of fuel wood but because of its abundance and the scarcity of trees it seems to have replaced firewood from trees. However, one could find firewood and charcoal available for those who can afford to buy them.

Around eleven o'clock, men join the family for eating breakfast, which is followed by tea and/or coffee (*Jabana*). Mostly, men eat separately at *Khalwas* (a common room, where men get together). A typical village meal is *Asida* (sorghum porridge) with *Mullah* (sauce) from wild okra. Tea, sugar and coffee are commodities which villagers cannot do without. A visitor will not be allowed to leave without eating or at least drinking a cup of tea.

Villagers might take a rest between twelve and three o'clock in the afternoon, when the weather is very hot. During this time men and women might get together (separately) with friends in the neighbourhood to have a chat or play cards (mainly for men). After having lunch and a cup of tea around three o'clock, they go back again to the farms until sunset (around six o'clock in the evening). Normally, villagers go to sleep early after praying *Isha* (the last daily prayer) and having a light supper. Unless you have experienced it yourself, you cannot imagine how beautiful it is, when the moonlight touches the sands in a village where no artificial lights exist. This is the favourite time for young people to get together to chat, to dream about their future, and tell their love stories. Sometimes they may stay until the late hours.

That is a rather typical day at a village in Tendulti area. However, during summer the routine might change dramatically . That is when most of the village men (and sometimes women) migrate to other areas to earn money for their families.

Forestry in the area

According to Harrison and Jackson in Alatalo (1989), this area is situated in the Acacia senegal (gum arabic tree) savanna zone, a sub-zone of low rainfall woodland called the sahel savanna. Hence, traditionally the area was part of the gum belt (gum arabic production area).

The vegetation in the study area mainly consists of such species as Acacia senegal, A. nubica, Balanites aegyptiaca, Calotropis procera, Leptadenia pyrotechnica (Marakh), Ziziphus spp., and Boscia senegalensis. In addition, Cenchrus biflorus and Seasamum alatum are typical herbaceous plant species found as ground vegetation. In the seasonal watercourses, trees species such as Acacia seyal, A. mellifera, A. nilotica and Capparis decidua are found.
One does not need to go to history books to realize how trees used to dominate the landscape. Any old villager will tell you how they could not go from one village to the other because of the dense forests. A villager from Um Hagar village says: "We witnessed the period when the area was full of trees. One couldn't move sometimes unless by crawling. We have seen the Gazelle and Hyaenas, our fathers told us there were lions as well". According to villagers, the area was full of *hashab*, *kitir*, *talih*, *hijlij*, *abanos*, *mukheit*, and *gudeim*. Moreover, there were *sidir* and *sunt* at the *Wadi* (valley). At present, the vegetation cover is very much deteriorated and some of these trees, like *gudeim*, have totally disappeared from the area.
Based on the shifting cultivation system, people used to leave woody perennials (mainly gum trees) to grow using 'a fallow' period of about 17 years. Due to the increase in the prices of oil seeds and the establishment of vegetable oil mills in the area, many farmers intensified their groundnut and sesame production at the expense of their 'gum gardens'. Consequently they started to shorten the 'rational' (Hakulinen and Luukkanen, 1989) cultivation cycles.
In 1960, the Sudan Forests Department started its activities in the area by demarcating forest reserves (*Ghabut Hakuma* or government forests). Since then, the Forests Department has continued its reservation/conservation and protective measures. In 1978, the Finnish International Development Agency (FINNIDA) started its programmes in the area. Up to 1992, the project has been supporting and executing afforestation programmes to rehabilitate the vegetation cover, working together with the Sudanese forestry authorities and local people. An interesting approach which has been followed by the project was the policy known as 'food-for-work', where villagers were given rations for planting, weeding and protecting trees on their farms. An extension officer in Tendulti still remembers the phrase of a Finnish expert who used to tell villagers "no weeding, no feeding".

Two case villages have been selected from each of the two research areas. In Tendulti area, the two villages were Um Hagar and El Milaih. The following is a description of the two villages.

Um Hagar village

The village is located 15 kms south-west of Tendulti town. The name Um Hagar, came from the arabic word *Hagar* which means stone. So, Um Hagar, means the place with hard soil. Villagers explained that when their fathers wanted to dig wells, after a few meters of sand they were ending up with stones and no water. Consequently, they abandoned the idea of digging wells inside the village, saying: "*Mahal da hagar bas*" or "this place is stony". Another descriptive name for the village which is only known by a few of the village elders is; Um bookh (*Bookh* means smoke). This name is due to the fact that villagers sometimes see mist around the village at early mornings.

Originally, villagers were living at Um Shokaba village. They moved during what they have described as "the time of troubles, *Zaman el kasrat*", referring to the famous Mahdia period, which was around the seventh and eighth decades of the nineteenth century.

The population of Um Hagar village is about 500 persons. Most of the villagers belong to the Mosalamia tribe.

Villagers were traditionally nomadic or as an old man in the village has put it: "People were people who looked after animals, they knew nothing about cropping, they had many gum gardens. Animals died because of the drought[6] and villagers changed to cropping". Now, villagers depend very much on small scale rainfed agriculture and the keeping of a few animals. Many of the village men leave the village after harvesting their crops looking for work in other areas.

Villagers do not feel very much discriminated as far as social services are concerned. A characteristic of the area is its rather poor social services. There is a primary school (co-education). A glance at the school is enough to say safely that the buildings have probably never seen any kind of maintenance since the school was built in 1935. Classrooms are used for studying during the day and for pupils to sleep at night. Other amenities include: a flour mill, a bakery, a mosque, and a rather poor dispensary.

Like other Sudanese villages, Um Hagar has got a *Sheikh* (village chief)[7]. While maintaining the traditional sheikh-dom system, the new government regime has introduced a parallel village level organization (*Lajna sha'abia* or village popular salvation committee).

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[6] Referring to the drought period of the late 70s and early 1980s.

[7] In fact, there is one official sheikh, but different sections or tribal groups have their own sheikhs, resulting in there being more than one sheikh in the village.

In 1978, FINNIDA started its activities by establishing their central nursery at a place which is about one kilometre from the village. In spite of the fact that many of the nursery workers are from this village, still unexpectedly, villagers have not shown very much interest in forestry programmes, but that will be the subject of our discussion in another chapter.

El Milaih village

El Milaih village is located not far from Um Hagar (about three kms) and about 20 kms south of Tendulti.

The name of the village came from the arabic word *Milih* which means salt. Like the case with the other village, the name also has to do with water. Long ago, villagers dug for water, and they found only salty water. Hence, the village got its name El Milaih, the place with salty water.

According to villagers, El Milaih village was established before Um Hagar. Moreover, the school at Um Hagar was originally established at El Milaih.

El Milaih has a population of about 1780 persons. The population is of a more heterogeneous tribal composition. Most of the villagers belong to one of the following tribes: Tugalab, Nasrab, Kawahla, and Gwamaa.

Although the village is divided into six sections (*Farig*), it has but one sheikh. Each section has its own *Sandoque* 'community fund'. However, sometimes the six sections might collaborate to solve village problems. The source of money for the *Sandoque* is mainly from the sale of the village sugar quota or by adding a certain amount of money to the official price. However, in the case of new village establishments, villagers ask people for a donation, where the village committee might fix amounts to be donated by villagers depending on each one's economic situation.

The political administrative structure is not very much different from Um Hagar. However due to the more heterogeneous nature of the village composition, a seemingly more democratic way is followed when forming village committees. The village sheikh calls for a public meeting which all could attend. Anyone can nominate committee members, though usually the sheikh does, and villagers might agree or reject them. Normally, things go smoothly (*Ma'fi mashakil*, there are no problems).

Villagers' economic activities are similar to those of their neighbours at Um Hagar village. However, villagers' involvement in forestry programmes is more intense, compared to Um Hagar.

In spite of its larger size (in population and area), amenities seem to be ever poorer than at Um Hagar. Villagers do not have a school, and their children have

to walk the distance between the two villages twice a day (some might use donkeys). Moreover, the drinking water situation is worse, as they share the wells existing near Um Hagar village. Other amenities include: a mosque, a mill, a bakery, adult education classes for women. The NGO Concern[8] was supporting this village in the form of providing teachers for the adult education, supporting the village multipurpose cooperative, and helping villagers in building their school which is now in construction.

1.3.2 Sennar-Singa area

Geographic and socio-economic description
At present, Sennar-Singa area is part of the Sennar State, its capital is in Singa. The area is located about 400 kms south to south-east of Khartoum along the Blue Nile river.

The topography of the area is generally flat with the exception of some small isolated hills. The soil is dark coloured alkaline clay, which swells and becomes extremely sticky when wet, but develops wide and deep cracks when dry. However, near the Blue Nile river, the soil is a permeable, fertile, sand-silt mixture (known locally as *gerif*).

Temperature varies from a mean daily minimum of 14 degrees Celsius to a mean daily maximum of 40 degrees Celsius.
The average annual rainfall is about 500 mm., concentrated in the period between June and October.

Typical to the area is the heterogeneous character of its population, mainly due to an already long existing immigration inflow. Van Renterghem (1992) reports as many as 40 different tribes: Kenana, Hamar, Rezigat, Rufaa, Lahaween, Tama, and Fellata are the largest tribes. According to Kismul (1989b) the last group comprises various ethnic categories residing in the Sudan (near the Blue Nile river), but originating from West Africa.
Most villagers live in *Gutati*, traditional thatched huts made of wood, mud and grasses, but a few have brick houses. Most of the villagers have compounds fenced by *Zariba*, traditional bushwood (but again, richer people have brick/mud walls to protect their compounds).

[8] Concern is an Irish non-governmental organization.

Most of the population is engaged in some kind of agricultural production. Along the river (*gerif* soil), farmers grow mainly vegetables and fruit trees like banana, mango, guava. However, *gerif* soil is very limited and most of the farmers depend on small or large scale rainfed agriculture away from the river; this includes the cultivation of sorghum, sesame and millet. Moreover, in the areas where hashab trees exist many farmers have 'gum gardens'.

The majority of villagers possess animals, mainly goats, sheep and some cattle. In general, the area is known for its livestock, which are increasingly becoming dependent on the remaining reserved forests as the only remaining grazing areas after the expansion of the rainfed mechanized farming.

Diversifying income sources is a familiar survival strategy employed by almost all families. Diversification can be considered in two aspects. The first is by having different sources of income like sale of crops, sale of animals, sale of charcoal/firewood, sale of gum/other forest products, and/or sale of labour (including working as a government employee). The second is by having more than one family member gaining income and then pooling it (or at least a part of it) into a common household treasure. Villagers combine the use of the first and the second strategies to a varying extent. One will hardly find a family who is solely dependent on one income source.

Unlike Tendulti area, seasonal migration is not common. Instead, hiring in and hiring out of labourers between villagers (mostly, within the same village) is a common practice.

Although to a lesser extent than in Tendulti area, women are still involved in all kinds of economic activities, including the hiring out of their labour.

Comparatively, this area has richer natural resources, and people are generally better off than their counterparts in Tendulti area. This might be the reason why GO or NGO rarely come (or are allowed to come) to work in this area.

Charcoal and firewood constitute major sources of cooking energy. Moreover, charcoal making techniques and marketing is well developed and organized in the area. In villages, collection of firewood from a nearby forest rather than buying, is more common.

As in most rural areas in Sudan, the illiteracy level is very high. Especially for women the picture is more gloomy, as most women has never attended school. Basic schools (primary schools) are not present in all villages and intermediate level ones are only found in Sennar and Singa towns. Since the culture does not always allow girls going to school outside the village, girls hardly ever continue further than the primary level.

Conditions of social services other than education (including water and health services) are generally poor, but better than in Tendulti area. A water supply system which is common to the area consists of a water yard with pump.

Villagers (mainly women) have to collect the water from this yard, mostly at agreed time schedules.
Although the source of electricity generation is not far from the area, for long villagers have been dreaming of enjoying the luxury of having electricity supply.
Major problems in the area are related to agriculture and land use disputes. Moreover, during the rainy season when the soil becomes too sticky for vehicles to move, villagers find difficulties in reaching town or other villages.

A day in a village

A day in a village in this area has much in common with the one in Tendulti area. Hence, our intention in this section, is to discuss the differences rather than repeating the whole story.
When the weather is too hot, villagers prefer to finish their work early. Therefore, like in the other area, villagers start working around 6 o'clock in the morning. Women prepare tea, clean the house, dress the children, ..etc. If the husband is a farmer, the wife might prepare some 'take away' food for him. Unlike in Tendulti area, many villagers (mainly the young generation) in Sennar-Singa area work in towns as merchants, workers, or government employees. In this case, men leave their homes early in the morning and come back around three o'clock in the afternoon. After having lunch and some rest, they might go to their farms (or help their old parents) to gain some extra income.

A common feature in the village is seeing women, children or old men taking their animals (goats, sheep and/or cattle) from their houses in the early morning to a collection point in the village centre for herders to take. Before sunset, animals are brought back and every one will come to collect his/her. Villagers milk their animals in such a way that goats are normally milked by women early morning before morning tea and cows are milked by men in the evening.
Farmers in this area prefer to rest at mid-day, under a tree in their farms instead of going home and coming back again in the afternoon. Under normal conditions, girls and young women do not work on the farms. They are only expected to participate when the family does not have sons or in case of an acute labour shortage (planting and harvesting). However, old women may own (inherited) land and/or work on farms. Consequently, depending on their specific situations, women may stay home doing normal household activities (including child-care and collecting water from the river or water yard); or go to the farms. Young women have more time for socializing and maintaining the necessary inter- and intra-family contacts. Collecting firewood is a woman's responsibility, which is performed either by old women bringing it on their way back from

farms, or by young women making special trips in the afternoon (when the weather becomes a bit cooler). In the latter case, you can see women going in groups carrying firewood on their heads.
Between 10:00 am and 12:00; young women might get together at one of their houses to chat. Thereafter they are expected to cook lunch. Farmers have two meals only i.e. breakfast at the farm and a rather early supper when coming back home at sunset.
Normally, men do the shopping in town, but sometimes women also go for shopping. Daily consumptive commodities like soap, tea, coffee, spices can be obtained from village shop(s).
Evening life is not very much different from Tendulti. But, here, sometimes young men (or boys) might decide to go the cinema in the nearby town (Singa or Sennar) on foot or by bicycle.

Forestry in the area
In general, the situation of natural forest resources is better than the one in Tendulti area. The vegetation of the area belongs to that of the low rainfall woodland savanna on clay. Dominant tree species include; Acacia seyal, Acacia mellifera, and Balanites aegyptiaca. Depressions and seasonally inundated plains of the Blue Nile are the natural habitat for the famous (in Sudan) *Sunt* (Acacia nilotica) forests. In fact, this is one of the areas where Departmental forestry started early this century. As indicated elsewhere, securing provision of fuel wood for steamers was one of the major reasons for establishing the Forests Department. The British started reserving naturally growing *sunt* forests (i.e. protecting them from villagers). Consequently, this is one of the areas where forestry work is deep rooted and better organized. Along both sides of the Blue Nile, the Forests Department maintain well stocked forests following strict working plans (on rotation of 35 years). Now, all the natural forests have completed the prescribed rotations and have been replaced by plantation forests. Hence, the area is the centre of the riverine plantation forests. In addition to the *sunt*, the Forests Department started the introduction of other species like mahogany (Khaya senegalensis), eucalyptus and bamboos.
Worth mentioning is the fact that these forests are on the fertile *gerif* soils. Therefore, this is an area of continuous disputes. On the one hand, villagers and horticulturists want to use the land for horticultural crops. On the other hand, foresters like to keep it under forest cover.

Away from the Nile and in the uplands (*dahara*) natural forests exist. One of the most important tree species in these forests is the Acacia senegal. Other

species include: Balanites aegyptiaca, Acacia seyal, Acacia mellifera and Capparis decidua. Traditionally, nomadic tribes utilized this area as natural open grazing area. Moreover, villagers for a long time practised shifting cultivation combining trees with crop production. Unlike the situation along the Blue Nile, the Forests Department has less control over this area. Although it is one of the potential gum production areas, it seems that rich people and the Mechanized Farming Corporation authorities somehow managed to be the main stakeholders. Vast areas have been cleared by rich farmers for mono-cultural cultivation of sorghum. No consideration is given to the important social, economical, and ecologic roles of trees. Nomadic tribes and original villagers were deprived of their traditional grazing and cultivation rights. This is one of the foremost areas where land use disputes need to be negotiated, worked out, and settled. There are always conflicts over land use and land allocation between the forestry authorities on the one hand and the rich mechanized farmers and the Mechanized Farming Corporation on the other hand.
In the past, the few donor supported projects in the area (Canadian International Development Agency (CIDA) and FINNIDA) concentrated their efforts on exploitation of the forest resources. Since 1987, the NGO Concern and the FAO project FDES have been involved in efforts to involve villagers in the management of forest resources. Hence, terms like 'village woodlots', 'private forests', and 'community woodlots' are finding their way into the vocabulary of both villagers and officials in the area.

El Azaza village

The village is located by the Blue Nile river, about 5 kms south-east of Singa town and very close to Azaza reserved forest. According to villagers, Azaza village was established before Singa town (during Mahdia period i.e. last decades of the nineteenth century). Originally, the village was right beside the river, but the abnormal floods of 1988 destroyed most of the village. Hence, villagers were forced to move to the present location. With the new settlement, the village has been divided into three sections (*Farig or Hey*), namely the Western section, the Bridge (El Jiko) section, and El Azaza section.

The population of the village amounts to about 1000 persons. Villagers belong to the two main tribes Jaalien and Maalia. The other two tribes Iraigat and Masaleit, are considered as new settlers (they came in the 1960's).
Almost all villagers practise some kind of agriculture and claim to be farmers. Many of them own *Ginaina* or gardens beside the river. This category grow vegetables and fruit trees for which there is a good market since the

establishment of the bridge, depending either on natural flooding or mostly pumping water directly from the river. Another category owns what villagers refer to as *Matara* or a garden far from the river. In this case, the owner has to dig a well for irrigation. The soil is not as fertile as the former (Ginaina). Hence, farmers of this category grow mainly vegetables. A third category, who do not 'officially' own land, grow vegetables on *Gerif*[9]. The *Gerif* is a low land within the Azaza reserved forest. This land gets annually inundated and is, consequently, difficult to afforest. Each year, farmers of this category sign contracts with the forests department (FNC) after payment of a nominal rent. Sometimes, farmers of this category are expected to sow sunt seeds (provided by the FNC) as a kind of taungya system[10]. They are still some villagers who do not have access to land, but find work as labourers on other villagers' farms. Most of the villagers keep some goats and cows for milk.

By now, it can be understood that unlike their counterparts in Tendulti, Azaza villagers have little reason for seasonal migration.

In one way or another, a villager's whole life is closely connected to the forest. Many villagers find work either as government employees or in self-employment. Even the children work as labourers in the forest and/or nursery during school vacations.

Available services include: a basic or primary school (co-education), a dispensary, water yard, and a mosque. Before 1981, village children used to go to schools in Singa town. According to village women, this was the reason why illiteracy among women is comparatively higher[11]. A middle aged lady said: "Girls of these days are very lucky. They have the school inside the village. Our fathers did not allow us to go to school in Singa".

The first strange impression we had about the village was related to the village sheikh. Traditionally, a typical village sheikh is an old man, not schooled, who inherited the sheikhdom from his father. Reaching the village, we intended to contact the village sheikh at least for courtesy reasons, expecting that image of village sheikhs. We were astonished to meet a young, university graduate village sheikh. Later on, we asked him how come a young man like him became the village sheikh? He explained that there were some problems with the former sheikh, and so villagers decided to select the new sheikh through voting.

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[9] Gerif here has a different meaning from the one we have explained earlier.

[10] According to the taungya system, farmers are allowed to grow crops on state-owned land for an agreed period and are expected to plant and take care of forest tree seedlings. Some see it as a kind of agroforestry.

[11] In general, the literacy level is low.

Other village organizations include *Lajna sha'abia* or "village salvation popular committee" (of which the sheikh is a member), a branch of the national youth organization, and a branch of the Red Crescent Association. Women are represented in all village institutions. However, they rarely participate in meetings together with men. Rather, they will be briefed before and after meetings and consulted on their opinions. Village women mostly have a heavy burden of work; together with the traditions, this contributes to the reason why women do not participate in meetings.

Wad Braima village

The village is located twelve kilometres east of Sennar town. It was established in 1919 when a family moved from Kassab El Danagla village (about 5 Kms away) after having some family troubles. People of the two villages still maintain good relations with each other and exchange visits on occasion.

The main tribe is Danagla (Bidairia Dahmashia), in addition there are some Rawashda, Jaalien and Burnoo. The three latter groups are seen as minorities, as they came to the village later, with the establishment of the Blue Nile Agricultural Scheme (in 1953).

The village has a population of about 500 persons. Most of them are tenants with the Blue Nile Agricultural Scheme.

When we asked about environmental changes in the area, villagers identified the disappearance of trees and more frequent occurrence of years of low rainfall. Among other trees, villagers were able to remember *talih*, *tundob*, and *hijlij*. There were very thick forests, villagers explained, which were cut to clear the land for the scheme. According to them, before the scheme, they used to clear small areas as they did not have tractors.

The scheme started in 1953 to grow sorghum and cotton. Before that, villagers practised rainfed shifting cultivation, growing sorghum in their small holdings (*Bildat*). For some time they cultivated groundnuts, but due to problems of diseases and low prices, farmers did not continue with groundnuts.

Villagers think that the situation of agriculture now is better than before, as the scheme brought irrigation water. Before, there was seasonal migration. Now, only some of the youth migrate as they do not want to be farmers. But in general, old people believe one can still gain a lot from agriculture if one works properly.

Old villagers still remember how the process of land registration went on when the scheme started. An old man explained to us the process as follows:

When the government came to register the land, they asked each farmer who claimed ownership of any piece of land to swear that he had been using this land for the last 20 years. Most of the villagers refused to swear because the shifting cultivation system does not allow the use of one piece of land for 20 years consecutively. Only very few own land (those who accepted to swear), the majority were given rights of use as tenants.

Hawasha is the local name for a cultivatable unit of land used by a tenant. The tenant is allowed to use the *Hawasha* and it can be inherited by his/her family, but they are not allowed 'officially' to sell it. According to the contract between the Government and the tenants, the Government has the right to withhold the right of use of certain Hawasha if the tenant fails to take care of it. However, in reality this was only applicable at the start of the scheme and only for cotton.
Traditionally (before the scheme), nomads used to pass through the area and graze the *Bildat*. Farmers used to collect the sorghum (grain) leaving the stalks as fodder for the nomads. However, after the scheme, cultivation became more or less continuous and nomads are no longer allowed to take their animals into the *Hawasha*. Now, nomads attack the crops frequently. Villagers appreciate the difficult situation of the nomads and affirm that their rights of use (for grazing) were not considered. But they do not think that they are to be blamed and that nomads should not attack crops. Conflicts between cattle owners and farmers can become very serious leading to bloodshed. Sometimes, the Government provides soldiers to protect cotton crops from animals. Even when they exist, social relations between cattle and crop owners seem to have little influence on settling the conflict situation. According to villagers, they do not know the nomads as they only come for short periods and most of the time they send the youth with the animals. But even the cattle owners who are already settled nearby (semi-nomadic), and with whom the villagers keep good social relations, come and attack crops.
Services at this village are poorer compared to Azaza village. At the time we started our field work, there was no school in the village. However, during the field work villagers managed to build two classrooms through popular contribution i.e. without government support. In this way, they were able to convince the government to provide teachers. Now, the work is continuing to complete the school building with 8 classrooms. Worth mentioning is the fact that all the contacts and contributions were handled by village emigrants (inside and outside the country). Before that, village boys and girls used to go to nearby villages for school. Other services include: a mosque, water yard and a youth club. There is virtually no kind of health service in the village. Hence, all

cases including serious ones like difficult delivery have to be taken to Sennar town. This is causing a lot of inconvenience to villagers especially during the rainy season, when roads become completely impassable.
Since 1988, villagers have been involved in a community forestry programme and they have managed to establish one of the successful (from foresters' point of view) village woodlots.

In the previous sections we have presented some background information in connection to the forestry sector in Sudan and a detailed description of the study area. Our aim was to contextualize forestry development in Sudan and the socio-economic environments within which, people interact in their effort to manage tree/forest resources. In the coming sections we explain how our research problem and questions came to be formulated.

1.4 Formulation of research problem and research questions

1.4.1 Assessment of present problems

Over the last decades, the vegetation cover in Sudan has very much deteriorated. The natural forest area decreased from 584,362 sq. km. in 1968 to 559,015 sq. km. in 1981 i.e. by about 1,940 sq. km. annually. Adding to that the fact that similar deterioration took place in the rangelands, Bayoumi (1989) estimates the reduction in the vegetation cover in Sudan as 50,695 sq. km. in thirteen years. People are witnessing the adverse results of this in the form of lack of food, fodder for animals, fuel and building materials; together with the economic consequences of the fall in gum production, and the rise in prices of fuel-wood/charcoal and building materials. Agricultural production decreased as a result of decreasing soil fertility, sand encroachment, and the silting up of canals and dams as a consequence of unprotected watershed areas. Furthermore, the latter has resulted in a shortage of irrigation water and hydraulic electricity generation.
The World Bank (1986) concludes that if nothing is done to protect and utilize the existing forest resources more effectively, Sudan will be faced in the near future with an enormous investment programme to replace the forests which are currently being cut down.
For a number of reasons (unstable and contradicting legislations, lack of data and information necessary for proper planning, lack of funds and lack of adequately trained staff) the Forests Department is unable to continue its originally envisaged programmes. Forest reserves which should cover 15

percent or even 20 percent of the total land area according to the 1986 forest policy, reached only 0.5 percent (i.e. within the last eighty years only 0.5 % of the country's total land area has been reserved). Moreover the Department is unable to continue protection of the natural forests effectively as it fails in putting the forest laws into effect for the reasons mentioned above (Khalifa, 1989). Hence, the need to involve local people in the management of forest resources is identified (Abdulla and Holding, 1988; Khalifa, 1989; Mahir, 1992). The study which we carried out in 1992 revealed that the Sudanese forestry authorities are willing to involve local people in the management of forest resources. But so far, the outcome of the few cases in which the cooperation between villagers and professional foresters has already started, has not come up to the expectations of either the local people or the professional foresters. One of the main reasons, we found, is that local people and professional foresters have different objectives and motives for the management of forest resources (Mahir, 1992). On the one hand some professional foresters want to involve local people in management of forest resources in such a way that the conventional management systems could be reinforced. Analysis of foresters' perceptions of forestry extension showed that for some foresters trees still remained at the 'centre' and villagers are at the 'periphery'. For this category of foresters, reserved forests should not be touched by villagers. If they are willing to participate, villagers can plant trees on their private lands or help the Forests Department in reforesting the vast empty reserved forest areas: "We are afraid, if people are allowed to, they will get used to coming into reserved forests, then we might loose control over our forests". This category of foresters we refer to as the **'forest-first'** category (Mahir, 1992: 42). On the other hand, local people seem to be very cautious in working with forestry authorities having in mind the many bitter previous experiences they have had with professional foresters. At the moment we have in mind the case of a villager who during an earlier study explained to us how he had been cheated by foresters. He said: "Forester El Jack[12] told us that they want to use our land to do some forestry research. At that time there was too much land, and we were only using part of it, so we agreed. Now there is not enough land, and we asked about our land. They told us that the land has been registered as a reserved forest" (a villager quoted in Mahir, 1992: 65).

The scenario of the problematic situation can be summarized in the following points:

[12] Names in this text have been changed to keep the real persons anonymous.

(1) Before government intervention, local people were used to utilizing their forest resources themselves.
(2) Government intervened to manage the resources for the benefit of the whole nation (at least that is what was claimed). And for that purpose the Government created a specialized professional forestry institution (in 1901). This institution has been staffed by foresters who are technically trained to 'deal with trees'.
(3) This institution tried to, and at least on paper did, take over resource management control from the local population through the reservation procedures and by issuing legislations.
(4) After more than eighty years the specialized professional forestry institution realized that it could not do the job alone. So, it started calling on 'others' to help rescuing the forests.
(5) Noticing the limited response to their call, professional foresters assumed that 'others' lack knowledge about the benefits of forests. Consequently, an extension unit has been created to transfer information and technology to the ignorant 'others'.
(6) New professional foresters had to be taught how to transfer technology to the 'others'. Hence, forestry educational institutions decided to add an course on extension to their existing curricula.
(7) The experience of involving the 'others' in the management of forest resources has so far showed that the agenda of professional foresters does not properly match the agenda of the 'other'.

The above scenario indicates that many changes are taking place within the sphere of forest resource management in Sudan. On the one hand, the 'official' forestry institution is asking 'other' people to come in again. On the other hand, the other people, while they also feel the need to go in, seem to be a little hesitant.

1.4.2 Research problem

In 1992, we studied the performance of the forestry extension service in Sudan. The soft systems perspective (Checkland, 1989) allowed us to conceive the problematic situation of forestry in Sudan as a Forestry Knowledge and Information System (FKIS). From such a perspective, the following problems have been identified (Mahir, 1992): (see fig. 1)

(1) Professional foresters assume that they know everything and other actors know nothing. Moreover, they see themselves as the hub around which all others revolve.

(2) Forestry research is not generating the kind of technology and/or information which is most needed by the field forestry staff especially by extensionists.
(3) Forestry educational institutions are not producing the kind of staff suitable for the new orientations in the field; they are not updating their curricula.
(4) The forestry knowledge and information system is based on the linear Transfer of Technology (TOT) Model, in which there is room for the knowledge and experiences of no one but the official forestry authorities.

We have a feeling that in spite of the seemingly general appreciation of the need to take collective action towards sustainable management of forest resources, people have failed to get together around a 'table' or a 'platform' (Röling, 1994b) to negotiate and maybe to bargain their expectations and roles.

In this study our intention is to see how people as individuals, groups or institutions involved in management of forest resources in Sudan, perceive forest resources, reconstruct changing situations, acquire and/or develop knowledge and skills, strategize to continuously make sense of the resources: and to see how the answer to this question can enhance the education of foresters to facilitate the creation of platforms or favourable learning environments for people to manage the resources in a better way.

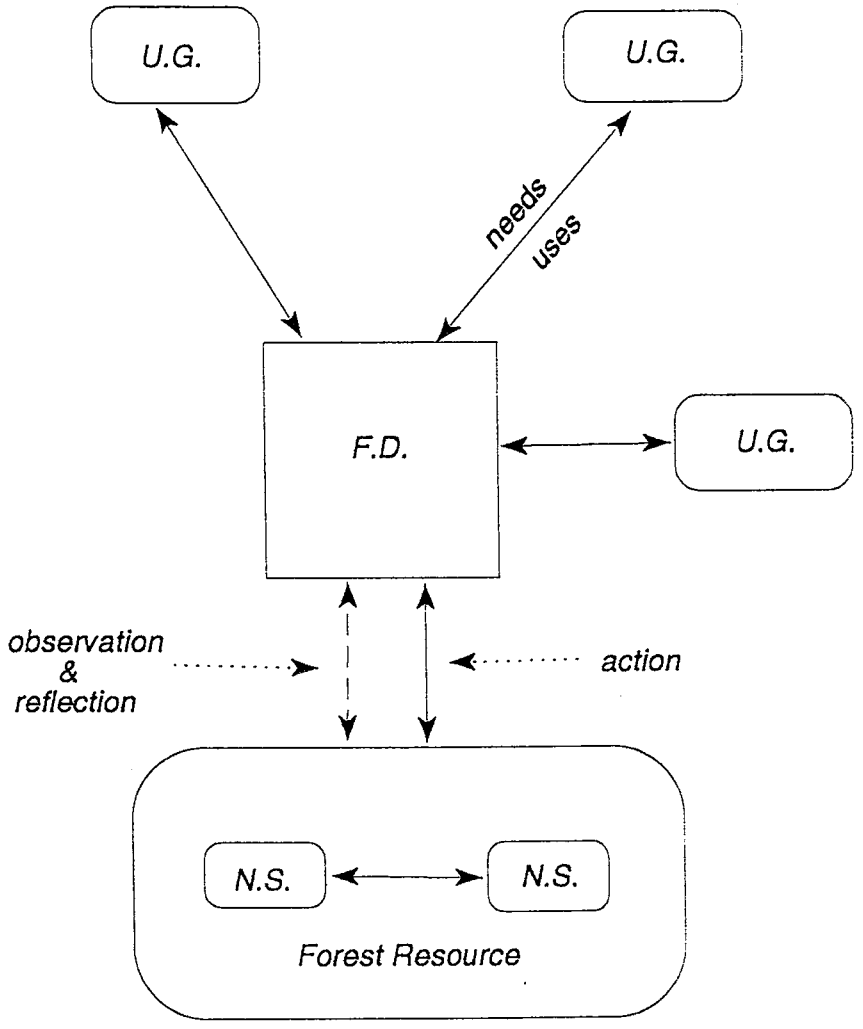
The present work is an effort to come to grips with the following specific questions:
(1) What is the perception of people of tree/forest resources? And how do they think these resources should be managed?
(2) To what extent are people changing their tree/forest management strategies? What are their rationales?
(3) What kind of institutions and organizational structures are developed for managing forest resource?
(4) What is the nature of the relationship between the changing management strategies and different people's knowledge basis?
(5) To what extent do different people see new learning needs (knowledge, skills and attitudes) emerging as a result of changes in management strategies? How do they meet these learning needs?
(6) To what extent are official (formal and non-formal) forestry educational systems facilitating and satisfying the changing learning needs?
(7) How can forestry education be better based on people's perceptions and realities, and be relevant to the contextual differences that might be found

within and between various social actors? And under what conditions will education play a better role in facilitating the accommodation of different people's interests and needs as a prerequisite for sustainable management of tree/forest resource in Sudan?

1.5 Summary

Historically, villagers used to utilise and manage forest resources in their surroundings. The Government intervened in different ways in an effort to manage forest resources for the benefit of the 'whole nation' on a scientific basis. The Government took (or at least tried to take) control over the management of these resources from the villagers. After more than eighty years, forestry authorities have realized that this is neither the most effective nor the most efficient way to manage forest resources. Now, professional foresters are looking for 'others' to share the responsibility for their management. To their astonishment, the 'others' are not very enthusiastic about the idea. Some are even stating clearly that it is not their responsibility to protect 'government forests'. Still another category of people is doubtful whether villagers can help in forest resource management.
In this study we would like to increase our understanding about people's changing forest management strategies and how these strategies are influencing and are influenced by processes of knowledge transformation. And to what extent these transformation processes are coming to be a challenge for forestry educational systems in Sudan.

In the following chapter we intend to discuss the theoretical orientations of this study and revisit the research problem and research questions.



U.G. = User Group

F.D. = Forest Department

N.S. = Natural System

Figure 1.1 ***Foresters' perception of forest management***

2 THEORETICAL ORIENTATION

2.1 Introduction

In the previous chapter we discussed the problematic situation of forestry in Sudan and ended by presenting the research problem and research questions. In this chapter we present the main concepts and analytical tools used during the research process. We start by presenting our analytical framework. Then we review relevant concepts with regard to forestry, knowledge and education.

2.2 Analytical framework: systems and actors perspectives

Reading through the problematic situation as presented in the previous chapter, one can safely conclude that a major cause of such a problem stems from the actors' failure to understand the interdisciplinary nature of forest resource management. This study is an effort to contribute together with other efforts towards facilitating such understanding. We believe that a prerequisite for conducting such a study is selection of a holistic research approach.

One way to tackle a problematic situation is to perceive it as a system[1]. Röling (1988) argues that defining a complex phenomenon as a system for analytical purposes allows one to observe the synergetic effect of the interaction between the parts. Hence, in this study we have opted for the soft systems perspective (Checkland, 1989; Röling, 1988; Röling and Engel, 1991) as our main analytical tool.

In general any collection of elements which, when put together, will have an overall collective product or 'emergent property' (Röling and Engel, 1991) which is more than the sum of individual contributions can be described as a system. Hence, there are natural systems e.g. trees; designed systems e.g. cars; human activity systems (HAS) e.g. knowledge and information systems. Checkland, differentiates between 'hard systems' and 'soft systems'. The former have clear

[1] The term system will be used in this study in two different ways: a) the everyday use where any organized set of elements, activities or institutions is described as a system; and b) as a process of inquiry whereby one tries to see something as a system: systemicity lies in the process of inquiry (Checkland, 1993).

purposes and are amenable to the powerful goal seeking techniques of systems engineering (e.g. cars), whereas 'soft systems' such as human activity systems only acquire missions as the outcome of stake holders' (often conflicting) objectives (Checkland in Röling and Engel, 1991). Human activity systems are sets of human activities which are inter-connected in such a way that it makes sense to consider them as comprising a system (Checkland in Bawden, 1992: 167).
Systems consist among other things of different social actors. A social actor can be an individual, a group of persons, or a whole organization. According to the actors' perspective, a social actor is not the same as individual actor, but represents the individual actor within a certain social context i.e. he[2] is a 'multiple personas'. Far from being passive, a social actor uses his 'agency'[3] and actively participates in processing information. Consequently, the social actor strategizes in his dealings with other social actors (Long, 1992 and Röling, 1992). An interesting article for realizing how social actors strategize in their dealings is written by Chambers (1994), titled "All power deceives".

Using a combination of the systems and actors perspectives allowed us to conceptualize forest resources as arenas where there are not only interactions between human activity systems and natural systems, but there are also interactions between various human activity systems (see fig. 2). Here, the natural system is the battle-field which social actors are struggling to manage. From this perspective, we see villagers not as disabled bodies who wait for the state or other powerful agents to decide for them how forest resources should be managed. On the contrary, villagers are seen as 'social actors' who are capable of making a difference even under the most difficult situations.
Social actors' cognitive abilities enable them to perceive, act and/or react, and reflexively monitor their relationships with the natural and other human systems. To do that social actors construct understandings, explanations (be they of a mythical, spiritual or scientific nature), and establish institutions of laws and organizations to guide their actions and to monitor the consequences of these actions (Woodhill and Röling, 1994). Such understanding entails giving consideration to aspects of social actors' perceptions, management institutions, knowledge activities, and management strategies.

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[2] Throughout this book we use he, his and him to stand for a human being irrespective of sex.

[3] "the notion of agency attributes to the actor the capacity to process social experience and to devise ways of coping with life, even under the most extreme forms of coercion" (Giddens in Long, 1992: 22-23).

In the coming sections we discuss social actors' perceptions and organization and management of forest resources. We leave aspects of knowledge processes to be tackled later in a separate section.

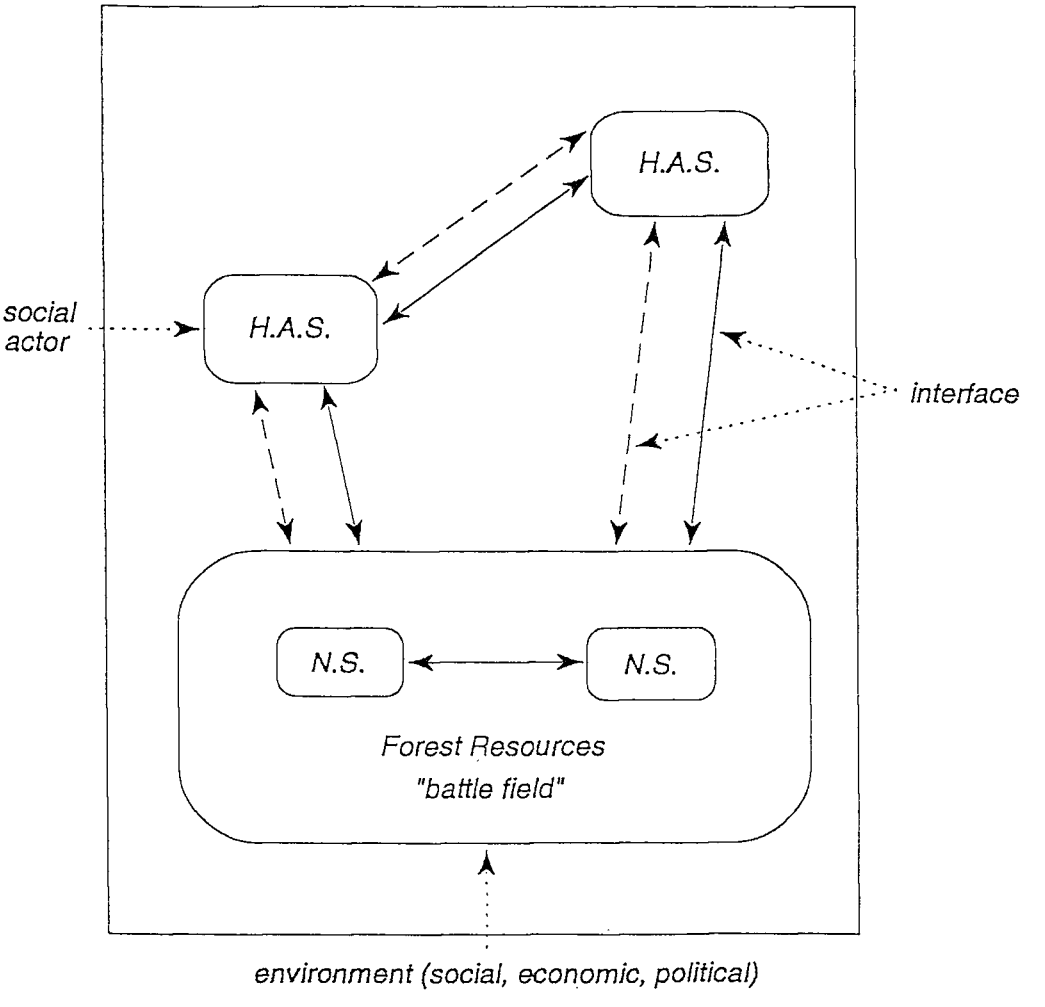
2.3 Perceptions of forest resources

Van Den Ban and Hawkins (1988:62) define perception as: "the process by which we receive information or stimuli from our environment and transform it into psychological awareness". Furthermore, they mention the following principles of perception:

(1) Perceptions are relative rather than absolute (i.e influenced by surroundings).
(2) Perceptions are very selective. Several physical and psychological factors (including expectations) influence what a person selects or pays attention to. For example; training may lead an individual to have different perceptions of situations from those of untrained people.
(3) Perceptions are organized. People tend to structure their sensory experiences in ways which make sense to them. Another characteristic of perceptual organization is termed 'closure'. The perceiver tends to close or complete what he perceives to be an open or incomplete figure.
(4) One individual's perception will differ markedly from another's in the same situation because of different 'cognitive styles'.

Traditionally, forestry scientists used to perceive forestry problems merely as technical problems. By the nature of their technical training, foresters failed to conceive forestry problems as social constructs. 'A problem' is a difference between what one expects to gain and what one actually gets i.e. problems are the perceived gaps between wants and gains. Forestry problems could be the result of physical, social and/or biological causes. However, whatever the cause is, 'a problem' only becomes 'the problem' when it is perceived by one or more of the social actors.

Nevertheless, understanding social actors' behaviour requires more than just looking into their perceptions. We have seen above how social actors' perceptions are interwoven with other factors. Hence, Ajzen and Fishbein (1980) argue that to understand people's behaviour we should analyze determinants of the specific behaviour. According to them a person's intention is the immediate determinant of the action. According to the theory of reasoned action, a person's intention is a function of two basic determinants, namely:



H.A.S. = Human Activity System
N.S. = Natural System
⟷ = action-link
⟷ = perceptual-link

Figure 2.1 ***A system perception of forest management***

their attitude toward the behaviour (i.e. personal evaluation of performing the specific behaviour); and the subjective norm (i.e. the person's perception of the social pressures put on him to perform the specific behaviour). Ajzen and Fishbein (1980) continue to argue that attitudes are functions of beliefs and they differentiate between behaviourial beliefs, which underline a person's attitude toward the behaviour, and normative beliefs, which underline a person's subjective norms. Ajzen and Fishbein (1980) accepted that they have not considered all aspects of behaviourial explanations and tried to put all other determinants in one large group (which they referred to as external variables). However, in order to make the theory of reasoned action in line with our conception, we need to put forward the following reflections on some aspects of the theory:

First, we are of the opinion that notions of external and internal seem to be irrelevant. Our argument is that intentionality is only one element in explaining people's behaviour, and other elements like opportunities, capabilities, perception (which also has to do with intentionality, but in addition determines what is external and what is internal) also influence social actors' behaviour.
Second, we think that attitude toward the behaviour and subjective norms should not be seen separately as they influence each other very much.
Third, it is not enough to indicate that a specific social actor's behaviour is influenced by subjective norms. This might give the impression that there is something out there called "subjective norms" which determines social actors' behaviour. We believe that it is essential to clarify whose social pressure matters most, and how and under which conditions these subjective norms influence a specific social actor's behaviour.
Fourth, we argue that not all behaviour can be reasoned i.e. sometimes one performs a certain action without being able to substantiate it with a reason.
This last point leads us to discuss issues of emotions and beliefs.
Social actors' attitudes and perceptions are interlinked with their beliefs and emotions[4]. According to Whale (1984) the concept of perception is closely related to the notion of the 'self'. Self is made up of a cognitive element (called self-concept) and an emotional element (called self-esteem). Whale (1984) argues that the emotional element plays an extremely important role in structuring the self. In turn, beliefs are related to concepts like taboos[5].

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[4] Belief is defined as "a proposition which is accepted as true but which, even though not contradictory to reason, cannot be substantiated by reason" (Good, 1959: 57).

[5] A taboo is the refraining from something or some practice which is expected to cause an undesired event based on a mystical belief (El-Mahi, 1994).

We are of the opinion that before developing an intention to behave in a certain way and prior to translating them into strategies, actors might need some kind of motivation. Motivation is described by Whale (1984) as a person's tendency to organize his behaviour, giving both direction and energy to what he does in response to changes within his environment in his continuous effort to meet his needs. Maslow argues that in fact people's behaviour arises to satisfy human needs. He classifies human needs into physiological needs, safety needs, social needs, ego needs (for esteem and status) and self-actualization needs (Maslow in Whale, 1984). Although Maslow indicated that these needs are arranged in a hierarchial manner in such a way that the first category of needs should be met at a satisfactory level before one can move to the next category, during their daily lives people may move up and down the hierarchy (Whale, 1984).
Without saying that perceptions and attitudes are not essential in determining people's behaviour, we would like to argue that it is essential to see perceptions and attitudes within context because they are mostly location specific and interwoven in a very complex way with other societal aspects. We should not overestimate the role of people's normal 'overt' attitudes as behaviour determinants. Sometimes people act against their beliefs and normal perceptions. It seems that under certain conditions people develop something like 'emergency' perceptions and attitudes.

During their daily interaction with the natural system, social actors carry out some kind of intellectual discussion within themselves similar to what Kolb (1993) refers to as observations and reflections. The outcome of these processes where actors' perceptions of the natural system interact with their needs is what we refer to as management objectives (see fig. 2). In the next paragraph we scrutinize our conceptualization of social actors' forest resource management objectives.

From biological science, we know that trees as living entities undergo certain physiological processes such as growth and reproduction. The outcome of such processes, but also the outcome of their interactions with their environments, are what we (human beings) perceive as goods and services. For us, forest values are human constructs, hence, we prefer to call them the social values of forests[6]. According to Kennedy (1985) forest social values exist in interrelated sets of four systems. These are the physical-environmental, social-cultural, economic, and political systems. He argues that forest social values originate

[6] The social values of forests consist of what social actors perceive as goods and services obtainable from forests.

only in the social/cultural system. However, these values are communicated by three systems; the economic, social-cultural, and political systems. The physical system itself neither generates nor expresses forest values. It is only through human association with the physical resources that forest values originate and are expressed (Kennedy, 1985).
A characteristic of forests/trees is that their social values are appreciated differently by various social actors. Hence, the concept of multiple use is one of the two fundamental concepts in forestry. The other is the concept of sustained yield. The role which trees may play does not only depend on the species, but also on the landscape niche in which they are growing. For example, trees growing in home compounds usually have an important role in providing shade and in producing fruits, whereas a similar tree species growing along river or canal bank may have a major function in erosion control. Also, the importance of various functions of trees may vary between different user-groups, e.g. men may regard commercial timber production as a major role of trees, while women may be more interested in their role for domestic fuelwood supply or food production. Similarly, pastoral people may value fodder production by trees highly. Thus, trees may have multipurpose functions, but their exact role depends on the place where they are growing and the needs of the user groups that utilize the trees (Wiersum, 1992c). Hence, the concept of 'multiple users' is becoming more popular. Rocheleau (1988) argues that paying attention to the concept of multiple users implies the separation between spheres of activity and control between different actors e.g. men and women, age groups, classes, occupations and ethnic groups.

We have indicated before that in this study we perceive forests as 'battle-fields'. Various social actors (multiple users) come with their management objectives and transform them into management strategies. There, social actors face the reality: other social actors (be they individuals, groups, or organizations) are simultaneously coming with their own (similar or contradictory) management objectives. During these processes, there is friction between social actors, where they consciously or unconsciously enter or trespass on each other's territories. Those points of frictions, or 'interfaces'[7], are when and where social actors carry out negotiations to organize the use of the resource. For that purpose, social actors carry out networking. Under

[7] Long (1989a: 1-2) defines a social interface as "a critical point of intersection or linkage between different social systems, fields or levels of social order where structural discontinuities, based upon differences of normative value and social interest, are most likely found".

'harsh' environmental, socio-economic, and political conditions, people believe that 'with one hand one cannot clap', hence they engage themselves in many networks. Networking in this study is seen as "a social process whereby intensive communication between actors leads to narrowing down of views and opinions and eventually to coalitions of actors who agree to pool their resources to implement certain solution strategies" (Engel and Van den Bor, 1995: 6). These networks are of different natures, different purposes and used at different occasions in time and space. In this respect we would like to differentiate between 'normal', 'direct' networks which people engage or find themselves engaged in (consciously or unconsciously) during their normal daily life; and specially constructed 'extended' networks. The latter are special types of networks which are created where existing networks do not suffice. We see networking as a crucial survival strategy of social actors. In general, these networking processes end up with social actors establishing institutions of laws and organizations to supervise, execute, and monitor the agreed upon accommodation arrangements. In the coming section we discuss the nature and structures of forest resource management institutions.

2.4 Organization and management of forest resources

Perceiving forest resource management problems as a system allows one to use systems thinking to analyze the problematic situation at different levels of systems aggregation.

At each level, the following two factors deserve special consideration:

(1) the degree of control or ownership over land and/or tree resources;

(2) the degree of management responsibility for forest/tree resources.

We first discuss the issue of forest/tree tenure. In this connection, McKean (1992) differentiates between the following types of property based on the type of owner:

(1) Unowned non-property (or open-access resources) to which no one has rights and from which no potential user can be excluded.

(2) Public property held in trust for the public by the state. The general public often has access.

(3) State property that is essentially exclusive i.e. private property of government bodies, to which the general public does not have access.

(4) Jointly owned private property whose individual co-owners may sell their shares at will without consulting the other co-owners.

(5) Common or communal property or jointly owned private property without unilaterally tradeable shares.

(6) Individually owned private property whose individual owners generally have full and complete ownership except as attenuated by government regulation.

Forest resources have some inherent characteristics e.g. provision of public goods and nature of tree/land tenure, which lend them vulnerable to become potential areas for situations of "social dilemmas" (Messick and Brewer, 1983) or "tragedy of the commons" (Hardin, 1968).
The prevailing view of the "tragedy of the commons" can be stated as follows: "If a group of people are placed in a situation where they could mutually benefit if all adopted a rule of restrained use of a common-pool resource, they will not do so in the absence of an external enforcer of agreements. Each individual has an incentive to ignore the social costs of his resource use for fear that others will capture the benefits of the resource before he can. The lack of exclusion from the resource thus creates an incentive for a rate of aggregate use which exceeds the physical or biological renewal of the resource" (Ostrom in Wade, 1987: 96).
To avoid situations of "tragedy of the commons" some argue that an external enforcer is needed e.g. the state. Others see the solution in privatization. However, McKean (1992) suggests "propertyization" rather than privatization[8]. Still another category of scholars e.g. Wade see the solution in collective action[9]. Consequently, what is needed is not only regulation but cooperation with regulation or what Levi refers to as 'quasi-voluntary compliance'. Therefore, the issue of the voluntariness of collective action has to be considered at two levels: "At the constitutional level people can negotiate voluntarily a set of rules of restrained access or financial contributions, their incentive to do so being the prospective net collective benefit. At the level of action, most of the compliance with the rules must also be voluntary, not the result of a calculus of evasion and punishment. Nevertheless, the rules must be backed by a system of punishment, the existence of which helps to reassure any one person that if he follows the rules he will not be suckered, and which at times of crisis can directly deter" (Wade, 1987: 103). This leads us to discuss aspects of institutions and organizations created by actors to manage forest resources.

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[8] According to McKean (1992) "propertyization" is creating clear, specific and exclusive rights to be vested in owner(s).

[9] "Collective action is action by more than one person directed towards the achievement of a common goal or the satisfaction of a common interest (that is, a goal or interest that cannot be obtained by an individual acting on his own)" (Wade, 1987: 97).

A forest management institution is the set of working rules formally or informally adhered to by users to manage products' procurement from a particular forest (Ostorm in Britt-Kapoor, 1994). Various social actors create their own institutions to manage what they perceive to be 'their own' forest resource. Looking at different levels of the system's aggregations, one realizes that in fact management of forest resources is not subject to just one single, coherent, and generally known body of legal concepts and rules, but to plural normative systems (Von Benda-Beckmann, 1992). In addition to the body of rules and institutions generated and maintained by the state agencies (state law), there are also normative systems which have been generated, transmitted and maintained by villagers. Unlike state laws, in local spheres rights to the forest resources are scarcely differentiated from other social, economic and political relations. In many societies, customary legal systems are particularly complex because rights to land and to trees are distinct. Tree tenure is possibly even more complex, since there are many ways to profit from trees. An important aspect of such rights is that they are not mutually exclusive (Rocheleau, 1988; Von Benda-Beckmann, 1992). Nevertheless, over time both state laws and traditional (customary, folk) laws change and hybrid forms of local regulations, made up of elements of various systems develop creating situations of "legal pluralism" (Von Benda-Beckmann, 1992). Notwithstanding, the situations of "legal pluralism" some social actors, e.g. the state, tend to intervene[10]. In many parts of the world, governments thought that because of their special nature, forest resources should be managed based on central policy and with an authoritative and hierarchial forest service (Wiersum, 1991). Hence, the concept of forest management by a bureaucracy originated and forestry as a career came into being.

Since in most cases forests are related with rural areas, governments often claim to manage forest resources for the sake of rural people. Douglas (1983) identifies two main distinct phases in the development of forest management strategies since the 1950s. The first is the industrialization approach, which was based on the assumption that through economic growth of the country and the creation of forest-based industries, the required development of the forestry sector and the consequent rural development will automatically 'trickle down'. However, towards the middle of the 1970s and following the changes in the international perception of development, the role of forest resources in rural development was revisited. It was realised that local people are not receiving

[10] In this book and in line with Long and van der Ploeg (1989), we see intervention as ongoing interactions (not limited by time or space) between various social actors involved in forest resources management.

reasonable benefits from the management of forest resources in their surroundings. Moreover, experience revealed that forest resource management by central bureaucracies is neither effective nor economically efficient. Hence, the second phase in which (participatory) approaches appeared. This is where the former assumption of managing forest resources by bureaucracies was reappraised and a need to complement it with new strategies that focus on basic needs, equity and popular participation was identified. These new approaches in forest resource management came to be presented under various names e.g. forestry for rural development, community forestry and social forestry (Wiersum, 1991).
Over millennia, local people "use-managed" forest resources in their surroundings[11]. Nonetheless, government interventions resulted in the differentiation of forest resource management into formal and informal. According to Wiersum (1992c) the formal one involves the formulation of an official management plan and contractual arrangements for utilization of specific forest products by selected forest user groups. Informal management, on the other hand, does not involve such official documents or contracts between the forest users and the official authority. Normally, the latter type is related to products which are considered as unprofitable or too difficult to manage by the official institution. Notwithstanding this separation into formal and informal resource management, we argue that in reality management systems are not mutually exclusive, but overlap with each other. Hence, in this study we will be using the term forest resource management to denote any situation where social actors are organizing the creation, maintenance and/or utilization of forest/tree resources.

Before concluding this section, it is worth mentioning that we opted for the use of the term 'strategies' in the title of this study to stress the importance of distinguishing different patterns of power that exist among social actors as influenced by the techniques they have access to and/or use (Arce, 1989).
West and Endicott (1976) define the term strategy as: a) the art of moving armies; b) a general plan of action. However, in our opinion sometimes it is difficult to separate between the planning process and the execution of that specific plan. In this study the term strategy is used to denote both intellectual and effective activities carried out by different social actors to work out their

[11] The concept of use-management is defined as management by individuals or groups who use the resource within certain cultural and social norms (i.e. based on shared values and expectations) that are not enforced by any formal authority (Roe and Fortmann in Uphoff, 1992).

'projects'. Unlike scientists' formal rationality, villagers' adaptive rationality does not see decision making as a separate process to be performed prior to taking actions (Schon in Stolzenbach, 1992). The kinds of strategies developed by social actors at any location in time and space is influenced among other things by: the physical, the social, the economic, the political characteristics of the environment, and social actors' own attitudes and perceptions of their aims and values (Persoon, 1988).

To sum up, we argue that among the important characteristics of local forest management institutions is their decision-making structure and the ability of the structure to ensure that the proposed activities are carried out as planned. Social actors may be engaged in different institutions to manage the same forest resource. However, in reality no single institution is able to control the management of the resource, but there are continuous struggles between different actors organized in their different institutions and the outcome every time is a different situation where actors accept the 'status quo' at that specific location in time and space. Following these accommodation arrangements, various social actors are 'allowed' to get certain benefit(s). Such an outcome is what we refer to as a social actor's management strategy (see fig. 3).
As we indicated before, systems thinking allowed us to see forest resource management as a whole, composed of natural and human systems. At the interfaces, these systems undergo various kinds of interactions. Theoretically, one could identify three types of interactions: natural/natural, human/human, and human/natural. During these interactions social actors develop and change perceptions, attitudes and motivations. Nevertheless, for these processes social actors need to communicate and use information. They attach meanings to received information based on their knowledge systems. Man uses forest resources in such a way that they make sense to him. We believe that knowledge is an essential element for this sense making process. In the next section we discuss issues of knowledge processes.

2.5 Knowledge processes

Knowledge in itself is such a complicated concept that debates concerning its nature and activities are still going on. A full description and reflection of such debates lies beyond the scope of this dissertation. Rather, we wish to highlight some relevant concepts prior to clarifying our perspective as to how we see knowledge.

2.5.1 What is knowledge?

We start our discussion by putting forward a rather philosophical question: what is knowledge?

Reflecting on such a question leads one to the heart of the ongoing debate between the realist/positivist and constructivist traditions of inquiries about knowledge.
Advocates of the positivist tradition believe in the existence of a 'reality' out-there. Using 'scientific' methods one can bring out the 'reality'. Although positivist science has managed to some extent to provide explanations of natural phenomena, it has failed to lend comparable explanations of social ones and has not contributed well to addressing complex social problems and dilemmas (Woodhill and Röling, 1994). Notwithstanding positivism, many scholars believe in multiple realities. For them, 'reality' and hence knowledge are to a great extent social constructs. Thus various social actors at different locations in time and space might have different but equally valid 'realities' (Maturana and Varela in Woodhill and Röling, 1994). Such a perspective is leading many scientists to increasingly realize that laboratories and research stations are not the only source of knowledge. Consequently, local people are no longer perceived as passive recipients who wait for 'scientists' to develop knowledge and extension staff to carry it to them, but they are themselves actively engaged in knowledge activities such as generation, acquisition, classification and utilization of knowledge (Röling and Engel, 1991; Engel, 1991; Chambers et al., 1989). Nonetheless, we are of the opinion that isolating and labelling the knowledge activities of lay men and women as local people's knowledge, indigenous knowledge, indigenous technical knowledge or rural people's knowledge has the connotation that some scientists still believe that their 'science' is superior and hence different from that of the local people. However, our argument is that whichever term we use to describe various social actors' knowledge, we believe it is essential to give consideration to the following points.

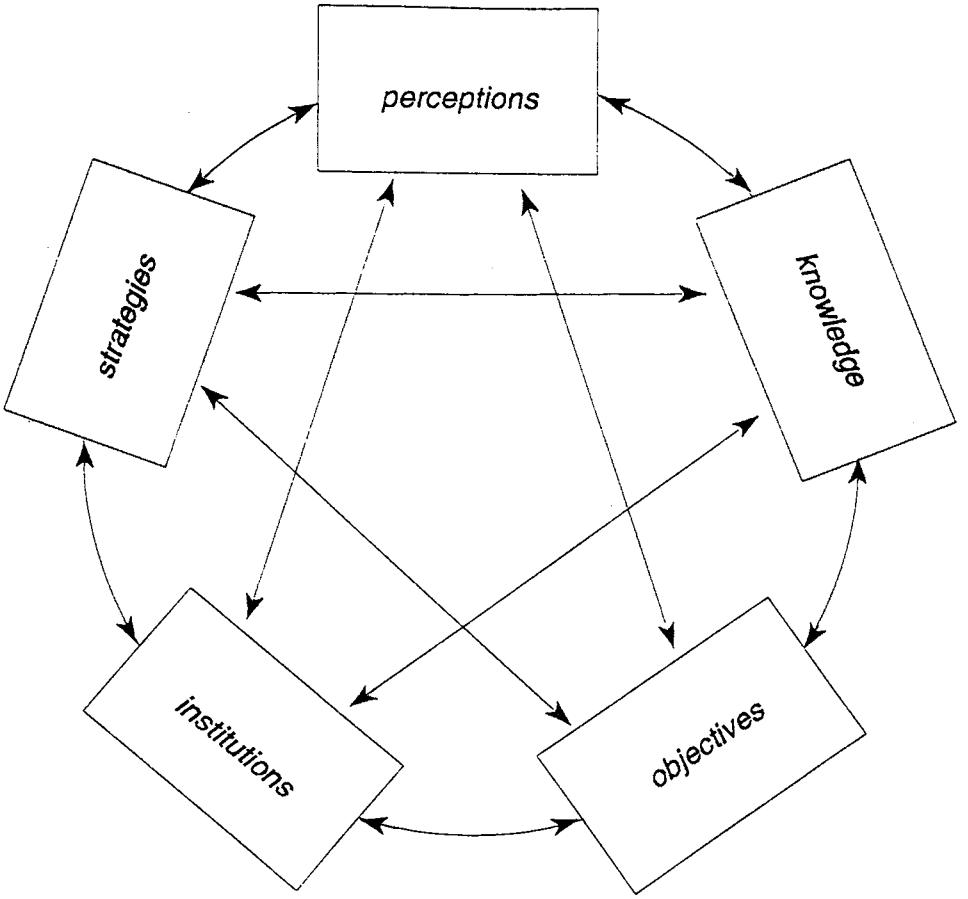

Figure 2.2 *Development of actors' forest management strategies*

First, in fact even the most remote rural communities have to varying degrees been in contact with, and been influenced by, the 'outside world'. During this process, they have adopted and/or adapted many ideas that have subsequently been incorporated within their current body of knowledge. As a result of social actors having different opportunities, their knowledge is not evenly distributed, but among local people there are different individuals who are recognised as 'local experts' in particular fields (Coombs, 1981; Scoones and Thompson, 1992). Nevertheless, in this research we adapt Zinyama's description of local people's knowledge: the body of knowledge that is immediately available for use by local people. Part of this knowledge is endogenous to the society while the other part may have been adopted or adapted from external sources. This knowledge is utilised continuously by local people to deal with their myriad problems (Zinyama, 1992).

Second, knowledge is embedded in social processes implying aspects of power and authority (Long and Villareal, 1989; Scoones and Thompson, 1992). Therefore, we argue that whatever knowledge social actors possess it is essential to see to what extent this knowledge is used in trying to keep the exploitation of the resources within their social and physical limits, and under which conditions social actors act against their knowledge? (Persoon, 1988).

Third, engagement of social actors in knowledge processes takes place within a cultural, economic, agro-ecological and socio-political context which is the product of local and non-local processes. Consequently, one has to be careful in trying to abstract local people's knowledge in an effort towards 'scientization' as that could result in significant errors in interpretations and applications.

Fourth, knowledge is no longer seen only as an accumulation of facts, but it is also a process: "knowledge is always in the making" (Scoones and Thompson, 1992: 4). We argue that without saying that local people's experiences are no longer relevant, it is important to recognize that the successful existing or past tree farming systems which have historically emerged were responses to changes which were only occurring slowly. Today, faced with a rapid rate of (mostly externally induced) change, rural people are frequently faced with situations they have not encountered previously. In many instances they have reached a critical point where they are no longer able to sustain their livelihood systems within the framework of their existing knowledge, resources and/or institutions. However, we think that is not specific to local people's knowledge but equally applicable to other social actors' knowledge including that of 'scientists'.

Efforts to classify knowledge take different factors as a basis for classification. On the basis of its uses, Walker (1992) classifies knowledge into knowledge for understanding of the world, which provides a basis for decisions, and procedural knowledge, which helps in understanding how to go about making a decision under given constraints. Furthermore, Walker (1992) classifies knowledge on the basis of acquisition into empirical knowledge, which is based on experimentation, and mechanistic knowledge, which is based on predictive understanding of mechanisms.

2.5.2 Knowledge transformation: towards a new paradigm

According to Bunting (1992) the knowledge of a particular social actor consists of information; concepts to understand the information; techniques for increasing, testing and using the information; and skills with which to use the techniques. However, we have indicated above that knowledge is always in the making. Consequently, social actors might transform their knowledge in response to introduction of a new technology[12].
Knowledge transformation is the process by which social actors continuously change and adapt their knowledge in response to changing intentions, opportunities and circumstances (Engel, 1987). Nevertheless, knowledge transformation could in turn lead to an innovation[13] and the development of a new technology. Mostly, changes take place so rapidly that they leave no time and/or space between the time when a social actor realizes that certain knowledge could no longer be in use and the time when he uses an adopted, adapted or invented alternative knowledge. However, sometimes the change is too great to be accommodated by a simple transformation process.
Such problematic situations in scientific domains lead to a paradigmatic revolution[14].

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[12] Technology is defined as "the software and hardware available for controlling the environment for human purposes" (Fresco in Röling, 1989:7).

[13] By the term 'innovation' we mean objects or actions which at a certain moment are classified and evaluated while before they were not (or differently) classified or evaluated (Van den Breemer in Persoon, 1988). Persoon (1988) differentiates between technological innovations and opportunity innovation.

[14] A paradigm is the collection of assumptions and elements of world-view which defines the nature and boundaries of scientific phenomena, types of questions to be asked and the methodologies considered legitimate for answering them (Kuhn in Wiersum, 1992:2).

Presently, there are discussions within the world of professional foresters as to whether the new orientations in forest management strategies could be handled within the present forestry paradigm or whether the changes necessitate consequent change in the paradigm itself (Wiersum, 1992b). Wiersum (1992b) argues that the emergence of new orientations such as social forestry are the results of dissatisfaction with the two central concepts in forestry i.e. the concepts of sustained yield and multiple-uses. In conventional forestry, consideration is given only to one main actor, that is the official forestry institution. It knows which benefit should be used, by whom and when. Moreover, it has the power and the ability to implement what is perceived to be appropriate. In social forestry all that has to be turned upside down. Under the new circumstances, the concept of multiple-uses implies giving consideration to a more diversified category of managers and a much greater variety of user activities. Consequently, it is argued that forestry science should be adapted or restructured to allow the study of such conflict situations which occur during social actors' struggles to make sense of what they perceive to be 'their forests'. Hence, Gilmour and King (1989) advocate the emergence of a new forestry paradigm; the 'people-centred' paradigm.

2.5.3 Knowledge and information systems

Knowledge and information are only two essential elements in forest resource management processes.
We have argued earlier that the very nature of our conception of forest resource management encouraged us to employ a holistic perspective, in our case the soft system one. However, using the term system does not mean that in reality one can go to Sudan and find an entity called Forestry Knowledge and Information System (FKIS). The FKIS is only an intellectual construct to allow us to perceive the emergent properties which come out when seeing something as a system.

Knowledge systems have been defined in many different ways. For example, Van den Bor sees a knowledge system as a combination of both actors and processes. He describes a knowledge system as follows: "A knowledge system encompasses processes of production of knowledge and the learning skills, and translation and adaptation of these products in such a way that they can be used by potential consumers. It further includes processes of transfer of knowledge and knowledge utilization. A knowledge system also contains conditions that influence these processes. Furthermore, a knowledge system

incorporates actors and institutions who play various roles within these processes: users, researchers, administrators, politicians" (Van den Bor, 1989b: 85-86). In this study we see Forestry Knowledge and Information Systems (FKIS) in Sudan as encompassing knowledge processes such as generation, exchange and utilization (Havelock, 1986) together with the conditions and factors (beliefs, cognitions and concepts) which explain and influence these processes and the different social actors involved in forest resource management.

Röling and Engel (1991) seem to have an image of what they believe to be an 'optimal' Knowledge and Information Systems (KIS). According to them, pre-requisites for such a system's performance include the following:

(1) Balance between the intervention power of specialized institutions and the countervailing power of clients.
(2) Affirmative action, so that knowledge will not accumulate where there is most of it already. This can be through targeting of opportunities and deliberate empowerment of forgotten categories.
(3) Responsiveness to diversity.
(4) Synergy between the tasks of the system's constituent actors.
(5) Mobilization and play off of forces which can overcome the incentives for default and entropy.
(6) A conducive KIS environment.

However, we are of the opinion that such an image is much influenced by the perspective of extensionists. It has an implicit assumption which goes as follows: there is an intervenor who has the ultimate knowledge and power, moreover this intervenor is capable and willing to help other social actors for the 'optimal'[15] performance of the system. Such statements do not fit smoothly into our conception of systems and intervention. To make these requirements more in line with this study, we need to adapt some of the statements to read as follows:

(1) Balance between various social actors' power, so that they can accommodate themselves at a satisfactory level at that specific location in time and space.
(2) Willingness of the social actors to share their knowledge and experiences with each other, and deliberate action by the relatively powerful ones to 'give a hand' to others. That should come out of a real belief in others' role for better performance of the system.

[15] Another question is: optimal from whose perspective?

(3) Social actors should be willing to negotiate (in a democratic way) and be ready to give up part of their power when responding to changing situations.
(4) Social actors see their tasks as part of a larger task which can only be achieved if everyone does his part. That should emerge from a realization that together they can do what none of them is able to do alone.
(5) Social actors have enough incentives and motivation to avoid the entropy (where every actor goes his own way). For that to take place, an actor (or actors) from a higher level system i.e. 'external coordinator(s)' (Röling, 1992) should have an interest in the better performance of the system under consideration, hence be willing to facilitate the creation of a conducive environment.

Keeping such an image we can apply systems thinking and identify systems pathology (Röling, 1992) and recommend suitable prescriptions.

In this section we have seen how the conceptualization of knowledge is changing from seeing knowledge as that 'thing' scientists produce in laboratories and research stations, to appreciating the value of local people's knowledge.
Knowledge in this study is conceived as a situated-dynamic human construct. Various social actors are engaged in knowledge processes in their effort to stay in harmony with their environment. This is leading us into issues of learning and education which we intend to discuss in the next section.

2.6 Educational systems in an era of change

2.6.1 Introduction: the concepts of education and learning

Seeing knowledge as a process brings the three terms knowledge, education and learning closer to each other. The old notion of education used to equate it with schooling, giving an impression that education is what one gets at school. Today on the one hand, it is increasingly realized that one can get education outside the boundaries of school systems. Hence, the concept of education is widened to allow for other out-of-school types of education. Consequently, education came to be linked to learning regardless of where, when and how it takes place. Accordingly, educational processes can take place at three different

social settings, namely; formal[16], non-formal, and informal settings (Coombs, 1985). On the other hand, the notion of experiential learning[17] is bringing more realization that knowing and acting might be inseparable (Schon in Stolzenbach, 1992; Maturana and Varela in Woodhill and Röling, 1994; Bawden, 1992). Stolzenbach (1992) presents the following three concepts that relate thinking, learning and acting as continuous integrated elements of practice:

(1) Knowing-in-action; where intelligent action is not to be seen as just an application of knowledge, "reflect before action", but as a form of knowing itself.
(2) Reflection-in-action; where reflection takes place while the action is being performed. The result of this reflection-in-action can be a theory of action.
(3) Reflection-in-practice; here the object of reflection is broadened to include all the implications in the context of practice (not limited to elementary actions as in 2 above).

Nevertheless, Hamadache (1991) argues that all learning processes necessarily fall into one of the following three categories:

First; **Random learning** which includes non-structured educational activities. These could be further categorized into:

(1) Incidental education, when neither the source nor the receiver has made a conscious attempt to promote learning i.e. no learning situation being set up purposefully.
(2) Informal education, when either the learner or the source has the conscious intention of promoting learning, but not both.

Although this type of learning is unorganized, unsystematic and even unintentional at times, yet it accounts for the great bulk of any person's total lifetime learning including that of even a highly "schooled" person (Coombs, 1985). However when dealing with random learning it is important to realize that what an individual learns is limited to whatever his personal environment happens to offer.

Second; **Non-formal education**, which encompasses all forms of learning situations where both source and receiver consciously promote learning outside the framework of the formal school systems. To mention but a few, examples

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[16] We see the (in)formality not only in the setting i.e. organized or unorganized, but also in the learning process. What one learns is a product of the totality of ones learning experiences which one acquires formally and informally within informal, non-formal, and formal educational settings.

[17] Experiential learning or 'praxis' is the process by which learners transform their experiences in the world into knowledge of the world as the basis for their adaptation to the world (Kolb in Bawden, 1992).

are agricultural extension, adult literacy programmes and occupational skill training given outside the formal system.
Third; **Formal education**, which differs from the non-formal one in that it is carried out in institutions or schools by permanently employed teachers within the framework of a fixed curriculum.
However, worth mentioning is the fact that the borderline or the interface between formal and non-formal education is not always clear-cut, as both types are normally organized by various societies to augment and improve the random learning processes, or in other words, to promote and facilitate certain valued types of learning that individuals cannot as readily or quickly acquire through exposure to the environment (Coombs, 1985).

Using systems thinking allows one to perceive education in different ways and at different levels of aggregation. In the next section we explain our perspective as concerns educational systems.

2.6.2 Educational systems

Like the knowledge systems, educational systems have been defined in different ways. Romiszowski (1970) used the term 'educational system' in the following two ways:
First, the term is used to refer to the system of provision of materials and resources. For example, the forestry educational system in Sudan would include all educational institutions in the area of forest resource management. The environment of such a system is the society in which the system flourishes; the jobs and the culture.
Second, the term refers to the learning process, hence the system includes little else but the learner himself. The environment is his school, the society and the various resources available to the learner.
Another way of looking at education from a system perspective allows one to see different levels of system aggregation. Van den Hoogen identifies three such levels to be considered when analyzing social actors' educational systems. These are the societal, the institutional and the activities' levels (Van den Hoogen, 1989). However, in this study educational systems are conceived as follows. First, education is seen as a system constituting different ways and modes of social actors' learning in relation to forest resource management. Second, education is seen as a system of institutions and individuals involved in educational process and activities. Third, educational systems of the various

social actors are put together to be conceptualized as a whole forestry educational system consisting of both social actors and processes.

2.6.3 Changing roles of education

We have already reflected on how development orientations in the domain of forestry are changing from 'forest-first' to 'people-first' and from seeing people only as one of the biotic factors which influence forests to seeing forests as 'battle-fields' where and for which social actors struggle. Consequently, foresters are expected to move from 'technological thinking' where forest resource management used to be perceived solely as a technical task, to conceiving it as a human activity (Woodhill and Röling, 1994). Within such a perspective in which "all power matters" (Chambers, 1994) one will soon realize that management of forest resources in fact far exceeds social actors' competencies, be they researchers, educators, extensionists, villagers or their organizations. Hence, forest resource management could better be perceived as a 'social competence carried out jointly' by relevant inter-dependant social actors (Engel and Van den Bor, 1995: 4). To reach such a realization, social actors need to get together on a 'platform' where they could see and talk to each other. Such platform negotiations might facilitate smoother processes of social change, cultural transformation and institutional development necessary to integrate the creative capacities of the inter-dependant social actors. That is what Woodhill and Röling (1994) refer to as social learning.

In principle, tasks of higher education in rural development related fields are thought to include teaching, research, and outreach (Van den Hoogen, 1989). The principal objective of teaching is to train manpower needed for management, research, teaching and other jobs in private or public institutions. Concerning the professional orientations of future graduates of higher agricultural education, Van den Bor et al., (1995) distinguish five categories of high level occupations, namely; creators of knowledge, managers of knowledge, users of knowledge, facilitators of knowledge, and decision making supporters. Nonetheless we think it is essential to realize that this categorization is rather an analytical one and that in reality "highly trained rural information managers will have to be jacks of all five trades" (Van den Bor et al., 1995: 6). From a knowledge and information systems perspective, we see the five occupations rather as knowledge/information activities which different actors perform to varying extents at different locations in time and space. Hence, higher educational institutions are expected to change their emphasis from aiming at

training professionals to be students on a 'once-in-a-life-time' basis to offering potential target categories a realistic perspective for on-going professional training over a long period (Van den Bor et al., 1995).
The objective of research is to produce, adapt and reflect upon new knowledge. Van den Hoogen (1989) holds the opinion that the primary aim of university research is not to produce new basic or pure knowledge, but to participate in the expansion of knowledge that contributes to the solution of rural problems.
The outreach task of higher education is to participate more directly in rural development through organizing off-campus educational programmes, conducting policy- and community-oriented research in areas identified by communities themselves, and offering various kinds of services to the community (Van den Hoogen, 1989; Van den Bor, 1989). Fuller and Waldron (1989) explain that the concept of outreach is different from access i.e. opening the doors of the university, as outreach implies also going out to the community.

Unfortunately it seems that educational institutions sometimes fail to provide professionals of the required qualities. When social actors' perceptions of a problem situation change, one logically expects changes in their expectations about the roles of education. Hence, when educational institutions do not modify their objectives and means of performing the new roles, disparity occurs. In this respect, Coombs (1981) argues that the specialized bureaucracies and specialists who are supposed to serve rural people fail to do so, because of the very nature of their professionalism[18]. Training prepares them to see only a narrow view of development in which they see their own speciality as the hub around which all else revolves.
Notwithstanding such a situation we argue that changes in the conceptualization of knowledge, education and forest resource management call for new qualities of professionals. While still needing their technical expertise, professional foresters are expected to acquire social skills required for performing their new roles. Hence, Röling (1994b) advocates a new type of communication professional, whose skills have little to do with 'extension' and more with facilitating platforms of inter-dependent social actors. However, before educational institutions can play roles of facilitating 'public learning' (Schon, 1973), they should be prepared to see their role not only as transferring knowledge, but also as network facilitators whose role is to create opportunities for relevant social actors to negotiate aspects of forest resource management.

[18] According to Chambers (1989) professionalism is the dominant thinking, values, methods and behaviour of the specific professionals.

They should shift their concern from being mainly training centres to "networking institutions" (Engel and Van den Bor, 1995: 12).

2.6.4 The curriculum: seeing the process for the product

Traditionally, a curriculum used to be seen as a product which shows what and how to teach students. It was expected that once developed by curriculum experts, teachers will apply it without any modifications. However, educational research shows that like other human constructs, a certain curriculum might be perceived differently by various social actors. In this respect, Montero-Sieburth (1992) differentiates between the following types of curricula:

(1) The ideal curriculum, which shows what scholars believe should be taught.
(2) The formal curriculum, which is what a monitoring agency such as the state mandates.
(3) The perceived curriculum, which is what teachers say they are teaching in response to students needs.
(4) The operational curriculum, which is what local supervisors, parents, and external observers see being taught.
(5) The experiential curriculum, which includes interests, abilities and learning styles of the students as well as their prior experiences.

Scholars have different views on the practice of curriculum development: Macdonald's model represents one way of viewing such processes. The following is a summary of the models and underlying conceptions as being presented by Searles (1984):

(1) The linear-expert model, according to which the whole process of curriculum development is controlled by experts.
(2) The circular-consensus model; the model is also known as a 'grass roots' approach to curriculum development. This model involves teachers, administrators, representatives of the community, with discipline scholars on call if needed.
(3) The dialogical model, which involves students as active participants in the process of curriculum development.

Following Adams, Van den Bor et al. (1995) established the comparison between rational and interactive models of curriculum planning.

RATIONAL MODELS	INTERACTIVE MODELS
rational decision making and technical reason	recognition of individual perceptions, inconsistency of human behaviour and variability of social context
predetermined and logically sequenced procedures	less emphasis on predetermined structured procedures
assume agreement on goals	see planning as a revolving process of interaction-interpretation-decision within an unpredictable context
assume that change could be managed by experts	consensual norms reached interactively by involving expectations and obligations of various actors
assume availability of required technologies	appreciate the dynamic nature of the interaction of individuals and systems with their environment
an 'objectivist paradigm'	a 'subjective paradigm'

In this research, curriculum is not seen as a separate entity that operates in isolation, but as one feature of an educational process that works in conjunction with a whole series of factors. Like other human constructs, a curriculum cannot be considered as a purely objective phenomenon. Hence, it is argued that the subjectivist/constructivist paradigm might facilitate the required kinds of curriculum restructuring (Schamhart and Van den Bor, 1994, and Wals, 1994).

A systems approach to the design of a learning event consists of three main types of activity which occur at various points in the model.

Firstly, there are the stages of analysis- analysis of learners, facilitators, and of the subject matter. The results of the analysis stages are presented as a set of educational objectives. Sources of information could include: studies of learners; studies of contemporary society and its cultural heritage; and subject specialists, and teachers.

Secondly, there are the stages of synthesis of the learning event construction i.e. which experiences learners should be exposed to and what ideas they may construct. This is where educators select and sequence subjects considering

their relevance from different perspectives e.g. global, country, clientele, socio-cultural and future relevance (Ekanayake, 1990).
Thirdly, there are the stages of evaluation when the whole process is revisited to carry out any necessary improvements. It is argued that curriculum planners should pay consideration to issues of internal and external consistency[19].
Although the model and the way we presented the stages might give an impression of a sequence of stages in the course of development, these stages are in fact very closely inter-related and thoroughly interactive.

2.6.5 Educational objectives

Educational scientists define educational objectives in term of the following three domains or levels:

(1) Cognitive level: to do with thinking i.e. intellectual elements such as knowledge.
(2) Affective level: to do with feelings i.e. attitudinal and value-related elements.
(3) Psychomotor or conative level: to do with doing i.e. actualized behaviour and behaviourial intentions such as skills, performance, acting.

Beard and Hartley (1984) argue that this classification does not mean that these objectives are separate entities, but learning always involves to varying degrees the achievement of all three kinds of objectives. However, we are of the opinion that in rethinking education, objectives should not be defined only in terms of expected behaviourial activities, but learning to learn becomes an objective in itself. This last objective is motivating educators to put more effort into understanding the learning process. In this respect, Salner explains that learners normally progress through the following three broad categories of epistemic development:

(1) Dualism; this is when the learner sees knowledge as a characteristic of an external knowable world which is either wrong or right.
(2) Multiplicity; when the learner realizes that there is no single truth of an objective reality, but there are as many truths as there are perspectives or constructions of reality.

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[19] Internal consistency of a curriculum means the selection of subjects based on a clear perception of objectives, whereas external consistency means the agreement between the different interest groups e.g. staff, students, management and employers about content and didactical principles on which the teaching-learning process is based (Kessels in Van den Bor, 1995: 6).

(3) Contextual relativism; when the learner becomes aware of the importance of context in defining truth and value.

It is believed that only when the learner reaches the third level of epistemic development he can embrace systemic praxis (Salner in Bawden, 1992).

To conclude this part, it is argued that "the goal of education, if we are to survive, is the facilitation of change and learning. The only man who is educated is the man who has learned how to learn; the man who has learned how to adapt and change; the man who has realized that no knowledge is secure, that only the process of seeking knowledge gives a basis for security. Changingness, a reliance on process rather than upon static knowledge, is the only thing that makes any sense as a goal for education in the modern world" (Rogers, 1993: 229).

2.6.6 From teaching to facilitating: new educator's role

According to Van den Bor in rethinking education, a fundamental shift in teaching/learning practice will involve the following (Van den Bor in Engel and Van den Bor, 1995: 15):

FROM	TO
teacher centred	learner centred
consumptive learning	discovery learning
theory dominated learning	dual learning
discipline orientation	problem orientation
content oriented learning	learning oriented learning
staff based learning	external source input
initial professional training	permanent learning support

Many authors contributed to suggesting approaches which could enhance learners' learning autonomy. In this respect, Van Eijnatten and Guritno (1989) argue that discipline-oriented lectures should be replaced to some degree by learners' activities such as group discussions, literature reviews, field visits and the like. Engel and Van den Bor (1995) advocate the deployment of such inquiry techniques as Participatory Technology Development (PTD), Participatory Rural

Appraisal (PRA) and Soft Systems Methodology (SSM). A perceived problem however, is the fact that although all these methods and approaches call for paying more attention to individual learners, the increasing numbers of learners and decreasing facilities are forcing teaching to become an extensive activity (i.e. less room for using intensive and interactive methods). Hence, Van den Bor (1993) proposes making curricula more flexible through adopting modularization or dualizing the last one or two years of the higher educational system by allowing learners to be engaged in real life situations, e.g. a part-time job.

It is clear that the tasks we are talking about are much different from what educators used to perform traditionally. Guthrie (1986) argues that most often teacher training programmes pay more attention to content (what is to be taught) and less to professional skills. Moreover, in the process of curriculum development an educator used to be seen as someone who will execute and follow the whats and hows of the curriculum. The new conceptualization of education and curriculum development, however, realizes that educators are no longer viewed as the detached transmitter of knowledge or skills. Instead, the educator becomes a facilitator who helps learners in the active construction of meaning by starting from learners' own ideas and by providing opportunities for them to build on these ideas, or if necessary to modify these ideas to accommodate conceptual change (Driver and Oldham in Wals, 1994).

Before ending this section, it is worth mentioning that education as we see it in this study is a holistic process which can better be conceived in view of the total activities which are influenced by personal and situational aspects. This way of perceiving education has consequences for the way educators should be prepared, for the required environment and for the way educators' reward systems should be developed. Hence, we argue that facilitating the kind of learning we advocated, will not flourish unless the suitable physical, social, political and economic environment is created. Before they are expected to play effective roles in sustainable management of forest resources, universities and other educational institutions should be able to conduct proper needs assessments, develop relevant curricula, have adequate teaching/learning methods, possess or have access to sufficient and appropriate educational facilities and have appropriate evaluation procedures. We are of the opinion that without modifying conventional procedures for assessing learning outcomes that encourage the passive acquisition and memorizing of facts just to pass exams, the whole endeavour will deemed to failure. Furthermore, universities should develop adequate research and outreach systems (Van den Bor, 1989 and Van den Hoogen, 1989).

2.7 Conclusion: forests management as a learning process

Forestry in the Sudan is conceptualized as a large system consisting of natural and human activity systems. Each human activity system consists among other things of various social actors (individuals, groups, or organizations). In their effort to use natural resources, social actors are in fact managing those resources, hence they could be considered as resource managers. We see forests as 'battle-fields' where various resource managers struggle to gain influence. Management has to do with decision-making and knowledge is a crucial input in decision-making processes. Resource managers' knowledge is shaped by (but at the same time influences) their beliefs, perceptions, and motivations. Their combined effect determines forest resource managers' intentions, which in turn have to be realised within the context of a social, economic, cultural and political environment. Moreover, forest resource management is perceived as a process during which different types of interactions occur (see fig. 4). On the one hand, interaction takes place between the natural system and the human activity systems of the various social actors. On the other hand, interaction occurs between social actors' human activity systems. During these processes actors develop perceptions and attitudes towards both the natural system and other actors' human activity systems. In their continuous effort to make sense of the natural system, social actors use their knowledge and develop their intentions. These are expressed in the form of resource management objectives. Coming to the 'battle-field' with their various (possibly contradicting) management objectives, social actors strategize and carry out negotiations. At this stage, actors need institutions to facilitate the negotiation processes and to supervise and monitor commitment to agreed upon accommodation arrangements. The outcomes of these negotiations are expressed in different forms of management strategies. However, one should not assume that the management strategies of the powerful actors (e.g. the state) always prevail. Other actors will continually struggle, and try to retaliate. They carry out networking and make alliances with other 'oppressed' actors and consequently their coordinated capabilities might lead to different accommodation arrangements. Again, social actors will need to use their knowledge and knowing capabilities to translate those strategies into reality and this process continues. Knowledge is not a product to be purchased, but "knowledge is always in the making". We see knowledge as a process and an outcome of continuous learning. During these processes social actors interact horizontally (within the same generation) and vertically (between generations). They create educational systems (formal and/or non-formal) to facilitate these

learning processes. Hence, we see forest resource management as a continuous learning process, where social actors experientially learn how to make sense of the natural system within the limited social, economic, political and physical context.

Before moving to the next chapter we put forward the following personal reflections on our theoretical orientations.
First, this dissertation is written keeping in mind two main, but rather different, groups of audiences; the social/educational and the technical/forestry professionals. Consequently, we thought it might be necessary not only to show the framework, but also to elaborate more about what is inside the frame. Our intention is to present the theoretical orientation in such a way that it will be easily understandable for both groups.
Second, for people like us who are trying to combine the social and technical sciences, neither sociologist's theoretical framework nor technical scientist's literature review separately will be satisfactory. Hence, we call for a new way of explaining research orientations which is a combination of a theoretical framework and literature review.

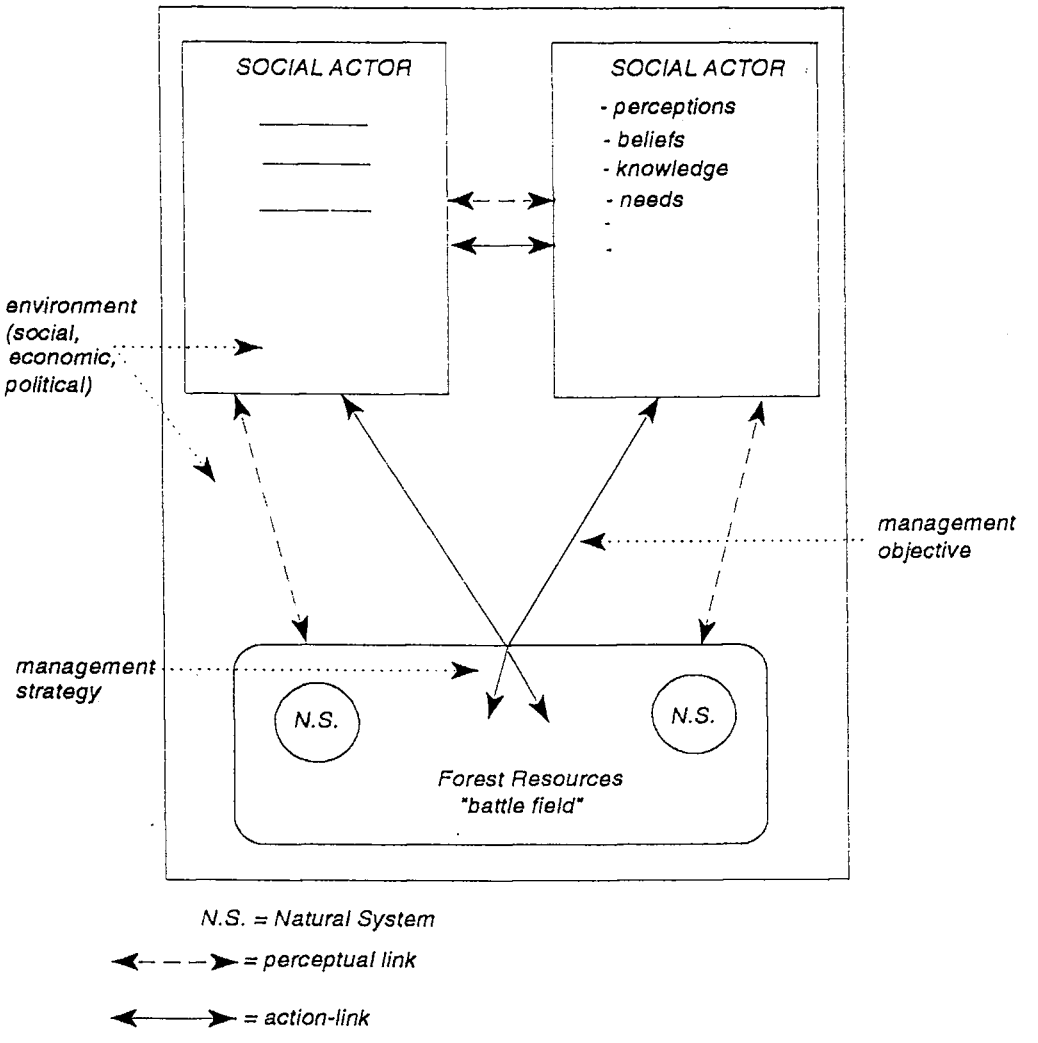

Figure 2.3 Forest management: a joint learning process

2.8 Reformulation of research questions

In chapter one we presented the research problem statement and the main research questions. However, we did not explain how these research questions came to be formulated. In this section we explain our perspectives when we looked at the problematic situation and show how the research questions came to be formulated.
In line with our conception of forest resource management as presented in the last section (2.7) and fig. (4), the research problem is analyzed in the following manner:

(1) Forest resource management, which entails looking into:
    # perceptual and attitudinal aspects,
    # institutional and organizational aspects, and
    # forest management strategies.
(2) Knowledge and information activities.
(3) Forestry educational systems.

2.8.1 Forest resource management

Perceptual and attitudinal aspects
A special feature of forestry activities lies in the long term nature of their investment i.e. the reward may not be immediate. Moreover, in many cases one of the main forest resource management objectives is the provision of some "public goods" (Hurditch, 1992). Hence pure economic calculations can hardly present enough motivation, especially for individuals to manage forest resources on a sustainable base or to be involved in tree planting activities. Therefore, in addition to the materialized benefits and management objectives one might need to explore "emotional objectives" (Mahir and Gerritsen, 1992), and cultural objectives of trees/forests resource management.

As explained in chapter one, since 1901, the experience of the Forest Department in the management of forest resources has been full of stories and conflict situations between the forestry authorities and villagers. In general it seems that the official forests policy and laws mean very little to local people and forestry offenses are not socially considered as crimes. Moreover, when forestry authorities recently decided to involve local people in forestry activities, local people asked for money and other incentives to plant trees or to protect forests. It is clear that different social actors have different perceptions and attitudes as far as forest resources are concerned. Therefore, we think it will be

necessary to look into the perceptions, values, beliefs and traditions of different social actors in relation to trees and management of forest resources.
We went to the field with the following perspective:

> *Changes in forest resource management strategies are followed, accompanied and/or guided by changes in social actors' perceptions of the natural and other human activity systems. During these processes, some actors have lost (at least partly) the incentive and motivation to manage the resources on a sustainable basis.*

By the time of the fieldwork the following questions became relevant to ask:

(1) What is the perception of social actors as concerns forests? Do these perceptions change over time?
(2) Do 'other' social actors appreciate foresters' classification of forests into reserved and unreserved? Do they have a different kind(s) of classification? And what is the meaning of those classifications and consequences for forest resource management?
(3) Why and when do actors plant, protect and manage forest resources i.e. what is their motivation?
(4) How do social actors see each other's forest management strategies? To what extent does this influence development of their own management strategies?
(5) Is there any relationship between local beliefs, traditions and management of forest resources? If so, are these relationships strong or weak and to what extent do they positively or negatively influence the management of the resources?

Institutional and organizational aspects

Management systems are not only characterized by the kind and intensity of the technical activities, but also by the institutional arrangements and organizational structure for decision-making on which activities are to be carried out (by whom and when). Since the British colonization, both formal and informal institutions/organizations in relation to forest resource management passed through a series of continual modifications. As we have indicated before, the Forests Department has been tossed backward and forward between different ministries. Moreover, it went through a process of centralization, decentralization and again centralization .. and so on. The other partner (informal or native) institutions experienced no better chances than the formal ones. They also passed through many stages of struggle on the one hand

among themselves, and on the other hand between themselves and the Government. On the way, many things changed e.g. policies, laws, and organizational structures.

At present, the Sudanese forestry authorities are trying to involve 'other actors' in forestry activities and programmes. But as explained before it seems that they are "talking in different languages" and having different objectives from those of the 'others'. To give one example: the authorities are expecting that by the year 2010 the 'others' should own and manage 50 percent of the Sudanese forest resources. Many villagers still believe, however, that the government should continue to protect and manage forest resources. They believe that by leaving forest resources for villagers to manage, everything will be finished in no time (Mahir, 1992).

In relation to this issue we developed the following perspective:

> *The decision of the Government to abolish the native systems together with the issuing of conflicting regulations in relation to natural resource management in general and forest resources in particular, have created a situation where local level institutions (formal and informal) fail to continue playing effective roles in management of forest resources.*

Then, we thought it worthwhile to pose the following questions:

(1) How do social actors organize the management forest resources? What kind of local level traditional and formal institutional changes take place in relation to the resource management?

(2) In which ways do institutional and organizational changes influence the performance of local level institutions in relation to management of forest resources?

(3) Under what conditions will existing local level institutions facilitate sharing the responsibilities of forest resource management?

Forest resource management strategies

Traditionally villagers in Sudan used the forest resources in their surroundings (Mukhtar, 1990). The decision of the government to intervene and manage the "nation's forests" using professional foresters was based on a belief that forest protection and resource management could better be based on central policy and planning with an authoritative and hierarchial forest service (Wiersum, 1991).

Until the mid-1980s, the majority of forestry programmes in Sudan were primarily concerned with reservation and reforestation, mostly without involving villagers in those areas. After the catastrophic drought of 1984/85, the forestry

authorities realized that without other actors' participation, they would not be able to reforest and manage sufficient land to provide the needs of the Sudanese people for forest products and services. Hence, the Forests Department decided to establish a national forestry extension service (Abdulla and Holding, 1988).
As we have already explained, forest resources were in the hands of local villagers. During interactions with 'their' resources, villagers developed certain management strategies. The government intervened and withdrew management control from villagers and followed new management approaches. To-day, the government is asking villagers to share management responsibilities again.
Keeping that background in mind, we went to the field with the following perspective:

> *In their continuous effort to create space for their 'projects', actors are changing and developing their own trees/forests management strategies. They do so, in the light of other actors' changing strategies.*

At that moment the following questions came to mind:
(1) Who are the social actors involved in the management of forest resources in Sudan?
(2) What kind of forest resource management strategies do social actors develop? What kind of changes in strategies take place? What are the driving forces e.g. social, economic, political, etc?
(3) To what extent is there coincidence between the management objectives of various social actors?

2.8.2 Knowledge and information activities

Basically most of the professional foresters are trained for managing large-scale reserved state forests, establishing plantations and keeping villagers[20] away from forests. Presently, the situation is changing and a need is identified for new strategies which focus on popular participation (Wiersum, 1991).
When the Sudanese forestry authorities realized the need for people's participation, they simply assumed that villagers do not plant trees because they do not know how to plant them. Moreover, they assumed that villagers are not aware of the benefits of trees and forests; that is the reason why villagers cut

[20] The word villagers is used interchangeably with local people referring to people living in the vicinity of forests.

trees. Accordingly, the forestry authorities started extension campaigns with the support of many donors to make 'others' aware of the importance of forests and to show them how to raise seedlings and plant them. So far, the success has been limited and experiences indicate that lack of knowledge about benefits of trees is not the main problem (Kismul, 1989b; and Mahir, 1992).
Before going to the field, we developed the following perspectives:

- Changes in actors' forest management strategies are guided by, and/or accompanied by, a knowledge transformation process, whereby, actors try to fit themselves into changing situations.
- In the present situation, none of the actors have adequate knowledge and skills for proper management of forest resources. On the one hand, due to ecological, economic, demographic and sociological changes, local people lost part of their skills and local knowledge regarding the management of forest resources (and they failed to catch-up with rapidly changing situations). On the other hand the accumulated and developed knowledge and skills of the professional foresters based on 'traditional' management strategies are obsolete.
- During their struggle to catch-up with changing conditions, some actors have lost the motivation and capability to develop 'positive' initiatives and have become less self-confident.

Against that background, we considered it relevant to ask the following questions:

(1) How and in what social context is actors' knowledge about the management of forest resources developed?
(2) How do actors exchange information concerning management of tree/forest resources i.e. in what kind of context is information disseminated?
(3) Under what conditions (i.e. political, environmental, economic, and social) does knowledge transformation take place?
(4) To what extent is actors' present knowledge base facilitating cooperation between social actors to enhance sustainable forest resource management?

2.8.3 Forestry educational systems

The study which we conducted in 1992 (Mahir, 1992) indicates that until recently, professional foresters' training in Sudan has been mainly dealing with

"natural" sciences. For example, curricula of the training institutions used to teach aspects like nursery techniques, silvicultural activities, harvesting and utilization of timber. The limited part of the curricula which used to deal with planning, laws and policy was oriented towards enforcing the "traditional" management approaches. At present, some of the educational institutions have decided to add new courses (without any change in the contents and structure of the other courses) to accommodate changes in training requirements.
Keeping that in mind, we went to the field with the following perspectives:

- *Forestry educational systems including formal, informal and non-formal (i.e. the educational environment) in Sudan are not responding adequately to the changing forest resource management situation.*
- *It will not be enough to study and revise only the formal forestry educational system. In reality the three kinds of educational systems influence and complement each other.*

With those perspectives in mind, we formulated the following questions:

(1) What kind of learning objectives are developed by various social actors in relation to forest resource management? How far are they similar or different from each other categories' learning objectives?

(2) What kind of new learning needs are emerging in various social actor categories in the light of the changing forest management situations? In other words: what kind of knowledge, skills, and attitudes should different actors develop in relation to forest resource management?

(3) What kind of educational techniques or teaching/learning methods are used by various social actors in their effort to acquire, adapt and exchange knowledge and experiences about forest resource management? To what extent are there similarities or differences between methods used by different actor categories?

(4) Is there any relationship between the formal, non-formal and informal forestry educational systems? If so, what is the nature of the relationship? In not, why not?

(5) Will the present forestry educational systems be able to meet the new demands, or in other words: are they adequately equipped, both from a didactical and organizational point of view, to start the necessary reorientation?

(6) Under what conditions will forestry education be able to play a better role in facilitating sustainable forest resource management?

So far, these were the lines along which our analysis of the problematic situation went. However, unless being given special attention, it is likely that two important aspects will not get the attention they deserve, namely; gender and heterogeneity. During the data collection and analysis, these two aspects were not dealt with in isolation from other aspects. However, for analytical purposes and to emphasise their importance, in the next section we present our perspective in relation to the two aspects.

2.8.4 Gender and heterogeneity

Rocheleau (1988) stresses the importance of addressing women's and men's distinct domains of both knowledge and concerns as a base for any agroforestry research. "The success or failure of future research efforts to improve existing agroforestry systems or to develop new ones will depend largely on the ability of researchers to serve the social objectives of diverse groups of rural producers and reconcile or accommodate the conflicts between men and women and between classes of rural clients" (Rocheleau, 1988: 149).
In Sudan like many other countries, rural women are involved in all aspects of fuel-wood use. But women's relationship with forest resources extends beyond that, as they are also involved in many activities like the collection of gum arabic, dates from their date palm trees, and fruits from other trees (Furfey, 1988).
From that background we went to the field with the following perspectives:

- *The impact of changes in forest resource management situations in Sudan on women is different from that on men. Consequently, women develop different perceptions and attitudes; create suitable management institutions for themselves; and undergo different knowledge transformation processes.*
- *Even the smallest social actor category e.g. a household does not constitute a homogeneous group. In reality, every social actor has intra/inter-specific characteristics which make it liable to differential responses to stimuli.*

In this connection we needed to answer the following questions in order to have a better understanding of how social actors go about managing forest resources in Sudan:

(1) Is there any kind of gender-based differential response in relation to the changing forest management situations? If so, what is the nature of this response? If not, why not?
(2) Is there any kind of differential response regarding changes in perceptions, knowledge transformation, and strategies in relation to forest resource management between the various social groups and population segments? If so, what is the nature of this differentiation? If not, why not?

By way of concluding, we present the main research questions in order of their appearance in the coming chapters.

(1) What is the perception of social actors of tree/forest? And what is the implication of such perceptions?
(2) What kind of institutions and organizational structures are developed by social actors for managing tree/forest resources in Sudan?
(3) What kind of tree/forest resource management strategies do social actors develop? To what extent and under what conditions are they changing their strategies?
(4) What kind of knowledge and information activities are performed by social actors in their effort to manage tree and forest resources? And what is the nature of the relationship between social actors' changing strategies and knowledge and information activities?
(5) To what extent are forestry educational systems in Sudan facilitating and satisfying social actors' learning needs with regards to tree and forest resource management? Are forestry educational institutions adequately equipped, from a didactical and organizational point of view?
(6) How can forestry education be better based on social actors' perceptions and realities, and be relevant to the contextual differences that might be found within and between their different categories? And under what conditions will education play better roles in facilitating the accommodation of different social actors' interests and needs as a prerequisite for sustainable management of tree/forest resources in Sudan?

In this chapter, we discussed the theoretical orientations of this study and clarified our position and biases before going to the fieldwork. In the next chapter we discuss the methodological approaches and research instruments used in carrying out this study.

3 METHODOLOGICAL APPROACHES AND RESEARCH INSTRUMENTS

This chapter discusses the methods and techniques used for data collection and analysis. It starts by discussing the general methodological approaches. This is followed by a description of the research process. Then it presents the specific methods and techniques employed during the data collection and analysis process. Towards the end, the chapter presents some of the ups and downs of the research process and shows to what extent this research fits 'scientific' research canons.

3.1 Methodological Approaches

This study deals with how social actors manage forest resources in Sudan under the changing conditions. As implied by the title, the study is about change. This has the consequence of bringing process issues into the analysis. Strauss and Corbin (1990) explain that studying issues of change involves an in-depth investigation and incorporation of changed action/interaction into analysis, as this varies over time in response to changes in conditions. Consequently, our **first** methodological orientation was to opt for a non-positivist inquiry approach. The positivist paradigm posits that there exists a reality which is waiting for an objective (neutral and detached from the world) scientist to discover. The process of reductionism involves breaking down components of a complex world into discrete parts, analyzing them and then making predictions about the world based on the interpretations of these parts (Pretty, 1994). That is not what we intend to do in this study. On the contrary, as we explained in the previous chapter we see forest resources as battle-fields. These battle-fields are not only locations where various social actors wrestle, but they also represent the subjects which the social actors of different perceptions and perspectives are trying to make sense of. We thought it (might be) necessary to declare our position from the beginning. For us most of 'reality' is a human construct, hence we do not believe in the existence of value-free approaches to grasp and understand realities. We are of the opinion that research is value-bounded, and the interaction between researcher and other research participants shapes its

findings. Therefore, instead of claiming to be an objective inquirer we will try to show explicitly our value-positions as one of the social actors participating in this study. However, before proceeding to discuss the other methodological orientations, we need to elaborate the term participatory. Drawing on the range of ways that development agencies use the term, Pretty (1994) identifies the following seven types of participation: passive participation, participation in information giving, participation by consultation, participation for material incentives, functional participation, interactive participation, and self-mobilization. Throughout this study and unless otherwise declared, whenever we use the term participation we mean interactive participation.

Conceptualizing forest resources in Sudan as battle-fields led us to believe that using a hybrid of actors and soft systems approaches could be the most suitable analytical tool. That was our **second** methodological orientation. The two perspectives were used iteratively throughout the study. This is similar to the way a painter works. First he must stand back to get a view of the whole picture, then he approaches to begin his work. Nevertheless, he must repeatedly stand back to see if something must be changed or added before continuing. Opting for a hybrid of actors and systems paradigms allowed us to conduct the study in such a way. Based on our M.Sc. study (Mahir, 1992) we perceived forestry in Sudan as a system. Using a systems perspective we developed an idea about the problematic situation, then during the field work we performed the research as one of the social actors. However, during the research period we took some kind of 'breaks' where we decided to pull ourselves out from the battle-field to gain a holistic view of what was going on, by looking at and analyzing the data that had been collected till that point. Consequently, sometimes we needed to revisit our strategies before re-joining the other social actors in their continuous sense-making process.

The very nature of studying change and processes implies the use of a rather flexible and participatory research approach. Hence, our **third** orientation was to select a rather interactive research approach, where there was no clear distinction between the stages of data collection and analysis. This brings our research very close to the "grounded theory approach" (Strauss and Corbin, 1990). Data collection and analysis were performed in the setting in which knowledge is used and involved exploration of ideas with people, rather than doing research on people (Walker, 1992; Scoones & Thompson, 1992; de Vries, 1992; Torres, 1992 and Wals, 1994). We tried to carry out the field work in a participatory way, by explaining in an honest and clear way the overall and specific objectives of the study. Sometimes (especially in Tendulti area), it was necessary to explain explicitly that this research had nothing to do either with the Forests National Corporation (FNC) or with continuation of the FINNIDA

project[1]. Our intention was to facilitate the creation of trust between ourselves and the other social actors involved in the research process.
As we explained above we opted for a rather flexible and open approach for the fieldwork. It was open in the sense that although we went to the field with some kind of conceptual framework, we were very open to accept and modify things based on the findings in the field. We did not go to the field with very specific hypotheses to check, rather we went with an open mind and with open eyes to learn together with other social actors during the research process. Hence, our **fourth** research approach emerged. We organized the fieldwork in such a way that there was an interplay between data collection and data analysis i.e. the data collection process was interspersed with pauses during which we tried to take off the spectacles of actor-oriented to use the system-oriented ones. During these pauses we looked into the data with the aim of answering questions such as; what has been collected? What is coming out? Which new or even old areas need to be added or given more emphasis? The fieldwork consisted of three main phases and was terminated by a short rounding up period. We started data collection with an exploratory or generative phase, carrying out the main part of the fieldwork in the formalization phase and ended up with the confirmatory phase[2].
Data collection started by using open discussions and ended by more structured interviews. For rounding up the field work our strategy was to spend a good time in saying 'good-bye' to social actors (Den Ouden, 1989). In order to grasp seasonal variations and to gain insight about seasonal social, economic and accompanied psychological changes, the field work was organized in such a way that we could spend a reasonable time in each 'social location' (Long, 1992) at varying seasons i.e. dry summer, rainy season (planting period) and harvesting period.

The **fifth** orientation was based on the author's own experience when he collected the data for his M.Sc. (Mahir, 1992). To overcome the problem of being isolated and treated as a bachelor guest, the author decided to follow 'a

[1] The FINNIDA project encompasses a series of afforestation projects launched jointly by the Sudan Government and the Government of Finland. It started in 1978 and continued up to 1992.

[2] We borrow the terms: generative, formalization, and confirmatory from Walker (1992).

family approach' when collecting data particularly at village level[3]. Hence, the researcher was accompanied all the time with his wife and sometimes also with their two daughters. That created a good atmosphere for the use of the participatory observation technique.

The **sixth** orientation was concerned with the way we went about choosing our research participants. Documenting variation and learning about social actors' differential responses being one of our main objectives, we were inclined to use also a rather flexible sampling strategy. This was based on 'purposive sampling' and 'theoretical sampling' (Bernard, 1988 and Strauss and Corbin, 1990). Accordingly, we selected our key informants based on their experiences, occupations, social status and capability of providing well-informed and/or knowledgeable insights[4]. We continued selecting and interviewing informants at each social location until we reached the 'theoretical saturation point', that is the point where and when patterns start to repeat themselves and the researcher feels that no more could be revealed through conducting more interviews (Strauss and Corbin, 1990).

This last point leads us to the discussion concerning the selection of the study area and participants.

3.2 Selection of the study area and participants

From the previous section, the reader may have noticed our affinity to what Pretty (1994) refers to as "the alternative inquiry approaches", being alternative to the positivist tradition of carrying out research. Logically, taking such a position brings with it some consequences for the way we decided to select the research area and participants. In this section we explain the 'hows' and 'whys' of choosing the research area and participants.

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[3] By 'a family approach' we mean that the researcher was accompanied by his family i.e. wife and sometimes children. Together with research participants they performed the research process in an interactive participatory way.

[4] However, we do not want to say that we have only been listening to our key informants. In a society like a Sudanese village you cannot do without listening to other voices coming out during informal occasions or from villagers volunteering and sometimes insisting on giving their opinion even when they were not asked.

3.2.1 Selection of the study area

We aimed at trying to document and contextualize social actors' differential responses to changing forest management situations. Hence, it was necessary to select a number of contrasting social locations (e.g. village, administrative organization) and carry out in-depth studies of the life-worlds[5] of the different social groups e.g. farmers, herders and professionals (Long, 1992). Although our strategy was based on the idea of selecting social actors rather than merely selecting geographical locations, we could not contextualize social actors' differential responses without giving consideration to the geographical location within which they perform their social activities.

We went to Sudan (where we undertook field work) with the idea of carrying out our research at the following three locations:

(1) Tendulti area,
(2) New Halfa area, and
(3) Sennar-Singa area.

Moreover we decided to use the areas of Khartoum and Wad Medani, where most of the research and educational institutions are, as meeting/discussion places with the staff of those institutions (for an overview of the research area see the map in annex 1).

Our choice was based on the following considerations:

(1) Our expectation of finding members of most of the social actors' categories concerned in these locations.
(2) These locations represent different ecological zones.
(3) These locations represent areas where many different tribal and ethnic groups live.
(4) Social actors at these locations have witnessed and participated in various kinds of interventions including recent social forestry programmes.
(5) The dominant economic activities vary very much within and between the locations. Economic activities range from irrigated horticultural crop production and large scale mechanized rainfed agriculture in Sennar-Singa area, to small scale rainfed crop production in Tendulti area. Animal production is practised to a varying extent at all these locations, with nomadic tribes moving around and spending part of their time at least at one of these locations.

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[5] Life-world in this book is used to "describe our own individual and socially constructed reality or our orientation towards the world which helps us determine how we define our situation, the way we look at things, what we believe to be true, valuable and real. In short: the kind of world we create for ourselves" (Wals, 1994: 24).

(6) As a result of the co-existence of different forms of land use systems, conflicts over land use and land allocation are characteristic of these locations.
(7) The (good) security situation and our familiarity with these locations facilitated the carrying out the field work.

However, during the first phase of the research process, we had to make some modifications. During the field work, the selection of specific villages to carry out the in-depth study was not easy. We spent considerable time in thinking and discussing the issue with the local supervisors, colleagues and key informants. The following points came out of the discussions:

(1) In a large country like Sudan, where heterogeneity is a characteristic in many respects, it is not enough to choose one location.
(2) The three locations suggested in our research proposal are all suitable, but the variation within the one area is very large, to the extent that each area could be the subject for a complete study.
(3) It would not be possible to carry out a good piece of research with the necessary in-depth quality if we decided to continue with the three areas and select two or three villages from each area.

Consequently, we decided to exclude the New Halfa area and concentrate the work in Tendulti and Sennar-Singa areas.

Tendulti area was selected for the following reasons:

(1) Different types of forest resources were available, e.g. natural, *hashab*, upland, reserved and unreserved forests.
(2) The foresters, at least, believe that the experience of the FINNIDA project and other state interventions had been positive.
(3) Historically, it is one of the gum arabic production areas. Villagers were traditionally involved in management of gum gardens.
(4) This is one of the areas where 'traditional' animal rearing and 'traditional' agriculture still exist together.

Sennar-Singa area was selected for the following reasons:

(1) For the FNC, this is one of the very important forestry areas in the country.
(2) Most of the social actors involved in this research are represented in this area, e.g. charcoal producers, firewood merchants, private sawmill owners and different categories of farmers.
(3) Most of the forest types are found in this area, mainly the famous Blue Nile riverine *Sunt* forests.
(4) Unlike in Tendulti area, the influence of GOs and NGOs is not very clear here. Instead, this is one of the areas where the State has been constantly trying to impose control.

We believe the selection of the above mention areas gave us opportunities to study the life-worlds of different social actors in different places and within various social, cultural, political and economic settings.

3.2.2 Selection of research participants

Based on the primary reconnaissance and in consultation with key informants (during phase one) we selectively chose those social groups (actors) who are closely involved in forest resource management to be our informants in this study. With this target in mind, we gave consideration to many aspects of population heterogeneity including; occupational variations (both formal and informal), gender, age, and social positions.
Within the framework of the theoretical sampling strategy (Strauss and Corbin, 1990); the snow-ball, purposive sampling, and random sampling techniques (Bernard, 1988) were used at different stages along the research process.
As indicated before, the research process consisted of three main phases. Key informants for the first phase (generative) were mainly selected according to their expertise, using the snow-ball sampling technique. After identifying the different categories of social actors in the study areas, purposive sampling was used in the second phase, and random sampling in the third phase[6].

To facilitate the presentation of results, we divide our research population into two main categories: the villagers and the officials[7].

A total of 257 informants were contacted during the different phases of our research journey. Of these, 165 were villagers (99 male and 66 female) and 92 were officials (65 male and 27 female).

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[6] Ration lists were used as sampling frames in the case of villagers, whereas for foresters, pay-sheets were used.

[7] We recognize that this categorization is vague, but it is made only to facilitate the presentation of the results. It was not used to influence how we related to the research population nor did it have any influence on any (theoretical) perspective consequences. We use the term villagers to refer to people living in the vicinity of forests and involved in the management of these resources, but not as a formal profession.

Within the category of villagers, we were able to identify the following sub-categories[8]:

(1) Farmers who cultivate rainfed agricultural crops mainly for subsistence in small areas (about two hectares) locally known as *Bildat*. They depend on family or hired labour and very few or no other inputs e.g. fertilizer.
(2) Tenants who have access to land locally known as *Hawashat* mainly within state irrigated schemes.
(3) Farmers who cultivate large areas (at least 250 hectares) locally known as *Masharei*. They are mechanised rainfed agricultural crop producers.
(4) Horticultural crop producers.
(5) Nomads and semi-nomads, who are the traditional livestock owners.
(6) Other livestock owners; among these are people who began livestock keeping recently, such as large scale merchants, and farmers mentioned under (3) above.
(7) Charcoal producers and firewood merchants.
(8) People involved in furniture production.
(9) People involved in collection and selling of non-timber forest products such as fruits, leaves and gums.

The category of officials included the following sub-categories:

(1) Senior forestry officers including those who are retired.
(2) Junior forestry staff including forest guards.
(3) Staff of the forestry training institutions.
(4) Staff of the forestry research institutions.
(5) Staff of other agencies whose work is closely related to forest resource management e.g. the gum arabic company, horticulturists and agricultural extensionists.
(6) Students and recent graduates, not yet employed, of forestry educational institutions.

3.3 Research process

As we have already indicated, our research process consisted of three main phases and a short rounding off period (see table 3.1). The following is a description of how our research 'journey' proceeded.

[8] A characteristic of villagers is that their occupations are not mutually exclusive, since a villager can have a variety of occupations at different times and places.

(1) **A generative phase:** We started this phase with a period of orientation, looking around and having open discussions with both officials and villagers. in a relaxed way, with the help of tea, *Jabana* (traditional coffee) and having meals together with research participants. Our main intentions were to select key informants, and specific social locations for study, and offices and to map the life-worlds of the social actors involved in forest resource management. At the same time, we started looking into and reviewing archives, reports and relevant secondary data.

During this period, we paid short visits to some villages in the research area and chose our four 'case' villages. The period ended with the selection of our key informants using the 'snow-ball' technique (Bernard, 1988).

The second step included carrying out in-depth unstructured interviews with key informants. In addition, we continued reading and collecting relevant literature. Our intention was to collect as much information as possible about the research area and research population which could help us to plan for the second phase. In this connection, Den Ouden (1989: 5) argues that "to approximate reality is difficult and most unlikely to yield results if the investigator goes on interviewing without a reasonable knowledge of a number of 'real cases'".

At the end of each day or early the next morning we would collect the notes of the day's interviews, conversations and other observations, analyze the material and try and connect it with what we had already learned. After three months of intensive work in the field, we went back to the office in Khartoum, analyzed the data we had collected and prepared the detailed programme for the second phase including the check-lists of key points to be discussed with various social actors.

(2) **Formalization phase:** Based on the information collected in phase one and with a good picture of the different social localities and categories, we returned to our research area, but this time equipped with check-lists and with specific issues to ask about. Using the theoretical sampling approach and purposive sampling within each category of social actor, we continued selecting and interviewing our informants until we reached the 'theoretical saturation point' (Strauss and Corbin, 1990). In-depth semi-structured interviews were carried out during which we used performative approaches such as problem analysis (Walker, 1992). Throughout the whole research period, participant observation (Bernard, 1988) continued to be one of the most effective techniques for data collection and verification. Also, relevant cases, life histories and careers of important key informants at each social locality were collected and analyzed. In order to follow the transformation process of activities, knowledge and skills across generations, and based on the 'three generation perspective' (den

Ouden, 1989) we interviewed people of different age groups around selected informants e.g. the husband, wife and father or son.
As explained before, this phase was organized in such a way that seasonal variations were considered. Hence, research was carried out in three rounds. At the end of each round, we analyzed the data, reappraised interviewing guides checking whether topics were covered reasonably, and looked at which new topics had emerged to be incorporated into the ongoing research process. Towards the end of the third round, all collected data were analyzed.
In fact phase two was the core of the data collection process, and took almost the whole period between October 1993 and August 1994.
(3) **Confirmatory phase:** As can be seen from the title of this phase, its main objective was to validate what we had come to understand from the previous two phases. During the two phases we developed various images concerning social actors' realities. Our objective was to validate our interpretations and to see to what extent social actors appreciated our interpretation of their realities.
Based on the findings of the first two phases, we developed another set of check-lists to guide our more organized semi-structured interviews.
After the necessary preparatory work, including pre-testing and introducing the necessary adjustments, the actual interviewing started in December 1994 and continued to the end of February 1995. Using available sampling frames a total of 115 informants were selected.
Taking a social actor (individual, group, or organisation) as our basic unit of analysis, we used a systems perspective to carry out a combination of descriptive and theoretical analyses. Main findings and learning points were prepared for the last part of the data collection process (the rounding off stage).

Table 3.1 Research phases and time-line

Research phase	1992	1993	1994	1995
Part I: developing conceptual and analytical framework	———	—		
Part II: data collection and analyses phase I: exploratory phase II: formalization phase III: confirmatory Rounding up		— ———	——— ———	— —
Part III: thesis writing				———

(4) **Rounding up the fieldwork**: This was an opportunity to have a last meeting with our research participants and to collect their 'good-bye' comments. Due to some delays in our original plan, the period was shortened to six weeks (instead of ten). During this period, short visits were paid to the main social locations. Main techniques used included group discussions, meetings with key informants, a seminar and informal discussions with colleagues from education and research institutions.

3.4 Research instruments

As explained earlier, a hybrid of actors and systems perspectives was selected as the main analytical tool. Within that perspective, we have opted for the case study method (Yin, 1984). For building up the cases a combination of three methodological techniques were used: review of literature, archive and secondary data; interviewing (different forms); and observing (including participant observation). The following is a brief account of the different methods, techniques and performative approaches used during the data collection process (see table 3.2).

(1) **Literature and archive study**; this consisted of reviewing secondary data about the research area and technical reports of the different institutions. Publications written by others about the research subject were also studied. This method continued to be used all over the research period.

(2) **Unstructured interviews (or meetings)**; this method was used mainly at the beginning of the research process. Using this method we had open discussions with key informants from the different categories of social actors. The purpose was to collect as much general information as possible for the selection of key informants, selection of specific research villages, operationalization of our research questions and preparation of interview guides (check-lists).

(3) **Semi-structured interviews**[9]; together with participant observation, semi-structured interviews provided most of the data used in this study. Key informants from different categories of social actors were interviewed using check-lists (see annex 2). This method was mainly used during the second phase of the research process. However, in order to check and

[9] These constituted both individual and group interviews.

validate information being collected during other phases, more organized semi-structured interviews were conducted in phase three .

(4) **Participant observation**; as indicated before, this, together with the semi-structured interviews, constituted the main instruments used during the data collection process. Among the strategies we used to facilitate participant observation was participation in social and formal occasions, i.e. allowing ourselves to get involved in some formal activities and meetings.

(5) **Group discussions and seminars**; these methods were used mainly during the rounding off stage of the research process. They gave us the opportunity to exchange feedback with the research participants.

Table 3.2 Research topics and methods

Research subject	Lit. std.	Intv.	Obs.
Development of forestry sector in Sudan	XX	X	
Resource management organizations	X	XX	
Officials' management strategies	X	XX	XX
Villagers' management strategies		XX	XX
Social actors' perceptions		X	XX
Knowledge activities & processes	X	XX	XX
Education in relation to forestry	X	XX	X

X = used
XX = used intensively
Lit. std. = literature study
Intv. = interviews
Obs. = observations

Before ending this section, it is worth mentioning that these research methods and techniques were discussed separately only for analytical purposes. However in reality, they were used in a rather iterative way and triangulated to tackle the depth and breadth of our research subject.

3.5 Struggling with the research process: the ups and downs

More often than not, researchers do not tend to explain difficulties experienced during data collection and analysis process. Hence, many of the "next generation researchers" are denied their rights of learning from our experiences (Den Ouden, 1989).
Although it was full of difficulties and hard times, we believe that the data collection and analysis constituted the richest part of the research process. During this research journey, we have learned a great deal and enjoyed the experience of successfully negotiating the 'road-blocks' on the way. It is a wonderful feeling when one has been lost and cannot see the way ahead to suddenly discover a new path opening up. These are the kinds of experiences we want to discuss in the coming paragraphs.

The **first** road-block was how to fit back into our own (Sudanese) social system after a rather long stay within a different (Dutch) system . In the Netherlands, everything is systematized. Going back to Sudan, we got lost. Everywhere we saw 'chaos'. That was a difficult experience for us, particularly bearing in mind that after a certain period we would have to go back to the other social system. We felt miserable when we imagined actors (i.e. supervisors and the funding agency) from the other 'systematized' social system watching us and waiting to see (and maybe to judge) the results of our research project. The supervisors' appreciation of the different (and rather difficult) research environment contributed to solving the problem. In addition, the visit of one of the supervisors to the research area gave us a great feeling of relief.

The **second** road-block was related to our culture which keeps men and women totally separated (especially in rural areas). Male visitors are looked upon rather suspiciously and cautiously. Foreign men (i.e. from outside the village) are not supposed to talk to village women. The problem was how to move freely in villages, and how to meet and discuss with female informants. Our former experience with employing a female assistant was not very helpful (see Mahir, 1992). So, we decided to use what we referred to as a 'family approach' to the research. The author's wife contributed very much to overcoming this problem by directly conducting interviews with female informants and by making it possible for the author to carry out interviews with them. The presence of the author's family helped very much in changing the whole research atmosphere.

The children in particular helped break the ice in many situations, with the result that villagers were more friendly and willing to cooperate[10].

The **third** road-block was connected to the availability of resources (including time) to carry out the field work. The nature of the scholarship assumes that resources for the field work are the responsibility of the recipient. We were fortunate to have paid leave for the whole research period. Moreover, we received 'a written' promise that we would be provided with necessary facilities. In reality, the latter was no more than 'a political promise'. During the field work, we had to face reality and develop our own strategies to get the work done. This is where we used our capacity of 'agency' to the maximum in enroling stake holders (including lay men/women villagers) into our project. Among the strategies we used was creating a kind of solidarity together with the resource providers. "You know, we are doing the study in another country. Completing the study successfully is not only a credit for ourselves, but for the whole Sudanese people". Here again, the visit of one of the supervisors facilitated these enrolment processes.

The **fourth** road-block is closely related to the third one, creating a suitable environment for the research process. We have already explained how we tried to enrol stakeholders into our project. A natural and expected consequence was to let others also enrol us into their projects: in the end life is about exchanging benefits. During the field work, we had to do some extra work for our research participants (both at individual and institutional levels). However, these occasions created opportunities for us to participate interactively in dealing with real-life problem situations: in other words, these occasions acted as 'windows-without-shutters' through which we were able to see social actors' real faces (without masks).

In these paragraphs we have explained how we dealt with the 'road-blocks' along our research journey. Our intention was to make our procedures sufficiently explicit. In the next section we present our reflections on the 'goodness' and 'trustworthiness' of our research.

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[10] Sometimes this was raising the level of villagers' participation in the research to the "self-mobilization" type of participation (Pretty, 1994).

3.6 Scientific canons and our research

In the 'positivist' research tradition, researchers use four criteria to judge the 'goodness' of the data and the research approach, namely: internal validity, external validity, reliability and objectivity. However, Pretty (1994) argues that these criteria cannot be used to judge findings arising out of the use of some alternative research traditions.

External validity is related to the generalizability of research findings to different social settings. We have already declared our position as working in a constructivist research tradition. Our main intention was not to generalize, but to contextualize diversity and to enrich our knowledge about the ways different social actors use their 'agency' to manage interfaces during their interactions with natural and other human activity systems. Such insights might create opportunities for other actors (other than the author) to develop meanings and learning for themselves. Nonetheless, non-positivist researchers feel more accountable for internal validity rather than external validity. We organized our research in such a way as to strive for a high level of internal validity. For this purpose, we used a combination of "multiple sources"[11] and "multiple methods"[12].
As we have already discussed, in this study we have used a variety of research methods, techniques, analytical tools, and performative approaches iteratively in our effort to try and grasp social actors' realities. Different techniques have been triangulated for maximum internal validity. Moreover, using the theoretical sampling approach, we selected social actors' categories with diverse personal, occupational, socio-economic, and geographical backgrounds. Within each category of social actor, we continued interviewing a number of individuals until we were confident that we had reached the theoretical saturation point. Although the specific nature of the study did not allow us to have an inter-/multi-disciplinary team, we tried to grasp the benefits of having such a team through exchanging feedback and allowing members of various social actors' categories to comment on our findings. That was the special reason for having the rounding up stage of our research process.

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[11] "Multiple sources implies multiple copies of one type of source (e.g. interviews with farmers from one social group); or different sources of the same information (e.g. interviews with men, women and children about the same topic)" (Pretty, 1994: 44).

[12] "Multiple methods implies comparing the results derived from a range of methods; once a proposition has been confirmed by one or more methods, the uncertainty of its interpretation is greatly reduced" (Pretty, 1994: 44).

Concerning reliability, we would argue that there is nothing like an absolute reality or truth existing 'out there' which scientific research can bring to us. We believe the quality of reliability is very much embedded in positivism, and we argue that there may be no way of accurately judging the reliability of the research findings other than by judging the reliability of the researcher himself. This leads us to discuss the fourth of the scientific canons, objectivity.
"Objectivity is the extent to which multiple observers can agree on a phenomenon, and is established by using a methodology that seeks to ensure that process and findings are not influenced by the investigators themselves" (Pretty, 1994: 43). In fact, this was an area of internal conflict between the part of ourselves that was schooled in the positivist tradition during our technical forestry training and the other part of ourselves which is increasingly developing affinity for the non-positivist tradition. In the end, we realized that the detachment of ourselves as researchers from 'the researched' is rather artificial and unattainable.

To conclude this section, we have to make it clear that using a constructivist approach, however, does not mean being against the idea of trying to avoid different kinds of biases. During this study we have used various research approaches and techniques to make sure that what we are presenting is not only a mirror of what we wanted to see. We argue that we tried very hard to be objective but from a non-positivist point of view.

4 CHANGING FOREST MANAGEMENT STRATEGIES IN SUDAN

4.1 Introduction

Traditionally, villagers in Sudan utilized indigenous and naturally regenerating trees that are of direct benefit to them such as *Hashab*, *Tebeldi* and *Dom* trees. According to Mukhtar and Warrag (1994) forestry has been practised in Sudan since the dawn of civilization in the Nile Valley. Early Sudanese traded in forest products such as gum and "*Luban*", with neighbouring countries since the period of the "Pharaohs". One grasps the importance of forests/trees from traditional songs and the names of villages.

From the mere feeling of their physical existence and through the many benefits people derived from trees, Sudanese people developed various perceptions, beliefs, attitudes, objectives as to the ways of using them, and knowledge and skills concerning their management and utilization.

In this inquiry our intention is to see how various social actors perceive forest resources and what meanings they attach to resources, how they reconstruct changing situations, develop management objectives, and strategize to continuously make sense of the resources.

This chapter starts by discussing social actors' perceptions, moves to organizational aspects and ends by discussing actors' management strategies.

4.2 Sudan forests: perceptions and attitudes

In this section we tackle the following question:

What is the perception of various social actors of trees/forests?

However, before answering this question, we think it is necessary to explain a little about the social actors involved in forest resource management in Sudan.

4.2.1 Social actors involved in management of trees/forests

In chapter two we indicated that conceptualizing tree/forest resources from a systems perspective allowed us to see the resources as battle-fields where a number of social actors struggle with each other and which they are continually trying to manage. In an earlier study, Mahir (1992) identified nine social actor categories as being involved in forestry knowledge and information systems. These are: domestic forest users, the Forests National Corporation, commercial forest utilizers, forestry research, forestry education, donors (GOs and NGOs projects), gum arabic producers, and the Gum Arabic Company (GAC). In this study we allowed actors themselves to identify others whom they believe to be involved in forest resource management. Nevertheless, following our categorization in chapter three we present our findings referring to the two main categories, the officials and the villagers.

In general officials identified eleven social actors, whereas villagers identified eight. Among the categories mentioned by most of the officials are the following:

(1) The Range and Pasture Administration,
(2) Rural Administration Offices,
(3) Villagers,
(4) Farmers' Unions and Mechanized Farming Corporation,
(5) Ministry of Economics and Finance,
(6) Forestry Department,
(7) Wildlife Administration,
(8) Department of Horticulture,
(9) Forestry Research,
(10) Education, and
(11) Native Administration.

The categories mentioned by villagers include:

(1) Villagers,
(2) Nomads,
(3) Farmers,
(4) Wood merchants,
(5) Forestry people,
(6) Sawmill owners,
(7) Bakeries, and
(8) Other villagers.

From the above lists, one can make the following points:

First, officials identified more organizations, whereas villagers identified actual user categories. In a way, this reflects different actors' conception of management. Foresters see management as an activity to be organized by institutions and organizations. Villagers see management as a normal every day activity whereby various actors try to meet their needs for forest products.
Second, villagers differentiate between themselves and people from other nearby villages who share the use of the same resource with them. They also distinguish between those who use the resource for subsistence use and those who use it for commercial purposes, e.g. wood merchants, sawmill owners, bakeries. Furthermore, farmers and nomads have been identified by villagers as two distinct categories.

4.2.2 Perception of trees and forests

We have already indicated that forest resources have some specific qualities such as provision of a range of benefits to various users' groups which make them of interest to various categories of social actor. These qualities have had consequences for the way social actors perceive tree/forest resources. However, before going into the details of social actors' perceptions of forest resources, it should be noted that villagers' perceptions are more related to trees than to forests. In this respect, this study reveals that most of the time villagers talk about trees and not about forests. Most of the villagers see a forest mainly as a collection of trees, some of which are positively valued by them, while others are seen as useless.

In chapter two we explained how perceptions are influenced partly by people's needs and their socio-economic environments. In general villagers see trees as a sign of life or as many of them put it: "When we see trees, we see life". However, it is logical that life itself means different things to social actors. Consequently, for many villagers trees are a source of cash. Villagers in Tendulti area have virtually no other sources of subsistence income during the dry season. Nevertheless, this is not only specific to Tendulti area. Under worsening economic conditions in the country, villagers increasingly see trees as potential sources of income. In addition, after experiencing the problems of desertification farmers in Tendulti are increasingly appreciating the protective role of trees. They explain how trees protect their sesame crops from wind. Moreover, villagers in general, but specifically women, see trees as a source of shade both

on farms and at homes: "The one who has a good shade tree in his compound does not need to build *rakoba*[1]" says a man from Wad Braima village.
A characteristic perception to Sennar-Singa area is villagers' appreciation of trees as a source of sawn timber. Villagers in this area more frequently talk about tree species which are suitable for furniture. This might be due to the presence of government and private sawmills in the area. Moreover, in general villagers see trees as important sources of local building materials. Furthermore, women and children talk about non-timber forest products such as edible fruits both for cash and their own consumption.
Livestock owners in general and nomads specifically see forests as the only remaining range lands where livestock can graze freely. Moreover, according to nomads, their animals must graze/browse trees particularly in the transitional period between the wet season and the dry season. They believe that the leaves and flowers of trees can kill intestinal worms which develop during this period.
Last but not the least, despite the fact that traditionally, foresters conceived of forests as the main source of villagers' cooking energy, in this study villagers generally attached less value to trees as source of energy. Many villagers indicated that although firewood is essential for them, it is usually not the main use of a tree. In other words; villagers see energy as a by-product and not the main forest product.

Unlike villagers, foresters are more concerned with forests rather than trees. Otherwise, their personal perceptions do not differ very much from that of villagers. This study indicates that in general the environmental aspects of forests are well appreciated by foresters: "A forest means a healthy environment" says a forest officer; "I feel really relaxed when I see a good forest" says a lecturer at the Faculty of Forestry. In addition, various foresters' categories have their own special ways of perceiving forest resources. For example, most of the researchers mentioned sawn timber as the most valued forest product, whereas forestry educators mention firewood and charcoal, and FNC's officers mention energy and cash.
At the institutional level, foresters see forests as the main source of the nation's domestic energy supply. In addition, other officials see forests as a ready source of income: "a gift from *Allah*". They are sources of local and 'hard' currencies. Nonetheless, foresters believe this way of perceiving forest resources has negative consequences for resource management.

[1] Rakoba is a flat roofed shade made of local material.

However, not all social actors' perceptions in relation to tree/forest resources are 'positive'. Sometimes actors develop 'negative' perceptions and attitudes which outweigh their 'positive' perceptions of forest resources. For example, farmers, horticulturists, and orchard owners in the Blue Nile see forest lands as too fertile to be wasted by allowing forest trees to grow on them. An old man from Azaza village pointed to the soil and said: "Is it not wasteful to grow *sunt* in this fertile soil when we can produce vegetables, guava and mango?". Other farmers see forests as hosts for insects and birds which then damage their crops.

However, from the way informants presented their cases and from the explanations of other villagers, we come to the conclusion that those 'negative' perceptions are rather related to personal biases and experiences. A villager from Um Hagar says: "Our old trees finished, we planted trees provided by *Khawagat*[2], but since then every year we are eaten by birds". The man is referring to seedlings provided by the FINNIDA project which villagers perceive to be castrated seedlings. He means that since they planted the 'useless' project's trees in place of their traditional productive *hashab* trees, they do not get a good crop harvest because of the birds.

Almost all social actors in this study agreed that forest resources are deteriorating: "Singa area was full of trees and wild animals; *talih*, *kitir*, *hashab* (which we use to tap for gum), *hijlij*, and *sidir*. On our way back from Singa we used to fill our bags with gum and *laloob* (fruits of *hijlij*)" a man from Azaza village explains.

The sheikh of Wad Braima village says: "Because of the thick forests, two persons could not walk side-by-side, they had to walk behind each other. Women used to collect firewood from the boundary of the village".

In spite of their agreement as concerns the deterioration of forest resources, various social actors have developed different explanations as to the causes. Among the causes mentioned by foresters are the following:

(1) Mechanized rainfed agriculture. Foresters see this as the main cause of deforestation. According to foresters this factor intensified the influence of other factors. Through clearing large areas, mechanized farming contributed to over-exploitation, over-grazing, and clearance of land for subsistence farming in the remaining forest areas.

(2) Over-grazing. In this respect foresters blame nomads and other livestock owners for not following appropriate grazing techniques. Moreover,

[2] Khawagat is a local name for Western or European people.

foresters blame nomads for chopping trees for their animals and for attacking new plantation areas.

(3) Illicit or illegal cutting of trees and charcoal making. Charcoal burners share part of the responsibility for deforestation as they do not stick to the areas and quantities contracted for with the Forestry Department. Moreover, charcoal producers indirectly contribute to the problem by opening areas for farmers who then come and clear the land for agriculture.

(4) Some foresters blame the Forestry Department and the Government for not allocating enough resources to taking care of forests. Moreover, many foresters believe that other officials see forests as a ready source of cash, and sometimes tend to over-exploit the resources. In this connection foresters refer to the regionalization period, which resulted in mining of the forest resources to generate funds locally. Much of these funds used to go directly to the Ministry of Finance and were not reallocated to the Forest Department either nationally or regionally (Abdulla and Holding, 1988).

On the other hand, the following are among the causes of deforestation as seen by villagers:

(1) Drought: For villagers drought is the main reason for deforestation. Many villagers say: "Trees have finished because of no rain". A village sheikh at Um Hagar village explained the way he perceives the deforestation process by saying: "Trees are like people, after reaching a certain age they die and new ones come out in their places. Now, there is not enough rain and therefore new trees are not replacing the old ones". Moreover, villagers are convinced that drought and other hardships are a kind of punishment by Allah for people's moral misbehaviour: "Because of bad deeds, Allah is punishing people with drought and desertification" a villager says. Villagers appreciate their limited human sense and avoid questioning Allah's will. They say: "We will not interfere with Allah's wishes. If people behave well, blessings will come back". During the time when we were working for the Forestry Extension Section we used to explain to villagers that they should not cut trees because cutting trees, is the main cause of deforestation and drought. Once while we were in a village, we had heavy rain, and then an old man smiled and said: "You see, only Allah controls these things. You claim that rain is not coming because people cut trees, but in reality neither the Government nor those *Khawagat* can do anything to bring the rain; only Allah can".

(2) Land clearance for agriculture: Accessibility to markets combined with the increase in population encouraged villagers to abolish their traditional shifting cultivation system and clear more land for farming. A private sawmill owner says: "Sawmills are not to be blamed for damaging forest

resources. The Forestry Department does not have any commitment to provide wood for private sawmills. Mechanized farming is the main cause of deforestation, all other factors do not spoil tree seeds and prevent natural regeneration". In this respect a villager says: "Agricultural schemes are the main cause of deforestation because they uproot trees for machines to work, hence no shoots re-sprout"; "What damage forests are charcoal making and *um bahatay* [uprooting trees for cropping]", one of the nomads says.

(3) Cutting trees for cash: The severe drought conditions left villagers with no other source of income but trees.

(4) Charcoal merchants: Villagers claim that merchants from other areas are given licences for large-scale charcoal making and felling trees for firewood.

(5) Nomads: On the one hand villagers (mainly farmers) blame nomads and other livestock owners for damaging forest resources. On the other hand, nomads blame farmers for clearing all the land (including forests) for farming, leaving them without any land to graze their animals.

(6) Forestry people: Many villagers and officials from other institutions accuse foresters of being corrupt and the Forestry Department of not being serious in managing the resource appropriately. "They are thieves. When they want to cut, they say there is a disease in the forest. They cut trees and sell to their friends", a villager says, talking about foresters in his area; "Foresters are good at cutting but not at planting" a school teacher says in Tendulti area. However, it should be mentioned that for many people (including officials from other departments) the sight of any truck loaded with wood is a sign of illegal felling and corruption. A senior forester explains: "Even when the felling is for technical reasons or following the scheduled working plans, many people still blame us".

(7) Orchard farmers: This reason was mainly mentioned in Singa area, where villagers (and foresters) blame orchard farmers for encroachment into forest lands.

4.2.3 Beliefs in relation to forest resources

Most of the social actors acknowledge existence of certain beliefs in relation to tree/forest resources. However, the nature of these beliefs varies between and within social locations and actors' categories.

In general, villagers' beliefs are location and species-specific. This study indicates that villagers' beliefs with regards to trees could be categorized into:

beliefs related to trees growing at specific locations; beliefs related to trees in general; beliefs related to specific species of trees; beliefs related to specific trees but under certain conditions; and beliefs related to the use of tree products. In the coming paragraphs we discuss each of these types of beliefs.
Many villagers, in particular in Sennar-Singa area, believe that trees, like human beings, are also living beings which worship Allah. Moreover, according to them trees could be the homes of jin which are also creations of Allah and live in communities. Two old men from Wad Braima village explained to us that one of their ancestors (villagers believe he was a *Welli* or a holy man) used to greet trees.

A common practice among villagers is not to cut trees growing in graveyards. Sometimes, even dry or dead trees are left to rot.
Villagers give different explanations for this behaviour. Some say: "We do not cut trees in a graveyard because people can rest under them when they come for visits or for funerals". Others say: "Trees growing in graveyards belong to those who passed to the other life, and a form of respect we pay to them is by not touching their belongings". Still others develop some kind of taboos in connection with cutting graveyard trees. They say: "we are afraid, something might happen to us if we dare to touch trees growing in graveyards". Then villagers start talking about all kinds of stories which they believe had happened to people who tried to cut graveyard trees.
Another location where villagers avoid cutting trees is near mosques, especially when villagers believe that a *welli* is buried there. In this connection, a forester told us about the following case which took place at his home area:

> "There are some trees near a mosque and people say that nobody should cut them. Once, a man tried to cut a tree, the axe stuck into the tree and caught fire. Now trees are over-aged, some die out and only termites eat them. Villagers need firewood but nobody dares to touch these trees".

Another kind of beliefs are related to certain tree species such as *sesaban* (Parkinsonia aculata). Another extension officer gave the following case:

> An extension officer indicated that villagers in some areas say: "*Sesaban* trees kill their owner". The extension officer continued to say: "as part of our extension programme we took some *sesaban* seedlings to a village, but villagers refused to take them and asked us to take them back".

The third kind of beliefs are related to specific trees, but only when they are growing in specific locations. In this respect, an old man from Azaza village says:

> "People say one should not cut such trees as *kuk* (Acacia sieberana), *sunt*, and *hijlij* when they are old and growing in isolation from other trees because these are the houses of jin and satan, but among humans there are also people who are like satan, they sometimes dare to cut them". The same man referred to a story of one who cut an old *Kuk* tree and after only five days he died. These kind of stories are very common at Azaza village. Villagers took us to a man who they said had been beaten by jin when he tried to cut a tree.

Another villager says: "It is not good to have a neem tree inside the house compound, because, it is the kind of tree which inherits your house", i.e. you will in one way or another leave your house e.g. by death. A farmer from Azaza village adds; "Even in the farm, neem trees are not good as they make too much shade for our crops, only okra can withstand shade of neem trees".

However, some tree species are appreciated by villagers and seen as a good omen. The following are some examples:

(1) Villagers believe *Sidir* tree is appreciated in Islam. People avoid cutting them, and only take the thorns. In some areas, villagers use sidir leaves for treatment of a body of the dead person before burial. Villagers say: "Do not cut a sidir tree because it is the paradise tree". An old woman from Um Hagar village says: "We do not use sidir as firewood, and do not allow people to cut it, because sidir is a holy tree".

(2) *Arak* (Salvadora persica) is another tree which is appreciated by muslims, who use it as tooth brush. Villagers say: "Satan does not enter the house if there is an *arak* tree".

(3) In some villages, the bridegroom will hold a tree branch in his hand during wedding celebrations as a sign of good omen. In general, some villagers say: "you have to hold something green", but at Wad Braima village, people prefer a branch of *hijlij* tree.

In Singa area villagers have developed close links with trees, and people use different parts and types of trees in their everyday life. The following are some examples mentioned by villagers:

(1) Boiled *sunt* leaves are used for curing eye diseases. Some villagers refer to *sunt* trees as the 'doctor'.

(2) Mahogany bark is used for diabetes, blood pressure, and tooth ache.

(3) The sap from *usher* (Calotropis procera) tree is used by some villagers for treating the sting of scorpion: "The milk from *usher* cures people from scorpion's sting, but one should not mention the name *usher* while using it", a villager from Wad Braima says.

(4) Villagers do not only use tree parts for curing diseases, but also have developed some preventive medicines. Villagers told us about certain parts of trees which can protect ten persons from scorpions and snakes. They call it *'Damin Ashara'*.

(5) Women at Wad Braima village indicate that they use leaves of *sidir* trees for hair dressing.

In addition to the above, at Azaza village, people were talking about a local expert who is famous for his abilities in using local medicines from trees. We decided to pay him a visit and what happened during that visit is presented in the following story:

At the time we entered his house there were many women waiting in the queue to meet the man. After about half an hour, we were allowed to enter his room. The man was sitting on a leather mat made of cow skin, in front of him there were different kinds of tree roots and leaves. After we explained to him the purpose of our study, he welcomed us and said: "Mostly, the value or the medicine is in the root and not in the stem or leaves". He added: "Even the doctors in Singa are convinced with our way of curing diseases". Then he explained how he deals with different types of cases:

First, "for snake's bite, we put medicine on the bite and give the patient a drink made of ground roots. The patient will vomit the poison and become well in three days".

Second, "for tooth ache we grind certain roots, put them in a piece of cotton and ask the patient to bite on it using his infected tooth. Within half an hour, he will be better".

Third, "for retention of urine we give the patient a drink made out of certain roots".

We tried to find out which kind of trees he uses, but it was impossible to recognize them from the roots. Then we asked what kind of trees he uses. Before giving an answer he smiled, and then said: "This is a secret". We asked whom he learned the skills from. He answered: "from fathers".

Villagers confirmed that they rarely go to the hospital in Singa, but depend more on local medicines, especially for scorpion and snake bites.

Despite the fact that almost all foresters indicated their familiarity with such beliefs, the majority declared that they do not believe in these things. A forester says: "When we were children we used to pay much attention to such beliefs. With education the nature and strength of the beliefs are weakened". A forest overseer says: "Beliefs do not affect villagers' behaviour. If someone wants to cut a tree for money, even if the devil himself comes out, he will cut it together with the tree".

The nature of beliefs varies from one location to another e.g. in Singa people have started to cut hijlij whereas in El Dalanj people still stick strongly to the belief that it should not be cut. Sometimes beliefs become very strong depending on villagers experiences and the location of trees. For example, presently villagers are building a school in Wad Braima village. A villager indicated that the original design of the school had to be changed because of a big tree, around which villagers have developed many beliefs.

Close to Um Hagar forestry nursery there is a graveyard where nomads used to leave their belongings such as local building materials and other heavy or bulky things which they did not need to take along with them on their journeys. Moreover, this is the only place where one could see trees growing naturally without human interference. Villagers badly need firewood and timber for building, but never cut trees from this graveyard.

Every day villagers come to collect water from wells located between the graveyard and the nursery. To see the character of villagers' belief we decided to carried out a simple experiment, and asked the forest officer in charge of the area to join us in carrying it out.

> We went to the place of the wells and started a discussion with a group of villagers about trees growing at the graveyard. Then we all decided to go to the graveyard to have a look at the trees and the things left by the nomads. When we reached there, we asked the forest officer to give permission for any one of the villagers to cut a branch of a tree. He agreed, but nobody wanted to try. Then we offered five thousands Sudanese pounds (about twenty U.S. Dollars)[3] for the one who would cut a branch. But again, nobody responded. Then the villagers challenged us by offering the same amount of money if we could cut a branch. But, to be honest, at that moment the atmosphere was so fearful, that we ourselves could not accept the challenge.

[3] This amount of money is equivalent to two months salary for a villager who works at the nursery.

Nevertheless, regarding the changing strength of beliefs, an old man says: "Now people are more enlightened, they know the realities of the beliefs, hence, the influence of beliefs is becoming weak". A young man from Wad Braima village explained that sometimes villagers do not like to use *hijlij* wood as firewood. Villagers say the smoke from *hijlij* tree is not good. He adds: "In my opinion, that is not related to beliefs, it is only because smoke causes allergy for some people"

To understand the modes of influence of beliefs on social actors management strategies and behaviour we might need to refer back to chapter two. Ajzen and Fishbein (1980) argued that beliefs in fact influence people's attitudes towards a certain behaviour and they differentiated between behaviourial beliefs and normative ones. However, we added that beliefs are inter-linked with people's perceptions and needs. Hence, we are of the opinion that the influence of beliefs on social actors' forest management strategies has to be understood within the contexts of their social, political and economic environments.
In the previous section we discussed the perceptual variations not only between villagers and foresters, but also among the villagers themselves. The extent to which normative beliefs influence social actors' strategies is determined by their perceptions and power relations *vis a vis* other social actors who structure the social norms concerning specific issue. In addition to that, actors' behaviourial beliefs are also determined by their own perceptions and their world-views concerning tree/forest resources. Consequently, in spite of the great influence of beliefs on social actors' behaviour with regards to trees, we found it difficult to see the relationship between these beliefs and the "forest", because the "forest" is not the unit of concern of villagers.

We conclude this part by indicating that most of the research participants appreciated the existence of beliefs about trees. However, these beliefs are more related to individual trees and they are location and culture-specific. Although beliefs about trees are no longer as influential as before, and despite the fact that the great majority of informants declared that they themselves do not believe in them, we are of the opinion that they are still strong enough to deter even unbelievers from acting against them.

4.2.4 Classification of tree/forest resources

Villagers and foresters use a variety of criteria as a basis for classifying tree/forest resources. Foresters pay attention to the roles of forests, to land/tree tenure and to establishment techniques as the basis for their classifications. Villagers on the other hand, take elements such as tree ownership, location where trees grow and types of trees themselves as important aspects of their classification. In the next paragraphs we look at the foresters' and villagers' categorization of tree/forest resources.

First, according to their roles, forests are classified into:

(1) Protective forests, which are managed for the protection of water courses, villages and towns, agricultural schemes, and animal resources (both domestic and wild animals); soil conservation and erosion control; and for controlling desertification.

(2) Productive forests, which are managed to meet the needs of the population for energy in the form of firewood and charcoal, and building material (sawn and poles); meeting the needs of industries for the raw material; and as sources of both local and foreign currencies.

Second, managerially, foresters classify Sudan forests into:

(1) National forests for meeting the nation's needs for goods and services.

(2) Regional and provincial forests, which are managed to meet the local needs of the region or the province.

(3) Other forests which include: other departments' forests, communal forests and private forests.

Third, based on establishment techniques, foresters classify forest resources into:

(1) Natural forests.

(2) Plantation or man-made forests. These can be irrigated or non-irrigated forests.

Fourth, based on land tenure, forests are categorized by foresters into:

(1) Reserved forests; which are already gazetted.

(2) Unreserved, but protected forests; these include forests which are under a reservation process and other forest resources which the forestry authorities are protecting through patrolling and opening fire-lines.

Fifth, based on the areas where forests exist, foresters differentiate between:
(1) Riverine forests; which are along the River Nile and/or its tributaries.
(2) Upland or *dahara* forests; these are forests growing away from water courses. *Hashab* forests are a special type of *dahara* forest.
(3) Montane forests; these are forests growing on mountains like Jebel Mara.

The villagers' classification can be outlined as follows:
First, based on the ownership of the tree resources, villagers differentiate between:
(1) Government forests. These are forests protected by forestry authorities. However, most of the villagers do not differentiate between reserved and unreserved ones.
(2) Natural forests. Villagers believe these trees are grown by *Allah* and forestry authorities have not very much to do with them.
(3) Communal or village forests. These are a rather newly appreciated type of forests, which are owned by certain communities.
(4) Private forests. These are woodlots owned by individuals such as "gum gardens".

Second, considering places where trees grow, villagers name forests after the villages where forests exist e.g. Azaza forest.

Third, based on previous experiences and/or characteristic features, villagers might attach names to forests e.g. *Ghabut El Feel* (the forest with elephants). This way of identifying forests is more common among nomads.

Fourth, based on the dominant trees, villagers differentiate between: e.g. *sunt* forest, *hashab* forest and *talih* forests. This way of classification is the most commonly used by villagers.

Nevertheless, it is important to realise that the above mentioned classification systems are not mutually exclusive. In their daily interactions with the resources, social actors use combinations of these systems e.g. natural reserved *hashab* forest and Wad Braima community forest.

As far as the implications of classification systems on social actors' management strategies are concerned, this study shows that there is no social appreciation for foresters' official classification systems. In general, an official classification influences social actors only to the extent that laws can be

enforced. Mostly, villagers keep laws in order not to be punished. That is clear from the way villagers see forest offenses. In this case offenders are not seen as criminals. However, villagers pay considerable attention to ownership types which are based on their classification systems. A school teacher in Singa area says: "Villagers do not see reserved forests as belonging to their villages but to the government. Hence, illegal cutting of trees from these forests is not a crime according to the villagers' perception". Another villager in Sennar area says: "We prefer to plant *Ban* trees because nomads think it is a government tree. Sunt is familiar to everybody, they can cut it. Moreover, *ban* is rare and if somebody cuts a pole we can find it and get it back, but sunt is everywhere and someone can claim that he cut it from somewhere else". Consequently, offenses in private and communal forests are comparatively fewer than those committed in government forests. Moreover, offenses in private and communal forests are socially punishable and offenses are committed either unintentionally or in a hidden way.

In chapter two it has been argued that social actors' perceptions are interwoven into knowledge processes. Hence, knowledge is believed to play an essential role in structuring social actors' resource management objectives. Although issues of knowledge will be discussed in a separate chapter, we thought it is necessary to touch briefly on it prior to the discussion of actors' motives for trees/forests management.

4.2.5 Knowledge, information and forest resource management

A full account of knowledge processes with regards to management of tree/forest resources is given in the next chapter. However, based on our experiences gained during this study we argue that knowledge and information play considerable roles in structuring social actors' management strategies. Mostly, they form the starting point from which new management strategies evolve. This is illustrated by the following case where differences in the level of actors' knowledge and information about the Forestry Bill led villagers from Tendulti area to develop different strategies from those developed by their partners from Sennar-Singa area.

Due to their proximity to information sources, people in Sennar-Singa area are more aware of the legal aspects of forestry. Legally, no forest area is accepted as a reserved forest unless certain procedures are completed. Only then is the area declared a reserved forest in the National Official Legal Magazine. Previously, people were not aware of these legal aspects. Hence, whenever forestry authorities started merely to protect trees by appointing forest guards, villagers used to consider it a forest reserve. Now, some villagers ask about the stage of reservation and whether it is already gazetted or not. Many cases have been reported in the area where villagers appointed lawyers to withdraw management control from the Forests Department and change the land use system to private orchards.
The situation in Tendulti area is rather different. Villagers are less aware about legal aspects of to forest resources. That may be due to the remoteness of the area from sources of information and villagers' relatively lower economic and social status which has resulted in villagers being less subjected to information. Most of the villagers still do not know that they have every right to utilize the trees which they have planted on their own lands. Consequently, despite their belief that *hashab* trees are 'castrated', many people do not cut the trees because they are afraid that forestry authorities will take them to jail. However, becoming aware of the new punishment measures villagers develop new strategies making use of the special social status of women, which makes it difficult to send them to jail. The result is the common feature of seeing women involved in forestry offenses.

Villagers are also continually developing their knowledge and technologies concerning the properties of trees and their products. Consequently, villagers develop new objectives for using forest resources, and these new technologies in turn influence social actors' abilities and create yet more opportunities. Leaving the discussion on knowledge processes for the next chapter, we now move on to issues of social actors' objectives resource management.

4.2.6 Actors' motives for forest resource management

Trees or even different parts of trees have different social values for different actors. Some of these values are expressed through the economic system i.e. they are valued in money terms. Other values are expressed in ritual, spiritual, emotional, and cultural terms. Still other social values are communicated

through the political systems (at different levels of aggregation), e.g. national food security. Sometimes, the motives of different actors coincide, but more often than not, social actors develop conflicting intentions toward managing the same forest resource. In this section we discuss foresters' and government's management objectives and see to what extent they are similar or different from those of villagers.

The 1986 Forest Policy gives official forest management objectives as follows: protection, establishment and development of forest resources in Sudan in such a way that they facilitate environmental protection and meet the requirements of the country for forest products (Anon., 1986). According to some senior forestry officers, the Forests Department's first management objective was provision of fuelwood for steamers, hence the reservation of *sunt* forests along the Blue Nile and the White Nile rivers. Later on, with the expansion of railway services, production of sleepers became the main management objective[4].
In general, the majority of foresters mentioned provision of firewood and charcoal as the main forest resource management objective.

Having discussed officials' forest management objectives, we proceed to address villagers' objectives. According to Grigg (1979) villagers do not only produce for money but also for social purposes, for ritual, status and prestige. Moreover, avoidance of risk is a primary motive for many peasants. The following are among the management objectives mentioned by villagers:

(1) Among villagers' motivations for planting trees in Tendulti area is their feeling of being threatened by desertification.
(2) Protecting crops against wind and sands. One villagers said: "We noticed that crops grown in between trees are not destroyed by wind. Therefore, we keep *hashab* trees even when they are not giving gum".
(3) A source of income to support village social services. In Singa area the main objective for villagers in establishing village woodlots is income generation to support village social services such as electricity.
(4) Production of fruits and other non-timber forest products. In Kordofan region of Sudan villagers protect *gimbeel* tree (Cordia spp.) for its edible fruits.
(5) Prestige and social status. One of the main reason villagers participate in community forestry programme is prestige. Many villagers mentioned that they participated or are willing to do so, because they have seen woodlots

[4] Gum production is one of officials' forest management objectives. However, for foresters gum is a 'minor' product and its production is mainly carried out by villagers.

in other villages. A lady at Wad Braima village says: "If a person does not feel jealous, he will not work hard".

(6) Cultural purposes. We have already explained how villagers protect and/or plant trees like *sidir* for the treatment of a corpse; *arak* for tooth brushes; and *hijlij* or other trees for weddings. Sometimes villagers leave one big tree in the village for shade for travellers, and as a "flag" as they say.

(7) Spiritual purposes. A villager pointed out a tree close to his house and said: "I protected this tree to grow for shade. People who know [religious elites] told me that as long as this tree is growing I will get *Thawab* [reward from Allah]". Moreover, we already showed how villagers leave trees growing in graveyards because of certain taboos, but also as a form of respect for those who passed to the 'other life'.

(8) Receiving food rations (food for work). We have already mentioned that the FINNIDA project used to provide rations (food for work), and many villagers indicated that this was their (main) reason for planting trees.

(9) Other uses, e.g. a supply of building materials, firewood were not mentioned directly as management objectives. Villagers consider these uses as benefits which they can get from forests, but not as management objectives as such.

At the beginning of this section we argued that social actors might develop conflicting tree/forest management objectives. During the fieldwork for this study we came across the following case which illustrates differences between local people's and foresters' management objectives.

During the fieldwork for this study, the Forestry Extension Section organized a workshop on management of community forests at El Gadarif town. On the second day of the workshop the participants went to the field to see a community forest belonging to nomads.The nomads were eager to show us their forest. Reaching the area, our first observation was that there were many trees which had been chopped down for animal fodder. We said to ourselves, "Oh what kind of a forest is this? For the last two days the nomads kept telling us about protecting the forest !!". Our friend the forester failed to keep this feeling to himself and said: "What is this? All this cutting and you are saying that you protect the forest? From whom are you protecting the forest then?". Soon the author realized the special situation of the nomads. He took a group of nomads aside and explained to them the purpose of his visit and that he did not work with the forestry department. Then the following conversation took place between the author and the nomads:

The author: "Why do you keep this forest?".

The nomads: "We keep it as a range for our animals to graze".

The author: "Do you think you as people who keep animals can manage without cutting trees?".

The nomads: "We need trees for every activity we perform. Immediately after reaching the area we need wood for our settlement to fix the huts, we need wood and thorns for making enclosures for small animals. We also need to cut some trees for the animals to graze because they need it specially at this time of the year for medical purposes. In addition, we need firewood for cooking".

The author: "Can you ask other nomads to keep away from your forest when they pass through the area?

The nomads: "Honestly no, because we also visit other nomads in other areas and we would have not been happy if they treated us like that. Moreover, who knows maybe one day we might need these people".

The author: "Do you think nomads have a role in destroying forest resources?".

The nomads: "Of course no, they only let their animals to graze. What damage forests are charcoal making and *um bahatay* [uprooting trees for cropping]".

After this short conversation we joined the group. At that time, the extension officer was showing the nomads how to plant a tree.

At the end of the workshop we realized that we had learnt the following lessons:

(1) Nomads have different management objectives from the forestry staff. On the one hand, foresters want to manage the forest for gum production, firewood, and environmental purposes. On the other hand, nomads want to manage the forest as a range for their animals and a source of firewood and building materials for their livelihood.

(2) From their perspective, foresters see the chopping of trees by nomads as a threat to the forest, i.e. a problem, whereas for nomads felling some trees is a management activity.

(3) Nomads cannot do without felling some trees. Moreover, they cannot strengthen their temporary relationship with the Forest Department at the expense of their life-long and vital relationships with other nomadic tribes.

(4) The case of El Gadarif indicates that nomads do not only chop down trees, but they also take initiatives to protect and establish their own 'grazing forests'.

To end this section one can conclude that coincidence between the management objectives of foresters and those of villagers is the exception rather than the rule. On the one hand, management objectives of the FNC focus on the sustainable provision of forestry goods (mainly firewood and charcoal) and services to Sudanese citizens. Recently, environmental issues and forestry for rural development also started to draw foresters' attention. On the other hand, villagers' management objectives vary considerably with geographical, occupational and sociological factors. Villagers plant or keep trees for fruits, fodder, shade, decoration or beauty and rarely for wood only. In general, what is important for villagers is mostly of secondary or minor importance for the FNC and vice versa.

In chapter two we indicated that according to Ajzen and Fishbein (1980), behaviourial and normative beliefs influence the attitudes of actors and structure their behaviourial intentions. In our opinion, beliefs become operational within a certain perceptual context. Beliefs are influenced by perceptions and at the same time beliefs play an essential role in determining how actors perceive things. Moreover, between the formation of an attitude and having an intention to act in a certain way, social actors form motivations. In turn, their motivation development is interwoven with knowledge processes. These relationships are not linear and unidirectional. In many cases, attitudes, interests and motivations are influenced by the behaviour of other social actors and/or the previous behaviour of the actors themselves. Moreover, after developing management

objectives actors need knowledge to develop strategies and to organize the management of the resources. In the coming section we discuss how social actors in Sudan organize the management of tree/forest resources.

4.3 The organization of forest resource management in Sudan

In this section we look into the following question:

> *What kind of institutions and organizational structures are developed by social actors for managing tree/forest resources in Sudan?*

An important characteristic of trees/forests is that their social values are appreciated differently by different social actors. However, this variation is not static, but might change with time. Moreover, once planted and after a certain age, trees are difficult to move. Hence, trees and forest resource management is closely linked with issues of tenure, access to and control of the land and/or trees. In this section we start by discussing issues of land and tree tenure, then we discuss the types and nature of institutions involved in management of forest resources in Sudan. Towards the end of the section we reflect on the issue of forest resources as potential areas for social dilemmas.

4.3.1 Who owns the forests in Sudan: land and tree tenure

In chapter two we indicated that we can see the forest as a battle-field. Various managers come with their different management objectives. In the forest they meet each other, some with similar objectives, others with very different objectives. In order to realize their management objectives managers need to communicate, negotiate and establish coalitions. For these purposes, managers carry out various types of networking activities.

After long years of unrest and tribal wars, which resulted partly from the immigration of Arabs into Sudan, people settled in tribal groups existing day during the period 1400-1500 A.D. The land of each tribe, known as *Dar*, was recognized by others through land marks. Accordingly, members of each tribe enjoyed rights of cultivation and grazing of their animals within their specified boundaries or *dar*. Certain kinds of agreements between tribal elders allowed nomadic tribes to move through the lands of other tribes, thus enjoying privileges over larger areas than their own tribe's *dar* (Seif El Din, 1979).

The first attempt by the Government to intervene in organizing land tenure was made by Kitchener who issued the "Title to Land Ordinance 1899". The ordinance recognized the validity of titles acquired during the *Mahdia*, and ordained that continuous cultivation for five years preceding the date of claim created an absolute title as against all persons. In 1925, The Land Settlement and Registration Ordinance (LSRO) was issued. This ordinance stipulated that all lands which were not registered in the names of normal persons were regarded as government property. This ordinance was later consolidated by the November 1971 Land Law which emphasized that all lands in the nation are government properties unless the contrary is proved by valid documents. According to these laws, the Government exercises its ownership as a trust for the people who have habitually exercised rights over the unregistered land (Saleem and Suliman, 1984). However, the Act recognized the rights and privileges enumerated in the LSRO of 1925, such as rights of cultivation, pasture, use of forest produce, occupation and any other benefits by individuals (Seif El Din, 1979). Consequently, the following three main levels of land ownership came to be identified:

(1) Land individually or privately owned,
(2) Government land subject to no rights,
(3) Government land subject to rights vested in a community.

Most of the land in the study areas belongs to the third level of ownership (i.e. government land subject to rights vested in a community). Legally in Tendulti area, all land belongs to the Government and no private ownership of land exists. However, usufruct rights are recognized according to traditional patterns of land tenure and continued residence guarantees rights in cultivable land. Consequently, there is *de facto* individual land ownership where land is individually owned and heritable (Saleem and Suliman, 1984).

The Forest Department was one of the first departments to be established by the British in Sudan (in 1901). In 1908, the first rules were issued for the management of natural forests of the Sudan. In 1917 additional conservation rules were passed to bring more land under the government management control. In 1932 the National Forest Policy was drawn up together with the Central and Provincial Forest Acts. The main feature of this policy was that it controlled the cutting of trees outside reserved areas. The policy was issued to put an end to the frequent problems arising between the national and the provincial directors of forest departments over the control and management of the forests resources in the provinces (Bayoumi, 1983).

According to Abdulla and Holding (1988) the experiences of the early 1980s of forestry projects that did not involve local people, the drought of 1984/85 and

the magnitude of the problem meant that solutions had to be looked for beyond the immediate scope of the forest department. It became clear that the only way to have any impact on the development of forest resources in Sudan was through people's participation in management of their own forest resources. To do this, however, changes in the forest law and its implementation had to be made. The 1932 forest law acted as a hindrance to tree planting by forbidding the cutting of any tree, even on ones own land, without prior consent of the forest department. Consequently, the National Forest Policy was revised in 1985. That was followed by a revision of the 1932 Central Forest Act and the Law of the Provincial Forest in 1989.

The new forest policy (Anon., 1986) intended to:

(1) stress the protective and environmental roles of forests,
(2) encourage the establishment of communal, private, and other departmental forests,
(3) vest decisions on cutting trees outside the reserved forests in the hands of the FNC general manager to ensure that cleared areas should be reserved, protected and reforested. This change is also to ensure that trees in areas allocated for other investments are utilized and not burnt to slash, and that a certain percentage of these areas is allocated for trees,
(4) emphasise that the FNC general manager is the legal (official) consultant of the corporations and other agencies for all aspects forestry ,
(5) gain popular (national) and international support for the establishment and development of forestry resources,
(6) raise the national target of the area to be under forestry cover from 15 to 20 percent of the total area of Sudan,
(7) stress the importance of extension and information in forestry, and
(8) facilitate division of the forest management authorities between the centre and the regions (states).

Consequently, the previous situation, where all trees belonged to the state, was changed and the new policy acknowledged other forms of tree/forest ownership. These are: forests belonging to other institutions, communal forests and private forests.

Traditionally, villagers do not see forests as possessions to be protected, but ownership of trees on private land was based on the species. Villagers claim ownership of culturally or economically valued-species such as *dom*, *hashab*, *haraz*, *arak*, *tebeldi* and *deleib*. Consequently, at a certain location some species might be treated as private whereas others are seen as common property of the tribe or village. A villager says: "On your own land *hashab* trees belong to you, but *talih* is for everybody". In addition, villagers' system of tenure is heavily

embedded in the socio-cultural context in such a way that despite the fact that someone might own the tree and/or land, under certain circumstances other people could have usufruct to a specific quantity or type of product.

4.3.2 Local level organizations involved in forest management

Mohamed (1994) identifies three types of local institutions in relation to natural resource management; the ethnic, the Native Administration (N.A.), and the 'modern' ones created by government to replace native administration.
The Native Administration is an old tribal system incorporated into the general administrative structure in Sudan by the British. The Native Administration structure in general begins with the *Nazir* at the top of the system, followed by *Umad* and finally *Sheikhs* at the bottom of the hierarchy (see Fig. 4.2). According to this system, each rural council consists of a number of *Umudias*, administrative units headed by an *Umda* and comprising an average of 20 villages. Each village has at least one sheikh, surrounded by village elders known as *Ummar* whom the sheikh consults in case of problems. The position of sheikh was always inherited.
The British passed a number of laws and ordinances to give the system a legal order and to make it fit within the framework of the judicial and administrative systems. These laws together with the local customs and traditions made the native administrator a very strong and powerful leader (Mohamed, 1994).
In some areas e.g Tendulti, native administrators used to mobilize the support of the ethnic institutions, thereby integrating native wisdom with 'modern' laws in performing their duties.

Traditional ethnic institutions were not part of the native administration hierarchy, but with close affinity to the system and they played an important auxiliary role in resource management. One of these traditional ethnic institutions is the *Ageed*. The position of *Ageed* started as a man who was responsible for organizing people for village defence, and was later entrusted with organizing village labour for communal works such as bush fire control, digging and fencing water ponds, and control of birds and locusts. The *Ageed* usually works in close association with sheikhs, as decisions to organize different activities come to him either from or through the sheikh.
According to Mohamed (1994), the success of the N.A. and traditional ethnic institutions in guiding and managing grassroots affairs was attributed to the following:

(1) They understand the local culture, behaviour and problems of the local people better.
(2) They are more respected and obeyed by the people because local people feel that they belong to their community.
(3) Unlike the modern local institutions which use alien concepts and procedures, traditional/ethnic institutions originated from the local cultures and usually follow the well understood procedures of native cultures in tackling local problems.

The sheikh of the Azaza village summarized the present responsibilities of the sheikh in the following points:

(1) Helping local government in collection of taxes.
(2) Receiving judiciary announcements and conveying messages to the villagers concerned.
(3) Settling small conflicts between villagers prior to (or instead of) taking the cases to the police.
(4) Forming committees for crop damage estimations.

The sheikh added: "Before, the village sheikh used to enjoy more power. But during certain periods his position was very much weakened. Now, sheikhs are re-gaining some of their previous positions as the government is trying to bring back the Native Administrative System. However at present, the Popular Salvation Committees are the official village level governments and sheikhs have to cooperate with them".

We asked a village sheikh about the factors which weakened the position of village sheikhs. He said: "Before, the village sheikh was the only village government and he was backed by the *umda* and *nazir*, hence, nobody could go against what he says. Now, there is more than one head in the village and nobody listens to the sheikh. Earlier, there were no schools, people were not educated. Now, many among the new generations are educated while most of us are still illiterate". Then he pointed to a boy of about fifteen years old and said: "Do you think we can control this new generation? If I decide to punish him, he can report me to the police in town".

As we have indicated before, traditionally villagers cared for trees and not forests as such. An old man from El Milaih village says: "Village sheikhs and *umda* used to protect some trees but not all. For example, trees like *sidir* and *gimbeel* were forbidden to be cut. Those who cut then used to be fined by village sheikhs". Otherwise, villagers explained that there was no need to protect trees as there were too many of them.

A villager from El Milaih village presented the following case to show how sheikhs used to protect forest resources more effectively before government intervention:

> "There were two forests called Id El Hijlij and El Shoosh and there was a pool close to them. Sheikhs and villagers kept these forests for a very long period. Now, forestry people took it from villagers and declared it reserved forests, they cut all trees and nothing is left". Then he added: "The government system allows for cheating. Someone can get a permission to make twenty sacks of charcoal and instead he produces one hundred, this kind of thing was not possible under our local system".

The majority of informants in this study indicated that native administrators had contributed effectively to the protection and management of forest resources in the past. This result is seemingly in contradiction with the fact that villagers did not pay much attention to protection of 'forest' resources in their surroundings before government intervention. However, more analysis revealed that in fact native administrators played an effective role in protecting forest resources only after the British started issuing forestry regulations. Having legal support, native administrators used their local wisdom and traditional social respect in enforcing official forestry regulations such as prohibiting the cutting of trees and opening fire-lines.

In this section we discussed how social actors establish institutions of laws and organizations to organize forest resource management in Sudan. However, we have argued earlier that social actors in their continuous efforts to manage forest resources use these institutions to develop and apply resource management approaches or activities strategically. In the coming section we examine the various strategies developed by social actors in their attempt to make sense of trees/forests.

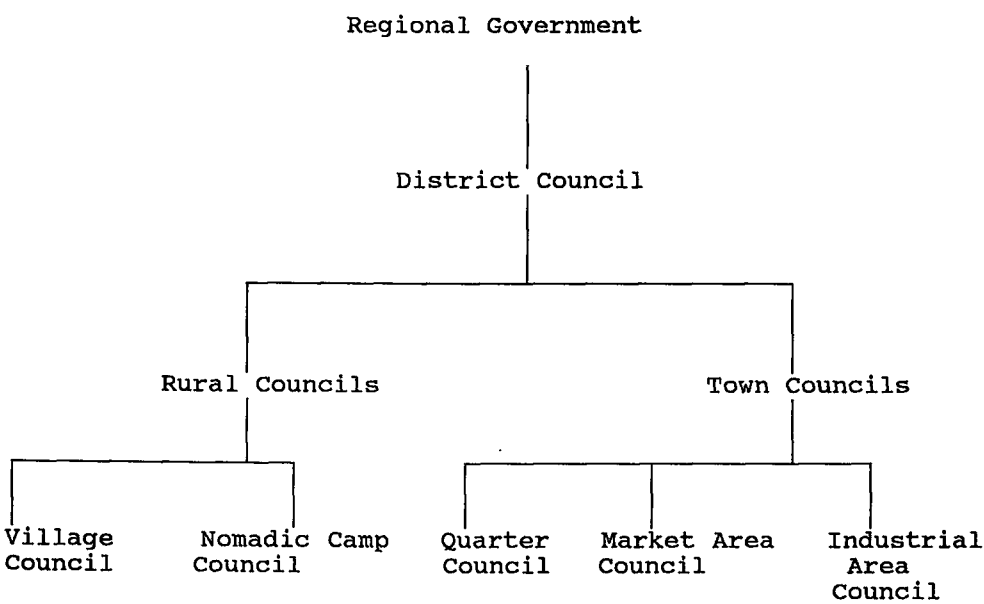
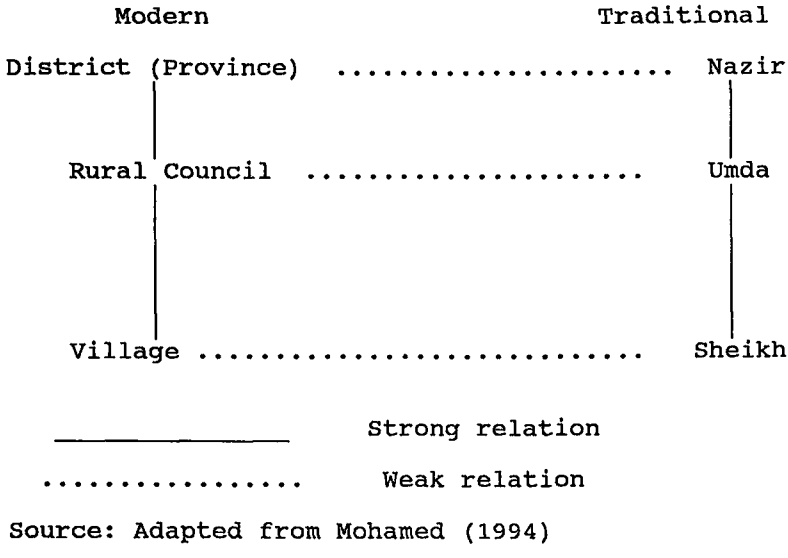


Figure 4.1 Local government structure



Source: Adapted from Mohamed (1994)

Figure 4.2 Relationship between tribal and state institutions

4.4 Changing forest resource management strategies in Sudan

In this section we discuss the following main question:

> *What kind of forest resource management strategies do social actors develop? To what extent and under what conditions are they changing their strategies?*

This section starts by presenting some of the villagers' tree and forest management strategies, moves on to address officials' strategies and proceeds to tackle issues of disputes over the management of the resources. This section ends by reflecting social actors' visions of the future of tree/forest resource management in Sudan.

4.4.1 Villagers' strategies

Mukhtar (1990) reports that traditionally local people used to take care of the naturally regenerating trees that were of direct benefit to them. However, there was no evidence that local people cared about planting forest trees for any purpose and in any form. There are no records or indications of any afforestation or reforestation practices prior to the colonial rule which came to the Sudan at the close of the 19th century.
In this connection the majority of our informants indicate that other than taking care of certain valued trees, villagers in the past did not follow any purposeful effort to protect 'forests'. Instead, they believe the reason why deterioration did not take place in the past is attributed to the fact that forest resources exceeded people's demand.

In the following case a village sheikh at Um Hagar village explains how forest resource management was before it became the subject of government intervention.

He says: "In the 1960s, Mr. Khamis came to the area as a forest guard. He was located at Abu Rukba village. Before that there were only *ghifar* [some trees controlled by village sheikhs]. Otherwise everything was *Fawda* [anarchy]. There were a lot of trees and sometimes people from El Diwaim and Fellata people used to come and collect wood from here to sell it in El Diwaim town. We did not need it at that time, villagers did not have any idea about what to do with all those trees. From Mr. Khamis they heard that it is forbidden to cut *hashab* trees, and that for *hijlij*, *sunt* and making charcoal kiln one needs permission from the forestry people. Sometimes village men used to threaten foreigners who came to collect wood from *ghifar* that they would inform the sheikh, which at that time was a serious measure. People would have preferred to leave the wood rather than being reported to the sheikh. Before, the authority was in the hands of sheikh, *Umda* and *Nazir*, now, these new people have come, and the power is no longer in our hands, it is becoming useless. Even when the forestry authorities appeared in the 1960s, they asked village sheikhs to supervise and monitor the application of forest regulations. We had been asked to inspect and to observe forest guards. Till now this is written in the forest law, but nobody keeps to it". Then he continued to argue: "Don't you think the village sheikh is more concerned about forest resources than forest guards? The forest guard is a government employee and he works mainly for the salary, he comes to take his days and goes. The village sheikh is more persistent and more concerned about the future of his village. Traditionally, firewood collection was a women's task and men only went for collection of *sheiba* for construction. Clearing areas for agriculture used to take place mainly at locations where trees were too old and started to fall down and in that case we did not take the wood, but burned it. So, villagers only used to take wood for their household consumption. But, then experimental growing of groundnuts came to the area. And villagers saw the money. They started clearing more land for growing groundnuts. That was the story of forestry before 1974".

Nevertheless, villagers explained that, traditionally, *hashab* trees were owned by individuals in the form of woodlots (which villagers refer to as *hashab* gardens). Farmers allow *hashab* trees to grow on their lands while weeding out other shrubs and trees. "Development of the gum is at the tip of the blade" a villager says. He means that normally during weeding farmers leave *hashab* seedlings or sprouts coming out of the coppices. *Hashab* "gardens" used to be managed applying shifting cultivation on a rotational basis. After being tapped for 8-14

years, *hashab* trees cease to produce gum arabic and farmers cut them to clear the land for millet cultivation. Gum was the main source of income.

In general the issue of forest resource management by villagers remained debatable. Foresters (the author of this text included) for long time did not pay attention to any trees which did not look a 'forest'. Moreover, they failed to see resource management other than as a series of technical tasks. Nonetheless, this study reveals the following conclusions:
First, in line with our earlier argument, villagers see the forest as a collection of trees. According to villagers, some of these trees are valuable and need to be managed, while others are 'useless' and do not deserve any managerial effort.
Second, unlike the segregated approaches to forest resource management which is followed by the government bureaucracies, villagers' tree management approaches are characterized by their holistic nature. Villagers do not see protecting or planting trees as an activity separate from the rest of their land use activities. One example is villagers' *hashab* 'gardens' management system which was traditionally incorporated into other land use activities such as cropping.
Third, villagers' management strategies are determined among other factors by the condition of the resources in relation to villagers' needs and utilization degree. Based on the condition of the resources in comparison to the degree of utilization, villagers decide about which management approach to follow. In this respect, Wiersum (1992c) indicates that traditionally, local people have been carrying out a wide array of indigenous management practices. These practices include the following:

(1) Purposeful propagation of valuable tree species such as protecting natural vegetation, transplanting wildings, direct seeding, planting cuttings, and backyard nurseries.
(2) Protection and maintenance of valuable tree species by restricting access to forest, mandatory use of herders, fencing individual trees or fields, restricted burning, and not cutting selected species.
(3) Controlled use of tree resources by following certain utilization measures such as pollarding, pruning, harvesting only selected products, harvesting according to tree conditions and harvesting limited amounts.

However, we are of the opinion that Wiersum (1992c) did not emphasise the hierarchial nature of villagers' management approaches. Our personal reflection concerning this issue is given in chapter seven.

Having discussed villagers' tree/forest management strategies we proceed to analyze officials' strategies.

4.4.2 Officials' strategies

In addition to the introduction of tree planting programmes along avenues, public gardens and homes in large towns and villages, the British tried to promote the gum arabic trade, which existed before the colonial period. They encouraged villagers in Kordofan and Darfur provinces to maintain and develop their *hashab* forests and to keep them in what have become known as "gum gardens". Villagers were encouraged to enrich their natural stands either by sowing selected seeds provided by the government or through the planting of seedlings obtained free of charge from government nurseries (Mukhtar, 1990).

As concerns management of other forest resources, a retired senior forester explained that originally forest management started by reserving natural forests and protecting them through patrolling and clearance of fire lines. Consequently, natural regeneration was encouraged. For decades the system worked satisfactorily. The system was broken when large areas were cleared for mechanized agriculture. The result was over-exploitation of remaining forest resources by overgrazing, charcoal production, illicit felling and land clearance for subsistence farming.
Nevertheless, a regular management plan for forest resources South of Sennar dam was started only in 1938 and used to be revised every ten years. In this area, *sunt* forests are managed for production of sleepers on a 30 year rotation. In 1939, the Royalty Ordinance was issued to collect royalties from forestry products collected from forests outside reserved forests. The idea was to discourage cutting of trees from unreserved forests and to limit this to reserved forests.
North of the Sennar dam, forests are managed for production of firewood and small size sawn-timber on a shorter rotation of 20 years.
Upland or *dahara* forests are mostly protected (with no management plan) for production of firewood and charcoal. An exception to this are *hashab* forests which are protected for gum production.
Irrigated plantations started in the Gezira after the building of the Sennar dam and the removal of the natural vegetation cover for the Gezira scheme. In 1950, a need was felt for the creation of irrigated plantations.
With the exception of the Blue Nile riverine forests and irrigated plantations, most of the other forests do not fall under a clear management plan. Moreover, in the past management plans concentrated on the exploitation of forest products and did not fully take into consideration the needs (e.g for grazing and fuel-wood) of the people living nearby these forests. However, the right of

passage and water points were given in certain areas (Abdulla and Holding, 1988).

4.4.3 Taungya as a special forest management strategy

In the early 1960s, the Forest Department decided to plant the open areas in the *'dahara'* reserved forests with *hashab* using the taungya system. The policy was implemented in El Gadarif Forest Circle in 1962 where *hashab* seeds were sown by wide level disc harrow and seed box.

According to a signed contract between the taungya farmers and the Forest Department, the farmers are allowed to cultivate a specified open area in the reserved forest for a period of two years with agricultural crops (sorghum). In the third year, the farmer has to plant the sorghum and hashab seeds and leave the land after harvesting his agricultural crop. Later on, the number of participating farmers increased beyond control, as land became scarce and the prices of sorghum increased substantially. Farmers became reluctant to follow their contracts. Farmers developed various tactics such as boiling the seeds prior to sowing and weeding out *hashab* seedlings together with weeds in order to continue using the land. Consequently large areas of reserved forests became in reality mechanised farms. In 1982, the Government decided to abolish the use of the taungya system in reserved areas. A senior forester says: "Application of taungya in upland forests was a wrong decision". But many foresters believe that the problem was rather in the selection of the farmers than in the taungya system itself. Farmers who participated were large, absentee mechanised farmers and not small farmers from local villages who had an interest in preserving their immediate forest resources (Abdulla and Holding, 1988). However, another type of taungya is still applied in the Blue Nile riverine forests. In this system, villagers are annually allotted plots of arable land inside the forest at the *Myaa*[5] (a depression which is most of the time water-logged) after paying a nominal rent to the Forest Department. Every villager knows where his plot is and at the beginning of the season, he goes to the Forest Department and pays the money. Although owned by the Government, these plots of land are becoming inheritable informally among villagers, i.e. nobody will apply for the plot of another, and if a farmer dies, his family applies for the land. Villagers know by experience that in this area, trees will not grow because the soil is water-logged for a long part of the year. Villagers also call these places *Um el myaa* or the mother of *myaa*.

[5] In Singa area, villagers call it gerif.

4.4.4 Forest resource management disputes and social dilemmas

For a long time, forest officials, working from their bio-physical and economic perspectives, (Röling, 1994a) have paid attention mainly to the nature/nature interactions and sometimes to the human/nature ones. Foresters rarely considered the fact that 'their forests' are in fact 'the battle-fields' where (and for which) social actors wrestle. As we indicated in chapter two, keeping in mind the specific characteristics of forests, the Government intervened. In this section we intend to pay more attention to the human/human interactions in relation to forest resource management.

This study indicates that most villagers perceive Government intervention mainly as represented by the prohibition on cutting trees and grazing in state forests. However, a considerable group of villagers indicate that for them Government intervention is represented by the fact that people need to have permission even to cut their own trees.

During the fieldwork, we asked the Um Hagar village sheikh to tell us about the process of Government intervention in their area. In the following box we present his story.

> He explained: "In 1974, a forestry officer came to Um Hagar area and established the old nursery. His name was Mr. Ali. A few years later he contacted us asking for permission to reserve an area close to the nursery for the establishment of the new (Finnish) nursery. We invited all the village men to a meeting at the school, the forester was there too. At the meeting I explained to the villagers what Mr. Ali had asked for". At that moment another villager interrupted the village sheikh to say: "The man was sweet tongued, he managed to cheat us". But, the village sheikh continued: "We made a deal with him that we accepted to give part of our land, and in return he would pay some money to complete some buildings for our school, which we needed badly at that time. Moreover, we asked him to employ some villagers as labourers and forest guards. Both things the man agreed to immediately and we decided to give up part of our agricultural land to the Forest Department". However, another man added: "Mr. Ali asked for a place for the nursery (..) I signed the contract on behalf of the villagers near the wells. But after establishing the nursery, forestry people came and extended the area and erected their stones on our land. When we asked questions, they said: this land belongs to the nazir and he gave it to the Forest Department. We kept asking and asking, but we were afraid".

We asked villagers about their opinion of Government intervention and forest reservation. Villagers in general agreed that without Government intervention all the forest would have disappeared. Some villagers even think that intervention came too late: "Intervention was good, but it was too late. Foresters woke up after all the trees had gone", a villager in Tendulti area said.
Nevertheless, villagers mentioned some drawbacks to the reservation process. The Azaza village sheikh said: "You see, we live in the neighbourhood of a forest and we are expected to protect it, especially when there is a fire. Still villagers do not get any kind of special treatment from the forestry authorities. When it comes to forest products, we are equal with those who live far away from the forest ". Then he added: "Reservation is good but it creates a lot of inconveniences for villagers to meet their daily needs for forest products". Another villager from Azaza said: "We help them when there is any problem in the forest such as fire, however later forestry people forget this". A third villager seems to have a slightly different opinion, he said: "Reservation was good for some people and bad for others. It was good for those who have *Zamlaa* [an animal such as a donkey or a camel] because then they can steal wood and sell it to those who will not be able to steal because they do not have Zamlaa". In this respect, women's opinions were not different. A lady from El Milaih village said: "Before, we used to go to the forest and collect firewood, but now we are not allowed, we have to buy it like people in the towns. Sometimes forest guards do not allow us even to collect dead wood. At present, mainly foresters benefit from forests. Sometimes we need *Sheiba* [a bi-forked stick], but the guard does not allow us to collect one. He is from our village, but he said: the Government prohibited taking wood without permission and I am only doing my job". Another woman from Um Hagar village said: "We agree that we should not cut trees planted from seedlings because they belong to the Government, but they are asking us not to use even those growing naturally by *Allah*".

Earlier in this chapter we showed that villagers have very little appreciation of the officials' classification of forest resources. Hence, among villagers violations against forest laws are not considered as crimes. In this section we continue to argue that government interventions led to confusion about management institutions, and to situations were some villagers lost responsibility for maintaining trees in their surroundings. We first discuss the issue of confusion about resource management institutions and then move to the discussion regarding loss of motivation among villagers for proper management of the resources.

In chapter two, we showed that Wiersum (1992c) differentiates between formal and informal forest management based on the procedures followed by users for procurement of certain forest products. However, during this study we realized the existence of a third kind of situation. A villager in Tendulti area told us about the following case:

> He said: "Not too far from here there is a *kitir* forest which is protected by people living near that forest. For the forestry people, it is considered as a reserve forest, so I needed to get permission from them, also I cannot carry wood from there without having a removal pass. However, villagers also claim ownership of the same forest and they will not allow me to take the wood if I show the permission from the forestry department, so I had to pay some money to the villagers as well".

Here, the villager needed to have permission from two sources before being allowed to collect some wood from a forest. This case shows a type of formality which is not only related to procurement procedures but also to management institutions. The case is an example of a situation where 'formal' institutions, notwithstanding existence of other forms of tenure, claim ownership of the resource. This leads to situations where both 'formal' and 'informal' institutions co-exist, though neither of them appreciates the existence of the other.

The second problem with government intervention in matters of tree/forest resource management is the creation of an atmosphere where many social actors have lost the motivation to use the resources in a sustainable way - in other words, it creates a suitable environment for what we referred to in chapter two as situations of "social dilemmas" (Messick and Brewer, 1983) and "tragedy of the commons" (Hardin, 1968).
A village sheikh explained to us that he believes that forestry people contributed to the misbehaviour of villagers because they gave the villagers the impression that these forests do not belong to them but to the Forests Department. A villager from Wad Braima explained: "Now, all trees belong to the government even if they are growing on your land. So, we ourselves cannot cut them. However, we cannot keep other people from cutting them either, because then, they might say: they are not yours, you did not inherit them from your parents, these trees belong to the Government". A school teacher in Tendulti area said: "Before, there were areas known as *ghifar*, where trees used to be under the sheikh's supervision. Now, all trees belong to the forestry people, and it is up to

them if they want to protect them or not. But, if I find someone cutting them I will not stop him".

Describing similar situations, Gueye and Laban (1992: 11) argue ".. it can be said that the villagers have to a great extent lost any feeling of responsibility for managing the natural resources of their land. They are often in a state of uncertainty as to their rights to the land and to the trees. In these conditions, it is not surprising that the villagers no longer feel really responsible for the protection and management of the woods on their land". Hence, as we indicated earlier, villagers differentiate in their dealings between government and other private or communal forests. A village sheikh in Singa area said: "The difference between communal and government forests is that the latter is public money and open to all people, whereas community forests belong to specific groups of people. (..) Nobody will dare to touch even the riverine forests if they are allocated to a village".

Based on the experiences gained during the course of this study, we can present the following scenario to show the situation of forest resource management in Sudan.

In chapter two we presented Mckean's six property types (Mckean, 1992). We believe tree/forest resources before government intervention belonged to type four, five and/or six. However, officials assumed that these resources were unowned (non-property type) and intervened to created property types two and three (public property held in trust for the public and state property that is essentially exclusive). The resulting situation has been described by Blaikie as follows: "Customary rights of land use, originally codified under the British mandate, are overlaid and contradicted by further laws passed since independence. Most of these laws increase the power of the state (at least on paper) in allocating land, designating forest reserves, and forbidding the cutting of trees, but due to the very volume of them, and their contradictory messages, they actually reduce the state's power to achieve much in practice. (..) because of the nature of agrarian society, these inconsistencies can be exploited in the countryside by the most powerful classes for their own benefit" (Blaikie, 1989: 29). The government was not able to play its role in providing incentives for appropriate use, and deterring misuse, of forest resources. In this connection, Beck et al. (1989: 41) argue that Government failed to provide a favourable environment for various actors to use the resources properly. They mentioned the following problems:

(1) Legislative aspects. Comprehensive legislation is either lacking, fragmented or contradictory. Moreover, laws are implemented inefficiently. All in all, "the present legislation is not coherent and consistent enough to replace

the communal land tenure system that still rules most people's use of the natural resources".

(2) Institutional aspects. In spite of the abolishment of the native administrative system, the departments responsible for natural resource management suffer from technical, logistic, operational and professional limitations. Moreover, the coordination of their activities is either lacking or inadequate.

Consequently, the forests came to belong to type one, where the resource is unowned.

To conclude this section about disputes over the management of forest resources in Sudan, we argue that without appreciating the phenomenon of 'legal pluralism' the state tried to impose its laws (state law). Moreover, the state abolished the native administration system. Traditional institutions seriously eroded by being denied powers of exclusion and access to the resources. Furthermore, the state was effectively unable to manage the resources because the local institutions created by the state failed to enforce state law. Consequently, in many situations the state intervention resulted in removing the conditions for a genuine communal property rights regime leading to situations where forest resources acquired the characteristics of an 'open access' system which is open to all.

The situation as described in this section seems to be gloomy. Nevertheless, conditions are continually changing and consequently social actors are changing their management strategies. However, it is not enough to know that change is taking place, but it is also essential to have an idea about the directions and nature of the change. This is what we intend to discuss in the coming section.

4.4.5 Changes in social actors' strategies

An ex-forest guard remembering and praising the time when he was working as a forest guard explained how forestry people were working hard to protect forests. He told us: "People were nice, trees were much more plentiful than now, and officers were serious in their work. In our time there was only one car at Singa office but it was used only for work. Women used to cut trees as well, but we used to solve the problems more easily than now". Then he added: "But I have to say now everything is changed, villagers need more trees, economic conditions are worse, and in general villagers know more about trees and they are willing to plant them". Another forest guard describing changes in villagers'

behaviour concerning their relation with forest resources said: "Previously, women used to come to the forest to collect dead wood, but now they cut trees and take them home to make charcoal for sale. Men also are more willing to resist and some times fight when we ask them to leave the forest". Nevertheless, in general most of the research participants acknowledged that there is a noticeable 'positive' change in villagers' behaviour concerning forest resource management. Villagers are becoming more cooperative with foresters and they are willing to participate in the resource management. Villagers themselves identified extension and mass media as the main factors leading to changes in their behaviour, followed by economic reasons and finally environmental factors.

Villagers identified the following main changes in foresters' behaviour:

(1) Closer supervision from senior staff i.e. they come more frequently to the field.
(2) Increasing planted areas and better protection of forests.
(3) People's involvement e.g. community forestry programmes.
(4) More attention Paid to gum arabic development.

However, among the negative changes mentioned by villagers are:

(1) The forestry department stopped providing food rations.
(2) Foresters are over-cutting forests leading to more deterioration of forest resources.
(3) Foresters have become more aggressive towards villagers in applying forest laws.

Nonetheless, villagers in general are of the opinion that the Forestry Department is now more concerned with development of forest resources. Moreover, the great majority of villagers appreciated that foresters are now more keen and serious in their efforts to enhance forest resources development. The same opinion is also shared by the forestry research staff, although the staff of the educational institutions do not see significant change in foresters' behaviour.
Most of the villagers think that deterioration of forest resources is the main reason for the change in foresters' behaviour. This opinion is also shared by forestry officials and research officers.

In chapter two we argued that different social actors come to manage forest resources with various objectives. Depending on the existing power relations, social actors might reach to a certain accommodation valid for that particular time and place. However, we further argued that social actors being knowledgeable and capable (within limits) continuously try to use their 'agency'

to create more room for manoeuvre during the next round in the battle. In the coming section we look into social actors coping strategies.

4.4.6 Social actors' coping strategies

In general this study indicates that different actors are now trying to control more forest **land** (with little interest in trees) in the hope that one day they can exploit it. A senior forestry officer explained: "Internationally, a forest is a land which is predominantly covered by trees, but for us in Sudan forest could mean any piece of land even if it is without a single tree". In their effort to control more land, social actors deploy different strategies. The following are some examples:

First, social actors arrange of alliances between themselves against other social actors. A common feature of these kinds of alliances is that villagers always try to gain the support of one or more official actors. The following case illustrates how nomads strategize and make alliances with forestry authorities:

> Nomads in El Gadarif district have established a communal forest. We discussed with some of them their motives and establishment procedures. We realized that there were some problems between these nomads and a big merchant farmer concerning the ownership of the land. It became clear that nomads are participating in the community forestry programme to try to legalize and legitimize their right to the land. They may be able to get the foresters' support to register the land in the name of their village as a 'grazing forest'.

However, rich farmers and orchard owners also make arrangements with departments such as Plant Protection, Horticulture, and Agricultural Investment Authorities.

Secondly, some social actors try to manipulate political issues to change land use systems in the Blue Nile riverine forests. They pretend that they could produce vegetables and fruits for nearby cities as part of the food security campaign raised by the Government. Sometimes, villagers claim that they do not have land for subsistence.

Thirdly, forestry officials talk about environmental influences of forest resources and raise the issue of national security concerning the effect of forests on

agricultural production. Moreover, foresters talk about forests as the main source of energy supply.

Fourthly, despite the fact that the recent forest policy and laws acknowledged the rights of other social actors to own trees/forest, the same laws also contain strict sentences for violators. The following case shows how villagers deal with such strict laws.

Once on our way back from Tendulti, we saw stacks of firewood along the highway. We wanted to buy some for a friend. We stopped our vehicle, but there was nobody to buy from. Then from a distance, we saw someone coming. Suddenly, he stopped and we shouted to him to come because we wanted to buy. He started to move very slowly as if he was afraid of something. The driver recognised this and explained to us that the man has realized that this vehicle belongs to the forestry people and that is why he is hesitant to come. At last he came, and immediately started to swear that these stacks did not belong to him and even that he did not know the owner. We tried to explain to him that we are not working for the FNC. But, it was clear that the man was too afraid to sell 'his' wood. We left him and moved on. A few kilometres further on we found another group of stacks. Again there was nobody nearby, but when we stopped three women appeared. Strangely, they seemed to have more courage than the man. After we bought from them, we discussed the case with them. They explained to us that they collect dry wood from the nearby forest. They put it on the highway to sell it to passers-by to earn some money. Forestry people do not allow this, and if they find these people with their stacks the forestry staff will take the wood and might take the villagers to jail. Villagers stay at a distance and only appear after being sure that no forest officer is around. Otherwise, they don't approach even if the passer-by started to take the wood for free. For them it is better to sacrifice the wood than be caught and taken to jail and have the wood confiscated.
The following questions came to the author's mind:
Why do women have more courage than men?
Discussions with foresters and other villagers revealed that traditionally, women have a special social status. It is not polite to be tough with women even in case of violations. If a man (officer) behaves otherwise he will be looked upon as an un-honourable man. Eventually, it is more likely that women will not be taken to jail, hence they have more courage to be engaged in forestry offenses.

Fifth, villagers have developed their own strategies for management of the "commons" and "social dilemmas". The following are examples of such strategies:

(1) Villagers use *Nafir*[6] in establishing community woodlots, weeding, and/or harvesting. In such gatherings, villagers always compete to display their skills and endurance in a picnic spirit. Moreover, participants feel proud and become more loyal to the work that has been accomplished.

(2) Villagers use techniques of 'social fencing' to protect their community woodlots. In this respect, some girls at Wad Braima village presented their experience of protecting their village woodlot:

> The girls said: "There are two women in the village forest committee to represent us. Because women always stay in the village they are more effective in noticing if there is anything wrong with our forest. When one sees anything, she very quickly reports it to the committee. Even children, if they see a branch being cut while playing, come running and shouting that a tree has been cut from the forest".
> We asked why this phenomenon does not take place in the case of a state forest.
> The girls answered at once: "But this is our forest, and we keep it because we expect to benefit from it. What belongs to the Government could not be protected the same as what belongs to villagers. In our case we asked the nomads not to bring in animals, but if it was a Government forest, they would have told us: this forest does not belong to you. In our forest, it happened only once that a man came to cut a tree. We heard the sound of the axe and we told our men and young boys to run after him, since then no one came to steal".

(3) During the cropping season, all villagers agree either to send their animals to another area with a herder or to join a village herder who takes the animals every day to graze away from cultivated lands. If someone finds an animal in his field, he takes it to *Zeribat al Hawamil* (an enclosure for strolling animals). The animal will only be given back to the owner after he has paid a certain amount of money as a fine. In case of large crop damage, the village sheikh will nominate a group to estimate the damage. The owner of the animal(s) has to pay the compensation to the farmer.

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[6] Nafir is a community feast arranged to help somebody in building his house or harvesting his crop. Moreover, it is used as a kind of collective activity to establish village social services such as schools.

Significantly, all this takes place at the village level and the role of the Government is only to act as an enforcer of last resort.

Having discussed social actors' coping strategies, in the next section we look at how they see the future of forestry development in Sudan.

4.4.7 Sudan forest resource management: future perspectives

In general most of the informants agreed that the best way to manage forest resources is through having a combination of officials' and villagers' management institutions. The resource would remain under the control of the state, but villagers should be consulted in every aspect of forest resource management.
In the following two paragraphs we discuss how foresters and villagers see the future of forest resource management in Sudan.

As indicated before, foresters at the institutional level see the participation of other social actors as a prerequisite for sustainable forest resource management. However, this study revealed that for many foresters, management still means reservation, control and protection. "Sometimes, foresters mean only reservation and protection when they talk about management. That is the case with most of the *dahara* forests. In fact only protection is not enough as these forests need real management. Trees like other living entities reach to a certain age and die. Management should follow an integrated holistic approach from seeds, seedlings through final felling and utilization", a forester in the field says. During the field work we did hear some foresters still repeating phrases such as; "All forests should be reserved", "People participation should be in agroforestry only", "It is essential to have some forests which are totally controlled by the Government. Villagers should establish their own woodlots. Village woodlots might not meet our definition of forest". However, as we have indicated before, foresters are changing their opinions and it is becoming more common to hear them saying: "Forest management need authority, but it is more in need of someone who can deal properly and wisely with local people", "Forests should be managed by the Government and local people together", and "Villagers should be involved in forest management from the planning stage i.e. preparation and revision of working plans". This latter opinion is becoming dominant among foresters as well as villagers.

In general villagers indicated that they prefer that forests be managed by foresters in consultation with villagers.

Villagers have various opinions about people's participation in forest resource management.

The Azaza village sheikh explained: "Villagers' participation in forest resource management is a good idea, but its success depends on how people interpret participation and what kind of benefits villagers will get when they participate. It is necessary to make clear these points from the very beginning". However, a villager from Wad Braima told us: "As far as the Government is involved our hearts will disagree", and an old man from Um Hagar village says: "We do not want a forest. The land which has been taken from us was very fertile, one *Mukhammas* [an area equal to one tenth of a hectare] could produce twenty sacks of sorghum. Every villager still knows the location of his land in the forest. If you leave the forest for us to manage, we will clear it and leave it empty like a tray". And an old woman from Um Hagar village put it this way: "If the forest is left to villagers to manage, nothing will remain. For me it is better that the forestry office takes care of the trees". However, another lady from Um Hagar had a different opinion: "Maybe we could benefit better if a village committee takes the responsibility of managing the forest, but foresters should take off their hands [i.e. stop interference]. Now, we even have to buy *Hatab El Dokhan* [wood used by women for a traditional smoke bath]. Our only benefit from the forest was getting wood. Now we are denied our right to collect it".

Asked about the possibility for new village level administrative units to help in forest resource management, both villagers and officials were doubtful and explained that before these institutions could play an effective role, certain conditions would have to be met.

Conditions for local level institutions sharing responsibility in forest resource management could be summarized in the following points:

(1) Political will on the part of the Government and readiness to give real chances and facilities to native administrators i.e. legal and material support.
(2) Abolishment of other local level committees.
(3) Creation of a high level of awareness among villagers concerning responsibilities of native administration and the importance of sustainable management of forest resources.
(4) Training of native administrators.
(5) Selection of native administrators by the villagers themselves.
(6) Close monitoring and cooperation by forestry authorities.
(7) Allocation of a specified share of income from forests to village social services (determined by villagers).

At present, cooperation between forestry authorities and NAS leaders is either lacking or ineffective. A village sheikh declared: "Forestry people rarely contact us. Only once, there was a problem when some women cut some trees from the forest, then the forestry people contacted us to talk to husbands of those women".

4.5 Summary

This chapter revealed that whereas a forest is the unit of concern for officials, it is the tree which draws villagers' attention more than the forest as such.
In general social actors perceive trees/forests as sources and signs of life. In addition, different actors have their own perception of trees such as a source of income, shade, sawn timber, non-timber products, and fodder. Nevertheless, under some conditions actors develop negative attitudes towards forests. They see forests as competitors for fertile land, host of birds and insects. The attitude or perception varies between and within types of actor depending on occupation and personal biases.
The chapter indicates that there is a common agreement concerning forest resources' deterioration. However, various social actors have different explanations as to the causes. Foresters see mechanized rainfed farming as the main cause, whereas villagers believe that drought is the main reason for deforestation. For villagers, drought is only a part of *Allah*'s affairs.
A variety of beliefs exist among social actors in relation to trees and forests. These beliefs are mostly location and/or species-specific. Beliefs cover taboos, good omens and use of tree products for cultural and medicinal purposes.
Foresters classify forest resources based on their roles, land tenure and establishment techniques. Villagers, however, differentiate between forests based on dominant tree species and tree tenure. In general, villagers do not appreciate official forest classification. Instead, villagers' management strategies are more governed by their own categorization.
Similarity between foresters' and villagers' management objectives is the exception rather than the rule. Foresters objectives are focused on sustainable management of forests for provision of forest goods (mainly firewood and charcoal) and services to the nation. Villagers keep trees for fruits, shade, social/cultural reasons, spiritual reasons, but rarely for wood alone. Sometimes what is important for villagers is labelled as 'of minor importance' by foresters.
Most of the land in the study areas is legally state-owned. However, villagers have *de facto* individual ownership and their customary regulations, which allow individuals to own and inherit land, are still effective.

Because they see trees as the important unit of concern, traditionally, villagers did not care about ownership of forests as such. However, ownership of trees on private and communal land was based on species. Hence, at a certain location some trees were individually owned while others were seen as the common property of the village.

The Native Administration system was incorporated into the general government administrative structure in Sudan by the British. Government legal support together with local customs made the system a very effective one for mobilizing local support for management of natural resources in the past. It is believed that NAS have played effective roles in protection of forest resources. Native administrators used 'modern' state laws and their native wisdom to enforce government regulations concerning protection of forest resources. According to villagers, their native system, unlike state institutions, does not allow for cheating.

Towards the end of 1960s the system was abolished and native administrators have lost much of their legal status and to some extent their social status.

Government intervention was seen as a good step without which villagers believe no forests would have remained. Villagers perceive intervention mainly in the form of prohibiting tree cutting from government forests. However, villagers indicated that they no longer enjoy the privileges of being close to forests, as they do not have free access to firewood and building materials. Moreover, it is believed that although the government took over forest resources, in many cases government institutions failed to effectively execute proper management plans and to enforce forest regulations at grassroots level. Consequently, in many situations government intervention resulted in removing the conditions for a genuine communal property rights regime leading to situations where forest resources become common-pool resources open to all.

Among the management strategies used by villagers, were enhancing natural regeneration and protecting coppices coming out after felling old trees. Villagers traditionally were not familiar with tree planting either from seeds or seedlings. However, during the British period villagers were encouraged to carry out enrichment planting for their "gum gardens" by direct sowing. They traditionally managed these forests on a shifting cultivation system. Official forest management strategies concentrated on reservation of forest lands, patrolling against illegal tree cutting and opening of fire-lines. The foresters, like the villagers also depended on protection and encouragement of natural regeneration. This technique is still dominant in most of the *dahara* forests. However, afforestation programmes using direct seeding and planting seedlings are becoming more common. For riverine *sunt* forests, "scientific" management working plans are prepared.

A special strategy adopted by foresters and welcomed by villagers is the taungya system. Nonetheless, during the implementation it became clear that the agenda of the villagers and of officials did not match.

This chapter indicates that land is still of more importance to social actors (including Forests Department) than tree resources. To this end, actors develop different coping strategies such as manipulating political issues and power, and arranging various kinds of alliances. Foresters are developing strategies ranging from asking villagers to participate in forestry programmes, to issuing and trying to enforcing more severe punishments for forestry offenses. Villagers, on the other hand, are developing various coping strategies to make sense of the new circumstances. Some villagers are trying to make use of the opportunities created by the new forest polices, which are in favour of social forestry, to control more land and/or forest resources. Other villagers are developing skills to avoid being caught and punished by the severe articles of the new laws.

Villagers have developed various strategies to deal with the commons. These strategies range from 'social fencing' as a collective action to protect common resources such as village woodlots; to the establishment of *'Zeribat al Hawamil'* to protect private farms; to mobilizing collective action using "*Nafir*" for establishing village forests.

In spite of the present problematic forestry situation in Sudan, this study reveals that both villagers and officials are becoming more concerned with the development and sustainable management of forest resources. It is believed that economic conditions and environmental changes are the most important forces leading to this change in social actors' attitudes and behaviour. Moreover, the roles of extension and mass media in the creation of awareness is well acknowledged by social actors.

Both officials and villagers see the future of forestry in Sudan in the cooperation between forestry authorities and village level native institutions. However, the situation of mutual distrust needs to be improved before actual steps can be undertaken in this direction. To day the real dilemma is in fact reflected in the growing popular feeling that neither native adminstration nor local level official systems are in a position to manage forest resources properly. On the one hand, the present native administrative system has neither the necessary social respect nor enough legal support to play its previous role. On the other hand, the official forestry agency does not have enough resources or the necessary social support to manage forest resources alone.

For the native administration system to play an effective role in sustainable management of forest resources, the Government should be willing to provide enough legal and material support. In addition, more awareness and training is required to prepare both villagers and their leaders for the new responsibilities.

5 ASSESSMENT OF KNOWLEDGE PROCESSES IN RELATION TO FOREST RESOURCE MANAGEMENT IN SUDAN

5.1 Introduction

In their everyday interaction with natural and human activity systems, social actors constantly make decisions and choices. Knowledge is one of the crucial inputs in these decision-making processes. In chapter two, we argued that knowledge influences (and is influenced by) social actors' perceptions of trees and forests. As a result of the interaction between knowledge and perceptions, actors develop management objectives. However, social actors need knowledge again to translate their management objectives into management strategies and activities. In this chapter we discuss the following main question:

> *What kind of knowledge and information activities are performed by social actors in their effort to manage forest resources? And what is the nature of the relationship between social actors' changing strategies and knowledge processes?*

In the coming sections we discuss social actors' knowledge and information activities, then proceed to tackle the issue of local people's knowledge about trees/forests. Toward the end of this chapter we look at actors' knowledge and information activities from a system perspective.

5.2 Knowledge processes

Knowledge processes encompass such activities as knowledge generation; acquisition and exchange; and translation of knowledge in such a way that it can be used in everyday decision-making processes. The following is the main question to be addressed in this section:

> *How and in what social context is actors' knowledge about tree/forest resources developed and utilized?*

Through answering the above question, we assess social actors' knowledge activities in relation to management of tree/forest resources.

5.2.1 Processes of knowledge generation

A prerequisite for understanding social actors' knowledge processes is to look into ways by which they generate or develop knowledge. Furthermore, one needs to have an idea about the social context within which actors develop their knowledge.
Knowledge in this study is perceived as a human construct. It is not only generated by scientists in laboratories and research stations, but equally developed and utilized by lay people in their daily interaction with their social and physical environments. In this section we discuss how and in which social contexts social actors generate knowledge. We start by discussing officials' knowledge generation processes and proceed to discuss local people's involvement in knowledge generation processes.

Official forestry research
Before the establishment of the Forest Research Centre (FRC) in 1962, forestry research used to be conducted on a small scale by interested field staff. The FRC was established as part of the Forest Research and Training Institute with the special fund of the United Nations Development Project (UNDP) and the Government of Sudan and executed by FAO. Moreover, regional research centres were established in the Central Region, the West and the South (World Bank, 1986).
During that period, forestry research was part of the general Forests Department and there was no special staff allocated for research, but the staff used to be exchanged between research, education, and the general forest service.
The primary purposes of the applied research programmes of the FR were to train the newly recruited staff in research methods and procedures and at the same time to meet the technological needs of the large scale forest development programme planned by the government to satisfy the timber, poles, fuel wood and processed wood needs of the growing population. However, within a few years following the end of the UNDP/FAO project, it was felt that the FR was receiving inadequate financial support. Moreover, career prospects for the professional staff encouraged several of them to move to other posts within and outside the government service to the detriment of the continuity and effectiveness of the research programme.

Following a request by the professional staff working at that time in the research section, in 1975 the FR was transferred from the Forests Department to become a component of the Agricultural Research Corporation (ARC). The ARC is a semi-autonomous body within the Ministry of Agriculture. It is one of four major sectoral research corporations of the Government of Sudan that form a loose network under the National Council for Research (NCR). Consequently, staff conditions were immediately improved. Unfortunately, the benefits of the change seem to have ended there. Among the regrettable consequence of the transfer was the loss of virtually all links between forest research and the forestry service. Furthermore, with the transfer of the FR from the Forests Department the nature of the research changed from applied to more basic research. "An unsuccessful effort was made to restore the former relationship through the appointment of a research programme committee (..). However, after a short period, it became defunct" (World Bank, 1986: 2).

In general, official forestry research programmes concentrate on the following issues:

(1) Species and provenance trials mainly of eucalyptus trees for irrigated plantations.
(2) Dry region research on drought resistant species like prosopis trees.
(3) Gum arabic research which emphasises drought tolerance, high productivity, and spacing trials with *hashab* trees.
(4) Wood technology research which conducts experiments on the characterization of Sudanese forestry tree species.
(5) Seed technology research which is involved in seed germination, viability and purity tests.

With the exception of the gum arabic research, all other sections used to carry out their research programmes without having any link or contact with local people. In 1960s, the gum arabic research started. Its name was the Gum Arabic Research and Extension Project. In fact, this was the first and only forestry extension endeavour prior to the 1980s. The gum arabic research and extension section used to organize extension campaigns to show villagers 'proper' tapping techniques. This project introduced the use of an instrument known as *Sunki* as a replacement for the traditionally used axe. Later on, when the whole Forestry Research moved from the Forests Department and joined the ARC, it was realised that the Gum Arabic Research and Extension section was doing more extension work at the expense of its basic mandate which is to conduct research. Consequently, the term extension was removed from the title, hence the present name is the Gum Arabic Research Section. In the late 1980s, the Western Sudan Agricultural Research Project (WSARP) was

launched with funding from the USAID and the Gum Arabic Research became part of this project.
A general strategy deployed by the WSARP is based on the farming systems' research approach which emphasises some degree of farmers' participation in the research process. At present, the Gum Arabic Research Section is carrying out farm trials using farmers' gum gardens to carry out spacing trials and different tapping techniques.
In addition to the FRS of the ARC, faculties and departments of forestry at higher educational institutions conduct some forestry research. Many of the staff of these institutions participate in forestry research through training of post-graduate students (to be discussed in chapter six). In addition, some GOs and NGOs working in the area of forestry, e.g. FDES project and CONCERN, have conducted some applied research for their own projects because of dissatisfaction with the bureaucracy of the FR authorities. However, in most cases these projects followed no different research approaches than those of the FRS which virtually did not see local people other than as passive recipients of research results conducted by the researchers. In the only case where CONCERN tried to conduct research together with villagers, farmers were not involved from the beginning: "We do not need them at this stage, they know nothing about it", an assistant researcher says. The study indicates that many researchers still look down on villagers and think that they are more knowledgeable than villagers.
At present, there are continuous debates among foresters about the contribution and roles of the FRS to forestry development in Sudan (to be discussed in section 5.4).

It is becoming increasingly realized that laboratories and research stations are not the only sources of knowledge. Nettleford argues that it is necessary that the researcher knows what the ordinary rural folk have learned over thousands of years, (Nettleford in Van den Bor, 1989: 4). We see villagers no longer as passive recipients who wait for 'scientists' to generate knowledge and extension people to carry it to them, but instead villagers are rather perceived as partners who are actively engaged in knowledge and information activities.

Process and nature of villagers' knowledge generation
With time, people living close to forests have developed various kinds of knowledge about trees and forests. In the previous chapter we indicated that people living in the gum belt have been familiar with gum production for hundreds of years. Consequently, they developed an enormous amount of knowledge and experiences concerning *hashab* trees. In this section we discuss

ways by which villagers acquire and generate knowledge. We do this through presenting some of the cases and experiences we came across during the field work.

The first case

From Tendulti area we present the following case to highlight knowledge and information processes regarding gum production and management of *hashab* forests.

Traditionally, villagers were familiar with gum trees and tree-tapping techniques. However, due to the deterioration in *hashab* forests which continued for more than a decade, many of the new generations are not familiar with gum production techniques. But, still that did not influence villagers' appreciation for the roles of the *hashab* trees. In the early 1980s, the Sudan/Finland project started its programmes in the area. Many villagers around Um Hagar nursery found jobs as labourers in the nursery. At the nursery, villagers for the first time saw the root pruning technique. When the project offered seedlings, many villagers planted *hashab* in their farms. Even those who had not witnessed the 'golden period' of gum production in the area were convinced as a result of the many extension campaigns. Villagers say: "extension people showed us by cinema, how *hashab* trees are going to produce gum in four to five years". The villagers waited for five years and then tapped their *hashab* trees. The trees did not give gum. They tried for a second and third time and concluded that these trees will not produce gum. Villagers tried to find the reasons why these trees did not produce gum. Being traditionally nomadic, villagers were familiar with the tradition of castrating male animals (mainly sheep). Castrated sheep grow faster and give more meat. Remembering back a few years, villagers remembered the strange technique of root pruning seedlings. That was in many ways similar to what villagers used to do to their animals. Hence, villagers concluded that *hashab* seedlings provided by the project were castrated. Like their castrated male sheep, the project's *hashab* seedlings grow more vigorously and just as their animals were sexually functionless, *hashab* trees failed to produce gum.

However, some village elites, like teachers, seem not to be happy with the idea of 'trees being castrated'. They tend to give different explanations. A villager from this category explained: "I know why *hashab* did not produce gum: before, there was an insect which used to appear during the tapping period and a lot of grasses used to grow under *hashab* trees, now both these have disappeared".

Another group of villagers believe that seedlings provided by the project were not of *hashab* but of *Shubahi* (Acacia laeta)[1]. A villager from Um Hagar claims that people who sell *hashab* seeds to the Forests Department mix them with *shubahi* seeds as the latter normally gives an enormous amount of seeds which is easier to collect.

We took these arguments to the first group, who believe that trees are castrated.

We asked them: is there any possibility that *hashab* trees did not produce gum for other reasons?

Then these villagers indicated that they know many other factors which influence gum production.

Villagers mentioned drought, grazing and locust attack. However, they insisted that none of these factors is the reason in this case, but the seedlings were castrated. A villager said: "We know how to differentiate between *hashab* and *shubahi*, what we have is for sure *hashab*". Then, villagers continued to argue that *hashab* from seedlings are not even similar to the trees they were familiar with.

We asked: how do you differentiate between trees from seedlings and naturally growing ones?

A villager said: "Trees growing naturally from seeds develop deep roots, whereas those growing from seedlings only develop shallow roots" and then he added: "We know all these things, we have a University degree in these matters".

Curious, we asked how they differentiated between shallow rooted and deep rooted trees.

At once, villagers mentioned the following two points:

First, "When the wind comes, shallow rooted trees are uprooted whereas deep rooted trees are only broken".

Second, "We are nomadic people, we go out with our animals, there we pull out seedlings to chew and suck the milk [sap] from the roots. Some are sweet like honey and others are bitter, we make rope from roots and we play together and try to slash each other with trees' roots. Then we knew which tree develops deep roots and which one does not".

We then asked: what do you think cutting seedlings' roots do to trees?

They explained to us: "When the main root is cut the tree does not develop roots deep enough to fetch water in the soil". An other villager even showed us through sketching on the ground how trees develop tap and lateral roots.

[1] This is a hybrid species from Acacia senegal (Hashab) and A mellifera (Kitir).

Our intention here is not to agree or disagree with the villagers' explanations, as it will a take long time before foresters can prove or disprove the existence of any relationship between the root pruning and physiological phenomena leading to gum exudation. However, we wanted to shed light on some procedures by which, and the social context within which, villagers develop their own knowledge.

The second case

This case is made-up of two small cases which show how villagers conduct experiments. In the first case a villager from Azaza shared his experience by saying:

> "We do not carry out experiments as such, but we observe and learn from what takes place incidentally. We believe, everything is from *Allah* and He teaches us little by little and according to our needs and capabilities. For example; after planting a certain crop we might notice that the crop is not performing well with most of the farmers. We try to find out whether there is any insect, check if there was a problem with water and look into the weather, maybe the season was abnormally hot or cold. We discuss and exchange our experiences and opinions. We make connections between various factors which led to that unexpected crop failure and avoid it next time".

However, sometimes villagers might conduct experiments to solve certain problems. In the second case, villagers claim that they have carried out different experiments with tapping of *hashab* trees, before reaching the conclusion that trees provided by the *khawagat* are castrated.

Some villagers from Um Hagar and El Milaih explained how they jointly, but in an un-organized way[2], carried out experiments. A villager from El Milaih says: "We tapped the trees using various tapping methods, different tree-age groups and different tapping periods, but the trees did not produce gum. Then we investigated by contacting our friends from other villages and found out that these trees are castrated".
We asked how they organize these kind of trials.
Villagers explained that each one was not trying in isolation from others, but every one was communicating with other villagers to find out what kind of trials had already being done, and then deciding to try a different way. Villagers continued to experiment and share results till they reached a conclusion acceptable from their perspective.

The third case

This case shows how villagers develop knowledge by careful observation and critical thinking. An old man from El Milaih village told us of his experience:

"A long time ago, while I was sowing *hashab* seeds in my *bilad*, a nomad came, riding on his camel. After we exchanged greetings, the following conversation took place between us:
The nomad said: you are sowing seeds very closely, this is not the best way to plant *hashab*, you should leave wider spaces between sowing-pits.
I said: do you want to show me how to farm! where did you learn about farming?
The nomad said: Yes, we are not familiar with farming, but normally when we pass through *hashab* forests with our animals, we notice that thick *hashab* forest produces more seeds, but less gum, whereas widely-spaced trees give less seeds and good gum"[3].

[2] Experiments were un-organized in the sense that there was no any kind of organized agreement where roles of various participants were decided beforehand.

[3] This inverse relationship between seed production and gum production has been confirmed by forestry researchers.

The fourth case

This case also consists of a number of small cases which are all related to techniques used by villagers for tree species identification.

First, villagers in Tendulti area differentiate between *hashab* and *shubahi* using different criteria from those used by foresters. Foresters use the types of prickles, whereas villagers use the colour and texture of the bark. Villagers say: "When you peel the bark of *shubahi*, it removes easily and without tearing. We make rope from it [*shubahi* bark has longer and stiffer fibres]".

Second at Azaza village, people differentiated poles already infected by borers from two tree species solely by looking at the bark of the poles. They indicated that when there is no bark they can use the colour of the heart of the wood e.g. the *sunt* tree has brick-red heartwood. Villagers differentiate between different shades of one colour e.g. light-red, dark-red and brick-red.

Thirdly, villagers at Wad Braima differentiate between wood from different tree species based on susceptibility to insect damage e.g. *sidir* is resistant to termite, *talih* is easily damaged by beetles.

Fourth, we have seen villagers at El Milaih village identifying wooden poles using density, using terms like light and heavy. Villagers decide about density simply by knocking on the piece of wood.

In an earlier study Mukhtar and Warrag (1994) established that tree identification by villagers is based on the following morphological characteristics:

(1) The crown, its shape and size.
(2) The stem form and branching system.
(3) Colour and composition of leaves .
(4) Bark texture and colour.
(5) Flower shape, colour, odour and time of flowering.
(6) Fruit and seed shape, size, colour, taste and whether edible and/or palatable by animals.
(7) Presence of aerial roots.
(8) Location and soil type where trees grow.
(9) Resistance to fire.

However, based on this study we add the following points:

(1) Within the one colour, villagers differentiate between different shades.
(2) Sometimes, villagers use wood density.

(3) Villagers do not only use bark colour and texture, but they also use the nature of the bark's fibres.
(4) Villagers do not base their identification only on external (morphological) features, but they also use internal 'anatomical' characters of the wood, such as the colour and structure of the heartwood.

From the above cases we derive the following lessons:
(1) Villagers are very good observers. They observe critically and intelligently.
(2) Local people's knowledge is holistic, not bound by time and space. Knowledge generation is an ongoing activity, during which villagers look through time and space to learn from their own experiences and those of others.
(3) Local people's knowledge generation takes place at times when it is really needed. (Innovations are mostly related to the extent and magnitude of an actors' need). Villagers generate, adapt and/or adopt certain knowledge because they actually need it for their livelihood.
(4) One way villagers do experiments is by allowing every one to try a certain experiment (instead of each one carrying out all trials himself). Then villagers share the results and exchange their experiences.
(5) Mostly, villagers start their knowledge generation process from a rather concrete experience, building on such an experience, villagers then carry out investigations.
(6) In general, villagers follow something like the classification-keys of "scientists" and they proceed step-wise through the identification process till they complete it by identifying the type of the tree.

By way of summing up we conclude: villagers do not have research stations or laboratories, but instead they make use of the totality of the environment in their surrounding. Consequently, villagers learn on the farm, from animals and natural phenomena. Furthermore, among local people there is no one whose job is to do research, but everyone is a (re)searcher. (Re)searching for villagers is not a profession, but rather it is a survival strategy and part of their livelihood.

Discussing knowledge processes entails giving consideration to such activities as generation, exchange and utilization of knowledge. In this section we addressed the issue of knowledge generation. Leaving the discussion of information exchange to be tackled later, in the next section we discuss knowledge utilization.

5.2.2 Knowledge utilization and decision-making

It has already been suggested that local people's knowledge is developed mostly in response to urgent needs or in 'modern scientific' terms it is of the action-research or research and development (RD) type. Moreover, from the previous chapter it was clear that historically villagers did not do very much about the establishment of forest resources. That was mainly due to the fact that forests were capable of renewing themselves naturally. However, villagers have developed an enormous knowledge about forest utilization.
This study indicates that whereas foresters have for long concentrated their efforts on silviculture and developed rich experiences regarding nursery techniques and plantation technologies, the area of wood uses in Sudan remains the domain of local people. A wood technologist at the Faculty of Forestry declared: "So far we have done very little in this area, most of the Sudanese wood/timber utilization is based on local people's own experiences and is not on a 'scientific' basis".

Wood use among villagers in most cases is species-specific. However, some trees are used for more than one purpose. Villagers have developed skills to differentiate between properties of various types of trees and hence established certain uses for each type of trees. Villagers have realised that *kitir* has high caloric value, and so have decided to use it for charcoal production. However, villagers use their own terms to express these kinds of findings. A villager from Wad Braima says: "The wood from *kitir* is better for charcoal than *talih* because it is stronger and less smoky. This knowledge I gained by experimenting and experience[4]". Moreover, local people have recognized that *sidir* is termite resistant and they have used it for building their houses. They have realized that *sunt* wood is not affected by water, hence they have decided to use it for building boats. By experimenting and experience villagers have come to know that wood from *haraz* does not impart any objectionable odour and that normally *haraz* trees develop good log sizes, and consequently, they have used them for making traditional oil mills.

Sometimes, foresters do not try to acquire a holistic view of situations before starting forestry programmes, but they think rather in terms of isolated programmes. To give but one example is the case where extension staff advised villagers to plant eucalyptus trees without considering problems of seasonal

[4] The villager links the two words 'experiment' and 'experience'.

water-shortage and termites. That resulted in the villagers losing their whole forest crop (Mahir, 1992). Moreover, professional foresters rarely make use of their 'formal' knowledge gained at universities (to be discussed in the next chapter). Unlike foresters, villagers, develop holistic views of circumstances (within the limits of their knowledge), before engaging themselves into a programme. The following case shows how villagers make use of knowledge and experiences in their planning and decision-making process.

Normally, foresters recommend planting of Eucalyptus microtheca wherever water availability is not secure. Accordingly, E. microtheca was to be planted in El Aama village. During the planting period the extension office ran out of seedlings from that variety. To meet their commitment, the extensionist gave Eucalyptus camaldulensis to villagers. The latter has smoother bark and broader leaves. However, at an early seedling stage it might be difficult for inexperienced persons to differentiate between the two varieties. Villagers planted the seedlings. Next year, the same people were supposed to plant more eucalyptus trees. But, this time they said: "We do not want seedlings like the one you gave us last year. If you do not have the other type we had better not plant this season". We thought maybe villagers did not want the E. camaldulensis because they had experienced some period of irrigation water shortage where seedlings performed poorly and therefore, villagers want to have the other type (E. microtheca) which can withstand such harsh conditions. The forester in charge of the community forestry programme had a similar opinion. However, in order to check our explanation we asked the villagers why they did not want this type of eucalyptus. To our astonishment, they gave a completely different reason. They did not want this variety (camaldulensis) because its poles are not as good as the other one, hence they will not fetch a good market price later. Villagers have realized by experience that microtheca's pole is better than the one from camaldulensis. They normally use the former for their houses. Once, they bought a camaldulensis pole for the mosque. Soon they discovered that it is not as good as the kind they were used to. They investigated and found out that there are different types of the eucalyptus.

It is clear from this case that villagers make use of their accumulated knowledge and experiences, give consideration to their management objectives, and consequently take decisions.

Normally, villagers tend to collect information from different sources and discuss it with friends and experienced, people and at the right moment everyone decides for himself. During the process they try to combine positive aspects from different sources and the outcome is an innovation or an adapted technology which includes positive aspects from various other experiences. However, it is not always the case that it is easy to grasp the good aspects of various experiences. Sometimes information provided or collected from different sources might be of a very contradictory nature. To show how villagers manage such a situation we present the following case where a villager from Azaza village talks about his experience when he wanted to repair the roof of his house.

"Once I wanted to repair the roof of my house. I contacted several persons to get an idea about which kind of wood I could use. Ali advised me not to use *ban* but to use *sunt*. Mohammed recommended *ban* and said: *sunt* could easily get damaged by insect-borers and there is nothing better than *ban*, and I could go and see it at his house".
We asked: "But who was right and how did you manage such contradictory information?".
He said: "You see, in fact there was nothing wrong with the information provided by either one. Both Ali and Mohammed were honest in telling their experiences and they provided advice based on what they have experienced. Ali used *ban* directly from the forest without any treatment and maybe he did not leave it to dry properly and his poles got twisted, therefore he advised me not to use *ban*. But Mohammed used wood from an immature *sunt* tree and his poles were damaged by insect-borers, so he advised me to use *ban*, but not *sunt*". Then the villager decided to use *sunt*, because *ban* is more expensive. The *sunt* he can get from the nearby forest. The man contacted the forestry office and got permission to cut a tree. Under the supervision of the forest guard he selected a mature *sunt* tree. During the field work the man showed us the pole and said: "It is already five years since I got this pole and you can see it is still in good condition".

By way of conclusion, we argue that having knowledge does not necessarily mean that one will behave in accordance with it. During the field work we came across many cases where villagers acted against their knowledge. For example, despite their knowledge and awareness of the desertification threat, villagers in

cash for subsistence. A forester also told us about a case where some villagers allowed their livestock to destroy a village woodlot. In fact, those villagers knew and appreciated the value of the village woodlot. Some of them even participated in its establishment. However later on, this group of villagers were doubtful of the real intention of some village leaders. Hence, they decided to destroy the woodlot.

In this section we discussed processes by which social actors develop and utilize knowledge and information. We have also tackled some aspects of local people's knowledge processes. In the coming section we shed more light on the characteristics of local people's knowledge in relation to forest resource management. In addition, we present social actors' opinions about local people's knowledge and discuss some of the merits and demerits of such type of knowledge.

5.3 Local people's knowledge in forestry: an untapped resource

It has already been indicated that far from being naive or stupid, in reality villagers have developed considerable wisdom through years of struggling for survival (Coombs, 1981). Among the forestry profession, the role of indigenous knowledge is also becoming more appreciated. Rocheleau (1988) argues that because trees require a lot of space and a long time to grow, rural people have a comparative advantage. For a long time they have known and been using whole systems in all their diversity and variability. Hence, local people have, over time, been able to develop a good wealth of knowledge and experiences about trees' interactions with soil, animals, and other crops; their uses; ownership and management.
In this section we need not repeat what has been written by scholars about local people's knowledge. The fact that local people are knowledgeable and experts in survival is well established and documented (see Chambers et al., 1989). However, our intention is to discuss the nature and types of local people's knowledge about forest resource management. Furthermore, we present social actors' reflections concerning local people's knowledge. The main question to be discussed is:

> *What are the perspectives of social actors on the value and nature of local people's knowledge in the field of forest resource management in Sudan?*

5.3.1 The character of local people's knowledge

Local people's knowledge is to a great extent dependent on what nature and their environment happens to offer. Tendulti and Singa being traditional gum production areas, many opportunities have arisen for local people to develop a good wealth of knowledge about gum production. This could be illustrated by the following examples:

Example one

> This is the case of the insect fly (*garaha*) which is believed to be associated with production of gum. After tapping the trees villagers wait for one week, and if this fly does not appear they abandon tapping and say: "this season will not be a good season for gum production". Most of the villagers have not seen the insect, but hear its sound when it flies. So far, there is no "scientific" explanation for this. An extension officer says: "This year we wanted to carry out aerial spraying against locusts but villagers opposed this and said that it is better for them to allow locusts to eat and they get what remains than to lose the season entirely by killing the *garaha* fly".

Example two

> When tapping *hashab* trees, villagers avoid injuring the main stem as it might kill the tree. They recommend that mainly the branches should be tapped. They say: "Do not tap the tree at its abdomen".

Another characteristic of local people's knowledge is that it is locality-specific. What is well known by villagers in one area might be totally unknown to villagers at other locations. This study reveals that while villagers in Kordofan have a good idea about *hashab*, villagers in Kosti area have limited experience and knowledge about it. Villagers at Wad Braima knew virtually nothing about *hashab*, other than that it is the gum producing tree.

A third characteristic of local people's knowledge in relation to forestry is its need/problem-oriented nature. Here we refer back to the case about 'castrated' *hashab*. Although, villagers from the beginning had noticed the 'strange'

practice of root pruning, they did not establish causal relations until they faced the problem of their trees not giving gum.

A fourth characteristic of local people's knowledge is related to the Arab culture which is more oral/verbal than written. Consequently, villagers do not document their knowledge by any means other than transferring it orally from generation to generation.

A fifth characteristic of local people's knowledge is that it has a rather holistic nature. Being more problem-oriented, local people's knowledge usually tackles the breadth and depth of the problem under consideration. The case (mentioned in the previous section) where villagers in Gezira refused to plant a certain variety of eucalyptus is illustrative of this.

A sixth characteristic of local people's knowledge lies in its culture-gender-specific nature. In general, local people's knowledge about trees/forests is gender-specific. A girl from Azaza village said: "Work in the forest is confined to boys and men". Consequently, except where local culture allows females to go to forests, women and girls do not know very much about trees. At Wad Braima village we met a woman from Tendulti area, who is married to a man from Wad Braima. She made the following comparison between women in her area and women in Wad Braima:

> In Tendulti fathers and mothers show boys and girls how to farm. She told us: "I used to go with my father and mother to the farm, they used to ask me to do so and so. They sowed and I covered the holes with soil. That is how we learn. Here, women do not work, they do not know how to farm, nobody showed them how to farm". Moreover, in Tendulti area, men tap *hashab* trees for gum and women collect the gum. "Tapping is a man's job, while women can participate in collecting gum from trees" the lady said.

In general, old people are more knowledgable than the young, whereas, among people of the same age, male are more knowledgeable about forests than females. Men have more contacts with the world outside their villages (and houses). However, during the study we came across special cases where women proved to be more experienced than men. These cases are related to the use of wood for fire and traditional smoke-bath (*hatab dokhan*), trees with good fibres for thatching such as *Zaaf*, and cosmetic and medicinal uses of trees. In

general, women are more involved in the use and trade of non-timber forest products.

A seventh characteristic is that local people's knowledge is not isolated from beliefs and spiritual issues. In the previous section, we showed how a villager from Azaza saw knowledge as a gift from *Allah*. Moreover, the study indicates that villagers sometimes fail to separate between feelings and mere scientific experiences. For example, they say forester (X) was a good man, his trees are successful, they grow very well. However, forester (Y) was not good, and his trees are not good. The whole area of local people's experiences of the medicinal uses of trees stands as an example of this characteristic of local people's knowledge.

Last but not the least, like scientists' "formal" knowledge, local people's knowledge can be classified on the basis of the way it was acquired, into empirical and mechanistic knowledge (Walker, 1992). For the mechanistic type of knowledge, villagers might observe a certain phenomenon, mostly by chance. They try to build causal relationships by linking it with other phenomena. This causal relationship is checked by various villagers. Then it becomes a theory which every one applies in his daily life e.g. the case of the *garaha* insect with *hashab* trees. As for empirical knowledge, villagers would carry out experiments in response to urgent problems.

Having considered the different characteristics of local people's knowledge, in the next two sections we address foresters' and villagers' opinions about this type of knowledge. We start by discussing officials' opinions about local people's knowledge, and then see to what extent villagers themselves appreciate their own knowledge.

5.3.2 Local people's knowledge: foresters' perspectives

We indicated before that experience is increasingly leading to wider acknowledgement of local people's knowledge. However, more often than not officials, out of their professionalism, look down upon such kind of knowledge. It is argued that villagers are in fact specialists in survival, but their skills and knowledge have yet to be appreciated and fully recognized (Chambers et al., 1989). In the coming paragraphs we discuss what Sudanese foresters think of local people's knowledge about forest resource management.

Based on the findings of this study, Sudanese foresters can be put into three categories as concerns their appreciation of local people's knowledge.
Foresters of the **first** category seem to be well aware and convinced of the value of local people's knowledge. Some of them even talk about situations where they have gained new insights from villagers. A female forestry extension officer shares her following experience:

> "I participated in a workshop about gum arabic production in El Obied. It was a kind of training of trainers' workshop organised for forestry extension officers. During the workshop we visited villagers and discussed with them *hashab* tapping techniques and why they tap this way and not that. I realised that villagers know their work very well". It was clear from the way she was talking with us that she is confident about villagers' knowledge and experiences. She goes on to say: "Villagers in *hashab* area talk about the benefits of trees like us, only they express it in different words. For example, they say that trees feed the soil talking about the fact that trees add to the fertility of the soil through the nitrogen fixation process".

This category mainly consists of foresters who have already had some experience working in extension and those who have had the opportunity to work in gum production areas.
The **second** category of foresters do not see any value in local people's knowledge. Mostly, these are fresh graduates. They seems to be enthusiastic and willing to show villagers what they have learnt at universities. A forester says: "I think we know about forestry better than villagers. We have to show them scientific ways of dealing with forests. Local people's knowledge is limited".
In between the two categories, there is a **third** category of foresters. Foresters of this category in fact acknowledge the existence and value of local people's knowledge about forests. However, they seem to be hesitant to advocate it. Some of them explained that they themselves sometimes make use of local knowledge e.g. medicinal uses of forest products, but they cannot tell others or use it in their extension work. A forester from this category says: "I do not believe very much in local people's knowledge. There are many mistakes and inaccuracies with this type of knowledge. I take it cautiously and investigate it carefully before I tell any one about it". Most of the staff of forestry research and educational institutions belong to this category.

5.3.3 Local people's knowledge: villagers' perspectives

As Coombs (1981) argues, villagers more often tend to accept and use their own knowledge and advice from their friends and local experts than follow foresters' advice. In general, villagers first contact old people and friends to ask for information. They only go to extension people and other specialists when the experience is totally new to their area. A villager at Azaza village referred to a local proverb which says: "You had better ask an experienced man, than ask a doctor". Most villagers believe that experienced people can provide better advice than those who studied at schools (see the case of the 'traditional' doctor at Azaza village in chapter four). Moreover, villagers tend to trust each other's experience, especially those who are old and known for their expertise, as is shown in the following example:

> In connection with the case of the 'castrated' *hashab* trees, a villager from Um Hagar says: "Uncle Ahamad[5] has tapped his *hashab* and it did not produce gum, so I will not tap my trees. Uncle Ahamad used to tap *hashab* even before the drought period. He contacted his friends in other areas and they confirmed that the *hashab* from *khawagat* does not produce gum".

Nonetheless, during the field work we came to the conclusion that sometimes villagers are not confident enough to use or to confront foresters with their local knowledge. Consequently, the following question came to our mind: When do villagers trust and feel more confident about their knowledge?
This study revealed a general belief among villagers that due to the deterioration of forest resources and restrictions on to the use of remaining resources, many people among the new generation do not know much about forests. Villagers indicate that traditionally there were people who were known for their expertise in dealing with trees. However, a villager from Tendulti says: "The people who were familiar with trees have died, now there is not much benefit from trees and people do not need to acquire knowledge". In general, even young villagers praise old methods of production and are negative about the present patterns of production. Their ancestor farmers, it is thought, were knowledgeable, devoted to their work, content and satisfied. Their behaviour was well adapted to the environment. A girl from El Milaih village says: "Our grandfathers were wiser than us, they kept their trees. They knew very much about trees as they were

[5] Not his real uncle, but he used the word as a form of respect to Ahamad who is older than him.

in close contact with forests. There are trees which we have only heard about like *Abanos* (ebony tree) but have never seen them".
In general, villagers seem to be very confident and proud of their empirical type of knowledge, such as in the cases of 'castrated' gum trees and the *garaha*. We have already presented a villager saying: "We have a university degree in these matters". However, villagers seem to be less confident and unwilling to confront officials in the case of the mechanistic type of knowledge which is not supported by empirical evidence. In such cases, they seem to acknowledge the superiority of scientists' knowledge. An old (retired) forest guard believes that studying forestry is a must for high level officers. He gave the following example to show the merits of what he called "science":

> He said: "Once, some trees in the forest started to dry out. We tried to find out the causes, but we could not. Then forestry research people came and to our surprise they asked us to dig around some infected trees. Then we realized that some insects were eating the roots of the trees". He added: "If that had been left to us, maybe we would not have found the reason till now".

Having reviewed the characters and actors perspectives with regards to local people's knowledge, we end this section by presenting the following remarks about the merits and demerits of villagers' knowledge about tree/forest resource management in Sudan.

5.3.4 Some merits and demerits of local people's knowledge

This study reveals the following merits of villagers' knowledge about forest resource management:

(1) Local people's knowledge is holistic. Their knowledge tackles issues under consideration as a whole.

(2) Local people's knowledge is more of an experiential type. Through knowing/reflecting-in-action, villagers develop a kind of knowledge which is more responsive to their ever changing circumstances.

(3) Being locality-specific and connected with villagers' beliefs, local people's knowledge has the advantage of being more suited to villagers' situations. Moreover, villagers' feeling of belonging and psychological readiness, influences positively the way they apply them.

(4) In some areas of knowledge such as agroforestry and forest utilization, villagers have developed good experiences which are far ahead of foresters' formal knowledge. These are potential areas where formal knowledge can gain from local people's knowledge.

Among the weak points of local people's knowledge, we identify the following:

(1) The very nature of being locality-specific creates difficulties when villagers try to apply their knowledge in other conditions. During the field work we came across situations where villagers' interpretations and their movement from an empirical to a mechanistic type of knowledge were not correct. For example, some villagers have seen eucalyptus trees growing in *gerif* soil in state forests, and consequently, in some villages people insist on planting them in their community woodlots (where the soil is not similar to the *gerif* one).

(2) Being need- and problem-oriented and not properly documented, local people's knowledge can get easily lost and/or forgotten. A good example is the case of villagers in Kosti area. For more than 15 years they have not seen tapping of gum trees. Many of the old people have moved to other areas or even started to forget the details of the work. As a result, new generations have no idea about the work.

(3) There are some areas of knowledge where local people have rather less experience such as plantation technology, silviculture, and forest protection.

(4) Mostly, local people's knowledge is based on what villagers can see with their naked eye and what their immediate environment happens to offer. The example of the forest guard who appreciated the merit of formal science in the case of root disease in his forest is a case in point.

(5) Not everything said or produced by local people should be taken for granted as true (valid) knowledge. Sometimes, villagers out of willingness to talk (or pretention to being knowledgeable) speak about imaginary experiences or things they are not sure about. For example, once some villagers told us that a coppice *hashab* tree does not produce gum. However, that statement was immediately contradicted by another group of villagers. As we ourselves did not have any experience, we could not judge at that time which group is correct. Later we contacted the research staff and they confirmed that coppice *hashab* can produce gum for up to four rotations.

In this section we discussed local people's knowledge about forestry. We round up this chapter by looking into forestry knowledge and information processes from a system perspective in the next section.

5.4 Forestry knowledge and information: a system perspective

In chapter two we showed what we mean by the Forestry Knowledge and Information Systems in Sudan (FKIS). We have indicated that FKIS encompass knowledge processes such as generation, exchange, and utilization; together with the conditions and factors which explain and influence these processes (beliefs, cognitions, and concepts) and the different actors involved in forest resource management in Sudan.
In an earlier study we identified nine main categories of social actors involved in FKIS in Sudan. These are: Forests National Corporation, forestry research, domestic users of forest resources, commercial utilizers, forestry education, forestry extension, gum arabic company, and gum arabic producers (Mahir, 1992). However, as indicated in chapter three, for the very specific purpose of this study we decided to put social actors into two main categories: villagers and officials.
In this section we look into FKIS from a system perspective by answering the following question:

> *To what extent is the forestry knowledge and information system in Sudan facilitating social actors' cooperation toward sustainable management of forest resources? How do actors exchange information to initiate and/or maintain such cooperation?*

From a system perspective, we try to put social actors together and see the performance of the system as a whole. Toward the end of the section we use a check-list (adapted from Röling and Engel, 1991) to look at the systems' pathology (Röling, 1992). First, we discuss actors' opinions about each other's knowledge, then we discuss the nature and processes of information exchange within FKIS, tackle the issue of gender and knowledge process and end up with some concluding remarks.
In the following sections we analyze how various social actors see each other's knowledge activities in relation to management of forest resources. First, we discuss opinions concerning the forestry service (including forestry extension), followed by a discussion about forestry research. Then we discuss social actors' opinions about forestry education and villagers' knowledge activities.

5.4.1 Perspectives regarding forestry service

Despite the many conflicts which took place between villagers and the forestry authorities, in this study most villagers acknowledge the positive change in foresters' attitudes and behaviour. In general, most of the informants indicated that foresters are becoming more concerned and serious in their efforts toward proper management of forest resources. Moreover, despite the fact that there is no formal linkage mechanism between research, education and the forests service, the staff of these institutions keep good personal relations and feel that they all belong to the 'forestry family'. Unfortunately, these personal relations are rarely reflected in the form of cooperation in the work domain. This is especially true in the case of the relationship between the FRC and the FNC. Traditionally, foresters used to keep very good personal relationships with the local people. It is believed that this was necessitated by the nature of the forester's work, which put him in such situations where he developed and maintained good relations with the public in his area. Usually, the forester would be the only educated person in such remote areas. Strangely enough these good relationships between foresters and villagers did not extend to cover the official forestry work. However, a reasonable explanation is given by a retired forestry officer: "At that time trees were very many and people's need was not that great. Consequently, there was not much pressure on forests and forest products and there were not many conflicts". Hence, in the odd cases of conflict, foresters did not face social resistance in enforcing forest laws. With time forestry offenses increased, and notwithstanding their good personal relations with villagers, foresters developed a greater tendency to enforce laws. There was a belief among foresters that forest resources could be protected and conserved through applying forest laws and regulations.

Currently, there is growing interest among foresters in the use of extension and participatory approaches to involve villagers in forestry development programmes. A young forester says: "My experience is that villagers are very simple and if you treat them kindly, and in a good manner as human beings, they will most probably cooperate and help you in your work". However, this study reveals that extension staff mainly follow very instructional top-down approaches in their work with villagers. As a result, villagers are coming to believe that as far new technologies are concerned, only forestry experts can give advice. In Tendulti area, villagers believe that they should not take initiatives and experiment as they used to do with their own trees. Experience indicates that villagers wait for forestry extension officers to give instructions even if they know what and how to proceed. One extension officer says: "In extension we are enforcing the idea that we know better than villagers about

technical aspects of forestry. On the one hand, we normally show villagers every detail concerning what, when, and how to do different operations. On the other hand, farmers wait for us or come to ask us even about very simple common sense things". During the field work, we asked villagers why they wait for extension staff when they know what to do. Their answer was as follows:

> A villager from El Milaih said: "Maybe the extension people will ask why we did not wait for them". A villager from Wad Braima said: "We thought, extension people might have new ideas, they are more educated than us". Another one says: "We can do nothing but observe the directive of the officials and obey the orders of the Government".

From the way villagers were talking it was clear that extension advice was sometimes inhibiting rather than helping. It made villagers reluctant to act on their own initiative because they feel trees are the responsibility of the project. Hisham et al., (1991) argue that these kinds of advice discourage farmers from trusting their own instincts about working with trees on their land and consequently from gaining practical experience.

Sometimes being over-motivated to sell their messages in encouraging villagers to plant trees, extension officers may give an incomplete picture and only show the good face of forest/trees to their clients. For example, they tend to talk about the benefits of certain trees without explaining to villagers the necessary conditions for getting these benefits. In many cases the results of the villagers' efforts were very disappointing, as for example in the case (above) of *hashab* in Tendulti area and the failure of eucalyptus in some places due to problems of irrigation-water and termites. In Tendulti area, some villagers believe that they have been deceived by extension workers. Extension officers showed them slides of trees producing large quantities of gum. Accordingly, they agreed to plant *hashab* and now it is not producing gum.

Many forestry officers think that the problem is that extension work is limited to creating awareness instead of dealing also with the protection and management of existing forests. Others, though, (mainly senior staff) call for more awareness campaigns: "There is a need for special forestry extension programmes for decision-makers. Most of the senior staff in other government departments know very little about forestry" said a senior forestry officer, at a forestry meeting.

5.4.2 Opinions on forestry research

As indicated before, Forestry Research (FR) started as a part of the Forests Department, and later joined the Agricultural Research Corporation (ARC). Many informants explained that the main reason for the transfer of FR from the Forests Department was that the staff wanted to enjoy the researchers' status. However, it seems that the benefits of joining the ARC ended there. Soon it was realized that forestry is not getting enough resources as it cannot compete with other agricultural research sections like cotton, horticulture, etc. It is clear that forestry research is not a priority for the ARC.

This study found that Forestry Research has a rather gloomy image among social actors. Villagers declared that they know nothing about forestry research, whilst staff of both forestry educational institutions and FNC feel sorry about the situation of the FR. However, during the field work it became clear that even the forestry research staff themselves are not happy about the contribution of their institution toward forestry development in Sudan. After leaving the Forests Department, FR kept virtually no links with the mother institution (the Forests Department). Recently, both departments decided to exchange representation on each other's board of directors, but experience indicates that this kind of linkage mechanism is not strong enough to bridge the gap between the two institutions. The many meetings organized to solve problems ended up in widening the gap by changing the nature of the problem from institutional to personal. However, the last meeting organized in November 1994 at which educational institutions also participated, was a good step towards improving the relationship between the FNC and the FRC.

Both the staff of FNC and educational institutions indicate that researchers are concentrating on basic research of little relevance to the needs of the field staff. In the following case a female extension officer in Tendulti expresses her dissatisfaction with the performance of FR:

> "Research people are doing research and keeping the results for themselves. We do not have any connection with them. In our extension work we depend on what we have studied at the university and what we have learnt from our own experience".

However, research staff claim to be carrying out more problem-solving research. When we challenged them with the points we had heard, they agreed that until very recently the emphasis was more on basic research. Moreover, researchers accepted that they very rarely contact villagers and other clients to assess their

problems and to discuss application of research findings in the field. Research staff identify research problems, carry out their research and then publish the results. They are of the opinion that it is not their responsibility to convey research results to villagers or even to field level foresters. As far as the research staff are concerned, FNC should strengthen its extension section to carry out the job of information transfer.

To end this section, we present social actors' opinions about problems which are hindering the efficient performance of the FR in Sudan. Among the problems identified by informants (including staff of the FR) are the following:

(1) Lack of good research facilities including; references, laboratories and transportation.
(2) Shortage of well motivated, trained staff.
(3) No proper links with FNC. Consequently, research is not oriented to the needs of the field staff.
(4) No follow up of research results. Moreover, the whole environment within the forestry sector is not conducive to good quality forestry research.
(5) Forestry research does not score highly among the priorities of the ARC.

5.4.3 Opinions on forestry education

Like research, forestry education started as a component of the Forests Department. Later it joined other higher educational institutions in the Ministry of Higher Education and Scientific Research. This resulted in forestry education become alienated from the needs and conditions of the foresters and forestry development at the grassroots level. Moreover, educational institutions do not keep any kind of formal linkage with FR. However, many informal links are maintained as sometimes researchers teach as part-time lecturers at educational institutions. This study found that most of the staff of the educational institutions are dissatisfied with the roles played by their institutions. In their opinion, their institutions do play some role in forestry development, but in a rather disorganized and haphazard way[6].

The image of forestry education among villagers is a little better than that of the research. Some villagers at least indicated that they have heard about forestry education because sometimes students came to their areas for practical training.

[6] The performance and problems of forestry education will be tackled in more detail in the next chapter.

5.4.4 Opinions on villagers' knowledge

In section 5.3 we discussed in more detail the issue of local people's knowledge, and saw the growing interest and appreciation it is receiving. However, this study shows that despite their acknowledgement and appreciation of local people's knowledge about trees, foresters rarely make use of this type of knowledge. Moreover, this has not changed the foresters' attitude that they know better and should tell villagers what to do. Usually, foresters do not take villagers' observations or comments seriously. However, as indicated, before some foresters have shown great interest in local people's knowledge: "I am convinced that farmers are good observers. Unfortunately, researchers and foresters in general do not take villagers observations and comments seriously", an extension officer said. Unfortunately, villagers seem to be increasingly demoralized regarding their local knowledge. During this study many villagers indicated that old people used to have more knowledge about trees and forests, whereas the new generation lacks both the motivation and opportunity to learn about forests. Hence, the villagers' tendency to wait for "external" ready-made knowledge and technologies seem to be growing.

5.4.5 Processes of information exchange

An essential component of any knowledge process is the way social actors exchange information. Only through exchanging information do they enrich their knowledge basis and utilize it. In this section we start by discussing information exchange among villagers, how foresters exchange information among themselves and at the end of the section we discuss the processes of information exchange between villagers and foresters.

Information exchange among villagers

In general, villagers do not have organized and fixed systems for information exchange. This process usually takes place in a haphazard and incidental way at informal settings during everyday conversation. Still, there are some unique situations where villagers are more likely to be active in exchanging information. The following are some examples:

First, one way villagers exchange information is by greeting each other. Normally at the time of greeting villagers take enough time to ask about many things. As part of the greeting villagers for example ask about oneself, families,

animals, crops, the weather (especially if the person is coming from another area) and general living conditions.

Secondly, another way villagers exchange information is through the use of local proverbs and sayings such as:

(1) "The relationship between members of this family is like the relationship between the stems of a *Laot* tree". *Laot* trees have many divergent stems. Although they belong to same tree, they only come together after being cut.

(2) "The relationship between these two persons is not good. It is like the relation between the *haraz* tree and the rain". *Haraz* tree normally sheds its leaves during the rainy season.

(3) "That man is very rich, but his relatives do not get any benefit from him, he only helps other people, he is like the *deleib* tree". A characteristic of the *deleib* tree is that its shade lies far from the tree i.e. the one who sits directly under the tree does not benefit from its shade.

Third, an interesting way villagers exchange information goes as follows. When a group of villagers meet, they may start discussing a specific issue, such as the best time for tapping *hashab* trees. Every one will contribute to the discussion and nobody is denied his right to participate in the discussion. No group facilitator is nominated and the discussion proceeds in a self-regulated way. For outsiders (like us) the situation might seem to be chaotic. Sometimes, villagers continue arguing for hours. During our first encounter with such a case we waited to find out which information the villagers see as correct and which is wrong. To our surprise the villagers parted without reaching any kind of consensus. Later on, we realized that villagers normally do not tend to reach a consensus as most of the time villagers were actually talking about their personal experiences which took place under each one's specific conditions. In other words; the seemingly contradictory experiences were not incompatible, but were genuine experiences which are in fact correct under very specific situations. Then, it is up to every person to decide whom to trust, to carry out more investigations and to take his own decision based on his specific conditions.

Fourth, under specific conditions and when they need specific information, villagers contact each other as shown in the case below.

Talking about an information exchanging process, a villager from Azaza said: "For example, if I have a disease I don't recognise in my crop, I contact my neighbour(s). Then the information well spread that Hassan's crop has got a disease, and immediately advice will come from different sources, that Ali had a similar disease and he used so and so, Osman had been to Gezira and there he heard that when this disease appears they do so and so, Mohamad knows a man who studied agriculture and he learnt from him that this disease is not serious, you just do so and so, Ibrahim has a relative who works for the Crop Protection Department, he can contact him to ask about this disease and so on". The villager continued: "However, in case you heard that your neighbour had experienced such a case, you directly go to him and ask: Mohamad I heard that you have had a disease like the one I have now, what did you do? Mohammed will say: I bought a drug called ... from shop ... in Singa. Then he will explain the procedure he used for using the drug".

Fifth, despite the fact that there is no organized way by which villagers exchange information, there are certain occasions and locations where information exchange is more likely to take place. The following are some examples:

(1) Funerals. Men go to the graveyard, whereas women stay at the dead person's house. During this period villagers exchange a great deal of information.
(2) Wedding parties. During such occasions relatives and friends from other villages get together. Then, villagers have the opportunity to exchange information.
(3) Hospitals. In hospitals people come to visit patients and find the opportunity to chat and exchange information.
(4) Market places and days. In rural areas there are some markets which move from one village to another throughout the days of the week. Market days are good occasions for villagers to exchange information.
(5) Religious and cultural feasts, including Friday prayer.
(6) When a villager returns from travelling or a guest comes to the village. In both cases many villagers will come and greet him. Then he is expected to tell villagers all kinds of odd things he has seen or experienced. This becomes an opportunity for villagers to exchange and share their experiences.

Although all villagers participate in information exchange processes, women seem to be more active.

Information exchange among forestry officials

In general, the area of information exchange among foresters seems to be a problematic one. We have already indicated that linkages between forestry research, education and the forestry service are either lacking or inadequate. In spite of the general appreciation of the need for an efficient forestry information system, the tendency of staff not to exchange information even within the one institution is the rule rather than the exception. A senior forester at Wad Medani office explained: "We asked all the staff to keep records and collect all the relevant data, but nobody cares and nobody took the matter seriously". Another forester said: "Information in forestry is very important. Foresters should organize seminars or discussion meetings to learn from each others' experiences and to exchange information". An exception to this was a tradition in the former Central Region of Sudan, where annually senior forestry staff used to organize a meeting to exchange experiences. However, this was limited to top senior staff and this tradition has now been abolished. The situation has been described by a forest overseer as follows:

> "At present, problems are discussed only at the senior staff level and the people who actually do the work are not involved in these meetings. Before, field staff used to be involved in discussions. They used to be asked about their opinions and experiences".

Normally, when foresters need specific information they tend to ask a friend rather than trying to look for it into a report or a book: "When I do not know something, I first ask friends and only go to books when they cannot provide the required information", a graduate forester in the field told us.

This study found that foresters tend to use their informal personal relations in exchanging information.

Information exchange between villagers and foresters

We have indicated before that despite their acknowledgement of the value of local people's knowledge, foresters do not make use of it by exchanging experiences with villagers. Instead, foresters follow the Transfer Of Technology (TOT) approach and tend to teach villagers. In this respect we refer back to the case of El Gadarif workshop during which we had an opportunity to watch the interaction between nomads and forestry officials. The idea of getting nomads and officials together to discuss things was good in itself. However, what matters more is how things went on during the workshop. It appeared that the

organizers had not thought much about this process. Among our observations and lessons we learnt from the workshop are the following:

(1) Inviting participation from the nomads by repeating phrases like: do you have a question? Do you have a comment? was not effective. Moreover, their lack of questions and comments is not always an indication of agreement and understanding. Nomads might keep quiet because they are not used to this way of being invited to discuss issues, or perhaps because the situation was too formal for them to participate.

(2) Most of the officials used "scientific" official jargon, which is different even from the everyday conversation among foresters themselves. It seems foresters were trapped by the feeling of being asked to give a 'lecture' but, to whom?

(3) Consequently, when it was the turn for the nomads to talk, they selected one of them who is closer to officials, or in other words, the one who could use official jargon.

(4) The three foresters who presented lectures emphasised issues such as the importance of 'Working Plans' and how to prepare them. At the end of the first day we asked two of the villagers about 'Working Plans', and it was clear that they did not know the meaning of the term.

In addition, this study displayed that pupils play an essential role in bridging the gap between their teachers and parents. They act in fact as channels through which information is exchanged incidentally between 'formal' and informal knowledge systems. Pupils indicated that their teachers are their main source of forestry information. Boys mentioned their fathers second to teachers, whereas girls mentioned both mothers and fathers in the second place after their teachers. Consequently, what children learnt at schools is brought home and indirectly infiltrates local people's knowledge. The following case might illustrate this process:

> We paid a visit to a village woodlot together with extension staff. During the visit, villagers and extension staff discussed the causes of some trees drying. Villagers attributed the cause to termites. Nearby there were some children, but in keeping with tradition they were keeping their distance. Then we heard one of the children saying: "but termites do not harm healthy trees". We became interested and we looked for the child, who was about nine years old. He was too shy to talk with us, but his colleagues explained that he had learned that from his brother who is studying at the university.

In general, it seems that there are communication problems between foresters and villagers. One female extension officer accepted: "We do not exchange experiences with villagers because we do not spend enough time with them". In general, a brief interaction occurs during villages enrolment and seedling delivery. However, extension staff pay only limited field visits both before and more importantly after tree planting. Moreover, the study indicated that in most cases the kind of knowledge possessed by the extension staff is not the one needed by villagers. In other words; what foresters know and offer is not always what villagers want to know. As one forestry extension officer said:

> "People mainly ask about tree diseases and plant protection, which I know very little about". However, such interactions can encourage extension officers to update their knowledge base: "People's questions convinced me to go back every now and then to my study notebooks".

So far, in this section we analyzed the information exchange processes among and between villagers and foresters. In the next section we address the issue of gender and the knowledge processes.

5.4.6 Knowledge processes and gender

Historically, forestry generally evolved as a man's profession, and Sudan is no exception. Nonetheless, for millennia rural women have joined their men in farming. Moreover, recent socio-economic changes bring with them a greater burden for rural women. Most of the male villagers are involved in seasonal migration looking for sources of income, and some men even emigrate to other countries leaving their families behind in the villages. Furthermore, the ever-worsening economic conditions are forcing women to enter professions which were traditionally not considered as a woman's job, such as charcoal production, selling firewood and tapping of gum trees. Hence, one can conclude that rural women are increasingly involved in forestry activities which traditionally they did practise. Consequently, rural women are now expected to play a more serious role in the management of forest resources.
Muslim culture in general and the rural Sudanese culture in particular does not allow male forestry extension officers to interact with village women. Even in the cases where villagers are becoming more 'open', neither village women nor extension officers feel at ease communicating directly. So, the need for female

forestry extension officers came to be realised and appreciated within the domain of professional foresters.

Prior to 1975 (the establishment of the Department of Forestry of the University of Khartoum), there was no forestry training for females in Sudan. In 1980, the first Sudanese female forester graduated from the University of Khartoum. However, at the technical level training, regulations have yet to be changed to allow enrolment of girls. Since 1980, the number of female foresters has greatly increased.

Despite what has been mentioned above regarding the interaction between male extension officers and village women, in general village men (including nomads) do not have problems in dealing with female foresters. Moreover, and in spite of the fact that many villagers (including women) claim that working in forests is a man's job, this study revealed that at village level there are normally no differences between boys and girls as to their knowledge about trees.

We conclude this section by presenting foresters' reflections with regards to the issue of female foresters. Some of the field level male foresters still hold the opinion that females could not qualify as 'real' foresters. "They are not foresters. Maybe they can work in laboratories, but not in the field", a retired forester argued. A limited number of female foresters agree with this opinion. "Studying forestry is interesting, but the work in the field is a bit hard for females", a female forester in the field told us. However, most female foresters would argue the following:

(1) The general impression given to girls at home, but also at school and university, is that they are not like boys, they should not do heavy work. During practicals, trainers used to ask boys to do all the hard work, while girls watched and kept notes.

(2) These kind of stereotypes have psychological consequences. As a result many girls started to believe that they cannot do heavy work. Moreover, many girls try to make use of the opportunity not to work in hardship localities away from their families. In fact many experiences have shown that girls like boys can do all kinds of forestry work.

(3) Another problem is related to the Sudanese culture, which does not in encourage free interaction between males and females, especially outside professional circles. As a result, it is difficult for female foresters to interact with junior staff in the field. It is also difficult for females to travel alone and work in rural areas.

We end this section about FKIS in Sudan by looking into the system using the check-list (see chapter two) we adapted from Röling and Engel (1991).

5.4.7 Concluding remarks

First, optimal performance of FKIS requires a balance of power between different actors. This study found that power relations between villagers and officials do not encourage bi-lateral partnership. The relationship is still like the one between the thief and the policeman.

Second, optimal FKIS performance necessitates that various social actors be willing to share their experiences. That should come out of a real belief in and appreciation of others' potential contribution to the performance of the system. This study reveals an increasing realization among social actors of the importance of each other's knowledge and experiences. In fact until very recently it was thought that the FKIS is monopolized by foresters. Now, others (government officials, politicians and the general public) know many things about forestry.

Third, for optimal performance of FKIS, actors should be willing to negotiate and be ready to give up part of their power when responding to changing situations within the system or in its environment. This study found that to some extent social actors are more willing than before to negotiate and reach agreements on forest resource management. On the one hand, there is greater appreciation among foresters of the need to follow participatory approaches in dealing with villagers. On the other hand, villagers have started to appreciate the positive roles played by forestry authorities in conserving and trying to rehabilitate forest resources.

Fourth, for optimal FKIS performance it is essential that social actors see their tasks as part of a larger task which can only be achieved if everyone does his part properly. Despite the many foresters' declarations of their willingness to involve villagers in the management of forest resources, sometimes practices in the field say otherwise. We have a feeling that the foresters' willingness to accept the involvement of villagers is rather induced and is not coming out of a real 'internal' belief.

Fifth, optimal performance of FKIS calls for a conducive environment which facilitates actors forming platforms. The system environment should provide incentives to encourage actors' cooperation and discourage the tendency to default and entropy. We believe, if 'external coordinator(s)' (Röling, 1992) are interested in the optimal performance of FKIS, this is an area where they can

contribute a great deal. In our opinion social actors within the system have so far not been able to tackle the following problems appropriately.

(1) The capacity for sustainable forest resource management in Sudan far exceeds social actors' competencies, be they researchers, educators, extension officers, villagers or their organizations separately. This study indicates that the necessary knowledge base is rather fragmented and unevenly spread among the different actors. In the absence of a suitable knowledge and information system, proper management of forest resources will be difficult.

(2) It seems that formal forestry knowledge is based on the assumption that wood (timber) is the main product. In most of their experiments forestry researchers have looked mainly into wood production, and have not paid enough attention to non-timber forest products. For most foresters, the latter group of products are still perceived as of 'minor' importance.

(3) In connection with the previous point, foresters in the field (particularly extension staff) are failing to acknowledge the fact that government and communal forests represent two different situations, and therefore managers have different objectives and resources (including knowledge). Consequently, extension officers tend to disseminate unified, ready messages to various clients. A good illustration for that is found in the case we discussed about the El Gadarif workshop.

5.5 Summary

Knowledge and information processes encompass such activities as knowledge generation, information exchange and knowledge utilization.

Formal forestry research in Sudan started in 1962 through the establishment of the Forestry Research Centre (FRC) at Soba. With the transfer of FRC from the Forests Department (FD) to the Agricultural Research Corporation (ARC), the nature of research as well as the links with forestry services were very much affected. FRC kept virtually no formal relation with the FD, whilst the nature of research changed from applied to basic research. Both factors resulted in research programmes being alienated from the needs of the forestry service. With the exception of gum arabic research, all other forestry research is staff-oriented. Researchers determine problems to be researched, carry out experiments and foresters in the field are expected to use research findings. Research staff rarely keep contact with either foresters at the grassroots level, or more importantly with villagers.

As far as local people's knowledge generation is concerned, gum production is one of the main areas where villagers have developed a wealth of knowledge and skills. Moreover with time and experience, villagers have developed expertise in the area of forest utilization which is sometimes far more advanced than professional foresters' knowledge.

In general, the following are among the lessons about knowledge and information processes learned from this study:

(1) Villagers' research is action and need oriented. Villagers start from a concrete problem and continue to search experientially through knowing/reflecting in action to develop solutions.

(2) During experimentation villagers tend to coordinate roles and research activities between themselves e.g. within one village or a group of closely located villages.

(3) Appreciating the diversity and variation between each one's situation, villagers do not try to reach consensus and uniform solutions.

(4) Unlike formal knowledge which claims rationality, local people's knowledge is embedded in different kinds of rituals and spiritual beliefs.

(5) Critical and careful observation represents the corner-stone of all villagers' experimentation and knowledge.

(6) Unlike formal scientists, villagers do not use research stations and laboratories for their knowledge generation. Instead they use their surrounding environment in its totality.

(7) Formal forestry knowledge is more developed in the area of plantation technology, whereas local people have developed more expertise in areas of agroforestry and forest utilization.

(8) More often than not foresters fail to apply their formal knowledge and experiences in a holistic manner, whereas villagers tend to make use of the totality of their knowledge in their decision-making process.

(9) Having knowledge does not mean that actors will behave accordingly. In reality, for various reasons social actors' behaviour may deviate substantially from the path indicated by the knowledge they possess.

Looking into forestry knowledge and information from a system perspective reveals the following:

(1) Linkages between social actors within the system are either lacking or inadequate.

(2) In spite of the fact that most of the foresters express their appreciation of local people's knowledge, extension staff still feel at home when they use the linear TOT approach.

(3) In general villagers trust their own knowledge and their local experts more than foresters' formal science. However, under certain circumstances villagers become demoralized and unconfident about their local knowledge.

(4) Villagers continually exchange information among themselves, whereas such a tradition is not common among foresters. Moreover, in extreme cases communication problems between villagers and foresters lead villagers to distrust extension staff.

(5) Women are becoming increasingly involved in forestry activities and the number of female foresters is increasing. However, the study revealed some disagreement among foresters over the role of female foresters.

(6) The study indicates that the formal forestry knowledge and information system is still based on the assumption that wood (timber) is the main forest product while other products are 'minor', and that foresters are those who know and should decide how to manage forest resources.

(7) The study indicates that the necessary knowledge and expertise needed for sustainable management of forest resources is rather fragmented and unevenly distributed among social actors involved in the management of forest resources. In the absence of a conducive knowledge and information system, sustainable management of forest resources in Sudan will be difficult.

6 FORESTRY EDUCATION IN SUDAN IN AN ERA OF CHANGE

6.1 Introduction

At the end of the previous chapter we concluded that the capacity for sustainable management of forest resources in Sudan far exceeds the competency of social actors, be they forestry officers, educators, researchers, villagers or their institutions separately. Moreover, the necessary knowledge base for sustainable forest resource management is rather fragmented and unevenly spread among the different social actors. Consequently, a need is identified for an efficient knowledge and information system within which actors can exchange information, negotiate and work out techniques and approaches for sustainable forest resource management. At the end of chapter two we indicated that tree/forest resource management can be conceived of as a social learning process where a group of interdependent managers continually learn during interactions with each other and with the natural systems. We believe forestry education has a role to play in this process.
The main question to be addressed in this chapter is:

> *To what extent are forestry educational systems in Sudan facilitating and satisfying social actors' learning needs with regards to tree and forest resource management? Are forestry educational institutions adequately equipped with the facilities, organization and didactic skills they need?*

In this chapter, following this introduction we give some background information about educational systems in Sudan. We then discuss the development and roles of forestry educational systems and proceed to tackle the issue of curriculum development. We conclude this chapter by looking into educational systems involved in the process to analyze their present contributions and their readiness to play the new roles.

6.2 Types and development of educational systems in Sudan

In this study education is perceived as a life-long process during which social actors are continually engaged in learning processes i.e. acquiring, exchanging and developing knowledge, attitudes and skills. Social actors learn within different social settings (informal, non-formal and/or formal) and by various modes of learning (random or purposeful; propositional, practical and/or experiential).
In this section we discuss the kind of social settings within which education is offered in Sudan. We begin by looking at the non-formal educational systems, and then we discuss the formal educational systems. The informal systems will be discussed in section 6.3 as part of the forestry educational systems.

6.2.1 Non-formal educational systems

Perhaps the oldest form of non-formal educational system in Sudan is that of the *Khalawi* (single *Khalwa*) or Koranic school system. According to Sandell (1980) the history of *khalawi* in Sudan can be traced back to the fourteenth century.
At *khalwa*, literacy is taught through the recitation and writing of the Koran. The most basic *khalwa* consists of a *feki* (a teacher or religious man) with a number of children sitting under a tree, or other shade, using wooden slates, pointed sticks and ink made from soot, gum arabic and water. Attendance at *khalawi* is voluntary and there is no streaming according to age or ability. Some *khalawi* are private, others are financed from mosque funds and others are state-aided. Traditionally in the case of children, the *feki* receives money from the parent when the child has completed learning one section of the koran. Although not very common, there were instances of women attending *khalawi* in the eighteenth century. In 1920s, the government thought it necessary to introduce the teaching of hygiene and to improve the teaching standards at *khalawi*. Hence, a local inspectorate was set up, responsible to the Education Department and the local authorities. Moreover, training centres were established in provincial headquarters to provide 2-3 month courses for the *feki* (Sandell, 1980).

Another form of non-formal education is the adult (literacy) education system[1]. Men's adult education programme started in the late 1930s. Whereas, the one for women started much later in 1958.

According to El Jack and Taha (1977) institutionalized vocational training in Sudan started in the beginning of this century when the Anglo-Egyptian Condominium was attempting to establish the rudiments of a state machinery[2]. At that time, the colonial government found it necessary to train a small number of artisans to help run its technical departments.
In Sudan, parallel with the formal vocational training system run by the Ministry of Education there exists another system for the training of skilled labour. This is the system of the National Craft Schools. This latter aims at providing non-formal, low-level vocational training for young people who would otherwise be left as school drop-outs without having any skills or qualification for obtaining regular and productive employment at reasonable wages (Anon, 1980).
The vocational training system does not provide any training in relation to the forestry profession other than training in carpentry and woodwork. Moreover, there was only one case where we came across a *khalwa* where the *feki* was teaching children how to raise tree seedlings and encouraging them to plant trees. That was in Wad Medani in 1987. Furthermore, we have already indicated that in 1960s the Gum Arabic Research and Extension Project used to organize some extension campaigns for farmers in the gum production areas. Otherwise, non-formal education in the area of forestry as an organized activity only started with the establishment of the Forestry Extension Service in the 1980s.

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[1] The Literacy and Adult Functional Education Act defines an illiterate as "a person unable to read, write and make simple arithmetical calculations at the standard of the fourth class of elementary school" (Sandell, 1980: 53).

[2] Vocational training is defined as: "Any systematic training which aims at providing the skill and knowledge required for employment in any trade or craft in any field of economic activity", (El Jack and Taha, 1977: 2).

6.2.2 Formal educational systems

The formal educational system in Sudan is divided into four levels consisting of; six years primary schooling, three years intermediate, three years secondary, and 2-6 years higher education[3]. Secondary education is further separated into general (academic) education, technical education and teachers' training.
The first technical school in Sudan was established in 1901 in Omdurman. It offered a three-year course in building, pottery, carpentry, smith-work and woodwork. In 1956, the Khartoum Up-grading Centre was established with ILO/UNDP assistance as the first formal vocational training centre. This was followed by many other centres in various parts of the country.
As concerns forestry subjects in the general educational system, one sees no specific subject which deals directly with forestry. However, school curricula contain a reasonable amount of information with regards to natural resources (including forestry) but in a rather fragmented manner.
Higher education includes both degree and diploma programmes. Basic degree (B.Sc. and B.Tech.) courses of 4-6 years are offered in academic and technical education, while diploma courses of 2-3 years are offered in teachers' training, agriculture, forestry, health, and other occupational field of study[4].
Sudan being a former British colony, the Sudanese formal educational systems were from their inception reared in the British tradition. Traditionally, in the British system the transfer (teaching) and production (research) of knowledge are integrated within the university sector, whereas application (technical training) of knowledge is left for polytechnics (Othman, 1988). This binary system of higher education, which separates between technical and academic training, is still applied in Sudan.

The entrance requirement for university and college level is the Sudanese School Certificate or its equivalent and the only difference between university and college enrolment lies in the standard of the examination results required.

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[3] This system is now changing in such away that the intermediate level will be abolished. Instead, pupils will spend eight years at primary school and proceed to secondary school.

[4] Agricultural education is provided also at secondary educational levels, though there is no separate forestry education at secondary level.

In general, forestry education at university and college level are in the form of departments of agricultural colleges or faculties[5].
From a discussion on Sudanese educational systems in general, we now turn to forestry education in particular.

6.3 Forestry education in Sudan: organization and mission

In chapter two we indicated that in this study knowledge, education and learning are conceived as inter-related and continuous processes. People learn in different ways and within various social settings. People's learning processes begin at the time of birth and continue even after completing formal schooling systems. Hence, we argue that out-of-school learning and education interact with and influence what a person learns at schools and together they structure the development of an individual's knowledge system.
We start this section by discussing informal educational systems and then examine the formal forestry education.

6.3.1 Informal educational system

According to Hamadache (1991) informal education is a sub-set of random learning where either the learner or the source has the conscious intention of creating an educational atmosphere and promoting learning, but not both. However, based on our experiences gained during this study we differentiate between informal education and informal learning. The latter, is a situation where neither the source nor the learner may have a conscious intention of creating a learning environment.
From birth a child starts learning from his mother[6], then from his direct (immediate) environment (father, relatives and nature) or, as a farmer put it: "From birth the child grows up as a farmer, the surroundings teach them to be a farmer. Soon they will either be helping the father or the mother in farming".
In the previous chapter we indicated how villagers' ways of knowing are based on careful observation: "Villagers are good observers", a forest officer agreed. In rural areas, culture, physical and social environments are the main source of

[5] Only at the University of Khartoum, where the Forestry Department was recently raised to Faculty status.

[6] The grandmother has a special role to play in teaching children as she has more time, experience and patience for them.

knowledge and experiences. Children learn informally by performance - sometimes even unintentionally. The father or mother will say: "you will find the donkey beside the *kitir* tree)", "Take the goats to graze in the *sunt* forest". During the field work for this study we asked the Azaza village local doctor about the sources of knowledge and how he learned:

> He said: "Cropping, like growing sesame and sorghum, does not need to be learnt, because one automatically learns it from ones father(s) through observation and being with him". Then he continued: "But this kind of *ilim* [science, meaning using roots for medicinal purposes] we learn from old people. Learning comes in the form of experiences gained through facing a specific problem and seeing how this problem was dealt with. Moreover, they teach us which types of roots to be used for which disease and how to use them".

Normally, villagers do not teach their children about agriculture and tree planting. Children follow their fathers to the farms and watch how things are done, then they try it for themselves. Fathers only explain things when children ask or do something in the wrong way. When they are grown-up, children might ask about causal relations and explanations, but mostly they find them out themselves without asking. This indicates that informal education normally starts from facing a concrete experience, the theoretical explanation following later.

Villagers believe these ways of learning are much better and more persistent than the schools' ways of learning. They argue that what the child learns at school he easily forgets, whereas what he learns from experience is difficult to forget.

However, informal learning is not limited to villagers. In reality it accounts for the great bulk of any person's total lifetime learning including that of highly 'schooled' people (Coombs, 1985). Normally before starting school, but also during and after their school-period, professionals acquire and exchange information and experiences outside formal and non-formal educational systems: "I learnt about saw milling at the industrial area before studying forestry", said one forester. In addition, informal learning is especially important when the formal and non-formal systems fail to provide immediate solutions.

6.3.2 Development and organization of forestry education

Since the inception of the Forests Department in 1902, forestry training started as on-the-job and in-service training. It was only in 1932 that formal forestry education was started when the Forest Rangers's School was established as a section of the Forests Department. However, the school was suspended during the Second World War and only reopened in 1946 (Bayoumi, 1975). The school offered two years training in forestry to students who completed eight years of general education. In 1960, the school was upgraded to college status. The course was improved in scope and in the depth of the subject matter and the entrance requirement was raised to twelve years general education and the college started to award a diploma in forestry. In 1965, the college was moved to its present premises at Soba (south of Khartoum) where it received an assistant under the UNDP project for education and research. In 1973, the college came under the supervision of the Department of Higher Education in the Ministry of Education and in 1975, the college became a Department of the College of Agricultural Studies of (the) Khartoum Polytechnic and the duration of the study programme increased to three years. Since then, the department has been offering a three-year diploma course.
In 1990 (the) Khartoum Polytechnic was upgraded to university status, and its name became the Sudan University of Science and Technology (SUST). The department was renamed the Department of Forestry Sciences and Wood Technology.
When the School started in 1946, most of students were former army officers who had taken part in the Second World War. Even during the period 1946-73, when the school (and later on the college) was under the responsibility of the Forests Administration, the students were recruited as forestry officers and were considered as employees at the time when they joined the school. However since 1973, students have to finish their study programme first and then look for a job (El Mahadi, 1983). Moreover till 1985, the Department had only one intake every three years. In 1985, annual admission began with an annual intake of forty students[7].

According to Bayoumi (1975) training of Sudanese professional foresters started in 1946 when three students were sent to Edinburgh University. The majority of early professional foresters were graduates of Edinburgh with a few from Aberdeen, Bangor, Peshawar, Australia and Ibadan. In 1958, the Forests

[7] There is no technical level training for female students. The only institution for training technicians of the SUST, admits only male students.

Department proposed the establishment of a training facility for professional foresters within the University of Khartoum (U. of K.). By 1975 a Department of Forestry had been established in the Faculty of Agriculture of the U. of K. through a FAO/UNDP project. In 1993, the Department of Forestry of the U. of K. was raised to Faculty status. This Faculty of Forestry offers a five-year course leading to the honours degree of B.Sc. (Forestry), with an average annual intake of twenty (male and female) students. At present, professional training in forestry is also offered at the University of Juba and other new universities.
So far, post-graduate studies in forestry are offered mainly at the Faculty of Forestry of U. of K. There students have to follow a combination of courses and a thesis programme prior to obtaining the M.Sc. Forestry degree.

Students are selected for entry to higher forestry education through the National Admission's Office of the Higher Education Admission's Committee on the basis of educational attainment in national examinations. Candidates are required to obtain the Sudanese Secondary School Certificate (Scientific Branch) or the Sudanese Technical Secondary School Certificate (Agriculture). Primary selection of candidates is according to grades achieved in these examinations. Short listed students are then interviewed to make the final selection.

6.3.3 The mission of higher forestry education

In most developing countries higher education in rural development related fields is expected to play a threefold function. Namely; teaching, research and outreach. Sudan is no exception.
According to the staff and administration of higher forestry educational institutions, the following are among the missions of higher forestry education in Sudan:

(1) provision of qualified technicians and professionals in the field of forestry, with the scientific theoretical and practical knowledge required for undertaking posts of planning and executive responsibility in forestry projects and promoting the aim of development and modernization in the forestry sector.
(2) undertaking basic and applied forestry research work and disseminating results to potential beneficiaries.
(3) carrying out in-service training and organizing short courses for the staff of forestry institutions.

(4) acting as enlightening centres for urban and rural populations, through organizing various kinds of outreach and off-campus educational programmes.
(5) establishing and maintaining links with national and international educational and scientific institutions.

Having presented the stated missions of higher forestry education we proceed to analyze forestry curricula and how they are developed. We delay discussion of the performance of forestry education until later in this chapter.

6.4 Curriculum development at higher forestry educational institutions in Sudan

This section starts by presenting an idea about the structure and procedure of curriculum development, and proceeds to discuss educational objectives. To give more insight about how curricula are operationalized we discuss respectively; teaching materials, teaching methods, assessment procedures and teachers' training.

6.4.1 Structure and procedure of curriculum development

It is worth mentioning from the beginning that properly planned curriculum documents are still to be worked out at forestry educational institutions in Sudan. All we found were lists of subjects taught together with short descriptions of these subjects. Hence, data collection and analysis for this study is based more on personal contacts and discussion with administrators, teaching staff, graduates and students of educational institutions.
The course in the Faculty of Forestry of the U.of K. consists of five years study. The first two years are devoted to cover basic agriculture and forestry related subjects, e.g., botany, zoology, chemistry, geology, mathematics, ecology, etc. The following three years are devoted to forestry subjects. Upon successful completion of the prescribed study programme students are awarded the honour degree of B.Sc. (forestry).
The course of the Department of Forestry Sciences and Wood technology of the SUST consists of three years of study. At the end of the third year, successful students graduate with a General Diploma in Forestry (for lists of subjects taught at both institutions see annex 4).

The academic programmes of both institutions consist of classroom sessions and off-campus field training and scientific tours. The proportion of teaching time for professionals is approximately 60% theory to 40% practical. In addition, students spend 15 weeks, mainly in the final year, on field work and study tours in forests within the Sudan, during which they have to prepare a working plan. For the technician students, about 60% of teaching time is devoted to practical work. In addition, students are required to spend ten weeks each year on supervised tours to selected forests and forest industries to gain practical experience.

The above distinction between technical and professional education remains as an indication for the fact that Sudanese higher education has not yet been able to get rid of its heritage from the British system concerning the dual system which separates between professional and technical education. According to Gebre-Ab (1988) it is the balance between basic and applied sciences which distinguishes technicians' training from university education in agriculture[8]. If the balance is not struck properly, technicians' training turns into a watered down version of university education, where the difference lies in the level rather than type of education. It is our opinion that to a significant extent, this seems to be the case in the technical forestry training in Sudan. Until the late 1970s, the diploma offered at the end of the third year did not provide qualification for further training in the country. Within Sudan, the diploma level training is usually seen as terminal. Hence, a considerable number of the graduates used to continue their education at the Alexandria University in Egypt to obtain the degree of B.Sc. (forestry). Only recently the Faculty of Forestry of the U. of K. started accepting a very small number of students (2 to 3 per year) for a B.Sc. course of a further three years training[9]. Moreover, the diploma holders are also eligible for a fourth year of studies in the Department of Technical Education of the SUST, leading to the degree of B.Sc. (Education). However, experiences showed that neither the forestry nor educational authorities accept this degree as a B.Sc.

Officially, the following three levels of decision making are involved in the process of curriculum development at forestry educational institutions:

(1) The Head of Department and Academic Staff; they make recommendations to the Faculty Board on the need for curriculum development. On approval,

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[8] According to Gebre-Ab (1988) technicians should study more applied/practical sciences than theoretical courses.

[9] However, this has been stopped.

the Head of Department and his staff then make the necessary revisions. These have to be endorsed by the Faculty Board before submission for approval by the University Senate.

(2) The Faculty Board; the members of the Faculty Board discuss the proposal and clear them so that the necessary revision can be done. Later they endorse these revisions and forward them to the University Senate for approval.

(3) The University Senate; this scrutinizes the proposed revisions, makes changes if necessary, and approves them for implementation by the Head of Department and his staff.

However, in reality this procedure is rarely followed. During the field work for this study none of the interviewed staff members could remember the last time the curriculum had been revised. Normally, decisions as to changes in subjects-lists and sequencing are taken by department staff (sometimes by the Head of Departments alone).

Moreover, the study found that there is no significant room for clients or employers to influence the curriculum development process. During the field work we asked members of the academic staff about this issue. The answer was: "We are the ones to decide what to teach", "Employers are just for consulting". In general, each lecturer gets information informally about changes in the field and takes decision regarding the necessary changes in contents of the subject(s) he teaches.

6.4.2 Educational and learning objectives

In the absence of a formal curriculum document one does not expect to find clear educational objectives.

In order to have an idea about the objectives of educational institutions and academic staff, during the field work we carried out individual and group discussions and participated in departmental meetings. The outcome of these efforts is presented below to represent official educational objectives of forestry educational institutions in Sudan.

In general, educational programmes aim at the provision of qualified professionals and technicians in the field of forestry, with the scientific theoretical and practical knowledge required for undertaking posts of planning and executive responsibilities in various fields of forestry. This is done in such a way that they can promote the aim of development and modernization in forestry. More specifically, it is expected that the courses will facilitate the student to develop the knowledge, attitudes and skills necessary for:

(1) reservation and protection of forests from fires and against other abiotic and biotic factors.
(2) participation in afforestation and reforestation programmes and assisting local communities to establish and manage their own forests[10].
(3) preparation and execution of working plans and any other inventory work.
(4) harvesting of forest products including non-timber forest products.
(5) cooperation with local officials and popular authorities about all forestry matters.
(6) identification of research requirements in his area and ability to assist in executing research plans.
(7) guidance, management and development of his staff including giving on-the-job training.

To understand the learning process fully, it is not enough just to look at the educational objectives of the institutions, the learners' objectives need to be given equal attention. That is what we intend to discuss in the following paragraph.

It seems that the social demand for studying forestry is rather low. Most of the informants in this study indicated that forestry was not their preferred choice of study. Moreover, the great majority do not see forestry as a suitable profession for females. These findings are in line with what Gebre-Ab found in an earlier study. Gebre-Ab (1988) concludes that forestry is not a preferred subject at either the university or technical level, and most students studying forestry, did not make it their first choice. In this study we asked the final year students of the Forestry Department of the SUST why they decided to study forestry. Out of the forty students only four had selected forestry as their first choice. One of those who selected forestry as a first choice said: "Forestry was my first choice. I want to participate in the scientific development and management of forests and to stop desertification". Otherwise, most of the students would say: "We joined forestry because we want to have a university degree", "That is just how it turned out - for the certificate". This was not specific to technical level students; many students from the Faculty of Forestry of the U. of K. expressed the same: "I was enroled in agriculture, then I realized that graduates from agricultural faculties do not find jobs. Forestry is a rather new option and there is more opportunity to find a job". Even among graduates (now working in

[10] One can already see the changes towards giving more consideration to social aspects of forestry being reflected in officials' educational objectives. However, as we show later these objectives have rarely been translated into practice.

different forestry fields), most of them indicated that they chose to study forestry because there was more opportunity for work: "The Forestry division was new and there was more opportunity for work and a better future", said a university lecturer. Another forester said: "I like travelling and visiting different areas, I thought forestry would give me more chance for that". A female forester gave a different reason: "There was a good teacher in the forestry department. His way of teaching was interesting".

From the above opinions we draw the following conclusions:
First, social actors have different motives and interests for learning about or studying forestry.
Second, social demand for studying forestry is rather low. However, we believe that this might be because few people know about the study of forestry. According to Salih and Amooti (1993) forestry students normally had no idea about the curriculum and fields of study before joining Forestry Departments. However, after being enroled they get some impressions about what they are going to study from senior fellow students, study time tables and welcoming programmes by university staff. Both the study by Salih and Amooti (1993) and this study reveal that despite the rather unwilling starting, forestry students show a very high level of interest in the study of forestry very soon after enrolment. Many students say: "studying forestry is like studying life" and the majority of foresters think that studying forestry was very interesting and useful.

6.4.3 Teaching/learning materials and methods

As in the case of the educational objectives, there are no stated objectives to guide the teaching/learning process. Lecturers rarely prepare lesson plans. Moreover, as a consequence of the lack of formal curriculum documents there are no syllabi. Instead, the contents of different course are left to the responsibility of their respective lecturers. The Head of Department of one of the institutions says: "I cannot easily influence or check lecturers since there is no prescription. There is no supervision of lecturers, they lecture according to what they know and we trust them". In such a situation, it is difficult to monitor the teaching process. Lecturers normally get the content of their courses from old notes and their own experiences, and base their teaching on whatever sources are available. Lecturers say: "I design my course according to my own ideas and I normally make general and specific objectives for the course", "I prepare the contents of my course myself with some ideas from

previous teachers". Furthermore, there is very limited consultation among lecturers (even within the same institution) during the course of the teaching process.

Many foresters in the field think that forestry education (especially at the technical level) was much better in the past. They explained that teaching consisted mainly of practicals, and the students were divided into groups, each group going to one region for two months. Coming back to Khartoum they would stay for only six months during which they used to exchange field experiences and have theoretical classes. Then groups would exchange places and so on. By the end of the two years, students would have had the chance to visit most of the regions in Sudan and be able to have an idea about the main forestry activities. One senior forester said:

> "We were trained in horse riding, boating, and swimming". He adds: "Before, it was a must that the forester should know the names of all trees, shrubs, grasses and even tribes in his working area. During their visits, senior staff used to ask about these things".

During the discussions with the staff of forestry educational institutions, most of them indicated that they teach theory in the classroom and leave practicals to the field work and study tours. Due to a lack of permanent teaching staff most of the institutions rely on part-time lecturers. However, most of the staff express their dissatisfaction with the way part-time lecturers influence the daily teaching programme, as the time table often has to be adjusted to suit the programmes of the part-time lecturers.

Teaching methods are predominantly of the lecture type. There is very limited room for discussion between instructors and students, but also among students themselves. Due to the lack of text books and duplicating facilities, lecturers spend most of their time dictating their lecture notes to students. Some of the lecturers use other teaching methods such as group discussions and seminars, however, that seems to be the exception rather than the rule. Moreover, most of the lecturers use blackboards as the only teaching aid. Despite the fact that most of the educational institutions do have some audio-visual instruments such as over head projectors and slide projectors, most of them are out of order due to lack of proper maintenance and spare parts. Furthermore, more often than not there are problems with the electricity supply, which de-motivates instructors from preparing audio-visual materials.

In conclusion, this study revealed that neither lecturers nor students are happy with the arrangements of the general learning/teaching process, including training materials, timing and arrangement of subjects, teaching methods and teaching aids. In the absence of extensive and properly planned curricula, it is clear that selection of teaching materials and sequencing of subjects are based on availability of resource persons rather than being based on didactical suitability.

6.4.4 Assessment procedures

As previously indicated, because of the lack of a well planned curriculum there is no well developed mechanism for monitoring the general teaching/learning implementation process. This is left to the responsibility of the senior academic staff and administrators, with no provision for the participation of lecturers or more importantly, of students.
Although the university examinations' regulations seem to be very flexible and leave considerable room for the staff to use various assessment techniques, in practice the instructors stick to 'traditional' rigid examination styles. Students are encouraged to study solely to pass examinations. This situation denies students the chance to study for broader educational objectives: "Degree examinations, in many universities, still require little more than the reproduction of information accumulated by rote learning" (Othman, 1988: 48).

6.4.5 Teachers' education

It has been argued before that it is a misunderstanding to believe that one can teach without any teacher education, or that one can teach by intuition alone (Beijaard, 1994). Unfortunately, this seems to be a common belief among the Sudanese educational authorities. It is believed that once one has his degree (M.Sc. or Ph.D.) in a specific field of study, then one is competent to lecture in that field. Consequently, didactic skills are not among the qualifications required for one to be a university lecturer.
Strangely enough many of the staff members do not feel the need to acquire didactic skills even after working for some time at universities. Indeed, many students felt that some instructors were even glad when students failed to understand the material. In other words; some lecturers feel proud when they manage to confuse students. We believe that this is a result of many staff members seeing knowledge as a commodity which they can monopolize. The

logical question is: why do academicians who value knowledge take such perverse pride in maintaining their ignorance about the teaching/learning process? The answer might be in the belief that excellence in teaching contributes very little towards promotion and professional growth in comparison with research. Moreover, unlike the general educational system, universities do not have an inspectorate system to check the teaching quality of their staff members: "It is no wonder then that university teachers turn away from teaching at best with a sense of guilt and at worst with pride and arrogance" (Othman, 1988: 33).

The study indicates that until very recently, most of the staff of forestry educational institutions have not had any kind of training in teaching skills. However, during the past few years many of the staff have undergone pedagogical training through short courses organized in Sudan or abroad. However, many of these courses were too short and too theoretical to give university lecturers either the motivation or confidence to apply new teaching approaches. In addition, given the lack of effective systems either to keep up with international developments or even to link up with domestic research. Researchers are probably lacking as much in up-to-date technical expertise as they are in didactic skills. One of our colleagues said upon arrival from abroad: "You know, I realised that we are teaching only the history of science to our poor students".

However, one should not expect too much from university lecturers under the present socio-economic and political environment. In reality, teaching is a complex and holistic activity which is influenced by personal and situational aspects. Under the pressure of the worsening economic conditions many of the staff are either looking for jobs elsewhere or have been forced to take a second job in an effort to earn enough even for subsistence.

To give an idea about curriculum development at forestry educational institutions in Sudan we presented the results of the analysis of the cases of two Sudanese higher forestry educational institutions, the Faculty of Forestry of the U. of K. and the Department of Forestry Sciences and Wood Technology of the SUST. Furthermore, we discussed teaching-learning materials, methods and techniques used to enhance the teaching/learning environment, ways of assessing outcomes of educational processes and the situation of teacher training.

In the next section we discuss the performance of forestry educational institutions keeping in mind social actors' learning needs and modes of learning and end with a concluding remark regarding the consequences for forestry development in Sudan.

6.5 Forestry education: a threat for forestry development

Forestry educational systems in Sudan consist mainly of the higher forestry educational institutions and the forestry extension service. We indicated before that both the general educational system and informal systems do not pay special attention to forestry as such. Hence, in this section we concentrate our discussion on the performance of formal higher forestry education and non-formal forestry education. We then reflect on social actors' learning needs in order to see to what extent formal and non-formal forestry education institutions facilitate and create suitable learning environments necessary for the sustainable management of forest resources in Sudan.

6.5.1 Performance and problems of forestry education in Sudan

It has already been mentioned that (higher) educational institutions are expected to perform three main tasks: teaching, research and outreach. However, like most higher educational institutions in developing countries many factors contribute to the disparity between the stated missions of Sudanese forestry educational institutions and what they do and can offer in practice. In this section we discuss the performance of higher forestry educational systems by looking at these three main tasks. However, whenever it is relevant we will reflect also on the performance of non-formal forestry educational institutions.

One way to assess the quality of an educational institution's activities is by scrutinizing the quality of the product i.e. the performance of the graduates. Many employers and senior staff indicated that many graduate foresters lack motivation to do their work properly, which some called lack of discipline. Graduates seldom link what they do and what they have studied. It seems that they do not have the spirit of creativity and willingness to innovate. When there is any problem they report to their bosses and wait for instructions, rather than trying to use their own knowledge and experiences. To give but one example we present the following case.

Foresters normally use a certain type of soil in their nurseries known as *gorairah* which is only available near rivers or water courses. Sometimes, foresters insist on using it even in places which are too far from rivers without asking themselves why this specific soil is used or whether there is any suitable alternative?
Once we asked some forest officers why they did not try to use another type of soil or develop a new mixture.
A forest officer answered as follows: "At this nursery we cannot apply most of what we have studied e.g. soil preparation, seed testing for germination, ..etc. A work plan has already been determined and we have to follow it".

Furthermore, during the field work we came across the following two extreme types of graduate foresters:

(1) Graduates who think that what they have studied at the university is irrelevant and useless. This type of graduate normally defers to experienced forest guards or overseers.

(2) Graduates who believe that science is entirely the domain of universities. Being university graduates they expect all others (non-graduates) to follow them. Hence, they never try to learn from the experience of 'lower' level staff. They normally say: "Oh, this is rubbish, you are not going to show me how to do my work, you should just do what I ask you to do".

With respect to the second category, we believe that educators impart to their students a perspective of a neutral scientific reality which exists 'out there'. As a result, these graduates are faced with the problem of the gap between what they see as scientific and what is realistic and applicable.

With regard to the research task, this has mainly been done by the Faculty of Forestry of the U. of K. The bulk of research conducted so far has been linked to the postgraduate studies programme in partial fulfilment of the M.Sc. degree. The specific research topics are mostly determined by supervisors, though sometimes students or their employers (or donors) can choose the research topics. In addition, the academic staff have their own research activities and projects which are chosen on the basis of personal interest. In general, university research is oriented more toward basic research than applied and adaptive research. Moreover, despite the fact that villagers are actively involved in (re)searching and developing their own knowledge, we found that none of the forestry educational institutions keep links with villagers.

Examination of the agendas and activities of higher forestry educational institutions reveals that they do not have any kind of planned or organized outreach programmes. Although not on a regular basis, students' associations sometimes organize cultural activities such as exhibitions, academic and cultural events both inside and outside universities' campuses.

In spite of all the problems we mentioned before in relation to the performance of forestry educational institutions, we are of the opinion that it would be an oversimplification to attribute the poor performance of graduate foresters solely to one specific factor. We believe that the foresters' performance is determined by a composite of inter-related factors. Moreover, we think that it is unfair to evaluate the performance of these institutions without considering the kind of problems faced by them.

The following are among the problems of higher forestry education in Sudan:

(1) In general the higher educational system is hierarchical, closed and inflexible. Within this system academic education enjoys a favoured position compared to technical education. The division between technicians and professionals is a very sensitive issue to tackle within the forestry sector in Sudan. Many foresters believe that technicians should be given chances to study and develop their careers: "There are many technicians who are not less intelligent than professionals. They simply became technicians because they were not lucky enough to score high marks to qualify for university", a senior lecturer said.

(2) Formal and non-formal forestry educational institutions do not pay attention to each other or to informal education. There is no system to link graduates back to the universities and colleges after they leave, with the consequence that educational institutions lack the necessary feedback for monitoring and evaluating their programmes. In short, there is no system through which different social actors exchange information.

(3) Most of the institutions do not have well equipped libraries. They lack important reference materials and documentation necessary for research or to supplement theoretical and practical lessons. Consequently, students rely mostly on dictated notes. However, teachers depend on very old notes themselves.

(4) A notable drawback in the programmes of forestry educational institutions is the lack of well organized off-campus field practicals and study tours. Moreover, many institutions are short of well equipped laboratories and sciences are taught merely as theory.

(5) Staff salaries are too low for a decent standard of living, leading either to the problem of brain drain or of the staff not having time or inclination for

teaching, conducting genuine research or organizing outreach programmes. However, the situation of research and teaching assistants is worse. In Sudan these positions are considered as temporary ones. Consequently, the assistants are usually left without clear job specifications and with a poor reward system.

(6) Higher education in Sudan is almost wholly dependent on public money with all the consequences that state control over the total budget implies.

We argued before that one should not only blame educational institutions for the poor performance of their graduates, but that the employers and work environment also have great influence. This study shows that in general employers do not pay enough attention to in-service training. For example, despite the fact that forest overseers constitute a large and an essential portion of the work force within the forestry service, they do not receive any kind of special training before or after being selected for the job. In fact no educational institution provides regular refresher courses for any levels of staff.
Moreover, the work environment does not provide enough motivation (either positive or negative[11]) for employees to work better. The following are some of the opinions on the influence of the work environment as expressed by foresters:

> The main job of graduate foresters is to write reports and sign letters. Most of the time, they have nothing to do with the technicalities of forestry work, that is left for overseers.

6.5.2 Learning needs and modes of learning

Throughout the last two chapters we presented various kinds of social actors' learning modes and needs. However, to examine the performance of the forestry educational systems, it is necessary to draw together our findings and conclusions into one coherent picture, before comparing these needs with what forestry educational institutions offer at present time. What we intend to do is not to rewrite what has gone before, but to summarise the material and add new experiences with regard to learning modes and needs.

[11] We mean by negative motivation, punishment or penalties which prevent employees from working carelessly.

Learning needs

First, the study indicates that the present situation within the forestry sector and the critical resource depletion is well understood by social actors. Moreover, the need for a change of emphasis from traditional forest resource management practices to a more widely based community and agroforestry development strategy is also well recognized by foresters. Consequently, there is a common agreement concerning the need to learn about dealing with people. For example, one senior forestry extension officer related:

> "I worked only for six months doing traditional forestry. During that short period, I realized that I am not the man for such work. I then joined the newly established extension unit. Most of what I have studied at the university needed to be revised to suit with participation, small scale community forestry and agroforestry practices. I studied nothing about social subjects. I felt that even our professional classification of forest products into major and minor needed to be changed up-side-down".

We believe that these kinds of changes in orientation and forest management strategies call for new types of knowledge (expertise), attitudes, and skills. The following are among the learning needs we identified in this connection:

(1) The development of an attitude which is no longer that of a policeman who keeps people away from forests, but that of an educator who works **with** and learns from people in order to facilitate sustainable management of forest resources. This should include a willingness to learn, not just to from villagers, but also from anyone who may have lower level of schooling: "I am convinced that one will not learn everything at school. Universities should make graduates polite and willing to learn from others including from un-schooled villagers", an extension officer says.

(2) Necessary communication and social skills like listening, talking, organising and facilitating group activities, good observation skills, etc.

(3) The kind of expertise and technical know-how which is suitable for small-scale, community and private forests, managed for purposes other than those of state forests.

Secondly, the shift towards private and communal forests should be accompanied by the realization that in fact villagers treat tree/forest resource management as part and parcel of their overall land use system. Local people do not compartmentalise forestry and other land use strategies and activities. Consequently, foresters should develop the following competencies:

(1) ability to have a systemic view of situations during decision making processes.
(2) ability and willingness to cooperate and coordinate knowledge, experiences and efforts with and between social actors involved in forest resource management.

Thirdly, we argued in chapter two that no knowledge is eternal and most of what we learn today will soon be out-dated, and so in this study we see learning as a lifelong learning process. Moreover, within forest resource management there is great degree of variability and heterogeneity of both managers and situations. We believe that under such circumstances social actors should develop the following knowledge, attitudes and skills:

(1) necessary skills and attitudes to work independently, creatively and to be ready to take innovative decisions in response to changes.
(2) ability and willingness to learn experientially and to facilitate problem-solving-oriented research and learning.
(3) readiness to facilitate villagers to be more confident of their natural abilities, talents and their own knowledge, instead of creating doubt about their local knowledge. However, villagers should also develop the required abilities and attitudes to learn from others (including foresters and other villagers).

Fourthly, seeing learning/education as a lifelong process calls for institutions which are capable of providing and facilitating in-service and continuous education. The importance of refresher courses and in-service training stems among other reasons from the fact that during regular education, students feel the need to learn mainly to pass exams, or as they call it: 'the commercial way of studying'. In such a case, the student's learning objective is to learn (or rather memorize) just to pass the exams. Another reason, as explained by a newly graduated forester is that: "Undergraduate training was very general, so I need more specific training for whichever division they allocate me". Hence, it may be necessary to give all newly recruited staff some kind of orientation training to help them link what they have studied with what they are going to do. A senior forester said: "I think every forester needs training after one of two years of work. They should not be left only with the undergraduate course. After one year in the field, the officer is more likely to know and feel his or her training needs". For this, social actors should develop the following:

(1) suitable attitudes for participating in refresher courses and for continuous learning.
(2) willingness and ability to learn from their everyday experiences and to share them with others both informally and during specially organised learning situations e.g. workshops, seminars, etc.

Fifthly, there is a currently a widespread feeling that forestry work is not challenging for highly educated personnel. Some foresters think that for the kind of work they do at present it is a waste of resources to have university graduate staff, but that these activities could be effectively performed by much less educated staff. Moreover, junior staff do not feel the need for more education or training. A forest overseer in the field put it this way:[12] "For the type of work I am doing now, I do not feel in need of any more training". We believe forestry educational institutions have much to contribute to change this situation. Instead of seeing themselves as "experts' bureaux" who always wait and expect to be consulted, educational institutions should take initiatives, and stimulate and facilitate change processes. However, to play such roles, educators must develop such qualities as:

(1) an attitude conducive to the role of facilitators and not of the 'expert'.
(2) willingness to acquire and update the skills and knowledge needed to play the role of facilitators.

Sixth, for us research is part and parcel of the learning process. The following research areas which were identified by different social actors (mainly foresters), can therefore also be seen as forming part of their learning needs:

(1) the role of forestry in maintaining environmental stability for food security and livestock production.
(2) forests as a renewable source of energy.
(3) forests as sources of timber and non-timber products.
(4) technologies for rehabilitation of degraded *dahara* forest.
(5) silviculture and management of indigenous and important naturalised tree species such as *hashab*, *tartar* and *neem*.
(6) development of the production of gums such as gum arabic and gum *tartar*, including the study of the trees' physiology.
(7) social, economic and technical aspects of agroforestry and intercropping as potential land use systems.
(8) efficient use of water resources for forests/trees including water harvesting techniques and possibilities for using waste water, such as sewage water.

Having discussed social actors' learning needs in the field of forest resource management, in the next section we discuss some of the ways different social actors learn.

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[12] A forest overseer normally does not has any certificate in forestry. Mostly, he is a secondary school-leaver who attended some kind of vocational training in forestry.

How social actors learn

This issue has been already tackled in several places in this dissertation. Here, we intend to bring together and summarize the points covered throughout the text.

First, social actors more often learn experientially, starting from a rather concrete problem or experience. They continue to learn and develop knowledge through knowing-in-action and reflection-in-action.

Second, villagers' learning is problem/need oriented. Normally, they learn and (re)search in response to a real problem or a felt need. Consequently, for villagers, education and (re)search are not professions, but rather survival strategies and an integral part of their lives.

Third, local people do not isolate learning from research, but both are performed simultaneously.

Fourth, villagers tend to carry out their experiments collectively i.e. they have informal "collective inquiry systems" through which they continue experimenting and sharing experiences until they reach acceptable results.

Fifth, local people's learning and research is embedded in spiritual and cultural issues and is often gender-specific.

Sixth, local people's ways of learning are mostly based on careful and critical observation.

Seventh, villagers in their inquiry usually collect information from various sources. However, they do not try to reach consensus i.e. they do not look for the "one correct reality". Instead, villagers pool their experiences so that everyone can choose what suits his special circumstances.

Eighth, both villagers and officials prefer verbal communication to written materials for exchanging and sharing experiences. In the Arab and the Sudanese culture, people do not like writing and reading, but prefer talking and listening: "Many things are written in manuals, but nobody cares about reading them. I prefer discussion to reading", a senior forester told us.

Ninth, for situations where "uppers" need to learn from "lowers" (Chambers, 1994), many informants think that "uppers" should try to learn indirectly and informally without letting the "lowers" recognise what is happening, otherwise, informants believe, power relations will be disturbed and images will be shaky: "You should steal knowledge surreptitiously from your junior staff and not take it directly (e.g. by asking), otherwise they will think that you are not qualified and may lose respect for you", said a forester in the field.

This section ends by confronting the demand side with the supply side to see to what extent educational institutions fulfil the needs of social actors.

6.5.3 Concluding remarks

In this section we confront learning needs of social actors' with what is offered by formal and non-formal forestry educational systems.

SOCIAL ACTORS' LEARNING NEEDS	WHAT IS OFFERED BY EDUCATIONAL SYSTEMS
Social skills and attitudes needed to change from forest-centred to people-centred forest management	Forest management is still seen as a purely technical activity, does not pay attention to social skills
expertise suitable for dealing with small-scale and social forestry	expertise suitable for large-scale-state forests
Knowledge of non-timber forest products, which constitutes important aspect of forest resource management	NTFPs other than gum are of minor importance, neither research nor education deal with them properly
Holistic view of situations, seeing forestry as part and parcel of overall land use system	narrow, discipline-oriented approach, forestry is an isolated discipline
Creativity and responsiveness to change and diversity	consumptive and exam-oriented education
Need- and problem-oriented learning and searching	subject-oriented teaching and researching
Learning experientially	learning propositionally and occasionally practically
Acceptance that consensus is not necessary in matters of knowledge	believe in a single reality, the "truth", a need to reach to compromised, "average" solutions
Give consideration to culture and cosmovisions	'science' is neutral
Actors make use of the totality of their surrounding environment for learning and knowing	learning is limited to classroom lessons and practicals
need for refresher courses and in-service training	refresher and in-service courses either not offered or inadequate
Appreciate other actors' knowledge and use it whenever relevant	Do not appreciate or use local people's knowledge
Learning and searching are part of all actors' lives	teaching and research seen as professions

6.6 Summary

Perceiving education as a lifelong process encourages us to use a system perspective in conceptualizing it. Considering the settings within which educational processes take place, we can see an educational system as consisting of the following three main sub-systems: the informal, the formal and the non-formal education. However, a system perspective allows us also to conceive of the educational system as composed of the following three aggregate levels: the societal, the institutional and the activity level.

In Sudan, informal education about trees/forests starts with the early ages of childhood, when children start following their parents to farms and forests. Within the surrounding environment, children learn incidentally, through curiosity, inquiry and through guidance and instructions by elder people. However, this study revealed no specific pattern whereby villagers selectively and purposefully teach youngsters aspects of dealing with trees or forests. In other words, this study found that it is difficult to isolate a (separate) system to be labelled "informal forestry education" distinct from villagers' general informal educational system. Thus informal forestry education is part and parcel of villagers' overall living strategies. In general, villagers believe that what children learn from life is more durable than what is learnt in schools.

The general educational system in Sudan provides a considerable amount of information about trees and forests, but in a rather fragmented manner. However, forestry education as such is only offered at the higher educational level, which is split into technical and academic or 'professional' forestry education.

The oldest non-formal educational system in Sudan is that of the *khalawi* or koranic schools, which can be traced back to the fourteenth century. However, like informal education, early non-formal educational systems did not pay special attention to trees/forests as such. It was only in the 1960s that the Gum Arabic Research and Extension Project carried out a kind of non-formal education specializing in forestry. However, this project did not continue long and specialized non-formal forestry education only resumed in the mid 1980s with the establishment of the FNC's forestry extension section.

The history of formal forestry education in Sudan goes back to the 1940s when the British established the Forest Rangers' School. However, university level forestry education within the country started later, in 1975.

Stated missions of the Sudanese higher forestry education do not vary from that of similar higher forestry educational institutions in other developing countries. They generally include; teaching, research and outreach activities.

In general, higher forestry educational institutions do not have clear and comprehensive curriculum documents. Instead, existing curricula include lists of subjects taught together with brief course descriptions. The course for technicians consists of a three-year study programme leading to a general diploma in forestry, whereas the course for professionals lasts for five years and leads to a B.Sc. degree in forestry.

Despite the fact that there is a clear structure to be followed for curriculum development, in reality this machinery is seldom used. Instead, curriculum revisions and modifications take place at faculty or department level mostly on a personal basis. However, neither official nor operational curriculum development approaches usually involve clients or employers as active participants in the process.

In general, higher forestry educational programmes aim at the provision of qualified professionals and technicians with the scientific theoretical and practical knowledge required for undertaking posts of planning and executive responsibilities in various forestry fields. However, educational objectives and specific course objectives are either lacking or are vaguely stated.

The study indicates that social demand for the study of forestry is rather low, and most of those who opted to study forestry did so for reasons other than interest e.g. solely to have a university degree.

In the absence of concrete and extensive curriculum documents, the selection and sequencing of subjects depend more on personal initiatives of the staff and even on the availability of qualified lecturers in the first place. Teaching methods are predominantly of the lecture type and due to shortage of textbooks and lack of duplicating facilities, lecturers use considerable time in dictating their lecture notes to students. Furthermore, assessment methods hardly require more than the reproduction of information accumulated by rote learning.

Though not specific to forestry education in Sudan, didactic skills are not among the qualifications required for one to be a lecturer in higher educational institutions and teaching quality rarely influences professional promotion. Although some efforts have been made to train forestry educators in curriculum development and didactic skills, it is clear that under the prevailing economic conditions and staff reward system educators have neither enough time nor the motivation to create favourable learning environments.

Such a situation has led us to conclude that forestry education in Sudan far from being developmental, rather impedes forestry development.

We believe that for the forestry educational institutions to facilitate sustainable forest resource management, they should no longer see their role as "bureaux of experts", but as networking institutions. In addition, educators should see themselves not only as teachers whose task it is to impart a certain quantity of knowledge, but also as facilitators who create opportunities for self-regulative learning.
However, to facilitate such learning, social actors (including learners and educators) will need to develop among others the following qualities:

(1) An attitude that is no longer that of a policeman or an 'expert' but that of an educator and facilitator.
(2) Communication and social skills.
(3) The kind of expertise suitable for small-scale private and community forestry.
(4) Ability to think globally and act locally.
(5) Ability and willingness to cooperate and coordinate knowledge and efforts with and between social actors.
(6) Skills and attitude necessary for learning experientially and to work independently and creatively.
(7) Willingness to keep on learning both informally and through participation in formal and non-formal educational programmes and activities.

This study shows that many organizational and didactical factors and problems of facilities hamper forestry educational institutions from playing an effective role in facilitating sustainable forest resource management. Before being able to play the role needed to support forestry development in Sudan, educational institutions must develop relevant curricula, a system for curriculum monitoring, adequate methods for facilitating learning, must possess or have access to sufficient and appropriate facilities, and have a good staff reward system. However, all the above mentioned requirements will be of limited effect in the absence of a suitable institutional environment.

We having discussed the roles that forestry educational systems can play in facilitating social actors to develop strategies for sustainable management of forest resources in Sudan and have mentioned the prerequisites for such roles: we now move to the discussion of main the conclusions and lessons to be drawn from this study.

6.7 Essential note before reading chapter seven

The last three chapters have tackled respectively aspects of social actors' perceptions, management objectives and strategies concerning forest resources; issues of knowledge processes and roles of forestry education.
Reading through chapter four, one realizes that forest resource management is interwoven with many social, cultural, political, and economic factors.
Chapter five and chapter six, showed how knowledge processes constitute essential, but limited sway in management of forest resources in Sudan. Moreover, chapter six emphasised the fact that a number of social, cultural, political, and economic factors, as well as administrative and didactical problems are hampering forestry education.
Keeping in mind just how complicated the management of forest resources can be, we thought it important to present the following considerations before proceeding to chapter seven.

(1) Given the prevailing economic and political unrest in Sudan, one expects no more than limited attention to be paid to issues of 'appropriate' management of forest resources. At present, higher level political institutions and policy makers are more concerned with problems of the civil war in the South, the national security, national economy, and poverty. Consequently, politicians have no time to "waste" listening to advice and recommendations regarding better management of forest resources.

(2) Poor villagers and local level (formal and tribal) institutions have no alternative but to continue exploiting (or over-exploiting) remaining forest resources. At the individual level, villagers have to cut trees for subsistence. Moreover, local institutions cannot do without mining the remaining forest resources in order to continue providing the very essential social services like water, health and education.

(3) We believe in the arabic proverb which says: "The thing which is thought to be harmful may turn out to be helpful". Accordingly, we think that at present with the 'big people' busy with other issues, people who are keen on better management of forest resources will have more room to work at the grass-roots level to initiate and facilitate bottom-up change processes.

(4) In connection to what is mentioned in (3) above, we believe that education can play crucial roles even under the most difficult circumstances. We fully agree that under the current conditions in Sudan, forestry education will have only a limited direct contribution. Nonetheless, we propose that forestry education play a very different role, working at the grass-roots level and leading the change from below. In other words; forestry

education could facilitate the preparation of a new generation of foresters who believe in alternative participatory approaches to forest resource management in Sudan.

The above considerations have encouraged us to limit ourselves at the end of this study to presenting a more practical contribution.

As indicated in chapter one, the main researcher in this endeavour is working at one of the higher forestry educational institutions in Sudan. He believes that facilitating this change among his colleagues (educators) is the main contribution which he could make at present. Consequently, the next chapter will focus on the discussion of how forestry education could review and restructure its mission and curriculum in view of the insights gained from this study.

7 TOWARDS AN EXPERIENTIAL FORESTRY CURRICULUM

7.1 Introduction

Having discussed the performance of the forestry educational systems in Sudan in the previous chapter, this chapter culminates in a proposal for a curriculum development model and a number of learning points and recommendations on how higher forestry education can better contribute to forestry development in Sudan.
The main question to be tackled in this chapter is:

> *How can forestry education be based on social actors' perceptions and realities, and reflecting the differences between them? And under which conditions can education help in facilitating accommodation of different social actors' interests and needs as a prerequisite for sustainable management of tree/forest resources in Sudan?*

In chapter six, we indicated that forestry education as a formal and organized activity is mainly offered at higher education level. Nonetheless, the forestry extension unit of the FNC also organizes non-formal educational opportunities mainly for villagers, but sometimes also for other non-forester who are involved in forest resource management.
In chapters two and six, we explained that in our opinion higher forestry educational institutions should not only see their roles as places where the foresters-to-be have be trained, but they should also act as networking institutions for facilitating continuous learning for various categories of social actors (including villagers). Following this conception of education, we decided to concentrate our efforts in this chapter on discussing how the performance of higher forestry education could be improved, which could in turn help bring an improvement in the functioning of non-formal and informal educational systems in relation to management of tree/forest resources.

In this chapter, we start by discussing our perspectives on the changing roles of forestry education in Sudan. Then we discuss our ideas on forestry curriculum development and propose a model for forestry curriculum development.

7.2 Changing roles of higher forestry education

The nature of changes in forestry education is twofold: on the one hand, there is a shift in the arena of the subject matter, the forestry, on the other hand, knowledge and education are being conceived in different ways than before.
In the following sections we discuss the nature of changes which led us to think about a new curriculum development model.

7.2.1 Perspectives on changes in forestry: the subject matter

This study has shown that whereas a forest is the unit of concern for officials, it is the tree which is the focus of villagers' attention. In general, social actors perceive trees/forests as sources and signs of life. Forests, trees or even different parts of trees have different social values for different social actors. In addition, trees have monetary values, ritual, spiritual, cultural and/or political values. Nonetheless, sometimes actors develop a negative attitude toward forest resources. In such cases, they may see forests as competitors for fertile land, or hosts of birds and/or insects.
A variety of beliefs exist among social actors in relation to trees/forests. Beliefs cover taboos, good omens, cultural and medicinal uses of trees. The study indicates that perceptions, attitudes and beliefs are mostly location and/or species-specific, and are embedded in various social, economic and political contexts. As well, one should distinguish 'normal' perceptions from 'emergency' perceptions developed by social actors under abnormal circumstances.

Since they see trees as the focal point rather than forests, traditionally, villagers did not care about ownership of forests as such. Ownership of trees on private and communal land was based on species. So, at a certain location some trees would be individually owned while others were seen as common property of the tribe or the village. Despite these customary tenure systems of tree ownership, the state believed that these resources would be better managed and controlled by specialized authoritarian forest service, bearing in mind the following characteristics of forest resources:

(1) The long term nature of investment, that is the time span between planting and harvesting.
(2) Forests provide a range of benefits which are appreciated by various actors as goods and services obtainable from forests. Moreover, some of these goods are of the type Hurditch (1992) refers to as "public goods".

(3) Forests do not only influence the environment at the micro-level, but their effects extend to the macro-level.

Consequently, since 1908 the Government has issued many laws and regulations to control forest resource management. In spite of that, during the colonization period the British maintained the traditional native administrative system in order to facilitate management of natural resources at the local level. Hence, there is a common belief that the native administration system has been effective in the protection of forest resources in Sudan. Native administrators used 'modern' state laws and their native wisdom to enforce government regulations on the protection of forest resources. According to villagers, their native system, unlike government institutions, does not allow for cheating.

Regardless of government intervention, the fact that the native administrators remained the direct organizers of the use of forest resources resulted to some extent in avoidance of conflicts between villagers and foresters. However, in the beginning of the 1970s the Government abolished the native administrative system, bringing forestry authorities into direct confrontation with villagers.

In general, villagers do not appreciate the official forest classification based on ownership of the forest. That is clear from the way villagers see forest offenses: offenders are not seen as criminals. Instead, villagers' management strategies are more governed by their own systems of categorization which pays more attention to tree species and property rights over trees. Consequently, offenses in private and communal forests are socially punishable.

Our argument is that without realizing the situation of 'legal pluralism' developed over time to regulate management of tree/forest resources, the state tried to impose its own new laws (state law). Moreover, through abolishment of the native administration system, traditional institutions were seriously weakened, as they were denied powers of exclusion and access to the resources. Furthermore, the state was effectively unable to manage the resources because the local institutions created by the state failed to enforce the state law. The combined effect of these factors led to the present situation where many forest resources became *de facto* unowned non-property (or 'open access') resources. To-day, the real dilemma is in fact reflected in the growing popular feeling that neither native administration nor local level official systems are in a position to manage forest resources properly. On the one hand, the present native administrative system has neither the necessary social respect nor enough legal support to play its previous role: on the other hand, the official forestry agency does not have enough resources or the necessary social support to manage forest resources alone.

At present, both officials and villagers seem to be convinced that the future of forestry in Sudan lies in cooperation between forestry authorities and village

level native institutions. However, it is clear that for the native administration system to play an effective role in sustainable management of forest resources, the Government must be willing to provide them with enough legal and material support. Local institutions are more likely to be successful in forest resource management where the resource is well defined and the users are an identifiable group or community with its own authority structure. We therefore argue that the creation of a clear system of property rights is most needed.

Before ending this section, we present the following personal reflections on forest resource management.

First, the influence of foresters' professionalism led to the situation where foresters for a long period did not pay attention to any collection of trees which did not look like a 'real forest'.

Second, influenced by our own technical training, we ourselves suffered very much at the beginning of this study from a failure to realize that our (foresters') conception of forest management objectives might be different from that of villagers. However, later during the research journey we came to appreciate that unlike foresters, the villagers' management objectives are not context-free. In reality, one patch of forest means different things to different social actors at different times and places. This study shows that similarity between foresters' and villagers' management objectives is the exception rather than the rule. Foresters' objectives are focused on sustainable management of forests for provision of forest goods (mainly firewood and charcoal) and services to the nation. Villagers keep trees for fruits, shade, social, cultural and spiritual reasons, but rarely for wood alone. Sometimes what is important for villagers is labelled as 'of minor importance' by foresters.

Third, forest resource management is a complex affair, influenced among other things by the nature of the resource involved, the nature of the tenure system concerned and the motivational dynamics of the various social actors involved. Accordingly, we have differentiated between the following three types (stages) of forest management:

(1) utilization-management, where the resource is so abundant that everyone can utilize it freely. In other words, the rate of utilization is less than the resources' natural renewal capacity.

(2) protective-management, where social actors realize that free utilization can lead to resource depletion. Consequently, they introduce regulative measures such as restricted use. However, the natural renewal capacity of the resource is still seen as sufficient.

(3) development-management, where actors realize that restrictive use is no longer enough to sustain the use of the resource. For whatever reasons,

the rate of use is becoming greater than the natural renewal capacity. Hence, besides the previous regulative utilization measures, actors may have to take decisions to supplement the forest's natural renewal capacity by encouraging natural regeneration and/or carrying out reforestation and afforestation programmes.

Hence, we are of the opinion that if foresters are to be effective, they should appreciate the different needs, realities and management objectives of other actors.

7.2.2 Perspectives on knowledge, education and learning

Knowledge, learning and education are three closely interrelated concepts. Our conception of knowledge is that it is to a great extent a situation-specific and dynamic human construct. We see learning as a life long knowledge process during which various social actors are continually engaged in developing, acquiring, exchanging, and sharing knowledge, including skills and attitudes, in their effort to stay in harmony with their environment. They learn in different ways and within different educational settings. Here, we would like to stress the importance of differentiating between the concepts of education and learning. We see education as an activity which is more organized by outsiders (individuals or institutions) i.e. the concept is more educator-oriented, whereas, learning is an internal mental activity and process i.e. the concept is more self-oriented. Hence, we think that educational activities can take place within three different settings: the informal, non-formal and formal. On the other hand, learning processes can take place randomly and incidentally, or purposefully. Sometimes, one can experience situations where learning by compliance takes places such as where children are compelled to recite a poem or religious verses. However, in this latter case we find ourselves agreeing with Jickling in differentiating between learning and training. He indicates that training is more concerned with the acquisition of skills and abilities which have instrumental connotations and can occur through repetition without leading to understanding (Jickling in Wals, 1991).

Knowledge is heavily embedded in social, economic and cultural processes. Hence, in our opinion it might not be appropriate to evaluate and judge other actors' knowledge one-sidedly. Rather we believe that one should appreciate and encourage free interactions between various actors' knowledge systems. In this connection, this study indicates that often villagers do not try to reach consensus and compromise in matters of knowledge. However, during free

interactions, villagers choose what is relevant and compatible with their systems, and then make the necessary modifications (if needed) before eventually incorporating and internalizing it within their own knowledge systems. Our argument is then, that if one is interested in facilitating a change in behaviour or attitude, one should emphasize not only what is taught but more what is learnt. Moreover, arguing along with Maturana and Varela, we might go further to question the legitimacy of using a term such as teaching to describe what 'teachers' try to do. Maturana and Varela argue that any living entity, including human beings, is "structurally determined and informationally closed". This way of seeing beings has the consequence that external stimuli cannot induce direct change, 'one can not tell anybody anything, they must learn it for themselves'. "Thus a process of 'structural change' in a person's thinking can be triggered but not directed". The nature of the change or what is learnt will be very much determined by the pre-existing structure of the person's world-views (Maturana and Varela in Woodhill and Röling, 1994: 13). Therefore, we believe educators can facilitate actors' learning by making things visible, helping them to reconstruct realities through experimentation, observation and meaningful experiences. Teaching in this sense is the organization of learning.
The above conceptual changes about forest resource management, knowledge and learning have implications for the way we see the new roles of forestry educational institutions in Sudan.

7.2.3 New roles for forestry education

Based on the changes in the domains of forestry and education, we think that the new roles of higher forestry educational institutions can be outlined as follows.
First, the shift in concern from 'forest-first' to 'people-first' resource management strategies implies that forest resources are no longer seen only as providers of multiple-uses, but also as a battle-field where multiple-users struggle to make sense of these multiple-uses. At the same time, this study indicates that the task of forest resource management in Sudan cannot be monopolized by any of the social actors alone. This would demand qualities that exceed the competencies of all social actors, be they villagers, educators, forestry officers, researchers or their organizations individually. The task could better be seen as a 'social competence carried out jointly' (Engel and Van den Bor, 1995) by relevant inter-dependant multiple-users. In other words; forest

resource management should be seen as a public learning process[1] which in turn calls for the creation of systems to facilitate this kind of learning process. We believe, higher forestry educational institutions have a role to play in this. Instead of seeing themselves as "experts' bureaux" who wait to be consulted, educational institutions should see their roles as networking institutions which stimulate and facilitate processes of change.

Secondly, seeing knowledge as a process which is always 'in the making' makes it imperative for social actors and their institutions to learn continuously. Consequently, higher educational institutions need to have a more holistic view of education and offer their various educational programmes in an integrated and a coordinated manner. We see the mission of higher educational institutions not as divided into three sub-tasks (teaching, research and outreach), but rather as one main task, which is creating a suitable environment for continuous learning. For us, research is a learning opportunity for both researchers and other research participants to learn together. Moreover, outreach activities should be seen as a kind of non-formal education where educational institutions create learning opportunities for and with various categories of learners outside the formal system. Hence, it is expected that educational institutions should coordinate their various educational activities with other institutions who offer similar activities. To mention but a few examples, higher forestry educational institutions can coordinate their outreach activities with forestry extension, *Khalawi* and adult (literacy) educational institutions. Moreover, research activities can be coordinated with formal and informal research communities.

Third, examination of the existing curricula of higher forestry educational institutions reveals a very formal adherence to the classic forms of forestry education which is very much geared to posts in the Government spheres. Consequently, the ones who do not find a job in the public forestry service find little value in what they have studied. Moreover, the study found that there are no clear-cut job descriptions and differences in the work nature to justify the existence of the binary system of higher forestry education which separates between professionals and technicians. Conceiving of learning as a lifelong process implies that educational institutions should no longer be seen as terminals, but as places where learning trajectories start. Hence, we believe that undergraduate forestry study programmes should not be narrowly specialized for

[1] Such a process focuses on continuous community-wide participatory processes of social change, whereby the social system responds as a whole to changes within the system or in its environment (Schon, 1973).

technicians or professionals. Instead, their main task should be seen as paving the way for learners to continue learning.

By way of summing up, we see the mission of higher forestry educational institutions not as divided into three tasks, but more as one main task, that is the facilitation of continuous learning for various kinds of social actors. This one task consists among others of the following activities:

(1) Facilitating qualifying personnel not only to work in state forestry institutions, but also to work in private, communal or other non-governmental institutions.
(2) Joint learning through involvement in research activities.
(3) More direct involvement in rural development processes through organizing outreach activities i.e. providing opportunities for non-formal education.
(4) Facilitating continued learning opportunities for various categories of foresters through meetings and courses.
(5) Networking between related institutions at local, national and international levels.

The above mentioned changes have their implications for content and organization of foresters' education. In fact, one thing all foresters (staff of FNC, research and education) agreed upon is that the curricula of forestry educational institutions should be revised in the light of the many social, environmental and economic changes that have taken place. However, we argue that change in curricula requires more than adding (and/or removing) a few subjects to existing lists of subjects. Instead, it calls for overall re-modelling and restructuring the curricula. In the pages to follow, we present what we have learnt about such a curriculum development process.

7.3 Making forestry education's curricula more experiential

7.3.1 Introduction: perspectives on curriculum development

This study revealed that due to the lack of appropriate systems for curriculum development at higher forestry educational institutions, administrators and lecturers play the main role in determining curricula. Sometimes, curriculum revision can be a very personal activity mostly determined by the head of a department. We believe that the existence of a system of curriculum development is a prerequisite for any educational institution to function effectively and efficiently.

In chapter two, we stated that we do not see a curriculum as an objective 'product', but as a human construct and a process. Consequently, it can be argued that it is more logical to use subjectivist/constructivist models of curriculum development. Such models differentiate the following four inputs which influence design, implementation and evaluation of curricula (Driver and Oldham in Wals, 1994):

(1) Decision on content: here one is not interested in which topics to include or exclude or what textbook should be used. What is more important is, which experiences the participants should be exposed to and what ideas they may construct from those experiences.
(2) Information about participants' prior ideas: learning is seen as a process of conceptual change, so information about the ideas participants bring to a learning situation is essential.
(3) Perspectives on the learning process: participants' ideas and decisions on content are meaningless for curriculum development unless they are part of some guiding philosophy on teaching and learning.
(4) Facilitator's practical knowledge of participants, schools and classroom settings: here one tackles the actual question as to how to proceed with the teaching/learning process.

Based on the insights gained during the course of this study, we came to the following perspectives on the curriculum development process.

First, during the process, curriculum developers should pay consideration to maintaining a balance of power between the various social actors outside and inside educational institution (employers, parents, educators, administrators and various categories of learners) particularly when tackling the issues of aims and claims. Consequently, there is a need to move from the linear-expert model, where the whole process of curriculum development is controlled by experts, to the more interactive circular-consensus and dialogical models, which allow room for other social actors (including students) to participate in the curriculum development process (Van den Bor et al., 1995).

Second, the curriculum should encourage educators to take affirmative action to create suitable learning environments for different types of learners. This can be realized by understanding and considering the different limitations and opportunities of different learners.

Third, the curriculum should be developed in such a way that it can easily respond to changes and diversity. Moreover, the curriculum should have an effective build-in feedback mechanism.

Fourth, the curriculum should facilitate staff to develop a holistic view of education so that they see each subject or learning event as a part of one whole educational process.

Fifth, curriculum developers and education administrators should realise that whatever effort they invest in developing the curriculum will have little result in the absence of a conducive educational and learning environment. However, we believe, a conducive environment will not create itself, but the staff and administration of educational institutions must work very hard to create one.

7.3.2 Educational and learning objectives

To-day, the educational objectives of forestry educational institutions are more targeted towards the attainment of the cognitive domain of learning objectives where lecturers equip their students with a certain quantity of scientific knowledge. However, we argue that in an era of rapid change, processes of seeking knowledge and facilitating learning are equally important. Consequently, learning objectives should not only be expressed in terms of expected behaviourial activities, but in addition, facilitating learners to learn experientially becomes an important objective in itself. Nonetheless, our argument is not to abolish the idea of expressing educational/learning objectives in terms of expected behaviourial activities. The experiential theory of learning in this sense should be understood rather as a holistic integrative perspective on learning that combines experience, perception, cognition, and behaviour (Kolb, 1993).

Foresters will always need to acquire and develop their technical expertise, although these technical demands might change over time and will need to be developed and understood within certain contexts. Nevertheless, Smith (1994) argues that the new element for foresters is the great change in their relationships with the public. Originally qualified to deal with trees, foresters are increasingly expected to deal mainly with people. Accordingly, foresters are expected to develop good communication and social skills.
As explained in chapter two, experiential curricula should also pay attention to the interests, abilities and learning styles of learners (Montero-Sieburth, 1992). We argue that these should be considered carefully when deciding educational

objectives. In this respect, Kitchener discriminates between the following three levels of cognitions (Kitchener in Bawden and Macadam, 1991):

(1) cognition, where a learner computes, memorises and reads.
(2) meta-cognition, where the learner starts to monitor his own progress.
(3) epistemic cognition, where the learner starts to reflect on the limits, certainty and criteria of knowing.

It is argued that reflections which emerge at the epistemic level are the ones which influence learner's understanding and ability to take independent innovative decisions when needed (Bawden and Macadam, 1991).

In the light of the above guidelines, we think forestry educational institutions in Sudan should strive towards the attainment of the following educational/learning objectives:

(1) to facilitate learners to achieve a solid grasp of relevant forestry principles and concepts by providing information in relation to specific technical and socio-politico-economic contexts, and to develop their ability to apply them to new situations.
(2) to develop the capacity of learners to reflect upon and learn from their own activities and those of others (capacity to reflect-in-action). Such a learning stage can be facilitated by putting learners into situations of 'constructive confusion'[2] so that learners will generate their own synthesis and arguments alongside the development of their value positions.
(3) to help learners to develop networking skills.
(4) to stimulate learners' experimental skills by encouraging them to dive into challenging intellectual situations (the Advisory Council for Education in Engel and Van den Bor, 1995).

We are fully aware of the difficulty of achieving such kinds of objectives at once. One the one hand, educators will need to develop the necessary attitudes and didactic skills. On the other hand, learners will need to be prepared to move from a situation where they are used to being 'spoon-fed' and see themselves as passive recipients, to the situation where they are ready to participate actively in the construction of what is learnt. These kinds of changes are heavily embedded in the traditional culture that has developed over time. Sudanese culture implies keeping a certain social distance between teachers and students

[2] We see 'constructive confusion' as a carefully planned and developed learning event during which the learner is led to be confused in such a way that he is challenged to start thinking critically and creatively.

and between old and young people. We are aware that such a transformation which calls for substantial cultural changes, will be difficult. Nevertheless, we believe that educators, instead of being pessimistic, should start slowly at least to initiate the process of change.

7.3.3 Selection and facilitation of learning opportunities

We have already indicated that in re-thinking education, what is important is not only which subjects to include in the study programme, but also to ask questions such as: which experiences should learners be exposed to? and what ideas may learners construct from those experiences? Hence, we think that educators should develop understanding and skills for the construction of learning events.

A well perceived challenge in front of many forestry educators in Sudan is how to equip students with the necessary amount of scientific knowledge within the 'limited' time allocated for a specific study programme. This problem may become less serious when educators realise that what is important is not only what quantity of scientific knowledge they provide to students, but also how much help they give to learners in acquiring and developing learning skills. Good selection and sequencing of subjects, and a curriculum which allows for optionals might contribute to solving the problem. Furthermore, it is necessary that educators and curriculum experts strike a balance between global and local relevance selecting learning materials.

It is logical to assume that one learns better when using the ways one is already familiar with. We argue, therefore, that non-formal and formal forestry educational institutions would be more effective and efficient if they followed learning modes which had already been mastered by learners. Educators should not look for learning events only within the domain of formal knowledge: we found that local people's knowledge is also a very practical resource for use within the formal knowledge system especially within a changing environment (In this respect, we refer to the deployment of rural pedagogy and cultural congruence (Ekanayake, 1990)[3].) Beliefs and taboos about trees/forests can be a particularly rich source of learning opportunities. With regard to this, El-Mahi

[3] Rural pedagogy (RP) refers to methods and processes of developing rural communities towards self-emancipation. Cultural congruence is an attempt by educators to ease difficult learning situations by merely accommodating cultural norms and practices of learners in their instructional styles (Ekanayake, 1990).

(1994) argues that taboos normally have two explanations: a pragmatic and folk explanation. The pragmatic one originally triggers the taboo in the society concerned. Then the folk explanation enforces the taboo and transmits it from one generation to another. El-Mahi goes on to argue that while the folk explanation remains alive in the memory of the society, the original reason or the pragmatic explanation of the taboo is forgotten (El-Mahi, 1994). We sure that efforts towards discovering not only the folk explanations, but more importantly also the pragmatic ones of such beliefs can enrich forestry knowledge.

In rural areas, culture, physical and social environments are the main sources of knowledge and experiences. Villagers do not have laboratories or research stations, instead they make use of the whole of their environment. Villagers learn at the farm, from animals and natural phenomena. Likewise, among local people there is no one whose job it is to do research, but rather everyone is a (re)searcher. (Re)searching for villagers is not a profession, but a learning opportunity and a survival strategy. Hence, we emphasis that it is important that educators should make use of social actors' natural ways of learning. In this respect, among the lessons we learned during this study is that villagers believe that learning can better take place by means other than direct teaching. Hence, in their informal educational processes, villagers deploy actual teaching as the last resort and only when they realize that the child (learner) was unable to make use of the opportunity to grasp the point. Forestry educational institutions are dominated by the lecture-type of teaching. However, we think that in an era of change new ways of teaching should be organized for realizing higher levels of learning objectives such as analysis, synthesis, application and evaluation. Moreover, for developing learners' learning skills, teaching methods should become more learner-centred, tuned to the capabilities of individual learners and facilitating self-regulative learning (Van den Bor et al., 1995). Nevertheless, we are aware of the difficulties which might impede forestry educators' efforts towards developing and using innovative learning events and facilitation strategies. Among these problems we mention the following:

(1) increasing students numbers.
(2) inadequately prepared class-rooms.
(3) insufficiently motivated staff.
(4) inflexible timetables and study programmes.
(5) scarcity of resources such as textbooks, facilities, references and laboratory equipment.
(6) low working budgets.

(7) neither the staff nor the students are prepared for such changes (as the use of innovative learning facilitation methods) and have neither the skills to use them effectively nor the cultural background to accept them.

Since some of these obstacles, like the shortage of funds and scarcity of resources, will continue to be a problem, forestry educators must think about and develop creative solutions. To contribute to this endeavour, we propose the following.

(1) Depending on the circumstances, one should look into the possibilities of dividing the students' group into a morning and evening group. Otherwise, one can opt for dividing the contact hours between the two sub-groups, for example, if there are four contact hours per week, each sub-group could have only two contact hours per week, while using the other two hours for self-study.

(2) Make the curriculum and working time table more flexible to allow the staff to coordinate their innovative strategies.

(3) Encourage and train the staff in the use of innovative learning facilitation approaches.

(4) Prepare learners to be active participants in the educational and learning processes.

(5) Make available references and textbooks. This might be facilitated through creating links with similar national, regional and international educational institutions, GOs and NGOs interested in promoting developmental education. Moreover, staff can be encouraged to write their subjects' syllabi. These readers could be made available for sale at subsidised prices.

(6) To generate income to support the use of innovative educational strategies, both educational institutions and students' unions can be engaged in investment programmes e.g. running students' canteens or cafeterias, work-place cooperatives, creating consultancy agencies, agroforestry investments, etc.

(7) Arrange students to work in groups or individually in forestry and related institutions to gain both practical experience and cash i.e. try to combine production with training at the sites of the field practicals. However, these arrangements need to be organized first at higher institutional levels.

(9) Another way to solve the problem of providing practical experience is to establish field stations in major socio-ecological zones in the country, forming alliances with research institutions and FNC field offices to ensure operational maintenance. Educational institutions can then combine training with research, and thus collect relevant data for use in curriculum development and implementation.

Based on the experiences gained during this study we conclude that the need for refresher and follow-up courses cannot be overemphasized. Hence, we think that forestry educational institutions should organise refresher and short courses for various forestry categories of staff. In a way this is an efficient use of an institutions' facilities and resources during vacations. In addition, they can establish and maintain good linkages between educators and field forestry staff and allow them to exchange information easily, and can be sources of additional income both for educators and their institutions. Nonetheless, from our own experiences we feel that conventional types of refresher courses might not be adequate. For some of the senior and field level staff it might be difficult to leave their duty-stations for more than one or two days to participate in courses organized at the university campus. More senior foresters might not even like the idea of being invited to attend a course as it has the connotation of being asked to be a student again. Consequently, we put forward the following suggestions for alternative ways of making refresher and follow-up courses more effective.

First of all, we think that sometimes it may be necessary to avoid using the term 'course' but rather a term like 'meeting' or 'seminar'.

Second, instead of only functioning within an enclosed set of buildings, educational institutions can spread into forest areas and villages in such a way that 'courses' can be organized in the field.

Third, it is not necessary (or to be encouraged) that everything should be controlled by the university staff. Instead, the staff should act as facilitators who organize learning opportunities through inviting experts from forestry and other related fields and experienced foresters to prepare and discuss some learning events.

Fourth, it is not necessary that courses should cover many themes. We think it will be better if courses are kept short and related to one theme e.g. one particular problem.

Fifth, instead of using the usual lecture-type of instruction we propose the use of group discussion, asking participants to prepare something about their experiences in relation to the theme and discussing these contributions.

Last but not the least, educational institutions should allocate defined staff and resources, including time in the academic year for organizing these kinds of programmes. This can be through establishing a specific office for non-formal education and outreach or nominating a number of staff on a rotational basis to be responsible for organizing such activities. In all cases, the institution will need to create a suitable reward system for those involved so that these kind of activities are not looked upon as of secondary importance.

We have repeatedly argued in the previous sections that in re-thinking education, learners and educators will have more active roles to play in the educational/learning process. In the next section we discuss our views on educators' and learners' qualities and new roles.

7.3.4 Perspectives on educators' and learners' characteristics

The new conceptualization of education, learning, knowledge and curriculum development realizes that educators are no longer viewed as the detached transmitter of knowledge or skills, who, having a coherent grasp of the subject, are able to transmit the subject to the learner effectively. Instead, the educator becomes a facilitator and a learner himself, who helps learners in the active construction of meaning by starting from the learners' own ideas and providing opportunities for building on these ideas, or if necessary to modify these ideas to accommodate conceptual change (Driver and Oldham in Wals, 1994). However, this by no means implies that educators will have a lesser role to play. On the contrary, the change from teaching to facilitating may put a greater burden on educators. On the one hand, as a result of losing the security of being the 'expert', educators will have to develop a level of self-confidence. On the other hand, shifting from conventional content-oriented teaching methods to facilitating learning calls for more creative qualities from educators. Unfortunately, as we have indicated before, there is a common misunderstanding among many educators that forestry specialists can teach by intuition alone. Notwithstanding this, we argue that it is essential that educators in higher educational institutions themselves be trained and qualified. We believe, this shift in the educators' role implies considerable change in the ways of facilitating educators' professional skills. There is a need to change from traditional teacher training programmes which pay more attention to content, to approaches which can help educators to develop the necessary professional knowledge, skills and attitudes.

The change in emphasis from teacher-centred education to learner-centred learning brings with it new roles for learners as well. Learners are no longer seen as "lumps of clay" to be moulded by teachers. Instead learning is based more on the learners' previous experiences and influenced by their realities. Hence, we argue that it is very essential during the needs assessment process to look carefully into learners' prior experiences and their social, economic and physical environment to grasp some ideas about opportunities and limitations which can influence educational and learning processes.

Nevertheless, among the difficulties which need to be addressed before educators and learners can be expected to play their new roles is how to overcome the influence of Sudanese culture which makes it hard for educators to show willingness to learn from those "lowers" than themselves e.g. students. Students too are used to keeping some social distance between themselves and their teachers. We believe, this kind of great cultural change is not easy to attain at once, but demands substantial efforts both from educators and learners.

Among the elements which might contribute to overcoming the above mentioned cultural problem is changing the present type of examination which reinforces the social distance between educators and learners. In the coming section we discuss this issue.

7.3.5 Assessment of educational-learning processes

Under the present socio-economic conditions where it is difficult to mobilize staff and students' internal motivation for facilitating proper learning environments, it may be necessary for educational institutions to develop systems to monitor and evaluate not only students' performance, but equally to assess learning facilitation of the staff. The latter evaluations can be somehow linked to staff promotion procedures. Moreover, it is necessary to involve students in these kind of evaluations as part of the whole educational process. However, these evaluation approaches must develop in an atmosphere where all feel secure and willing to be evaluated. In other words; monitoring and evaluation far from being a kind of inspectorate activity, should give the feeling that the purpose is not to approve, but to improve. Likewise, we are of the opinion that assessment of students' learning should give greater responsibility and power to the learners. In this respect, we think that as part of the learning facilitation strategy educators can create opportunities for the students to self-evaluate their own learning process. The student can be asked to reflect upon and show what and how he has learnt. We think this can constitute as least part of the final assessment. Other alternatives can be: group self-evaluation[4], open book and take home exams, project works and presentations. We argue that without abolishing the present assessment procedures that encourage learners to acquire 'facts' propositionally in a rather passive way and memorize them solely to pass exams, the whole endeavour will deemed to be a failure.

[4] In this respect, we have experience of where group members have been involved in evaluating each other's group work.

Nonetheless, it is essential to realise that Sudanese students are now familiar with "spoon-feeding" types of delivery like lecturing and dictating lecture notes, and accustomed to examination methods which ask no more than reciting what they have been taught in that specific subject. It may be necessary therefore to take the student through the process gradually.

7.4 Educational-learning systems' environments

The kind of learning we advocated will not flourish unless a suitable environment is created through the provision of necessary material and human resources. On the one hand, it is clear that under the prevailing conditions educators are not likely to make an effort to create suitable learning environments unless they are well motivated, hence, the need for developing creative reward systems which do not only depend on publications and numbers of hours taught, but also give consideration to staff's innovative capacities. Moreover, it is essential to strengthen educators' creative powers by strengthening their professional pride through better training. The availability of suitable materials is also a prerequisite for such type of learning to take place. Forestry educational institutions in Sudan should have a reasonable standard of physical and material facilities such as: equipment and tools for laboratory and outdoor practical work; workshops; good libraries; audio-visual equipment; written materials like syllabi; well prepared classrooms and transport facilities. However, it is clear that as long as the operational budget remains limited, provision of necessary human and other resources will be difficult. This situation in turn, puts more demands on educators, learners and administrators, as they need strong internal motivation to work under such poor circumstances. We have argued before that one way to improve the economic situation is through urging higher forestry educational institutions in Sudan to diversify their budgetary sources by creating some commercial production units instead of totally depending on public finance.

In turn, we think that all these changes cannot be made smoothly without substantial changes in the organizational structures of these institutions. The management of educational institutions is academics who mostly do not have any kind of qualification in management. This has caused difficulties, particularly since academics often take the management task as a second priority, because for their professional and career development they still have to compete with their colleagues through research and publishing.

We have repeatedly argued in this study that it would be an oversimplification to attribute foresters' poor performance solely to one specific factor. In reality, performance is determined by a composite of interrelated factors. Hence, we think one should not only blame educational institutions for the poor performance of their graduates, but employers and the work environment have also great influence. In Sudan, although forestry educational institutions belong to the Ministry of Higher Education, the Forests National Corporation is the main employer of both B.Sc. and diploma holders. Consequently, unless the FNC creates a favourable work environment and encourages staff to be innovative, whatever improvement takes place within the forestry educational system will have a minor impact only. We found that, in general, employers do not pay enough attention to in-service training and the work environment does not provide enough motivation for employees to work better.

By way of summing up this section, we argue together with Van den Bor and Shute (1991: 11), that: "Apart from the relatively limited contribution universities can make one has to keep in mind that education is but one of the factors promoting socio-economic development. The impact of education will lead to individual and social change only if combined with relevant non-educational inputs". So, at the needs assessment stage of the curriculum development, educators should look for opportunities and limitations in the systems' environment, which can influence the educational processes. In the next section we reflect upon the kind of needs assessment we call for in support of curriculum development.

7.5 Participatory inquiry in support of curriculum development

Unless concrete curriculum documents are prepared on the basis of a proper inquiry, we wonder whether the whole educational process will not proceed aimlessly and get lost. Moreover, we argued in the previous section that the performance of forestry graduates is influenced by a composite of interrelated factors, some of which are not even related directly to the educational sector, such as the subsequent work environment. Hence, we believe that we should not limit ourselves to analyzing higher forestry educational institutions, but our efforts should be extended to cover also the educational systems' environment. System thinking allows us to conceptualize and to analyze forestry education at three levels of system's aggregation. These are: societal, institutional and activity levels.

However, 'conventional' needs assessment studies may not be the appropriate approach to facilitate the kind of curriculum we advocate, for the following reasons.

(1) Going out to the field with the idea of looking for learning needs does not always give the required insights into actual social actors' learning needs. Sometimes, actors themselves are not very clear about their learning needs.

(2) By confining ourselves to looking only for learning needs, we believe, we may miss the opportunity of learning ourselves, and of collecting cases, learning events and strategies which could later be used during the educational/learning process.

(3) Confining ourselves to needs assessment only, prevents us from grasping characteristics of the various aggregate levels of the educational system. Consequently, we may miss the chance to learn about the opportunities and limitations influencing educational/learning processes.

Hence, we argue that for facilitating the development of an experiential curriculum, a more general and participatory inventory is most needed. Such a participatory inquiry should produce perspectives and information about knowledge, education and learning; roles and characteristics of educators and learners; occupational tasks; and the environments of educational systems to form the foundation for a curriculum development process.

In this study we tried to contribute to the discussion on the curricula of higher forestry educational institutions in Sudan through proposing the following model for curriculum development.

7.6 The proposed model for curriculum development

The proposed model consists of the following main six tasks.

First, participatory inquiry in support of curriculum development. This could be organized in the form of a workshop consisting of both office work and field visits. Participants representing relevant categories of social actors can be invited. Following an introductory opening session, participants could be split into sub-groups e.g. five groups. During the workshop, group facilitators can deploy techniques such as PRRA, sondeo, SSM and PTD. The outcome of such a workshop can be in the form of the following outputs:

(1) perspectives on knowledge, education and learning processes.

(2) educators' characteristics and roles.

(3) learners' characteristics and roles.

(4) occupational forestry tasks.

(5) educational systems' environments.

The sub-groups should pool their contributions on the above five issues into an information platform organized in the form of a panel.

Secondly, the model needs decision making concerning educational and learning objectives; subject selection; teaching/learning facilitation strategies and approaches for assessment of educational and learning processes' outcomes.

Using the information that has been discussed and modified in the information platform, participants should continue working in four sub-groups to come out with specific decisions and recommendations on the following issues:

(1) educational and learning objectives.
(2) learning opportunities selection, time and sequencing[5].
(3) learning facilitation strategies and media.
(4) educational and learning processes assessment criteria.

Again, the sub-groups' contributions should be reviewed through a panel discussion.

Thirdly, specific syllabi need to be developed, which can be done by concerned Subject Matter Specialists.

Guided by the frameworks developed regarding the above four issues, concerned SMSs should determine the following:

(1) Specific educational and learning objectives.
(2) Specific learning events.
(3) Learning facilitation strategies and aids.
(4) Criteria and strategies to assess educational and learning processes and outcomes.

Fourth, bringing it all together, concerned SMSs should come with their syllabi proposals to a discussion in the large group. Meanwhile, the group should revise the whole endeavour looking for the necessary harmonization between the different components of the curriculum.

By the end of this activity the curriculum document should be ready for actual testing.

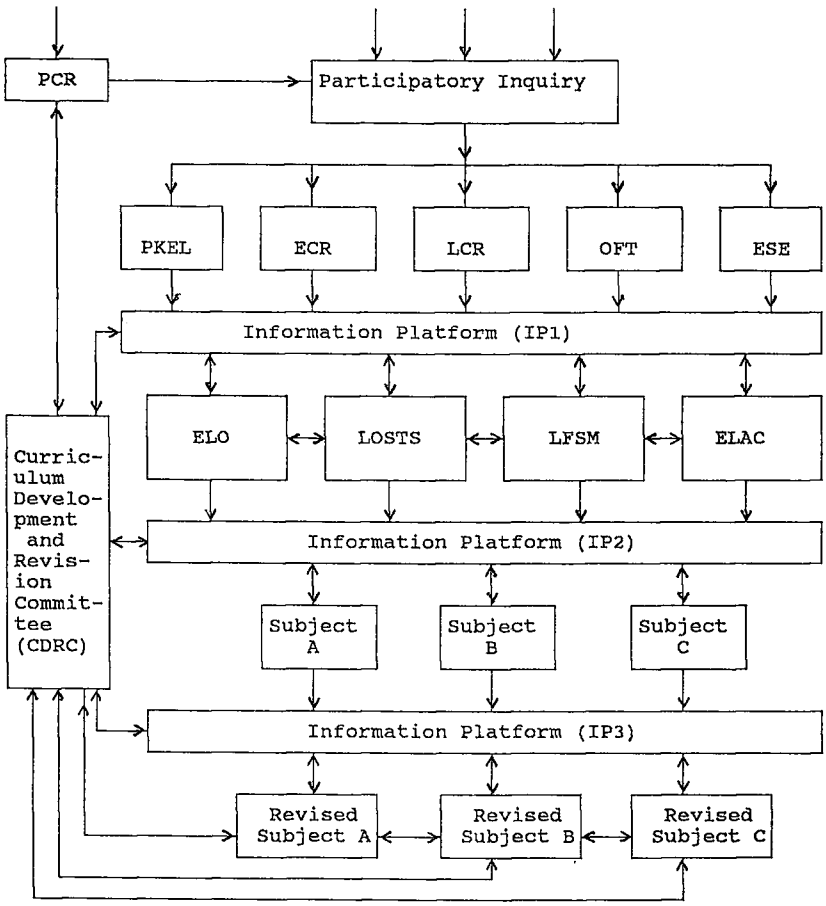
Fifth, the staff concerned must implement the newly developed curriculum document. During this process it is essential that a specific committee should

[5] A learning opportunity or event will not necessarily be similar to what we have traditionally labelled as a subject. Instead, a learning opportunity can be focused on a particular real problem.

encourage and ensure the necessary interaction between the different facilitators (and their subjects).

Sixth, continuous monitoring and evaluation of the curriculum, could be the responsibility of a special committee such as a Curriculum Development and Revision Committee. This committee should look for both feedback from the internal staff and also externally, from students coming back from home or field practicals, participants of refresher courses and meetings, etc. Moreover, this committee in consultation with the administration should create *ad hoc* opportunities for general curriculum evaluations, inviting relevant personnel and institutions.

Although the model as presented might give an impression of a sequence of stages in the course of development, these stages or tasks are in fact very closely inter-related and thoroughly interactive.



CDRC: Curriculum development and revision committee
ECR: Educators' characteristics and roles
ELAC: Educational and learning processes assessment criteria
ELO: Educational and learning objectives
ESE: Educational systems' environments
IP: Information platform
LCR: Learners' characteristics and roles
LFSM: Learning facilitation strategies and media
LOSTS: Learning opportunities selection, timing and sequencing
OFT: Occupational forestry tasks
PCR: Participatory curriculum revision
PKEL: Perspectives on knowledge, education and learning processes

Figure 7.1 A proposed model for forestry curriculum development

8 GENERAL CONCLUSIONS AND RECOMMENDATIONS

In this last chapter we do not intend to add new information, rather we will draw the main conclusions and propose some recommendations for policy and practice with regard to forest resource management and forestry education in Sudan.
We start by presenting the general conclusions and consider the recommendations.

8.1 Conclusions

In this section we will present conclusions regarding perceptions of tree/forest resources, the organization of resource management and future outlooks on forest resource management in Sudan. We then tackle conclusions concerning knowledge processes

8.1.1 Perceptions of tree/forest resources

This study indicated that whereas a forest is the unit of concern for officials, the tree is the focus of villagers' attention. For villagers, a forest is a collection of trees, where some are positively valued and need to be protected, while others are not important, and still others are seen as evil trees which should not be touched.

In general, social actors see trees/forests as sources and signs of life. In addition, various categories of actors attach different social, economic and/or cultural meanings to trees/forests.

This study revealed existence of a variety of beliefs among social actors regarding tree/forest resources. These beliefs vary from good omens to taboos and cosmovisions related to the use of trees or forest products for medicinal, cultural and spiritual performances. Notably these beliefs are characterized by being location and/or species-specific.

Perceptions, beliefs, socio-economic and cultural needs, and knowledge interact and together they structure social actors' objectives for tree/forest resource management. Similarity between foresters' and villagers' objectives was found to be rare. On the one hand, foresters' management objectives are focused on management of forests for provision of forest goods (mainly firewood and charcoal) and forest services (soil conservation) for the whole nation. On the other hand, villagers keep trees for shade, fruits, social-cultural-spiritual-economic reasons, but rarely for firewood alone. Moreover, sometimes what is important for villagers is seen as of 'minor importance' to foresters.

8.1.2 Organization of forests management

As a result of focusing on trees, villagers traditionally did not care about ownership of forests. Nonetheless, ownership of valued trees on private or communal land was well known. Consequently, in any one place, some trees like *hashab* would be individually owned while others were seen as common property of the tribe or village and still other species would be open to everyone.

Ignoring villagers' systems of property rights over trees, the Government in Sudan intervened in many ways to manage the resources on 'scientific' basis. Nevertheless, the abolition of the traditional Native Administrative system together with many other factors led to the situation where the state was effectively unable to manage the resources on a sustainable basis. Consequently, some of the tree/forest resources acquired the characteristics of unowned, non-property resources. State laws and classification of forest resources did not command the necessary social regard.

Despite the fact that villagers indicated that they no longer enjoy the privileges of being close to forests, the majority of informants in the study accepted that Government intervention in the form of reservation was a positive step, without which villagers believed that no forest would have remained.

Most foresters see forest management mainly as a technical task consisting of a series of context-free management activities. Hence, they have a set of pre-determined management prescriptions which they follow irrespective of the socio-economic and cultural environment. In contrast, for villagers, forest resource management is part and parcel of their overall land use system. Local people do not compartmentalise between forestry and other land use strategies

and activities. Moreover, forest resource management must deal with a considerable degree of heterogeneity of both actors and situations.
Based on the experiences we gained during this study, we differentiate three levels of forest resource management strategies. These are: utilization-management, protection-management and development management.

8.1.3 Forests management: future outlook

With regard to the future of forest resource management in Sudan, social actors appreciated the positive changes in each other's attitudes and behaviours, and showed willingness to manage the resources jointly. Both villagers and foresters see the future of forestry in Sudan in the cooperation between forestry authorities and village level native institutions. Nevertheless, it is necessary that the situation of the mutual scepticism be removed before any actual step can be taken in this direction. At present, the real dilemma is the fact that many people feel that neither native institutions nor government ones are in a position to manage forest resources effectively. On the one hand, the present native institutions lack both the necessary social respect and legal support. On the other hand, local government forestry institutions have neither enough resources nor the social support to manage the resources.
It is argued that for the native institutions to start playing an effective role in the management of the resources, the state should willingly provide material, but more importantly legal, support to them. Moreover, villagers and their leaders as well as officials must be aware of and prepared for their new rights and responsibilities.

8.1.4 Knowledge and information activities

Formal Forestry Research (FR) in Sudan started as part of the Forests Department (FD). Nevertheless, since it joined the Agricultural Research Corporation, the nature of research as well as the links with the forestry services were very much affected. On the one hand, FR kept virtually no formal link with the FD. On the other hand, the nature of research changed from applied to basic research. Both resulted in research programmes becoming alienated from the needs of the forestry service. In addition, most research is staff-oriented. Researchers determine problems to be researched, and carry out experiments, leaving foresters and villagers to apply the findings. However,

research staff rarely keep contacts with either foresters at the grassroots level, or more importantly with villagers.

The experiences we gained during this study have led us to the conclusion that formal forestry knowledge in Sudan is based on the assumption that wood is the main product. In most of their experiments forestry researchers look mainly at wood production, and do not pay enough attention to non-timber products. For many foresters, the latter are perceived as 'minor' products. In addition, foresters in the field failed to acknowledge the fact that Government and other (private and communal) forests represent two different situations where managers might have different objectives and resources (including knowledge). Consequently, extension officers tend to disseminate unified, ready-made messages to very different groups of clients.
In the past, it was thought that the forestry knowledge system was monopolized by foresters. At present, it is becoming increasingly realized that other non-foresters also know a lot about trees/forests. Hence, in this study officials showed great interest and appreciation for local people's knowledge. Nonetheless, despite their recognition and appreciation of this kind of knowledge, foresters rarely make use of it. Moreover, this has not changed the foresters' attitude that they know better and should tell villagers what to do. Foresters do not usually take villagers' observations and comments seriously.

In general, the following are among the lessons about villagers' knowledge activities that we learned from this study:

(1) Villagers do not isolate learning from researching, but perform both at the same time. Hence, their research is rather action and need oriented. Villagers start from a concrete problem and learn experientially through knowing-reflecting-in-action to develop solutions. For knowledge generation, villagers make use of the whole of their surrounding environment. Therefore, careful observation represents the corner-stone in all villagers' experimentation and knowledge.

(2) During experimentation villagers tend to coordinate roles and research activities among themselves. Moreover, unlike formal knowledge which claims rationality, local people's knowledge is embedded in different kinds of rituals and spiritual beliefs.

(3) Appreciating the diversity and variation of each one's situation, villagers do not tend to reach to consensus and unified knowledge and solutions. Instead, villagers pool their experiences so that everyone can tailor (use) what suits his particular circumstances.

(4) Formal forestry knowledge is more developed in the areas of nursery and plantation technology, whereas local people show more expertise in areas of agroforestry and forest utilization.

(5) Many cases in this study indicate that villagers use their knowledge as a whole in their decision-making. Nevertheless, having knowledge does not mean that social actors will follow it. In reality, for various reasons they may behave in a substantially different manner.

(6) Villagers normally exchange information among themselves during greetings; particular occasions and locations such as funerals, market days, and religious/cultural feasts. Such tradition is not common among foresters. In general, both villagers and officials prefer to use verbal communication to written materials for exchanging and sharing experiences. Moreover, in extreme cases communication problems between villagers and foresters can lead villagers to distrust extension staff.

Regardless of all that has been mentioned about local people's knowledge, villagers seem to be increasingly demoralized with regard to their knowledge. During this study many villagers indicated that old people used to have more knowledge about trees, whereas new generations lack both the motivation and opportunity to learn about trees. Consequently, villagers' tend more and more to wait for "external" ready-made knowledge and technologies.

8.1.5 Forestry educational systems

The findings of this study support the idea that the capacity for sustainable management of forest resources in Sudan exceeds social actors' competencies be they researchers, educators, forestry officers, villagers or their organizations individually. The necessary knowledge base for effective tree and forest resource management is fragmented among the different social actors. In the absence of a suitable knowledge and information system, appropriate management of forest resources will be difficult.

Knowledge in this research is conceived as a situation-specific and dynamic human construct. Social actors are continuously engaged in knowledge processes in their effort to stay in harmony with their environment. Knowledge is heavily embedded in social, economic and cultural processes. One cannot therefore judge others' knowledge one-sidedly, but instead we believe that one should facilitate free interaction between various social actors' knowledge

systems. During these interactions, social actors can choose what is relevant and compatible with their systems, then they can make the necessary modifications (if required) before eventually incorporating and internalizing it within their own knowledge systems.

The Sudanese begin their informal education about trees/forests at an early age, when as children they start following their parents to farms and forests. Within (the boundaries) of their surrounding environment, children learn incidentally, through curiosity, inquiry and through guidance and instructions by elder people. However, this we found no specific pattern whereby villagers selectively and purposefully teach youngsters aspects of dealing with trees or forests. In other words; it is difficult to isolate a separate system which we can label an informal forestry education distinct from villagers' general informal educational system. Thus informal forestry education is an integral part of villagers' overall living strategies. However, villagers believe that this way of learning, where children learn from experience, is more durable than what is learnt in schools. Nonetheless, informal education is not limited to villagers. In reality it accounts for the great bulk of any person's total lifetime learning including that of highly 'schooled' people (Coombs, 1985). Normally before joining school, but also during and after their school-period, professionals acquire and exchange information outside formal and non-formal educational systems. Informal learning becomes particularly important when formal and non-formal systems fail to provide immediate solutions.

The oldest non-formal educational system in Sudan is that of the *khalawi* or koranic schools, which can be traced back to the fourteenth century. However, this study indicated that early non-formal educational systems did not pay special attention to trees/forests as such. It was only in the 1960s that the Gum Arabic Research and Extension Project carried out a kind of non-formal education specializing in forestry. However, this project did not continue for long and specialized non-formal forestry education was only resumed in the mid 1980s through the establishment of the FNC's forestry extension section.

The general educational system in Sudan provides a noteworthy amount of information about trees and forests, but in a rather sporadic manner. Forestry education as such is only offered at the higher educational level, where it is split into technical and academic forestry education.
We are of the opinion that this discrimination between technical and professional education remains an indication of the fact that Sudanese higher education has not yet been able to get rid of its legacy from the British system.

In reality, technicians' education in Sudan is only a watered down version of university education, where the difference lies in level rather than type of education.

The history of formal forestry education in Sudan goes back to the 1940s when the British established the Forest Rangers' School. However, university level forestry education within the country started later in 1975.
Stated missions of the Sudanese higher forestry education do not vary from those of similar higher forestry educational institutions in other developing countries. They generally include; teaching, research and outreach activities.
In general, higher forestry educational institutions do not have clear and comprehensive curriculum documents. Instead, existing curricula include lists of subjects taught together with brief course descriptions. The course for technicians consists of a three-year study programme leading to a general diploma in forestry, whereas the course for the professionals lasts for five years and leads to a B.Sc. degree in forestry.
Despite the fact that there is a clear structure to be followed for curriculum development, in reality this machinery is seldom used. Instead, curriculum revisions and modifications take place at faculty or department level mostly on a personal basis. However, neither official nor operational curriculum development approaches usually involve clients or employers as active participants in the process.

In the absence of concrete and extensive curriculum documents, the selection and sequencing of subjects depend more on the personal initiatives of staff and the availability of qualified lecturers. Moreover, teaching methods are predominantly of the lecture type and due to shortage of textbooks and lack of duplicating facilities, lecturers use considerable time in dictating their lecture notes to students. Furthermore, assessment methods require little more than the reproduction of information accumulated by rote learning.

Though not specific to forestry education in Sudan, didactic skills are not among the qualifications required for one to be a lecturer in a higher educational institution and teaching quality rarely influences staff promotion. Although some efforts have been made to train forestry educators in curriculum development and didactic skills, it is clear that under the prevailing economic conditions and staff reward system educators have neither the time nor motivation to create a favourable learning environment.

One way to assess the quality of an educational institution's activities is by examining the quality of the product i.e. the performance of the graduates. Some employers indicated that many new graduate foresters lack motivation, which some labelled as lack of discipline. Graduates seldom link what they do with what they have studied. It seems that they do not have the spirit of creativity and willingness to innovate.

Examination of the agendas and activities of higher forestry educational institutions reveals that they do not have any kind of planned or organized outreach programmes. In addition, as indicated in the case of the research, the situation of university research is no better than that carried out by the FR. Most of the research is thesis-oriented and not related to the needs and inspirations of either field level foresters or villagers.
Such situations have led us to conclude that forestry education in Sudan far from being developmental, rather impedes forestry development.

However, it would be an oversimplification to attribute poor performance of graduate foresters solely to one specific factor. In reality, graduates' performance is determined by a composite of inter-related factors. Some of these factors are not even directly related to education, such as the work environment. Under the prevailing situation some informants believe that the work environment for highly educated personnel is not demanding. Some foresters even think that for the kind of work they do at present it is a wasteful use of resources to have university graduate staff. They believe these kind of activities can be effectively performed by much less educated staff.
We believe forestry educational institutions have much to contribute to correcting this situation. Instead of seeing themselves as "experts' bureaux", waiting to be consulted, they should take initiatives, and stimulate and facilitate change processes.

Perceiving education/learning as a lifelong process calls for institutions which are willing and capable of facilitating in-service and continuous education and an appropriate learning environment. The importance of refresher courses and in-service training stems also from the fact that during regular education, students feel the need to learn mainly to pass exams.

Women are becoming increasingly involved in forestry activities and the number of female foresters is increasing. Taking into consideration the fact that rural Sudanese culture in many places does not allow easy interaction between male extension officers and village women, the need for female forestry extension

officers seems to be well understood. However, the study reveals some disagreement among foresters over the role of female foresters.

We are afraid that from the way we have been talking about knowledge education and learning, one might develop the impression that everything is changing so quickly that there is no rationale for learning any specific skills and/or knowledge since these would become almost immediately obsolete. What we want to say is that despite these great changes, a great deal of knowledge does not lost its relevance that quickly. Rather at any one time and place, one needs to learn some knowledge, develop some attitudes and acquire certain skills, otherwise one will not have any intellectual position from which to develop. We believe: "change does not takes place in vacuum". We argue with Kolb (1993) that new ways of education and learning should not be seen as a replacement for present-day educational/learning paradigms, but rather as a holistic integrative perspective on learning that combines experience, perception, cognition, and behaviour.

8.2 Recommendations for policy and practice

In this section we first deal with recommendations regarding forest resource management and then address issues of knowledge activities.

8.2.1 Forest resource management

Without saying that social actors' perceptions, beliefs and knowledge do not influence their behaviour as concerns management of forest resources, we argue that foresters have to be cautious in dealing with them. These issues have to be understood within their social, cultural and economic contexts. Nevertheless, we recommend that if foresters are to be effective they should take other social actors' perceptions, knowledge and management objectives into consideration when deciding official management objectives and strategies.

As concerns tree and forest land tenure, the State should facilitate the establishment of property systems by defining groups in defined areas and with rights of inclusion and exclusion. Only when they are granted such genuine proprietorship, will actors become effective and sincere in managing forest resources in a sustainable way. What is needed is not only regulation but cooperation with regulation. Government can help local native institutions by

providing a legal framework, and perhaps technical assistance. "The legal framework should make it possible for local collective action organisations to obtain legally enforceable recognition of their identity and rights within the society, and to call upon the state as an enforcer of last resort" (Wade, 1987: 105).

8.2.2 Knowledge processes

In the circumstances where none of the social actors alone has the required knowledge base, it is logical that the group of interdependent forest resource managers should create a platform and discuss, negotiate, bargain and coordinate their resources (including expertise) to manage the resources in a sustainable way. We believe that forestry educational institutions can help this process, but before being able to do so, they must stop seeing themselves as "experts' bureaux", but become networking institutions.

Moreover, in an era of rapid change, social actors should learn more about learning. Facilitation of learning could be through making things visible, helping people to reconstruct realities through experimentation, discourse, observation and meaningful experience. Here, we think that local people's knowledge is a useful and practical resource for use within the formal knowledge systems. However, in order to facilitate such kinds of learning, educators should not only see themselves as ones whose task it is to impart certain a quantity of knowledge, but also as facilitators who create opportunities for continuous and self-regulative learning.
Nevertheless, educators have to be aware that this kind of innovative education may put more responsibilities on them. Although, they may spend less time in teaching, educators will need much time for careful planning and developing learning events.

In general, forestry educational institutions need to restructure their curricula, create channels for on-going monitoring and feedback, and develop systems for revising the curriculum. In addition, educators in the various fields of forestry are expected to develop syllabi as soon as possible and pay more attention to the preparation and the use of lesson plans. Furthermore, lecturers should be encouraged to develop and print readers for their courses to be sold to students. This will allow more time for interactive learning instead of spending most of the time on dictation or taking notes during lectures.

One way to facilitate students getting suitable practical experience given the present critical budgetary problems is by attaching them to forestry institutions throughout the country. These forestry institutions are then, requested to give "feed-back" to the educational institution on the students' competence, attitude and achievements, which would be taken into account in the final assessment. However, we believe it is essential that the staff of educational institutions make sure that students actually practice and work in the field and do not spend most of their time in offices.

However, all the above mentioned requirements will be of limited effect in the absence of a suitable administrative institution and an overall conducive environment, including a good staff reward system. Again, educators should not wait for these improvements to come by themselves, but they should work very hard for the creation of such a conducive educational and learning environment.

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SUMMARY

This study is an effort to understand the way various categories of social actors go about their interaction with the management of forest resources in Sudan. By providing an overview and description of the motives, perceptions, and management objectives and strategies of social actors, the study tries to contribute towards better understanding of the social, economic and cultural factors influencing the resource management. The specific objectives of this study include:

(1) Investigation of how social actors interact with forest resources in an era of rapidly changing conditions.
(2) Get a better understanding of how changes in management objectives and strategies are influencing and are influenced by knowledge processes.
(3) Analyze present forestry education's curriculum.
(4) Explore possibilities of incorporating what we learn during the course of this study to propose a model for development of curriculum for forestry education in Sudan.

This dissertation is written on the basis of empirical data collected from various individuals, groups and institutions involved in forest resources management in Sudan. The field work for the study was carried out mainly in the Central region of Sudan. However, the author's own experiences and those of other officials who worked in other locations, made the scope of the study not limited to geographical boundaries of the region.
For the data collection, a combination of methodological instruments such as discussions, semi-structured interviews and participant observation, were used iteratively. Besides, taking a social actor as a unit of analysis, the study has used a hybrid of the systems' and the actors' perspectives as the main analytical tool.

The main findings of this study indicate that:

First, whereas, a forest is the unit of concern for officials, it is the tree which draws villagers' attention more than the forest as such. However, in general social actors see trees and forests as sources and signs of life. Besides, various

actors attach different social, economic and/or cultural meanings to trees/forests. Consequently, they develop varying management objectives and strategies. In this regard, this study shows that similarity between foresters' and villagers' objectives is the exception rather than the rule. Foresters' management objectives are focused on management of forests for provision of forest goods and services for the nation, whereas villagers keep trees for social-cultural-spiritual-economic reasons, but rarely for firewood alone. Sometimes, what is important for villagers is seen as of 'minor importance' to foresters.

Second, villagers traditionally, did not care about ownership of forests. However, ownership of valued-trees was well known. Notwithstanding such a situation, the government in Sudan intervened to manage the resource. Nonetheless, abolishment of the traditional Native Administrative system together with many other factors led to the situation where the state was unable to manage the resources on a sustainable basis. Hence, some of the tree/forest resources acquired the characteristics of the unowned, none-property resources.

Third, most of the foresters see forest management mainly as consisting of a series of context-free technical activities, while villagers perform trees/forests management as part and parcel of their overall land use.

Fourth, this study exposes social actors' appreciation concerning positive changes in each other's attitudes and behaviours and their willingness to manage forest resources jointly. Nevertheless, villagers and their leaders as well as officials have to be aware of and prepared for their new rights and responsibilities.

Fifth, this study manifests that the formal forestry knowledge in Sudan is based on the assumption that wood is the main product. In most of their experiments forestry researchers look mainly into wood, and did not pay enough attention to non-timber-products. In addition, extension officers tend to disseminate unified, ready-made messages to various clients' segments. As well, in spite of the shown appreciation of local people's forestry knowledge, foresters rarely take villagers' observations and comments seriously.

Sixth, women are becoming increasingly involved in forestry activities and the number of female foresters is increasing. Taking into consideration the fact that the rural Sudanese culture in many places does not allow easy interaction

between male extension officers and village women, the need for female forestry extension officers seems to be well understood.

Seventh, the following are among the learning points in relation to villagers' knowledge activities as depicted from this study:

(1) For villagers researching and learning are inseparable. Deploying their surrounding environment in its totality, villagers carefully observe and learn experientially.
(2) Local people's knowledge is embedded into different kinds of rituals and spiritual beliefs.
(3) Villagers do not tend to reach to consensus and unified kind of knowledge and solutions.
(4) Villagers normally exchange information among themselves during greetings; direct and indirect asking; certain occasions and locations such as funerals, market places and days, and religious/cultural feasts.

Eighth, the findings of this study reveal that none of social actors alone has the technical/managerial capacity pertinent to sustainable management of forest resources. The necessary knowledge base is rather fragmented and unevenly scattered among different actors. Hence, we argued that in the absence of a suitable knowledge and information system, appropriate management of forest resources will be difficult. Forestry education has a role to play in facilitation of such knowledge and information system. Nonetheless, many economic, didactical and organizational problems remain as constraints for present institutions to perform better roles.

Ninth, the results of this study came to support the idea that education is but one element which influences foresters' attitudes and behaviour. In reality, foresters' performance is determined by a composite of inter-related factors such as the work environment. Under the prevailing situation, learners and educators have neither enough time nor good motivation for creation of favourable learning environments.

The main recommendations of this study are:

(1) Foresters should take other social actors' perceptions, knowledge and management objectives into consideration when deciding about official management objectives and strategies.
(2) Forestry educational institutions will and should have a role to play in facilitating various forest resources managers getting around a platform and discuss, learn and coordinate their resources to manage the resources

on a sustainable basis. However, before being able to play such a role, they should start to see their roles as "experts' bureaux", but instead try to develop networking institutions.

(3) Moreover, in an era of fast change, forest managers should learn more about learning. Nevertheless, to facilitate such kinds of learning, forestry educational institutions need to restructure their curricula involving other social actors and create channels for ongoing monitoring.

(4) However, all the above mentioned requirements will be of limited effect in the absence of an overall conducive environment. Again, educators should not wait for these improvements to come, instead they should work very hard for the creation of such a conducive educational and learning environment.

As a contribution towards development of such educational and learning environment, a model for forestry curriculum development has been proposed.

SAMENVATTING

Dit onderzoek is een poging te begrijpen hoe verschillende categorieën van sociale actoren interacteren binnen het management van het bos-areaal in Soedan. Dit wordt gerealiseerd door middel van een overzicht en beschrijving van de motieven, waarnemingen, beheers-doeleinden en strategieën van de sociale actoren. Het onderzoek heeft tot doel bij te dragen tot een beter begrip van de sociale, economische en culturele factoren die het beheer van deze natuurlijke hulpbronnen beïnvloeden. De specifieke doelen van dit onderzoek omvatten:

1. Bestudering van de interactie tussen sociale actoren en natuurlijke hulpbron nen (bossen) in een periode van snel wisselende omstandigheden.
2. Verbetering van het inzicht in de wisselwerking tussen kennisprocessen en veranderingen in beheersdoeleinden en strategieën.
3. Analyse van het leerplan van het huidige bosbouwonderwijs.
4. Verkenning van de mogelijkheden het geleerde te gebruiken voor de ontwikkeling van een modelleerplan in het Soedanese bosbouwonderwijs.

Deze dissertatie is geschreven op grond van empirische gegevens verkregen via bevraging van individuen, groepen en instellingen op het gebied van bosbeheer in Soedan. Het veldwerk werd in hoofdzaak uitgevoerd in centraal Soedan. De eigen ervaringen van de auteur en die van andere beambten in andere streken laten evenwel zien dat de strekking van het onderzoek niet beperkt blijft tot de geografische grenzen van het gebied.
Voor de verzameling van gegevens werd op iteratieve wijze gebruik gemaakt van een combinatie van onderzoeksmethoden, zoals discussies, semi-gestructureerde interviews en participerende observatie. Door het definiëren van de sociale actor als analyse-eenheid is binnen het onderzoek een hybride gebruik nagestreefd van systeem- en actor-perspectieven als belangrijkste analyse-instrumenten.

De belangrijkste bevindingen van dit onderzoek tonen aan dat:

Ten eerste: voor de beheersambtenaar/bosbouwer het bos de eenheid van zorg is, terwijl de dorpelingen meer de aandacht richten op de boom zelf dan op het bos als geheel. In het algemeen zien sociale actoren bomen en bossen echter wel als hulpbronnen en als belangrijkste levensvoorwaarde. Daarnaast hechten diverse

actoren verschillende sociale, economische en/of culturele betekenissen aan bomen en/of bossen. Bijgevolg worden uiteenlopende beheers-doeleinden en -strategieën ontwikkeld. In dit opzicht laat het onderzoek zien dat gelijkgezindheid tussen de bedoelingen van bosbouwers en dorpelingen eerder uitzondering dan regel is.

Het doel van de bosbouwer is gericht op het beheer van bossen met het oog op voorziening van bosprodukten voor en diensten aan de natie, terwijl dorpelingen bomen zien in termen van sociale, culturele, spirituele en economische doelen, maar zelden als bron voor brandhout alleen. Wat dorpelingen belangrijk vinden wordt door bosbouwers soms van ondergeschikt belang geacht.

Ten tweede: dorpelingen maakten zich traditioneel geen zorgen over het eigendom van bossen hoewel eigendom van waardevolle bomen zeer wel bekend was. Niettegenstaande deze situatie kwam de Soedanese regering tussenbeide om deze hulpbronnen te beheren. Toch leidde afschaffing van het traditionele 'Native Administrative System', samen met vele andere factoren, tot de situatie waarin de overheid niet in staat bleek het beheer van de hulpbronnen op een efficiënte basis te voeren. Hierdoor verkregen sommige van deze bronnen het karakter van onbeheerde en niemand toebehorende gebieden.

Ten derde: de meeste bosbouwers zien bosbeheer voornamelijk als bestaande uit een aantal onsamenhangende, technische activiteiten terwijl dorpelingen het boom/bosbeheer uitvoeren als een essentieel onderdeel van hun totale landgebruik.

Ten vierde: dit onderzoek zet de waardering van sociale actoren uiteen met betrekking tot positieve veranderingen in houding en gedrag ten opzichte van elkaar en de wil tot gezamenlijk bosbeheer. Toch moeten dorpelingen en hun leiders, evenals de beambten/bosbouwers, zich bewust zijn van hun nieuwe rechten en verantwoordelijkheden en hierop worden voorbereid.

Ten vijfde: dit onderzoek maakt duidelijk dat de formele bosbouwkennis in Soedan gebaseerd is op de veronderstelling dat hout het belangrijkste produkt is. In de meeste bosbouw-experimenten kijken onderzoekers in hoofdzaak naar hout en besteden daardoor onvoldoende aandacht aan nevenprodukten. Daarbij zijn sommige voorlichters geneigd uniforme, kant en klare berichten te verspreiden binnen de verschillende klantsegmenten. Ondanks de getoonde waardering voor de lokale bosbouwkennis nemen bosbouwers de waarnemingen en commentaren van de dorpelingen zelden serieus.

Ten zesde: vrouwen worden steeds meer betrokken in bosbouwactiviteiten, het aantal vrouwelijke bosbouwers neemt toe. In aanmerking nemende dat de landelijke Soedanese cultuur niet altijd gemakkelijk contacten toestaat tussen mannelijke voorlichters en dorpsvrouwen, schijnt de behoefte aan vrouwelijke bosbouwvoorlichters nu voor alle partijen evident te zijn.

Ten zevende: uit dit onderzoek blijkt dat de volgende punten aandacht verdienen m.b.t. de manier waarop dorpelingen met kennis omgaan.

(1) Voor dorpelingen zijn onderzoek en leren onscheidbaar. Ze bezien hun naaste omgeving in zijn totaliteit, ze observeren zorgvuldig en leren door ervaring.
(2) De kennis van de plaatselijke bevolking is verweven met verschillende soorten rituelen en spirituele waarden.
(3) Dorpelingen neigen niet naar het bereiken van overeenstemming en uniforme kennisdomeinen of oplossingen.
(4) Dorpelingen wisselen gewoonlijk kennis uit bij begroetingen, door elkaar direct en indirect vragen te stellen en via sommige gelegenheden zoals begrafenissen, markten en religieuze en culturele feesten.

Ten achtste: de bevindingen van dit onderzoek tonen aan dat geen van de sociale actoren apart de technische of beheerscapaciteit bezitten om een duurzaam beheer van bosbouw-hulpbronnen te garanderen. De benodigde basiskennis is tamelijk versplinterd en ongelijk verdeeld tussen de verschillende actoren, vandaar dat we kunnen stellen dat in afwezigheid van een passend kennis- en informatiesysteem een geschikt beheer van bosbouw-hulpbronnen moeilijk zal zijn. Bosbouwonderwijs moet een rol spelen in de voorziening van een dergelijk kennis- en informatiesysteem. Desondanks zijn er veel economische, didactische en organisatorische problemen binnen de relevante instellingen die een betere rolverdeling in de weg staan.

Ten negende: de resultaten van dit onderzoek ondersteunen het idee dat onderwijs slechts één element is dat de houding en het gedrag van de bosbouwers beïnvloedt. In werkelijkheid worden hun prestaties bepaald door een samenspel van onderling samenhangende factoren zoals de werkomgeving. In de huidige situatie hebben noch lerenden noch informatie-verschaffers genoeg tijd en voldoende motivatie om gunstige leeromstandigheden te scheppen.

De belangrijkste aanbevelingen uit dit onderzoek zijn:

(1) Bosbouwers moeten waarnemingen, kennis en beheersdoelen van andere sociale actoren in aanmerking nemen wanneer ze beslissingen nemen over officiële beheersdoelen en strategieën.

(2) Onderwijsinstellingen op het gebied van de bosbouw moeten een rol kunnen spelen in pogingen de diverse beheerders van bosbouw-hulpbronnen rond de tafel te krijgen teneinde te discussiëren, te leren en hun inspanningen te coördineren waardoor een beheer van die bronnen op een duurzame basis mogelijk wordt. Alvorens die rol te kunnen spelen moeten de betrokken instellingen zich niet meer beschouwen als 'expert-bureaus' maar als 'netwerk-instellingen'.

(3) Bovendien moeten bosbeheerders, in dit tijdperk van snelle veranderingen, meer leren over leren. Om dit te vergemakkelijken zullen instellingen van bosbouw-onderwijs hun leerstof moeten herstructureren, waarbij andere sociale actoren betrokken moeten worden en waarbij mogelijkheden ter voortdurende stimulering van het leerproces gecreëerd dienen te worden.

(4) Alle bovengenoemde eisen zullen evenwel een beperkt effect hebben bij afwezigheid van een adequate en stimulerende omgeving. Nogmaals, onderwijzenden moeten niet wachten tot verbeteringen vanzelf tot stand komen, in plaats daarvan moeten ze zeer hard werken aan de verwezenlijking van zo'n stimulerende, opvoedende en lerende omgeving.

Als bijdrage aan de ontwikkeling van een dergelijke opvoedende en lerende omgeving wordt een model voor de ontwikkeling van een bosbouw-leerplan voorgesteld.

CURRICULUM VITAE

Mahir Salih Sulieman was born in 1958 in Wadi Halfa, Republic of Sudan. In 1983, he obtained his B.Sc. degree in Forestry from the University of Khartoum. After working for more than one year as a higher secondary school teacher, he joined the Sudan National Forests Administration in 1985 to work for the FAO project as an extension officer. In 1987, he was selected as a regional coordinator for forestry extension in the Central Region of Sudan.

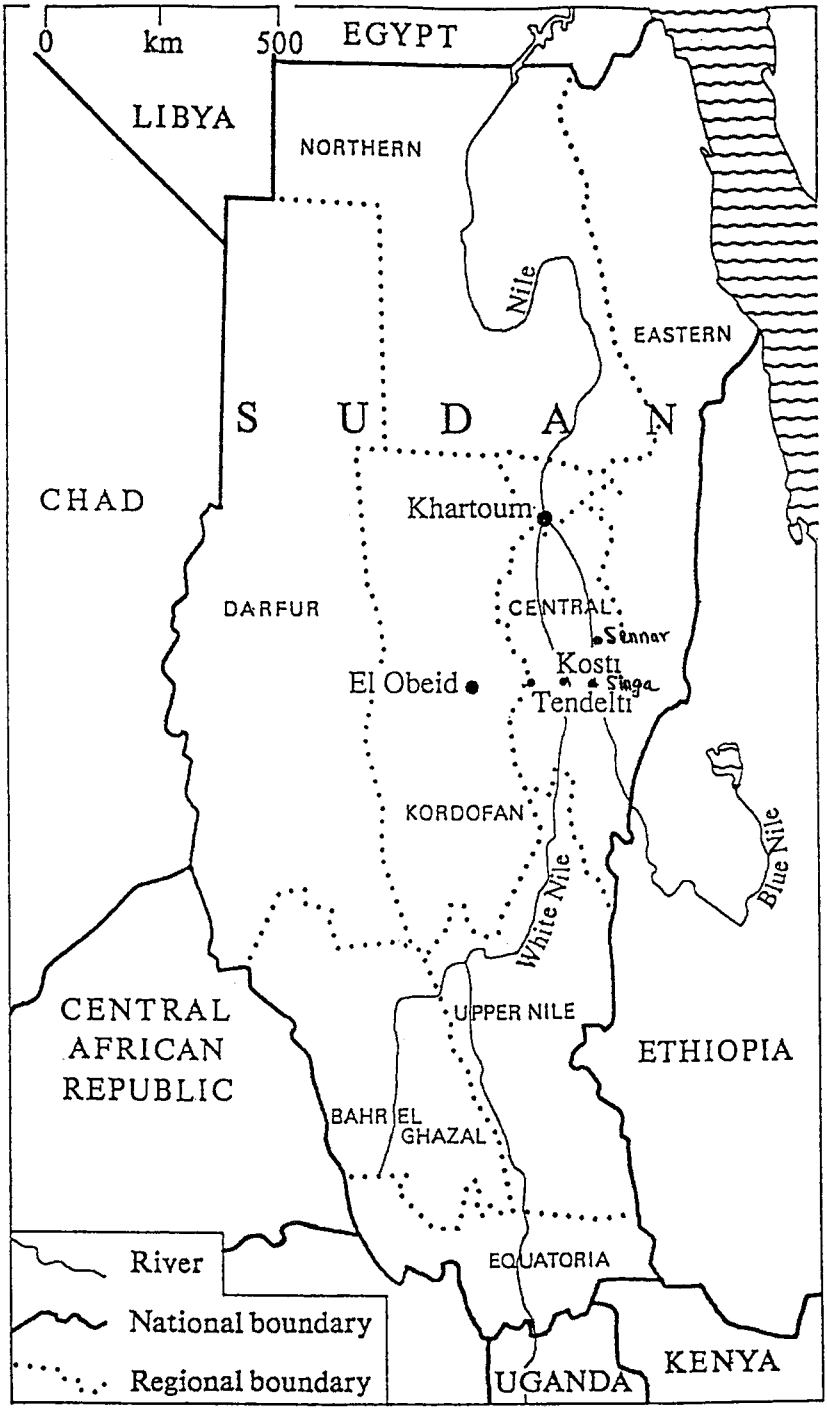
In 1988, he obtained his M.Sc. degree in sawmilling (forestry) from the University of Khartoum. In 1989 he joined the Forestry Division of the Khartoum Polytechnics (now Sudan University for Science and Technology) as a teaching assistant. In line with his professional interest and career development, he pursued a two-year M.Sc. course in Management of Agricultural Knowledge Systems (MAKS) at Wageningen Agricultural University, which he completed in 1992 with distinction. In 1993, he was promoted to the job of a lecturer for forestry extension at the Department of Forestry Sciences and Wood Technology of the Sudan University.

In October 1992, he started his Ph.D. programme at the Department of Agricultural Education, Wageningen Agricultural University, the Netherlands.

In addition to his teaching activities, he has been engaged in many development activities and consultancies in Sudan. Among the consultancy jobs he has done are two consultancies for the FAO, one for DANIDA, one for FINNIDA, and one for CONCERN.

The author is married, and a father for two daughters and a son.

Annex 1: The map of Sudan showing the study area



Annex 2: Examples of check-lists used to guide discussions

Check-list used for forestry officers

(1) Why and how have you joined the forestry career?
(2) How do you think forest resources should be managed? Do you think that others (colleagues and local people) share you this opinion? Explain.
(3) Do you feel any changes in your attitudes and perceptions of trees/forest (explain by giving an example)? What do you think are the reasons for this change?
(4) Have you noticed any change in the behaviour and/or attitude of other forest user groups in their interaction with forest resources? Explain and give one case. What do you think are the driving forces for this change?
(5) Do you know any kinds of beliefs (cosmovision) which influence the relationship between villagers and forest resources? What is the nature of these beliefs (give one real case if possible)?
(6) What kind of training (basic and/or in-service) did you have in relation to forestry career? What is your opinion about the relevance of the training you have had to the nature of your actual work?
(7) What do you do when you realise that what you have learned during your training is not relevant (not applicable) under some specific conditions (could you give one case and show how did you deal with it)?
(8) Do you sometimes feel the desire for updating your knowledge and information? How do you manage to deal with such needs?
(9) Do you believe that you could learn something in relation to your profession from local people? Could you give one impressing case in your professional life where you have learnt something in an informal setting (preferably from local people)?
(10) Do you discuss the nature of your professional work with your family and friends (non-foresters)? To what extent, do you think they influence what/how you learn about trees/forest?
(11) Assume that one of your close relatives or friends wants to study forestry, would you encourage him to do so? Why?

Check-list used for the forestry education staff

(1) Do you think that there is any kind of changes in the way officials (including foresters) and local people interact with forestry resources? Explain and give cases? How do you keep yourself aware of the change(s)?
(2) What is your opinion about the changes? And what are the driving forces?
(3) To what extent yourself (or institution) is involved in the change process? Are you satisfied with this role (explain)?
(4) How and on what basis do you (or institution) determine the objectives of the course(s) you offer? Do you involve others in this activity? If yes, whom do you involve?
(5) How do you determine the contents, teaching methods an the use of teaching materials for your course? Is there any variation between what you want and what you actually do (explain)?
(6) When (under which conditions) do you decide to revise the syllabus of your subject or the curriculum in general? How frequently this used to take place?
(7) Do you (your institution) keep any linkages with Forestry Research Centre (FRC), Forests National Corporation (FNC) and the local population at the field level (give examples if possible)? What is the nature of these relationships?
(8) To what extent your institution is involved in research and/or outreach programmes? What is the nature of these programmes?

Check-list used for forestry research staff

(1) Do you think that there is any kind of changes in the way officials (including foresters) and local people interact with forestry resources? Explain and give cases? How do you keep yourself aware of the change(s)?
(2) What is your opinion about the changes? And what are the driving forces?
(3) To what extent yourself (or institution) is involved in the change process? Are you satisfied with this role (explain)?
(4) How and on what basis do you determine the objectives (goals) of your research programmes? Do you involve others in this activity? If yes, whom do you involve?
(5) Do you (your institution) keep any linkages with Forestry Training Institutions, Forests National Corporation (FNC) and the local population at

the field level (give examples if possible)? What is the nature of these relationships?

(6) What is your opinion about local people's knowledge in relation to trees/forests? To what extent do you believe that this type of knowledge could contribute to the development of forestry research? Do you remember any case where your research have been influenced (in any way) by local people's observation or experimentation (explain)?

Check-list used for villagers

(1) What kinds of interaction do you have with forest resources? Have you noticed any changes in the way yourself and/or other people in your village interact with the resource? Explain and mention one case?

(2) Have you noticed any changes in the way officials (e.g. forestry authorities) deal with forest resources? Could you give one example?

(3) What do you think are the reasons for this change?

(4) What do you get from trees/forest or what do trees mean for you? Do you think your benefits from trees/forest have increased or decreased compared to the situation five years ago?

(5) How was the situation of forest resources and the ways people in your area used to deal with the resource before the forestry authorities come to your area? How do you (villagers) used to organise the utilization of the resource in your area? Do you see that the resource condition is better or worse than before?

(6) Do you think that forest reservation processes resulted into better resource conditions or otherwise? Explain and give cases.

(7) Suppose that the forestry department decided to re-open the reserved forests for villagers to manage themselves, do you think that people in your village will be able to organise the use of the resource? Do you think this will lead to the improvement of the resource condition? Why (explain)?

(8) If the answer to the previous question is that villagers will not be able to organise the use of the resource, then why it was possible before and not now?

(9) Have you planted trees or participated in any forestry activities? Why (what is your motivation)?

(10) Why do you think other people in your village participate (or don't participate) in forestry activities?

(11) Who do you think are the friends of forests/trees? And who are the enemies of forests? Explain and give cases if possible.

(12) Do you know any kinds of beliefs (or cosmovisions) which influence the way people in your area deal with trees/forest resources? Do you think the degree of the influence is such strong that no body deviate from the expected behaviour? Explain.

(13) Do you sometimes feel the need for information/knowledge with respect to trees/forest? What is the nature of the information you need more frequently i.e. legal, technical ...or others (please specify)? Whom do you contact in such case?

(14) Do you feel (think) that old people in your area are more knowledgeable with respect to trees/forest than the new generations? Explain and give examples.

(15) How and what channels do you (villagers) use in exchanging information and experiences in general, and in relation to trees/forests in particular?

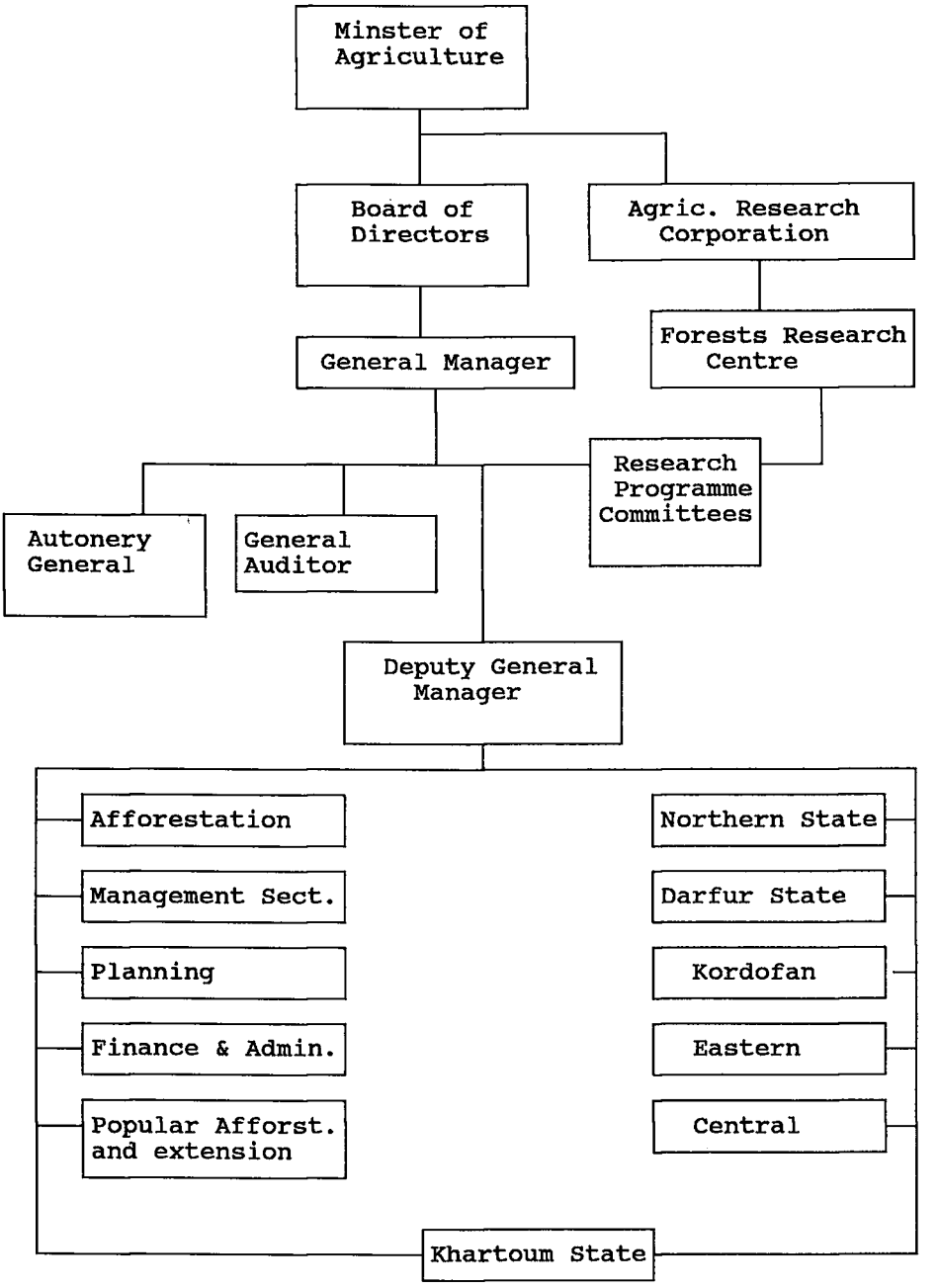
(16) Are there any people in your area who are famous for their knowledge (expertise) in relation to trees/forests? Do villagers contact them in search of information? How do these local experts gained knowledge/expertise?

(17) Do you (or do you know any one who) use to do any kinds of experiments (trials) in relation to trees/forests (give examples)? What is your (or his/her) motivation for conducting such experiments?

(18) Do have a relative or a friend who is working in forestry department (i.e. studied forestry)? Have you ever discussed forestry issues with him/her? To what extent do you think you have been influenced by his knowledge, experiences or opinions?

(19) Would you encourage your son or daughter to study forestry or to work for the forestry department? Why?

Annex 3: Administrative Structure of the FNC



Source: Anon (1992)

Annex 4: Examples of Curricula of forestry education in Sudan[1]

The curriculum of the Department of Forestry of the U. of K.

First Year

Taken at the Faculty of Science as Preliminary Year.

Second Year

First Semester
(1) Agricultural Botany (3 + 4)[2]
(2) General Chemistry and Geology (4 + 6)
(3) Mathematics & Statistics (2 + 2)
(4) Agric. Zoology (2 + 3)
(5) Introduction to Agriculture and Forestry (2 + 3)

Second Semester
(1) General Chemistry and Geology (4 + 6)
(2) Biometrics and Experimental Design (4, all theory)
(3) Forest Botany (3 + 3)
(4) Meteorology and Climatology (3 + 2)
(5) Fundamentals of Silviculture (2 + 2)

Third Year

First Semester
(1) Forest Botany (Dendrology) (3 + 3)
(2) Biochemistry of wood (3 + 3)
(3) Agricultural Mechanization (2 + 2)
(4) Principles of Economics (4, all theory)
(5) Silviculture (3 + 3)
(6) Forest Mensuration (3 + 2)

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[1] Due to lack of a written curriculum, one might find other lists of course content.

[2] The numbers within brackets indicate respectively the numbers of contact hours of theory and practical.

Second Semester

(1) Introduction to Wildlife Management (3 + 1)
(2) Forest Surveying (3 + 4)
(3) Soil Science (3 + 3)
(4) Forest Pathology (2 + 2)
(5) Seminars (2 hrs.)
(6) Field Practical (two weeks).

Fourth Year

First Semester

(1) Soil Science (3 + 3)
(2) Forest Economics (4, all theory)
(3) Silviculture (3 + 1)
(4) Forest Utilization (3 + 2)
(5) Forest Entomology (3 + 3)
(6) Forest Engineering (3 + 3)

Second Semester

(1) Forest Utilization (3 + 2)
(2) Silviculture (3 + 2)
(3) Forest Policy, Law & Organization (3 + 1)
(4) Genetics & Plant Breeding (4, all theory)
(5) Forest Management (3 + 2)
(6) Seminars (2 hrs.)
(7) Field Practical (two weeks)

Fifth Year

First Semester

(1) Forest Utilization (5 + 3)
(2) Forest Protection - General (3, all theory)
(3) Introduction to Land Use Planning (4, all theory)
(4) Introduction to Range Management (4, all theory)
(5) Forest Development Planning (3 + 2)
(6) Forest Management (3 + 2)
(7) Seminars (2 hrs.)

Second semester

(1) Forest Management: Field Practical of 2 months for preparation of a management plan.
(2) Study Tours 3 weeks

The curriculum of the Dept. of Forestry Sciences of the SUST

First Year

(1) Botany (2 + 2)
(2) Geology (3 + 1)
(3) Mensuration (1 + 2)
(4) Silviculture (2 + 2)
(5) Meteorology (2, all theory)
(6) Surveying (2 + 2)
(7) Forest protection and Entomology (2 + 1)
(8) Soil Science (2 + 2)

Second Year

(1) Botany (2 + 2)
(2) Surveying (2 + 2)
(3) Silviculture (2 + 2)
(4) Utilization (2 + 2)
(5) Range Management (2 + 2)
(6) Forest Influences (3, all theory)
(7) Mensuration (1 + 2)
(8) Forest Policy (2, all theory)

Third Year

(1) Timber Utilization (2 + 2)
(2) Forest Management (2 + 2)
(3) Ecology (2 + 1)
(4) Wildlife Management (3, all theory)
(5) Forestry Extension (2, all theory)
(6) Costing (2, all theory)
(7) Botany (2 + 2)
(8) Surveying (2 + 2)