CAN THE RAIN FORESTS OF NIGERIA SUSTAIN TRADE IN MEDICINAL PLANTS?

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Abstract

This study assessed stakeholder opinions on the capability of the rainforests to sustain commercial harvest of medicinal plants in Nigeria. Data were derived from a questionnaire survey of commercial collectors of medicinal plants in the rainforest of Nigeria. The study reveals that sustainability of the rainforest was hampered by complicated land tenure regimes under common resource management, intensive logging and poor harvesting practices. Problems of lack of management plans, little or no forest regeneration by planting, lack of forest inventory and monitoring activities and freerider issues under community regulations did not favour sustainability of the rainforest. However, stakeholders were willing to cooperate with a third party and apply scientific methods to manage the forests under strict regulations based on transparency, assigned responsibilities and equitable sharing of financial benefits derived from forest management. The conclusion is reached that the forests may continue to sustain trade in medicinal plants if in situ and ex situ conservation practices are combined within natural and man made habitants respectively.

Keywords: *stakeholders, medicinal plants, conservation, forest regeneration, management plans.*

Introduction

The majority of Nigerians depend directly or indirectly on traditional health care. Traditional medicine is patronized because it is easy to gain access to healers, treatments are cheap and it is convenient for patients who believe in traditional religion with observation of taboos (Sofowora 1993, NPC 2000). The bulk of the traditional medicine in Nigeria is prepared from plants and less than 5% of medical preparations come from soil minerals, domestic and wild animal sources. Medicinal plants are commonly traded in open markets. These plants and their products are derived from natural forests in form of tree barks, roots, leaves, flowers, fruits and exudates. Trade in

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medicinal plants is a huge economic activity which supports an estimated population of over 124 million Nigerians on regular basis (Osemeobo 2001, 2009).

Over the past 15 years, the natural forests have witnessed declining supply of medicinal plants from the forests (Osemeobo 1993a). Inadequate supply of medicinal plants has threatened traditional health care and declining income to stakeholders in the traditional health care sector. Shortages of medicinal plants particularly of choice species in medical preparations have increased prices of traditional health care delivery. The supply of medicinal plants is gradually causing ecosystem instability because the forests are being harvested beyond their annual yields thereby devastating the resource base (Osemeobo 1993b). The forests where medicinal plants are harvested are under traditional management regimes within the framework of common property utilization. Unfortunately, these natural forests lacked planned conservation practices despite the huge quantity of medicinal plants harvested on annual basis. Poor management of the forests is largely due to poor funding, land tenure factors, lack of adequate research on the biology and ecology of species and non application of biotechnology to improve forest plants to meet market demands (Osemeobo 1993a, FAO 2001a).

Despite the devastating state of the natural forests (Osemeobo, 1995), the land available for *in-situ* conservation is being reduced on an annual basis for alternative uses (agriculture and public infrastructure) by government and landholding communities. For example, about 4,535 km2 of protected forests (including the rainforest zone) were de-reserved for the purposes of agricultural production between 1960 and 2003 (Osemeobo 2003a). These unplanned land use practices weakened the chance of the forests to withstand the pressures of sustaining trade in medicinal plats. In a survey conducted in the rainforest in 2008, Osemeobo (2009) found decreasing volume of harvest in several species including *Hypoeses rosea, Phyllanthus mulerianus, Afromomum melagueta* and *Piper guineense*. This situation was similar to that in India when Verma *et al,* (2007) reported that market-driven harvesting did not pay attention to conservation and adversely affected the resource base of medicinal plants. In the Nigerian context, poor harvesting methods in medicinal plant conflict with ecological principles thereby causing extirpation in choice species (Verma *et al* 2007). However, the management of the rainforest in Nigeria is problematic due to inadequate data on biodiversity (Cunningham 1990) in terms of types of species in geographical locations, biomass and primary production, phenology, drug contents and silvicultural requirements for their conservation (Osemeobo 2005).

Objectives

The objective of this study is to evaluate opinions of stakeholders on how the rainforests can be managed to sustain medicinal plant trade in Nigeria. The specific objectives are to: (i) Identify factors that undermine trade in medicinal plants; (ii) Examine the possibility of the rainforest to support trade in medicinal plants in the near future; and (iii) Suggest solutions for sustainable management of medicinal plants and their habitats.

Methodology

A social survey was used to derive information for this study. The survey was focused on commercial resource users that harvested medicinal plants from natural forests. Reliable information on medicinal plant trade and ecosystem stability was sought from herbal medicine sellers, herbal collectors and leaders of landholding communities where medicinal plants were harvested. Field data were combined with literature and professional knowledge of medicinal plants in the rainforest areas of Nigeria (Cunningham 1990, 1993a; Osemeobo 2005) to yield full information for the study between August 2008 and May 2009.

The Study Area

The study has a spatial focus on the rainforest zone of Nigeria. The study area is located in the southern part of Nigeria between latitudes $4^0\ 30'$ N and $7^0\ 30'$ N; and between longitudes $2^030'$ E and $9^0\ 30'$ E (Figure1). The rainforest is the richest in biodiversity in Nigeria. It consists of a vegetation type with three distinct topographic positions of moist evergreen forest.

Sampling

A list of all the 10 states in the rainforest zone in the country was compiled and arranged in alphabetical order. Using the table of random number, 5 states comprising of Edo, Ondo, Ekiti, Cross River and Enugu were selected for data collection. In each state, a reconnaissance survey was conducted and one representative rural settlement where medicinal plants were frequently collected for the market was selected for data collection.

Data collection

Data were derived from: (i) interviews conducted with selected harvesters (collectors) of medicinal plants using a structured questionnaire, and (ii) discussions with elders of land holding settlements and marketers of medicinal plants. Because of lack of records, the questionnaire was designed to capture both ecological and socio-economic information (appendix 1). In all, data were collected from 50 respondents from 5 states and 5 rural settlements in the rainforest of Nigeria.

Figure 1. The Lowland Rainforest Zone of Nigeria
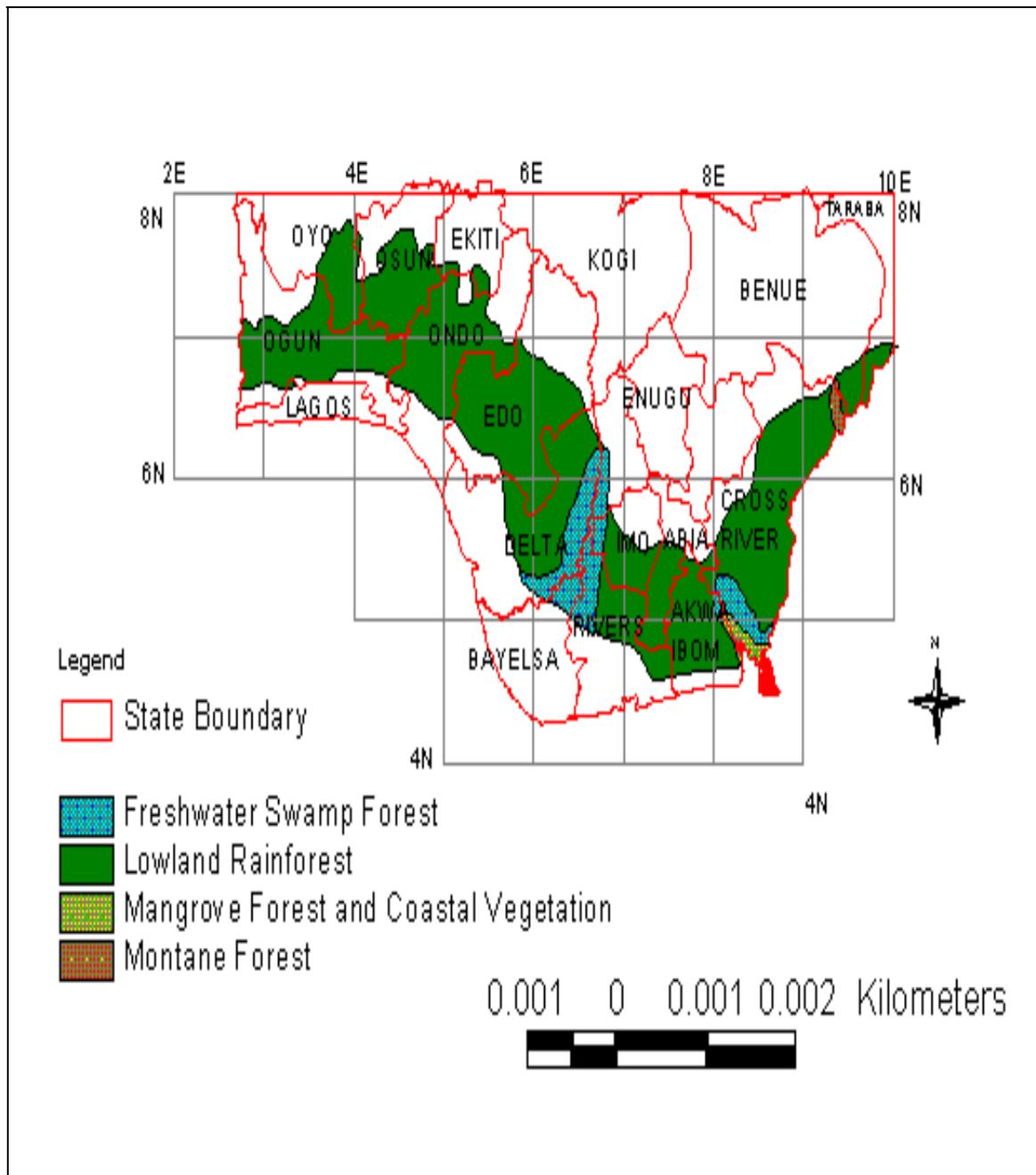
Results
Status of Medicinal Plants in Natural Forests
    The status of medicinal plants under regular trade in the rainforests is presented in Table 1. The data were based on the opinions of stakeholders (respondents) directly involved in harvesting medicinal plants for the market. The data in Table 1 revealed that 45 medicinal plants were traded on regular basis in the rainforest of Nigeria. Out of these, 8 medicinal plants wee endangered, 12 species were rare and 8 species were threatened, while 17 were common or abundant in natural forests.

Table 1. Respondent Opinions on the Status of Traded Medicinal Plants in Community Forests

Medicinal plants	Opinion of respondents (%)				
	Endangered	Threatened	Rare	Common	%
Canarium schwein-furthii	32	28	24	16	100
Zingiber officinale	56	24	10	10	100
Piper guineense	16	18	56	10	100
Afromomum mela-gueta	0	4	12	84	100
Xylopia aethiopica	8	8	44	40	100
Tetrapluera tetraptera	18	24	46	12	100
Ananthus montanus	32	54	10	4	100
Ocimum gratissimum	46	24	20	10	100
Hypoeses rosea	4	16	18	60	100
Thorningia sanguinea	24	42	20	14	100
Khaya senegalensis	0	0	10	90	100
Tetracarpidium cono-phorum	10	12	34	44	100
Laggera alata	4	10	22	64	100
Rauvolfia vomitoria	24	64	8	4	100
Cocholospermum planchonni	44	26	16	14	100
Solanum indicum	6	8	62	24	100
Enantia chloratha	44	30	14	12	100
Combretum smeath-manii	48	23	24	2	100
Daniellia ogea	6	30	40	24	100
Uraria picta	44	22	14	20	100
Struchium spargono-phora	32	48	22	18	100
Rothmannia hispida	46	38	10	6	100

Lophira procera	24	42	30	4	50
Annona senegalensis	4	12	12	72	100
Sansevieria berica	4	23	46	24	100
Sanseuieria guineense	24	60	14	2	100
Acanthus montanus	4	14	18	64	100
Cissus aralioides	34	48	10	8	100
Uvaria chamae	6	8	62	24	100
Callichilia barteri	42	22	20	16	100
Rauvolfia vomitoria	22	60	14	4	100
Anchomanes diffor-mis	16	20	46	23	100
Marsdenia latifolia	0	0	14	86	100
Spathodea campanu-lata	4	6	46	44	100
Combretum racemo-sum	2	4	32	62	100
Acanthospermum his-pidum	4	2	12	84	100
Aspilia Africana	2	4	42	52	100
Byrsocarpus cocci-neus	2	4	8	86	100
Cnestis ferruginea	10	18	24	50	100
Ipomoea involucrate	4	6	26	64	100
Alchornea cordifolia	44	24	20	12	100
Bridelia ferruginea	30	48	22	24	100
Phyllantus muelle-rianu	8	12	52	28	100
Dissotis graminicola	8	12	30	50	100
Boerhavia coccinea	6	8	46	40	100

Source: Field survey, 2009

Anthropogenic Factors in Forest Land Use

Table 2 presents some anthropogenic factors affecting ecosystem instability in the natural forests supporting medicinal plant trade. Factors devastating forest stability in Table 2 were intensive logging and poor harvesting practices in medicinal plants. Logging opened up the forests for light to reach the forest floor thereby setting in motion the process of succession. Logging led to canopy opening and caused loss of understorey species as a result of increased soil temperature and invasion of undesired species that strangle seedlings of choice species in *the exposed* forest floor. Intensive harvesting practices identified in the rainforest were uprooting of tree seedlings and herbaceous plants (*Alchornea cordifolia*); debarking (*Khaya

senegalensis); harvesting mature and apical leaves (*Gloriosa superba*); cutting of tree roots (*Hannoe undulata*); looping flowers and immature fruits (*Elaeis guineensis*); and collection of exudates (gum) (*Khaya grandifolia*). These poor harvesting practices led to loss of species, die-back of species and reduced vigour in plants.

Table 2. Ecosystem Stability-Ecological Factors

Anthropogenic factors	Opinion of Respondents (%)			
	Yes	No	No idea	Total
Bush fire is annually	0	100	0	100
Logging is intensive	60	20	20	100
Forest conversion is annually	10	60	30	100
Harvesting of plants is intensive	50	30	20	100

Source: Field survey, 2009

The Status of the Forests

The status of ecosystem management was considered in Table 3. The natural forests were not managed scientifically. For the past 15 years the forests had no management plans. There were no enrichment plantings to boost forest regeneration and forest inventory was not carried out. Traditional methods were used to manage the forests as a common resource. Rights to the forests were based on open access, restricted access and closed access within specific time frames.

Table 3. Forest Management Factors Affecting Ecosystem Stability

Forest Management Factors	Opinion of Respondents (%)			
	Yes	No	No idea	Total
Regeneration of forests by planting is in place	0	90	10	100
Management plans of the forest is in place	0	100	0	100
Forest inventory has been carried out	10	80	10	100
Land tenure is a problem to plant harvest	0	100	0	100
Forest regulation is in place	40	30	30	100
Government interference on land use is common	30	50	20	100

Source: Field survey, 2009

Stakeholder Willingness to Manage Forests

Table 4 revealed that respondents were willing to participate in scientific management of the forest. For example, the people were willing to participate in putting management plans in place, implement management decisions, enforce management plans and monitor field activities.

Table 4. Forest Management by Communities

Forest management factors	Opinion of respondents (%)			
	Yes	No	No idea	Total
Willingness to put community based management plans in place	90	4	6	100
Willingness to implement community based management decisions	84	6	10	100
Willingness to enforce community based plans by self-help efforts	78	12	10	100
Willingness to participate in monitoring forest product harvest and inventory of species	86	10	4	100

Source: Field survey, 2009

Conditions for Stakeholder Participation in Forest Management

Table 5 presents the conditions given by stakeholders for allowing third party participation in managing the forests. The conditions include equitable sharing of (i) responsibilities among stakeholders and (ii) benefits derived from management of the forests (revenues, free access). The stakeholders were of the opinion that a forum to resolve conflicts that might arise in forest management should be put in place and the operating systems should be transparent in carrying out management practices.

Table 5. Conditions for Participation in Community Forest Management

Conditions for participating in forest management	Opinion of respondents (%)			
	Agree	Disagree	No idea	Total
Equitable sharing of responsibilities	96	2	2	100
Equitable sharing of benefits from forest management	98	0	2	100
Conflict resolution by community members	90	6	4	100
Transparency in forest management activities	98	0	2	100

Lack of interference from government/neighbouring communities	86	8	6	100

Source: Field survey, 2009

Discussions
Sustaining the Medicinal Plants
    The challenges posed by the findings in Table 1 in terms of the status of commercial based medicinal plants led to the suggestions that urgent researches are crucial to: (i) investigate the causes of the present status of species in terms of types and numbers of commercial species found to be endangered and threatened; (ii) find out suitable methods for conserving the species under *in situ* and *ex situ* practices; (iii) document detailed ecology and biology of species in terms of flowering and fruiting patterns, propagation methods and incidence of pests; (iv) understand suitable silvicultural practices for the species within natural forests and in artificial plantations. The status of medicinal plants in the rainforests of Nigeria has not been fully investigated by scientific methods. This study is a pioneering one based on the views of people responsible for harvesting medicinal plants for the market. Because the respondents were familiar with the ecology and biology of the forest ecosystems (Osemeobo 2005a) and because they directly depend on the forests for sustaining their livelihoods (Osemeobo 2005b), the views of stakeholder respondents in this study are valid in determining the status of the forest species (IUCN 2007). The views of Cunningham (1993) that most vulnerable medicinal plant species in Africa are popular, slow reproducing species with specific habitat requirements and a limited distribution are relevant in decision making in this study.

Ecosystem Stability for Medicinal Plants
    The natural forests occurred within unplanned land use for logging and intensive harvest of medicinal plants. These land use practices were in strict conflict with ecosystem stability which is inimical to the sustainability of the medicinal plant trade. Extirpation of choice species in the medicinal plant trade has hampered the traditional medical systems in the country. The data in Table 3 clearly indicated that: (i) the forests were managed with the rule of the thumb without plans, (ii) the land tenure system led to poor harvesting of species that destroyed medicinal plants under a common property system that lacks third person control of resource exploitation, (iii) habitat enrichment planting was not in place. The local people lacked the technology and funds to carry out regeneration of indigenous plant species in natural forests and (iv) no forest inventory had been carried out at least in the last 20 years. Forest inventory is a technical issue that requires combined efforts of

specialists that were not at the disposal of the landholding communities. However, some of the stakeholders felt that the forests were managed through regulations (40%) with third party interference in the management of the forests (30%).

Table 4 showed that the stakeholders had strong will to: (i) put a scientific based forest management in place, (ii) obey rules and regulations for managing the forests, (iii) enforce forest regulations and (iv) participate in monitoring land use practices including harvesting of plants and inventory of plants in natural forests. This study confirms the findings of Cunningham (1993) and FAO (2001b) that ecosystem stability can best be maintained when management plans are put in place and executed by communities that owned the forests.

Community Forest Management

Medicinal plant trade represents an important opportunity to rural communities as a source of poverty reduction (Osemeobo, 2001). However, over-harvesting of medicinal plants is a problem that is difficult to deal with because of high level of poverty among members of the communities involved in medicinal plant trade (CTA 2007, Osemeobo 2008). Investigations carried out in the survey on which this study was based, revealed that the rural landowners must rely on Forestry experts in order to put sustainable forest plans in place. The willingness of rural stakeholders to participate at various levels of forest management in Table 5 calls for the support of State Departments of Forestry to supplement the aspirations of forest communities.

Policy Issues
Policy Issues from Findings

This study found out that: (i) 45 medicinal plants were harvested for trade on regular basis in the rainforest of Nigeria. Out of these, 8 medicinal plants were endangered, 12 species were rare and 8 species were threatened, while 17 were common or abundant in natural forests. (ii) The forests faced the challenges unplanned multiple forest use. The sustenance of medicinal plants were under threats of intensive logging and poor harvesting practices that have collectively led to loss of species, die-back in species and reduced vigour in plants for fruiting. (iii) Exclusive management of forests under common property with little or no financial and technical support from the third party (governments and non governmental organizations) weakened the capability of the forests to sustain supply of medicinal plants from the forests. (v) Stakeholders conditionality, on which support from outside would be accepted, were based on fears that government might take over their forests and lands from them if they are directly involved in managing the forests.

Trade in medicinal plants operates in the informal sector. Increasing rate of urbanization and unemployment are major factors that exert a *demand-pull* on medicinal plant trade. Lack of third party involvement in the medicinal plant business created a setback in the management of the natural forests. For example, there were no harvesting standards for species and the volumes of harvest per species in specific forest locations were unknown. With ageing population of medicinal plant collectors the cultural based ecological knowledge of the forest was collapsing. Moreover, modifications of the forests arising from intensive harvesting of plants and agricultural production have caused extirpation of sensitive understorey species (including *Hypoeses rosea and Afromomum melagueta*). Disappearance of species is common among those of high demand or habit in narrow ecological ranges or with small population size (IUCN 2007). Beyond these are overriding problems associated with freerider issues of common property management causing a transforming the land tenure system from community to individual use.

Trends in Rainforest Utilization

The rural communities had strong will to keep the forests and sustain trade in medicinal plants at present and in the future. Based on the findings of this study, a main question this study intends to address is *can the rainforests of Nigeria sustain trade in medicinal plants*? The opinion of the stakeholders was that the forests would continue to sustain trade in medicinal plants at different volumes of supply. The people were zealous in their willingness to improve the stability of the forests to sustain trade in medicinal plants. However, many anthropogenic factors have worked against the interests of the people. The rainforest is the richest in biodiversity and it supports the majority of the poor both in rural and urban areas in terms of food, medicine and income generation. A number of protected areas that were established by government in the decades of 1930s to 1950s to prevent forest destruction have become too small and have been encroached by agricultural tree crops at the expense of few endemic plant species. Intensive poaching activities in the forests under limited forestry budgets and inadequate staff have made protected forests less sustainable for medicinal plants conservation. High human population density of over 300 to 450 persons per km² in the rainforest had made the protected forests suffer from increasing human activities. Under the current degradation the status of the forests, *ex situ* conservation should be combined with *in situ* practices as a main option for sustained trade in medicinal plants. The long term unsustainable harvests of the forests have eroded much of genetic resources through selection of best seeds, plant forms and destruction of best habitats for narrow ranged species. Moreover, the breakdown of traditional control of the forests within increasing freerider

issues and lack of legislative support for common resource management have given support to plant domestication.

Conclusion

Trade in traditional medicine in the Nigerian rainforest is a major source of employment, social stabilization, poverty reduction and sustenance of ecological knowledge of the natural forests. The findings of this study call for immediate action to conserve these important species that sustain the poor in the society.

Recommendations

Sustainability of the rainforest ecosystems and trade in medicinal plants rest on the following actions: (i) rehabilitation of the natural forests through enrichment planting of endangered and rare species; (ii) strict management of the forests through the rule of law. Local communities should lobby their Local Councils to make bylaws for the management of community forests with clear terms on species and ecosystem conservation practices; (iii) *ex situ* conservation of species of high demand should be encouraged in private farms and home gardens; (iv) governments at state and local council levels should organize monitoring tours and social surveys to find out detailed information on how specific problems of medicinal plant conservation can be addressed in different forest locations; and (v) financial and technical support for conservation activities should be made available by interested stake-holders such as pharmaceutical industries, non governmental organizations, state and local governments and federal ministries of health and social development.

Forestry Departments at state and federal levels should liaise with the people and put in place training programmes that would equip the people to manage the forests sustainably. Training programmes should focus on participatory design of management plans, community monitoring and evaluation of forestry activities. Others include revenue generation and collection, forest regeneration and rehabilitation, sustainable harvesting methods and regulations that would guarantee secured rights of access to forest resources within specified time frames.

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Appendix: Questionnaire on Sustainability of Medicinal Plant Trade

I. Species Diversity
Based on your experience of over 15 years in the medicinal plant trade in the rainforest of Nigeria list 5 species that fall into the following categories in your community forests:
Extirpated species (species no longer seen in community forests) ……………...
Endangered species (species difficult to see in community forests) …………….
Threatened species (species with reduced numbers-populations) ……………...
Rare species (species with limited numbers in the forest locations) …………….
Abundant species (species in large numbers and easily seen) …………………..

II. Ecosystem (Habitat) Stability
Please choose the most correct answer from the statements listed below about trade in medicinal plants in your forest locations:
There is high incidence of bush fires in the forests. (a)Yes... (b) No… (c) No
    idea …
Logging in the forests is intensive. (a)Yes... (b) No… (c) No idea …
New forests are converted to farms annually. (a)Yes... (b) No… (c) No idea …
Planting of seedlings is regular in the forests. (a)Yes... (b) No… (c) No idea …
Tree harvest for trade is harmful to the forests. (a)Yes... (b) No… (c) No
    idea …
There are management plans for the forests. (a)Yes... (b) No… (c) No idea …
Forest inventory has been carried out in the forests. (a)Yes... (b) No… (c) No
    idea …
The forest is owned by the communities. (a)Yes... (b) No… (c) No idea …
Regulations are enforced in the forests. (a)Yes... (b) No… (c) No idea …
Government interferes with land use in the forests. (a)Yes... (b) No… (c) No
    idea …

III. Forest Management by Communities
Are you willing to put management plans in place? (a)Yes... (b) No… (c) No
    idea …
Are you willing to implement management decisions? (a)Yes... (b) No…
    (c) No idea …
Are you willing to enforce plans by self-help efforts? (a)Yes... (b) No… (c) No
    idea …
How do you want the financial benefits from resources shared?
    (a) Equitably... (b) Fairly ... (c) by custom...
How do you want the regulations enforced? (a) Equitably... (b) Fairly ... (c) by
    custom...

IV. Conditions for Participating in Community Forest Management

Equitable sharing of responsibilities (a) Yes … (b) No… (c) No idea …

Equitable sharing of benefits derived from forests (a) Yes … (b) No… (c) No idea …

Transparency in management practices (a) Yes … (b) No… (c) No idea …

Conflict resolution to be conducted by community members (a) Yes … (b) No… (c) No idea …

Lack of interference by government/neighbour communities in forest management (a) Yes … (b) No… (c) No idea …