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Report of the IBSRAM sessions
Seminar on Lateritic Soils Materials and Ores

**LAND DEVELOPMENT AND MANAGEMENT
OF ACID TROPICAL SOILS IN AFRICA**

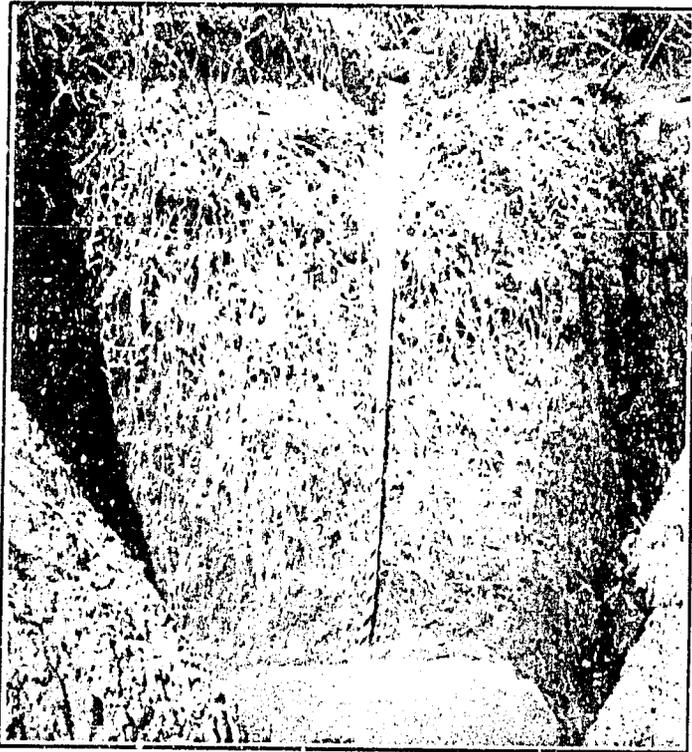
**January 21 - 27, 1986
Douala, Cameroon**

IBSRAM

International Board for Soil Research and Management Inc.

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IBSRAM is an international agency dedicated to assisting and speeding applications of soils science in the interest of increasing sustainable food production in developing countries.

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PROPOSED COOPERATORS LAND CLEARING AND MANAGEMENT OF ACID TROPICAL SOILS IN AFRICA (JAN, 1986)



ACKNOWLEDGEMENTS

The organizing committee of the regional seminar on Lateritic Soils Materials and Ores, together with, IBSRAM wish to express their appreciation to the Cameroonian authorities: the Ministry of Higher Education and Scientific Research (MFSRES), the Institute for Agronomic Research (IRA), the Center for Soil Research (CRS) and the National Center for Studies and Experimentation in Agricultural Mechanization (CENEFMA) for the impressive work they have accomplished to allow the holding of this meeting in Douala. We all know the great difficulties which occurred with the transfer of the location of the meeting from Yaounde to Douala. The seminar took place, as if everything had been organized in Douala for months previously - the well organized field trip in Barombi Kang being a special example of this effort. I also would like to express sincere thanks to the French Institute for Research in Cooperation (ORSTOM) which has co-organized this seminar through Prof. Ruellan, Prof. Becquier and Dr. Mathieu, and many soil scientists who have participated and have given such effective support to the scientific and logistical aspects of the meeting.

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We have been very honored by the presence of the authorities of the Province of Littoral during our opening and closing sessions.

Finally, appreciation is due to the translators (who have sometimes had a hard time with us), to the secretaries who have typed and duplicated our documents and who have arranged our tickets, to the members of the welcoming committee who helped us on our arrival, to the drivers, and especially to our Cameroonian friends - Jacques Ekebil (Director of IRA) and Joseph Bindzi Tsala (Director of the National Center for Soils) who have been a constant support at the meeting and to whom we are most grateful.

M. LATHAM
Director of IBSRAM

SUMMARY

The IBSRAM session on Clearing and Management of Acid Tropical Soils took place during the first Regional Seminar on Lateritic Soils, Materials and Ores held in Douala, January 24-27, 1986. Nine African countries were formally represented : Burundi, Cameroon, Congo, Ivory Coast, Madagascar, Nigeria, Rwanda, Tanzania, and Zambia. They decided to form a regional program on Land Development and Management of Acid Tropical Soils in Africa as part of the IBSRAM Management of Acid Tropical Soils and Tropical Land Clearing Networks, with a common coordination.

The meeting was hosted by the Ministry of Higher Education and Scientific Research of Cameroon. Other cosponsoring institutions were the Institut Français de Recherche pour le Développement en Coopération (ORSTOM) and the Bundesministerium für Wirtschaftliche Zusammenarbeit (BMZ). The International Institute for Tropical Agriculture (IITA), the Agricultural University of Norway and the University of Nancy also sent representatives at their own expenses. During the first two days of the session (Friday 24 and Saturday 25), general presentations were made on the organization of the IBSRAM network, and on the site selection, site characterization and adaptation of the experimental design to soil characteristics. Then national projects were presented and working groups assembled on the following four subjects : morphological structural, and taxonomic characterization; physicochemical characterization (Fertility Capability Classification - FCC); sampling, design of experiments; and cropping system evaluation. In the meantime, the Network Coordinating Committees (NCC) of the two IBSRAM networks, namely committee on Management of Acid Tropical Soils and the committee on Tropical Land Clearing for Sustainable Agriculture, met to focus the objectives of these two networks with regard to Africa. Sunday was devoted to a field trip in Barombi Kang, a former Benchmark Project site in Western Cameroon. On Monday, conclusions of the working groups and of the NCC meeting were presented. They were followed by a general discussion and a closing session. A total of 55 individuals, representatives of 15 countries, participated in the IBSRAM session.

The recommendations of the seminar were as follows :

- To create an African inter-network program within the context of the Management of Acid Tropical Soils and Tropical Land Clearing for Sustainable Agriculture Networks, and to assign the responsibility for coordinating this program to IBSRAM.
- That those countries which were in a position to do so should start immediately to implement some activities of this program.
- To ask SMSS, Tropsoils and ORSTOM to characterize at least one site each in accordance with their particular approach.

FOREWORD

The seminar on Lateritic Soils, Materials and Ores originated from a discussion between Dr. Bindzi Tsala (Director of the National Center for Soil, Cameroon), Dr. Ekebil (Director of the Institute for Agronomic Research, Cameroon), and Prof. G. Bocquier (Professor in the University of Paris 7, temporarily attached to ORSTOM in Central Africa). The idea was based on the fact that in the last few years a distinct advance in knowledge has occurred on laterites through fundamental and applied research. It was time to collect and evaluate these recent contributions on various aspects of the topic in order to plan new research programs in soil science, agriculture, civil engineering and mining.

The term laterite was chosen as a nonrestrictive word which could be used by soil scientists, civil engineers and geologists interested in the genesis, distribution, characterization and survey of these tropical superficial formations, as well as in their use and management. It must be pointed out that laterite now has a wider definition than the one originally given by Buchanan - i.e. earth which will harden like brick when exposed to the sun. International conferences have widened definition of this word to deep ancient weathering horizons on different substrata, characterized by a huge residual accumulation of clay and of different metallic hydroxides which may occur as hardpans. So Oxisols and Ultisols, which cover the acid tropical soils studied by IBSRAM, are included in this entity, even though they are only part of it.

J. ECKEBIL

Chairman of Organizing Committee



BACKGROUND

Many national project proposals prepared by program participants were presented to IBSRAM after the two inaugural workshops - one on Management of Acid Tropical Soils and the other on Tropical Land Clearing for Sustainable Agriculture.

These proposals represent the first success of this exercise in establishing a network. However, a network should be considered as an innovative, iterative process of communication between the cooperators, IBSRAM, the NCC and the donors. A careful discussion of projects will undoubtedly improve their quality and ensure the homogeneity of the network.

The Board of Trustees has agreed in its December meeting that seminars should convene potential cooperators and the NCC, on a regional basis in order to revise, harmonize and establish the basis for the implementation of projects.

One of the intentions of first regional seminar on laterite soils, materials and ores, coorganized by MESRES, ORSTOM and IBSRAM, was to solve this harmonization problem and to help cooperators in the first steps of the implementation of their projects, notably with regard to :

- site selection ,
- site characterization, and
- the design of the experiments in accordance with the site characteristics .

Site selection is the first key for the transfer of experimental results to farmers. It must include a socio-economic and physical survey in order to be sure of being useful and representative of the chosen site. When an existing experimental station has been selected, the extent to which it fulfills the criteria for usefulness and representativeness must be checked with reference to the surrounding areas.

Site characterization is the second key for any transfer of results, and the basis for the interpretation of these results. Site characterization for soil management cannot involve only a taxonomic characterization. It must take into account edaphic parameters, vertical and lateral variability, the dynamics of water and ions, and the distribution of biological activity.

Finally, the design of experiments must take into account the site characterization and the variability of the soil mantle. Statistical designs must adapt to the site reality, and may in some places of high variability not be the only tool for ascertaining experimental results.

It is essential to produce some harmonization of these different approaches when looking at the formation of a network.

GOAL AND OBJECTIVES

GENERAL GOAL

The general goal of the IBSRAM sessions was to organize an African program for the networks on "Management of Acid Tropical Soils" and on "Tropical Land Clearing for Sustainable Agriculture" and to see how to implement it.

OBJECTIVES

More specifically the IBSRAM session had to deal with a common approach for the first steps of the National Projects implementation :

- Regional soil analysis for site selection
- Site characterization
- Design of experiments according to the site characteristics.

The seminar had also been a mandate to clarify the objectives of the two networks and to discuss national projects.

PROGRAM AND PARTICIPATION

The IBSRAM session consisted of three main parts : the formal presentations (2 days), the field tour (2 days), and a final session (1 day). (Appendix 1)

Participants

A total of 55 individuals (Appendix 2) participated in the session. Nine African countries were formally represented

Burundi	- Faculty of Agronomic Sciences Bujumbura C. MATHIEU
Cameroon	- CNS J. BINDZI TSALA - CENEEMA E.R. ELA ELVINA
Congo	- Ministry of Research / ORSTOM A. MAPANGUI
Ivory Coast	- Ministry of Research / ORSTOM GODO GNAHOUA and YORO GBALLOU
Madagascar	- Ministry of Scientific Research VIOLETTE RAHARINOSY
Nigeria	- University of Ibadan AKINOLA A. AGBOLA - University of IFE T.I. ASHAYE
Rwanda	- Faculty of Agronomy, Butare V. NDOREYAHU

Tanzania	- Sokoine University of Agriculture AKU O'KTING'ATI
Zambia	- Soil Survey Unit L. CHLESHE

The Central African Republic sent an observer. In addition, some of these countries sent representatives at their own cost - reflecting the keen interest in developing the program.

The following 24 institutions were represented: CENEEMA (Cameroon), National Center for Soils (Cameroon), Centre de Pédologie Biologique, Nancy (France), Centre Pédologie du Rwanda, Centre de Coopération Internationale en Recherche Agronomique pour le Développement, CIRAD (France), Department of Land Development (Thailand), Faculté des Sciences Agronomiques (Burundi), Faculté d'Agronomie (Rwanda), FAO (Cameroon), IBM (France), IITA (Nigeria), Institut de Recherche Agronomique (Cameroon), Ministère de la Recherche (Madagascar), North Carolina State University (U.S.A.), ORSTOM (France), Sokoine University (Tanzania), Soil Survey Unit (Zambia), University of Dschang (Cameroon), University of Hamburg (FRG), University of Ibadan (Nigeria), University of Ife (Nigeria), Université M. Ngouabi (Congo), University of Agriculture (Norway) and University of Yaounde (Cameroon).

The Total global distribution of participants according to the country where they work was as follows: Burundi (1), Cameroon (25), Central African Republic (1), Congo (3), Federal Republic of Germany (1), France (5), Ivory Coast (4), Madagascar (1), Nigeria (5), Norway (1), Rwanda (2), Tanzania (1), Thailand (2), U.S.A. (1), and Zambia (2).

PROGRAM

Formal presentation

The first day and part of the morning of the second day were devoted to formal presentations on IBSRAM network organization, site selection, site characterization and adaptation of experimental designs to soil characteristics. After a general introduction to IBSRAM (Latham), results of the inaugural workshops on Management of Acid Tropical Soils (Sanchez) and on Tropical Land Clearing for Sustainable Agriculture (Lal) were presented. The object of the IBSRAM session (Latham) and two papers on site selection in Cameroon (Bindzi Tsala) and in Zambia (Chleshe) followed. Different aspects of site characterization were then presented: porosity and pedoclimate in different ferrallitic soils of Cameroon (Humbel), superficial crusting (Valentin), organic matter (Scharpenseel), edaphic parameters F.C.C. (Sanchez), mineralogical characters (Juo) and phosphorus (Raharinosy). Following these presentations, two approaches for the adaptation of experimental designs were proposed - one on highly differentiated soil mantles (Humbel), and another on rather homogeneous soil mantles (Moreau).

Country project proposals were then examined, and were considered in the context of network objectives.

Table 1 Distribution of project proposals according to networks

	Management of Acid Tropical Soils	Land Clearing for Sustainable Agriculture	Combined Proposal
Burundi	1		
Cameroon			1
Congo	1	1	
Ivory Coast			1
Madagascar	1	1	
Nigeria	1	1	
Rwanda	1	1	
Tanzania		1	
Zambia	1	1	

Field tour

The field tour was divided into two parts : The tour, which took place on the first day linked the first session on genesis, distribution, characterization and survey of laterites to the IBSRAM session on Clearing and Management of Acid Tropical Soils. It allowed participants to see, on a road cut close to Douala, the vertical and lateral distribution of the different horizons of a lateritic formation on metamorphic rocks. Participants discussed the classification, distribution and use of two lateric soils (Paleudults) in Tika plain and the Ekona research station, West of Douala.

On the second field day participants were shown the transfer experiments undertaken in connection with the Benchmark Soil Project conducted from 1980 to 1982 in Barombi Kang (West Cameroon). This very rich Ultisol - clayey, kaolinitic, isohypothermic, and typic Paleudult - supported very high yields of maize. The characteristics and classification of the reference pedon were discussed. It transpired that there were problems because of the high pH and high base saturation in the upper horizon, and regarding the importance of iron hydroxide (goethite) and phosphorus fixation. It appeared that, whereas this fixation is high, phosphorus fertilization gives little response on yields. There were also visits to cocoa and cassava plantations.

Final Discussion

The final discussions were devoted to the mechanisms of work of the IBSRAM program, to the objectives of the two networks, and to the final proposals for cooperation. The seminar was then closed by Prof. Beaupelé, Head of the General Direction for Scientific Research, Ministry of Higher Education and Scientific Research, Cameroon.

PROPOSAL FOR THE IMPLEMENTATION OF THE PROGRAM ON LAND CLEARING AND MANAGEMENT OF ACID TROPICAL SOILS IN AFRICA

COOPERATORS' PROJECT PROPOSALS

The presentation of the Cooperators' project proposals was one of the highlights of the IBSRAM session. In some cases these projects are very elaborate and have already started. This illustrated that the IBSRAM concept is a dynamic one, and that the network idea is already being translated into reality.

Cameroon described a project entitled "Clearing and management of acid soils in forested areas close to Yaounde." The project will be located in the IRA station of Nkong Meyos on ferrallitic soils. It will be conducted jointly by IRA and CENEEMA. Its objectives are :

- to compare slash and burn vs. mechanized clearing techniques,
- to control erosion hazard, and
- to improve cultural practices.

Some parts of this program have already started, and it is envisaged that the duration of the project, which will officially commence in January 1987, will be for three years. The tentative budget is 186 million Francs CFA or around US\$ 520,000.

Congo presented two projects. One is entitled "Study of acid tropical soils' behaviour under different cropping systems, with cassava as main crop, in the Niari Valley." This project will take place in Mantsoumba, Niari Valley, and is presented by the General Direction for Scientific Research (DGRST) with ORSTOM as the implementing agency. The objectives of the project are to study the process and influence of transformation factors of cultivated soils in the Niari Valley with special reference to the dynamics of the soil's physical, chemical and biological properties.

The study will follow a three-step sequence over a period of four years :

- characterization of the experimental site,
- experiment of the field and
- comparative studies on pot and lysimeter trials.

The first stage has already started. An estimated budget of 45 million Francs CFA, or about US\$ 125,000 for three years is forecast.

The second project is headed "Land clearing and management of steepland soils in the Mayombe Ridge". It is envisaged that this project, prepared by DGRST, will be carried out with the support of UNESCO, and with additional support from ORSTOM and other agencies. It will focus on :

- antierosive practices,
- management of acidity, and
- adapted cropping systems.

Ivory Coast presented a project entitled the "Soil dynamic under cultivation-fertility upholding," which would utilize two sites - one in areas of the southeast which are under forest, notably in

Djimini (close to Ono), and the other in the North (Mankono, Bandama Valley). Both sites are on ferrallitic soils, but the last may belong to Alfisols.

The two main objectives of the project are :

- to clarify the dynamics of the cultivated soils, and
- to establish sustainable cropping systems.

The project also aims to enhance interactions between farmers and scientists and will address both networks. The tentative budget amounts to 40 million Francs CFA or about US\$ 110,000 for three years.

Madagascar has presented a project headed "Management of acid soils" with two proposed locations : - one on the high plateau between Tananarive and Antsirabe (under 1,400-1,800 mm. of rainfall/year), and the other on the eastern versant of the Great Island (under more than 2,500 mm. rainfall/year) Five experimental sites are envisaged, four of which have already been established.

Besides the problem of acidity, aluminium toxicity, and phosphorus fertilization - which are of very high importance -, five additional features will also be studied :

- erodibility and the role of vegetal cover,
- species capable of protecting and regenerating soils,
- agroforestry,
- lime treatment, and
- natural vs. cultivated fallow.

This project proposal addresses both networks. Two laboratories are available in Tananarive, one of which is specialized in radioagronomy. Requests have been presented for an expert in soil characterization, for various other consultancies, and for equipment. Linkages with Brazilian scientists are already under way.

Zambia is a special case because it has a soil management project on acid soils. The project is already under way and is funded by the Norwegian Aid Program (NORAD).

Three benchmark sites are presently used :

- Misamfu Regional Research Station in the North,
- Mutande Regional Research Station in the Northwest, and
- Luapula Regional Research Station in the North.

The main problems being studied are :

- soil acidity and aluminium toxicity,
- nutrient dynamics,
- trace element deficiencies,
- soil erosion and structure, and
- farming systems.

It is envisaged that Zambia could join both the network on Tropical Land Clearing for Sustainable Agriculture and the one on Management of Acid Tropical Soils.

Zambia has some good laboratory facilities and envisages to test a method for measuring soil nutrients and toxic elements directly on soil solutions.

Nigeria needs regional research to extend current research being undertaken by the IITA, the University of IBADAN, and the University of Ife. Two programs related to the two IBSRAM networks are envisaged. As regards tropical land clearing, research is envisaged on :

- mechanical vs. manual land clearing methods, and
- organic and inorganic fertilizers.

Concerning the management of acid tropical soils, research is needed on :

- fertility parameters,
- soil acidity and aluminium toxicity, and
- phosphorus fertilization.

Burundi is a very poor country with little research data on soil management. The most important problems are linked to the management of acid tropical soils. The soils to be studied are mainly Oxisols at high altitudes. The technologies required are mainly low input technologies, and research has to concentrate on :

- soil characterization,
- aluminium toxicity,
- lime application, and
- traditional manure.

The cropping systems envisaged are : cassava, sweet potato, taro and maize in Kirimiro and wheat, maize and potato in Bututuri. Some results have already been obtained from an agronomic experimental station and from soil surveys. These results need to be confirmed, preferably with the help of SMSS, IBSNAT and IBSRAM.

Rwanda is a very densely populated country in Central Africa. The main problems concerning the soil arise from :

- soil degradation by over exploitation,
- soil acidity and Al toxicity,
- fallow extent,
- low input possibilities,
- no organic matter and no fertilizer,
- the difficulty in getting information,
- the transfer of experimental results to the farmer, and
- agronomic projects which are not always linked to a good site characterization.

Rwanda would like IBSRAM to help in the following ways :

- to provide guidelines for site characterization, and
- to set up an agronomic research organization.

The agencies interested in conducting research work are the Faculty of Agronomy of Butare and the Centre Pedologique Rwandais of Kigali.

Tanzania is mostly interested in tropical land clearing programs, even though it has no current program running at the moment. The site selected could be Morogoro Research Station, which is located in an area where a big land clearing scheme on red soils is forecast. The main questions to be looked at will be :

- land clearing methodology, and
- post-clearing management.

WORKING GROUP REPORTS

The recommendations of the four working groups may be summarized as follows :

MORPHOLOGICAL, STRUCTURAL AND TAXONOMIC CHARACTERIZATION

The group examining this topic recognized that two approaches had been identified during the session :

- Description of representative profiles or pedons and of their inclusion - i.e. deviations from the representative profiles.
- Structural analysis of the site - that is, - study of the vertical and lateral differentiations of the

soil horizons of the site and of their respective position.

It was recognized that these two approaches were in fact complementary.

Three proposals were made to IBSRAM:

a) that IBSRAM should disseminate information on the methods used for structural characterization of sites and on the results obtained in countries where these methods have been applied. It was suggested that IBSRAM should coordinate the methodological backstopping on the sites.

b) that IBSRAM should organize the characterization of one site following both methods and present it to the coordinators of the different cooperators. It is suggested that this could be in the country where the next meeting would take place.

c) that a classification of the sites in three or four major systems - i.e. FAO, USDA, CPCS (French) and the national system (if it exists) - should be retained as a means of easy communication about sites.

PHYSICOCHEMICAL CHARACTERIZATION (FCC)

The group proposed the following procedure:

- The characterization should be made on identified polypedons (described in accordance with soil taxonomy, and eventually other classification systems)
- The FCC system was taken as a base for discussion, and it was agreed that more attention should be paid to:
 - physical characteristics, and
 - polypedons - for some characterizations.

It was further admitted that most methods should be classical and traditional. However, a new simple method may be accepted for testing.

Characteristics supplementary to FCC are classified as:

- minimum required set,
- optimal, but recommended, set, and
- other selected optional set.

As characteristics supplementary to FCC, the group proposed -

a) Physical aspects

- Minimum set should include
 - slope (soil survey manual)
 - bulk density at planting time
 - laboratory field capacity for A and B horizons
- Optimal (tropical land clearing mainly)
 - erosion
 - K factor (Wishmeier and Smith)
 - lysimeter
 - System of erosion control (by C. Rose)
 - water balance
 - pF curves
 - regular neutron probe measurements
 - structure compaction
 - γ probe
 - air picnometry
- Optional
 - Cole value
 - pF curves
- Others may be
 - Measurement of the porosity (method to be selected)
 - Aggregate stability (see FAO on the saturating Stein method)

b) Chemical aspects

As a general recommendation, the group suggested that more attention should be paid to :

- the depth of the sample, and
- the time at which it is taken.

Minimum set

- Organic C and total N in 0-10 cm and 10-20 cm layers
- pH value in water and KCl with 1 to 1 soil/water ratio. If there is no clear solution (clayey soils), 1 to 2.5 should be adopted. This pH has to be taken for the first horizon and for at least one subsurface horizon, depending on the crop (to be discussed).
- Phosphate absorption curves (Fox curves, see Fox and Juo).
- The effective cation exchange capacity should include KCl extractable Mn if significant.

Optional set

- pH Na F for soils with amorphous aluminium and soil contaminated by volcanic ash.
- Extractable Mn in KCl where Mn toxicity is suspected.
- Zero point of charge where acidic soil properties are suspected (method described later on).

SAMPLING-DESIGN OF EXPERIMENTS

After a proper characterization of the site and an assessment on the variability of the experimental field, the group agreed on the following :

- Design of experiment
 - The choice of design depends on the objectives of the experiment and on site characteristics. The most common and simplest possible designs should be preferred to more complicated factorial designs.
 - Plot size, which depends on the type of crop, the soil variability, and the precision, can range from 20-100 or more m². For land clearing, a watershed of 1 to 3 ha is envisaged.
 - A minimum of replications should be made so as to minimize experimental errors.
- Crop parameters
 - Observation and measurements of plant parameters at different growth stages.
 - Dry matter yield at important growth stages.
 - Yield components grains, 1,000 grains weight, straw yield, etc.
 - Timing of important phenological events.
 - Nutrient concentration of specific plant parts at different growth stages.
- Soil parameters
 - Preplant soil sampling of each plot for characterization of important physical, chemical and biological properties.
 - Field measurements before planting and after harvest.
 - Observations on cultural profiles with relation to root development and water movement.
 - Soil sampling of each plot after harvest for the measurement of the properties mentioned under the first item.
- Management
 - Calendar and type of cultural practices. Land preparation, sowing, fertilizer application, weed control etc.
 - Observation on yield contributing factors other than the soil (i.e. meteorological, attack of pest and diseases etc.)
- Soil dynamics
 - Follow up of the soil dynamics in relation to plants, and to cultural and management practices, in a defined cropping system at a given site.

CROPPING SYSTEM EVALUATION

The group agreed that cropping systems should be evaluated according to a minimum data set retained by IBSNAT, and the other groups.

- As a general recommendation three criteria were proposed :
 - adaptability : crops which fit with acid tropical soils;
 - acceptability : crops acceptable by farmer;
 - compatibility : crops which are compatible with each other.
- Minimum data set
 - Evaluation of local agricultural practices.
 - Soil characterization under the identified systems (see the conclusions of group A and B).
 - Crop characterization.
 - Number of crops by farm.
 - Number of cultivar by crops.
 - Post cultivations.
 - Soil preparation methods
 - etc.
- Identification of clearing methodology
- Socio-economic studies
 - Land tenure.
 - Land use pattern.
 - Size of the farm.
 - Size of the family.
 - Agricultural inputs.
 - Manpower.
 - Cause for stopping cultivation (fallow, infertility, or others).

In conclusion, a cropping system will be interesting in so far as it contributes to the maintenance or the increase in soil fertility and to the socioeconomic development of the region, while at the same time ensuring equilibrium of the ecological system.

NETWORK OBJECTIVES

As a result of the discussions which took place during the last IBSRAM Board Meeting, the members of the Network Coordinating Committee present in Douala met with the cooperators to specify and highlight the objectives of the networks. The following summaries refer only to current participation in the network, identification of sites, and major objectives. The recommendations regarding the implementation of activities are given in the sections on Working Groups and Implementation.

MANAGEMENT OF ACID TROPICAL SOILS (MATS)

1. Eight countries have joined the MATS network in Africa. Five (Cameroon, Congo, Ivory Coast, Madagascar, Zambia) have already initiated field activities while three others (Nigeria, Burundi and Rwanda) began their participation at this seminar.
 2. Fifteen sites have been identified, of which five are in the humid tropics and ten in acid savanna. All have soils classified either as ferrallitic or as Oxisols or Ultisols.
 3. Research will focus on :
 - Soil nutrient dynamics for sustained agrosystem in the humid tropics.
 - Soil acidity and phosphorus management in the savannas.
- No specific network experiments were developed at this time.

TROPICAL LAND CLEARING FOR SUSTAINABLE AGRICULTURE (TLCSA)

Eight project proposals - from Cameroon, Congo, the Ivory Coast, Madagascar, Nigeria, Rwanda, Tanzania, and Zambia - were presented that come within the framework of the TLCSA network. These proposals can be classified into three major fields :

1. Land clearing methodology -

Five countries (Cameroon, Ivory Coast, Nigeria, Tanzania, and Zambia) expressed an interest in land clearing methodology. The reasons for deforestation and land clearing in these countries include population settlement schemes and the development of large-scale mechanized agriculture. To meet this requirement, the network envisages the development of pilot studies to :

- evaluate and validate the consequences of land clearing methods (manual vs. mechanical) in terms of productivity, soil characteristics and economic returns.

- develop criteria for the choice of land and for land clearing methods to facilitate sustainable agriculture while minimizing ecological damage.

2. Land clearing and post-clearing management -

All seven countries wanted to take part in this activity; so even though this component had a great deal in common with the work of the MATS network, it was felt that it should nevertheless be maintained and that its emphasis should be on erosion control and assessment, water balance measurement, and structure and compaction measurements.

3. Rehabilitation of degraded land -

The need for the rehabilitation of degraded lands was emphasized in project proposals from the Ivory Coast, Madagascar and Rwanda. Simple experiments should be made which focus on mechanical and biological techniques for restoring productivity to degraded lands.

Table 2
MANAGEMENT OF ACID TROPICAL SOILS IN AFRICA

Country	Lead Institution	Site	Ecosystem	Annual Rainfall	Main Soils	Focus
Burundi	Univ. Burundi	Bututsi	Highland	1400	Oxisols	Al toxicity, fertility soil erosion
		Kirimiro	Savanna	1200	Oxi-Ultisols	Al toxicity, fertility
Cameroon	IRA	Nkolbisson	Forest	1600	Ultisol	Shifting cultivation stable systems
Congo	DGRST	Mantsoumba	Savanna	1200	Ferrallitic pH 5.5	Savanna cassava production
		Dimonika	Forest	1800	Ferrallitic pH 4.5	Shifting Cultivation stable systems
Ivory Coast	ORSTOM	Djimini	Forest	2100	Ferrallitic sandy	Fertility maintenance and improvement
		Bandama V.	Savanna	1200	Ferrallitic non-acid	
Madagascar	Min. Rech.	N. Plateau	Savanna	1400	Ferrallitic	Stable food production
		S. Plateau	Savanna	1400	Ferrallitic	Stable food production
		East Coast	Forest	2500	Ferrallitic	Shifting cultiv. - rice
Nigeria	Univ. Ife	Mokwa	Savanna	1500	Sedimentary	Fill gaps in charact., fertility
		Epe	Forest	3000		
Rwanda	Univ. Rwanda CPR	Crete Zaire-Nil (2000 m ⁺)	Savanna	1400-2000	Ultisols	Soil deterioration, data management, fertility
		Low Plains (1400 m)	Savanna	900	Oxisols	improvement
Zambia	SPRP + SSU	Misamfu	Savanna	1300	Ultisols + Oxisols	Chitemene sustained agriculture Applied soil + plant residue

Table 3
LAND CLEARING NETWORK IN AFRICA

Country	Lead Institution	Site	Ecosystem	Annual Rainfall	Main Soils	Focus
Congo	DGRST	Dimonika	Forest	1,800 mm	Ferrallitic Soils	Shifting cultiv. Sustainable cropping systems
Nigeria	Univ. of Ibadan	Epemakinde Ikdle	Forest Savanna	3,000 mm 1,500 mm	Ultisols Alfisols	Methods of land clearing and post clearing management
Cameroon	CENEEMA	Nkonsmeyos	Forest Savanna	1,600 mm	Ferrallitic Soils	Land clearing methods and Soil conservation
Ivory Coast	Ministry of Research/ ORSTOM	Bonoua Mankono	Forest Savanna	1,800 mm 1,200 mm	Ferrallitic Soils	Soil dynamic under different clearing methods
Tanzania	SOKOINE Univ. of Agriculture	Morogoro	Forest Savanna	1,000-1,500 mm	Ferrallitic Soils	Methods of land clearing and post clearing management
Zambia	Soil Survey/Research	Solwezi	Forest Savanna	> 1,500 mm	Ultisols Oxisols	Methods of land clearing (Manual & Mechanical) and post clearing management

PROGRAM ORGANIZATION

PROPOSED INTERNETWORK PROGRAM

The network organization has been described in other IBSRAM publications, mainly in the reports of the inaugural workshops and the newsletter. By and large these descriptions remain valid; but in order to achieve better efficiency, a regional approach is taking place in conjunction with a common coordination concept for the two networks - Tropical Land Clearing for Sustainable Agriculture and Management of Acid Tropical Soils.

It has been decided that the title of the proposed internetwork program should be "Land Development and Management of Acid Tropical Soils in Africa (LDMATSA)". This network development will not destroy the integrity of the two initial networks, but should help to foster links between them while at the same time facilitating the coordination process. It is recognized that some projects will focus on tropical land clearing whereas others will concentrate on the management of acid tropical soils. Others again, like the one presented by Cameroon, may integrate the two objectives.

MECHANISM FOR PARTICIPATION IN THE PROGRAM

The mechanism which has been set up for participating in the IBSRAM program is specified in the following guidelines :

1. Type of participation
 - Three types of participation are possible in the program -
 - a) A simple participation in different program activities (receiving the IBSRAM newsletter, and participating in some workshop and training sessions).
 - b) Active participation - both by having an accepted program and by participating in all the various program activities.
 - c) Participation by having an accepted program in the common area of research and also by carrying out some basic research related to the objectives of the networks - in addition to participating in all the different program activities.
2. Mechanism of approval for the projects
 - a) The project may be presented to IBSRAM by national institutions.
 - b) The project may be reviewed by the members of the Network Coordinating Committee in accordance with the criteria of approval (see below).
 - c) The project, having been discussed and agreed upon between the NCC and the cooperator, may be accepted as an IBSRAM project. (Bear in mind, however, that the IBSRAM Board of Trustees must endorse this acceptance.)
 - d) After approval an official letter of acceptance will be sent to the cooperator who may use it as a letter of support for fund seeking.
 - e) During regular meeting of the networks, cooperators will present their results. These will be discussed and reviewed by the participants in order to maintain a high scientific and development standard in the program.
3. Criteria of approval
 - a) The project must fulfill the network objectives as defined in the inaugural workshop and as clarified during the present seminar.
 - b) The project is technically acceptable, i.e. it follows the approach which has been defined during the present seminar and is well defined.
 - c) The project is thought to be economically acceptable.
 - d) The country is already involved in research of the type proposed, or is willing to invest in training for its personnel to achieve worthwhile participation.
 - e) If a research project is proposed, it should have a broader objective than the country objectives per se, and should have implications on wider a scale. This requirement will not apply to validation projects.

PROGRAM IMPLEMENTATION

Immediate action will be taken by the Director of IBSRAM to gain donor support for the program, especially for the cost of coordination. These funds include employment of a program coordinator and the cost of meetings and monitoring tours. The role of the program coordinator will be the same as that described for the network coordinator in the reports of the inaugural workshops.

So as not to lose momentum in the period before the program coordinator is appointed, the Director will immediately contact cooperators and relevant organizations to carry out various functions as set out below :

1. Cooperators to redraft their project proposals in accordance with the discussions which took place during the seminar, and with the guidelines provided during the inaugural workshop on Tropical Land Clearing for Sustainable Agriculture. (Appendix IV)
2. Cooperators to follow up activities already be started or to start activities as soon as their program is agreed upon, even on a small scale.
3. SMSS, Tropsoils and ORSTOM to help in detailed characterization by carrying out their own approaches (Soil Taxonomy, FCC, French classification and structural analysis for at least one site which could be the following year's meeting place), and to give guidance to the cooperators in order to help them in this exercise.
4. Cooperators to send to IBSRAM an inventory of their available laboratory equipment and to list their needs regarding soil and plant analyses.
5. Cooperators to send their training plans and a list of available facilities at different levels in order to organize training sessions. IBSRAM will encourage cooperators to send participants to IITA soil and plant analysis courses, or to avail themselves of similar opportunities.

APPENDIX 1 PROGRAM OF THE IBSRAM SESSION

Thursday January 23

- morning : visit to a road cutting showing Laterites on metamorphic rocks Douala - Yaounde road
- afternoon : Soil profiles - classification repartition - uses
 - Mungo river terraces
 - Ekona experimental station

Friday January 24

First Part : IBSRAM Network organization

Chairman : Prof. H. Scharpenseel
Dr. Binzi Tsala

General presentation

M. Latham

Result of the Inaugural Workshop on

Management of Acid Tropical Soils

P. Sanchez

Result of the Inaugural Workshop

on Tropical Land Clearing for

Sustainable Agriculture

R. Lal

Second Part : Site selection

Chairman : Prof. A. Herbillon

Prof. P. Ashaye

Clearing and Management of Lateritic
Soils. First steps in the
implementation of IBSRAM projects
Analyse de la couverture
pedologique Choix du site
experimental au Cameroon

M. Latham

J. Bindzi - Tsala
L.R. Ambassa - Kiki
P. Bilong
A. Anguene - Mala
L. Chileshe
O. Spargaren

Site selection in Zambia

Third Part : Site characterization 1

Chairman : Dr. V. Raharinosy
Prof. C. Mathieu

Relation entre la porosite et le
pedoclimat dans le domaine
ferallitique au Cameroon
Encroûtement superficiel du sol
quelques applications agronomiques
Organic matter characters

F.X. Humbel

Ch. Valentin
H. Scharpenseel

Fourth Part : Site characterization 2

Chairman : Prof. A. Ruellan
Dr. L. Chileshe

Edaphic characters
Mineralogical characters
Phosphorus characters

F. Sanchez
A.S.H. Juo
V. Raharinosy

Saturday, January 25

**Fifth Part : Adaptation of the experimental design
to soil characteristics**

Chairman : Dr. A. Mapangui
Dr. O. Spaargaren

Analyse structurale des couvertures
pedologiques et implantation
d'essais agronomiques orientes
Variation spatiale d'une
couverture ferrallitique
relativement homogene et
experimentation agronomiques en
basse Cote d'Ivoire

F.X. Humbel

R. Moreau

Sixth Part : Presentation of National Project Proposals ATS

Chairman : Prof. Pedro Sanchez
Cochairman : Dr. Aku O'Kting'Ati
Cameroon
Congo
Ivory Coast
Madagascar
Zambia
Nigeria
Burundi
Rwanda

**Seventh Part : Presentation of National Project Proposals
On Tropical Land Clearing for Sustainable Agriculture**

Chairman : R. Lal

Cochairman : A. Moukam

Tanzania

Nigeria

Ivory Coast

Meeting of the network coordinating committee

Meeting of the working groups

Sunday, January 26

Field Trip Barombi Kang

Monday, January 27

Eight Part : Implementation of the networks

Chairman : J. Ekeobil

M. Latham

Report of the NCC

Report of the working groups

Formation of the Land Development and Management of Acid Tropical Soil
Program

General discussion

Closing session. Charied by Prof. Beaufele

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APPENDIX 4

GUIDELINES FOR NATIONAL COOPERATOR PROJECT PROPOSALS

The country project proposals (about 10 pages double - spaced) should include :

- Map of the proposed area
- Introduction - significance of the project
- Background
 - brief review of the literature
 - impact of the proposed study on agricultural development and eventually on the advance of general knowledge
 - description of the studied area(s) from an agroecological and socioeconomic point of view
- Identification of the national agency responsible for the project and of the national coordinator scientist
- Details of proposed study
 - rationale
 - objectives and scope
 - methodology
 - implementation schedule and arrangements
- Statement of locally available facilities in terms of
 - experimental fields
 - staff
 - equipment, vehicle
 - laboratories, offices
- Estimate of costs and requirements including
 - national participation
 - external requirements in terms of equipment, travel, working expenses
 - training and consultancies.

The proposed study should be planned taking into account the conclusions and recommendations of the working group reports. Furthermore, the need for consistency of several procedures (experimental designs, laboratory methods) among country projects should be kept in mind.

APPENDIX 5

MOTION OF THANKS

TO THE HEAD OF THE STATE AND TO THE GOVERNMENT OF THE REPUBLIC OF CAMEROON

Participants to the Regional Seminar on Laterite and the organizing agencies address their sincere thanks to President Paul BIYA Head of the State of the Republic of Cameroon as well as to his Government to have authorized the holding of this Seminar on the Cameroonesse Territory and in this nice City of Douala. The international character of this seminar has allowed dense and fruitful exchanges of scientific experiences between African Countries present to this seminar. Fairly, this meeting has been a real forum of the given and receipt whose merit go to Cameroon which shows in this circumstance the example of incent and of material support that African nations have to give to their scientists so as these ones may better contribute to the development of this continent.

Douala 27 January 1986
The Seminar

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