FIRST PROGRESS REPORT ON THE "COOPERATIVE STUDY OF POSSIBILITIES OF STANDARDIZATION AND IMPROVEMENT OF SOIL TESTING METHODS OF SOILS FROM THE HUMID TROPICS WITH EMPHASIS ON SOIL PHOSPHATE" (1978 - first half 1979)

INTRODUCTION

Laboratory soil testing as a means of assessing soil fertility on which fertilizer recommendations can be based is generally accepted. Conventionally it is considered as to be empirical by nature. This has resulted in the development and application of a large number of soil testing methods, the results of which are usually not mutually comparable. Even contradictory indications of nutrient availability may be found. This confusing situation reflects the fact that the quantity of a nutrient dissolved as the result of chemical interaction of a particular extractant and the relevant components of the soil is usually not a direct measure of the level of the plant-available nutrient, but is an index, the value of which depends also on the types and the contents of other reacting soil components that characterize the chemical properties of the soil.

Thus a particular interpretation of the so-obtained index as a measure of the nutrient level holds in principle only for soils with the same or rather closely related chemical properties.

Furthermore, differences in the climatic conditions and in the ability of various types of plants to take up nutrients from soil give rise to differences in the agricultural interpretation of the results.

Attempts to bring about uniformity of methods were so far not successful because:

a. Different methods for soil testing already came to stay. There are not only different extracting agents, but also modifications in extracting techniques, time of contact with the extractant, soil/extractant ratio, etc. Details are not always mentioned.
b. In reports from various countries, dealing with the correlation between the results of soil testing and plant performance, the kinds of soil used were not always men-

tioned, or they were insufficiently characterized.

c. In these studies a wide variety of crops was used, growing under different climatic conditions.

In order to overcome these drawbacks it was proposed to carry out a project in which correlation studies are centralized, using soils which are selected, sampled and characterized in a uniform way and tested with a selection of well standardized methods and with specific crops.
It is to be expected that the results of such an approach will be more easily accepted universally or at least can be used as a standard method for comparison with local methods.

Based on the aforementioned considerations a cooperative research project was agreed upon between the Institute of Soil Fertility (ISF), Haren and the Soil Science and Agrochemistry Division (SSAD) of the Department of Agricultural Research, Royal Tropical Institute (KIT), Amsterdam. The project is entitled: "Cooperative study on possibilities of standardization and improvement of soil testing methods of soils from the humid tropics, with emphasis on soil phosphate" (CSST).

The study will initially be restricted to soils:

a. in use or having potential for rainfed (non-irrigated) agriculture (particularly food crops),

b. belonging to the Orders (Soil Taxonomy, USDA 1975) of Alfisols, Ultisols, Oxisols and Inceptisols or related units in other classification systems excluding the hydromorphic soils, peat soils and paddy soils.

The study is to encompass not more than 5 soil classification units for each country of which 2 to 3 fields need to be selected.

For purposes of sampling the following criteria serve for the selection of fields and sites.

a. The fields should be on well drained, level to moderately sloping land and of a size sufficiently large, to carry out field experiments in the future (about 2000 m^2).

b. The legal status of the land should be such that in future no problems will arise concerning the use of the field for experimental work,

c. existing field experimental areas, particularly those on which much information has already been collected should be given preference.

d. fields having a known range in nutrient status, although belonging to the same soil unit, would be highly appropriate for the study.

The study will be conducted with the aid of soil analyses carried out at ISF and SSAD, pot experiments at ISF and plant analysis at SSAD and partly also at ISF.

The plan of operations is as follows:

1st phase: Collection and analyses of samples from countries in the humid tropics.
Based on the analytical results selection of sites for the collection of bulk samples for pot experiments, collection of this material and transport to the Netherlands.

2nd phase: Pot experiments at ISF, soil and plant analyses at ISF and SSAD.
Study and if necessary improvement of analytical methods, particularly for the determination of available P.

3rd phase: If the results of the studies in the first and second phase are positive the promising method(s) will have to be tested in the field. Therefore, in the future an appeal will be made to organizations in the humid tropics for controlled fertilizer experiments at research stations or in farmers' fields.

At ISF the method for the evaluation of available P in soils in relation to arable crops in the Netherlands known as the $P_{w(ater)}$ method will in the first place be tested on its suitability for use with tropical soils and plants. At SSAD the interest is not only focussed on methods for available P,

but also on the methods for the evaluation of the status of other nutrients such as N, K, Ca and Mg.
Of course the project can only be implemented if organizations in the humid tropics will cooperate in sending the necessary soil material. Therefore, the first step taken was the distribution of a circular letter explaining the objectives of the project (see Annex I) among about 20 organizations in Latin America, Africa and South East Asia. Practically all the institutes responded favourably, expressing their interest, but regrettably due to various problems only 6 countries could actually cooperate. To these organizations a second circular with detailed instructions was forwarded (see Annex I). It was the intention to conduct the first and second phase of the project in 1978 but most of the samples arrived rather late in 1978 and the last batch even during the first half of 1979. In the first progress report the results of the study so far obtained is presented.

REVIEW OF MATERIALS AND ACTIVITIES

Soils

In alphabetical order, samples (numbers in brackets) were received from the following countries:

Colombia: Institute Colombiano Agropecuario (ICA) (10)
Kenya I : National Agricultural Laboratories/Kenya Soil Survey (8)
Kenya II: Kisii student training project of the State Agricultural University, Wageningen, The Netherlands (35)
Nigeria : University of Nigeria, Nsukka (10)
Philippines : Bureau of Soils, Manilla (10)
Surinam : Soil Survey Department/Agricultural Research Station, Paramaribo (36)
Sri Lanka : Rubber Research Institute Sri Lanka (30)

Details on the samples are presented in Annex II.

Activities at SSAD

The samples received from the various countries were divided in two portions, one portion being sent to ISF. The other portion of soils was analysed according to a standard program used by SSAD for a general characterization of soils from the humid tropics consisting of: texture, % C, % N, pH-H_2O, pH-KCl, Electrical conductivity of the pH-H_2O suspension (EC_s), NH_4 in the pH-KCl extract, Ca, Mg, K, Na, Fe, Al, Mn, SO_4 and Cl after extraction with NH_4-acetate/acetic acid pH 4.8. Regrettably the P-content in the NH_4-acetate pH 4.8 extract of soils from the humid tropics is usually very low so that it cannot be used for the evaluation of available P. For the present study, two methods which are frequently used for soils from the humid tropics, P-Olsen and P-Bray II, were included.

So far the samples from Colombia, Sri Lanka, Kenya I, Kenya II, the Philippines, Nigeria and Surinam have been analysed. In addition the soils used in preliminary pot experiments at ISF and plant material of the test crops Maize, Amaranthus, Arachis and Soybean have been analysed.
Improvements were made in the procedures for P-Olsen and P-Bray II whereas a method was tested to concentrate water soluble P to improve the reproducibility of the determination of P_w in soils with very low water soluble P content.

Based on the analytical results, bulk samples from Sri Lanka and the Philippines from specific sites were requested and received for pot experiments at ISF. A portion of these samples were also analysed.

Activities at ISF

At ISF the aforementioned samples were analysed on their total content of P, Al, and Fe. As already stated before, at ISF the so-called $P_{w(ater)}$ method will be tested.
For climatic conditions as prevailing in The Netherlands the agricultural meaning of the P_w-value has proved to be essentially independent of the chemical properties of the soil.

Usually the P_w-value is determined at 20°C, but for the present study, it has been also determined at 30°C. In addition the reaction with the soil of added water soluble phosphate was studied by determining with how many units the P_w-value is increased after adding 100 P_w-units of water soluble phosphate to the soil (one P_w-unit = 1 µg P_2O_5/ml soil). The result is expressed as ΔP_w%. It is a reciprocal measure of P-fixation, the lesser the P-fixation, the higher ΔP_w%.
From the ΔP_w%-value of the soil, the increase in the P_w-value, resulting from phosphate fertilization, can be calculated. Inversely, the rate of phosphate fertilization resulting in a P_w-value, indicating an adequate phosphate supply, can be calculated also.
Of course, calibration of the results should be made to conform to the special conditions of the plant production in pot experiments or in the field. This matter is part of the current investigations.

Through the intermediary of the Laboratory of Agricultural Chemistry of the State Agricultural University at Wageningen, The Netherlands, 4 bulk samples from Kenya II were received from the Kisii student project in Kenya. With these soils pot experiments were carried out in 1978 with Maize, Amaranthus, Arachis and Soybean. For comparison a dutch soil from an experimental farm was included. One of the purposes was to gain experience with pot experiments with tropical crops. Furthermore, phosphate response of the various plant types, dependent on the P_w-value and on the phosphate fixation of the soil were studied.
In addition, a pot experiment was conducted with one of the soils from Kenya II, a rich volcanic ash soil, and again Maize, Amaranthus, Arachis and Soybean as test plants using radio active phosphorus. The purpose was to find out whether the amount of water extractable soil phosphate and the phosphate taken up by the plant came from the same source. If so, then the use of water as the extractant for available

soil phosphate would be justified on a rational basis. New pot experiments were started in the beginning of 1979 with soils from Sri Lanka, the Philippines and Kenya II, using Maize, Amaranthus, and Soybean as test plants. In addition the effect of placement of the phosphate fertilizer was studied with one of the soils from the Philippines and Amaranthus as the test plant.

ANALYTICAL RESULTS AND RESULTS OF POT EXPERIMENTS 1978

In this report only the analytical results for the soil and plant samples and the results of the pot experiments are presented respectively in the Annexes III, IV and V. The available data still have to be studied in more detail. The results of these studies will be presented separately. One of such a report is already available for the first batch of Sri Lanka soils and of the preliminary pot experiments conducted at ISF in 1978.

PRELIMINARY CONCLUSIONS

1. Particularly due to logistic problems it took quite a long time before samples from the humid tropics were received, retarding the planning of the programme.
2. It proved to be very difficult to obtain samples with a satisfactory range of available P-contents.
3. In the very low range indicating strong P-deficiency and in the high range of P-availability there seems to be not much difference between P_w, P-Olsen and P-Bray II. The plants growing in soils with a very low P-value determined with the three methods reacted strongly on P-application, whereas in the soils with high P-values the response was much smaller.
4. The experiment with radio active phosphorus and the rich volcanic ash soil from Kenya II proved that the water soluble phosphate and the phosphate taken up by the Maize, Amaranthus, Arachis and Soybean plants came

from the same source. This statement justifies in this case the use of water as an extractant for available phosphate.

5. The suitability of the diverse types of indicator plants for P-deficient soils depends, among others, on the phosphate content of the seeds. A relatively high amount of phosphate in the seeds proves to be favourable, as the first stage of development of the roots is then independent of the phosphate supply from the (poor) soil, thus bringing the total mass of the pot soil within reach of the roots. In this respect Arachis, Maize and Soybeans are suitable test plants, but Amaranthus (extremely low amount of phosphate in the seeds) is not: the complete lack of development makes it impossible to distinguish between levels in strongly P-deficient soils.

Annex I

First circular letter with project proposal.

Second circular letter with instruction for site selection, sampling and documentation.

Haren,
Amsterdam, September 14, 1977.

Dear Sir,

The Institute for Soil Fertility at Haren and the Department of Agricultural Research of the Royal Tropical Institute at Amsterdam, would like to draw your attention to the enclosed project proposal entitled: "Cooperative study on the possibility of standardization and improvement of soil testing methods for soils from the humid tropics, with emphasis on soil phosphate".

The institutes mentioned are interested in this study within the framework of agricultural research activities carried out in The Netherlands for developing countries.

We would appreciate to hear from you whether your organization is prepared to cooperate in the project by providing the necessary soil material. If so, detailed instructions on selection of soils, method of sampling, etc. will be forwarded.

Awaiting your reply at your earliest convenience and thanking you in anticipation,

Yours sincerely,

Institute for Soil Fertility,

Oosterweg 92, HAREN (Gr),
The Netherlands.

Ir O.M.J. Sluijsmans,
Director.

Royal Tropical Institute,
Department of Agricultural Research,
Mauritskade 63, AMSTERDAM-Oost,
The Netherlands.

Ir H.Ph. Huffnagel,
Director.

Project proposal

I. Project title

Coöperative study on possibilities of standarization and improvement of soil testing methods for soils from the humid tropics, with emphasis on soil phosphate.

II. Motivation

1. Laboratory soil testing as a means of assessing soil fertility on which fertilizer recommendations can be based has been considered as to be empirical by nature. This has resulted in the development and application of a large number of soil testing methods, the results of which are usually not mutually comparable. Even contradictory indications of nutrient availability may be found. This confusing situation reflects the fact that the quantity of a nutrient dissolved by a particular extractant is usually not a direct measure of the level of the plant-available nutrient, but is an index, the value of which depends also on the content of other reacting soil components that characterize the properties of the soil.

   Thus a particular interpretation of the index as a measure of the nutrient level holds in principle only for soils with the same or rather closely related properties.

   Furthermore, differences in the climatic conditions and in the ability of various types of plants to take up nutrients from soil give rise to differences in the agricultural value of the results.

   Attempts to bring about uniformity of methods were so far not successful because:

   a. Different methods for soil testing already came to stay. There are not only different extracting agents, but also modifications in extracting techniques, time of contact with the extractant, soil/extractant ratio, etc. Details are not always mentioned.
   b. In reports from various countries, dealing with the correlation between the results of soil testing and plant performance, the kinds of soil used were not always mentioned, or they were insufficiently characterized.
   c. In these studies a wide variety of crops was used, growing under different climatic conditions.

In order to overcome these drawbacks it is proposed to carry out a project in which correlation studies are centralized, using soils which are selected, sampled and characterized in a uniform way and tested with a selection of well standardized methods and with specific crops. It is to be expected that the results of such an approach will be more easily accepted universally or at least can be used as a standard method for comparison with local methods.

2. The above mentioned problems concerning soil testing methods refer in principle to all nutrients, but particularly to soil phosphate. In most tropical countries different P-testing methods are used for different kinds of arable soils and crops. Even when the same testing method is used, the agricultural evaluation of the results will be mostly different for various soil types.
   The Netherlands belong to the few countries where for a variety of arable soils a testing method is used, the agricultural evaluation of the results being valid for all soil types at least for those found in this country.
   A quantitative prediction (with a high probability of success) of the necessary P-fertilizer application can be made.
   This so called Pw(ater)-method was developed by Dr. H.A. Sissingh from the Institute for Soil Fertility at Haren-Groningen, The Netherlands. The Institute for Soil Fertility is interested in finding out whether the method as such will be suitable for the humid tropics or, if not, whether it will be possible to develop a similar P-testing method applicable to a wide range of soils in these regions, following the same line of thought and research which has resulted in the present Pw-method on which the recommendations for P-fertilization of arable crops on all soil types in The Netherlands are based.

III. Research coöperation

a. The Tropical Soils Division of the Department of Agricultural Research Royal Tropical Institute, Amsterdam, is interested in the first part of the project, namely the selection of soils and the necessary analyses on the basis of standardized methods.

b. The Institute for Soil Fertility, Haren-Groningen, is interested in the second part of the project and will carry out the necessary studies on methodology of soil analyses together with the pot experiments needed for both parts of the project.

Institutes and other organizations in the humid tropics will be invited to provide the soil material. Costs of surface freight to The Netherlands will be carried by the two above-mentioned institutes. Selection of soils, methods of sampling etc. will be clearly specified. Coöperating institutes will be kept informed regularly on the progress of the investigations.

IV. Follow-up

Testing of methods will be done initially with pot-experiments (by the Institute for Soil Fertility).

If the results of the studies are positive, the promising method(s) will have to be tested in the field. Therefore, in the future an appeal will be made to participating organizations in the humid tropics for controlled experiments at research stations or in farmers' fields.

List of contact addresses

Latin America

1. Centro Tropical de Ensenanza e Investigacion,
Instituto Interamericano de Ciencias Agricolas de la OEA,
Apartado 74, TURRIALBA, Costa Rica.

2. Centro Internacional de Agricultura Tropical,
Apartado Aereo 76-13, CALI, Colombia.
Dr R. Howeler, soil scientist.

3. Instituto Geografico "Augustin Codazi",
Carrera 30 no. 48-51, BOGOTA, Colombia.
Dr C. Luna Zembrano.

4. Fundacion Servicio para el Agricultor,
Edificio la Estancia - Oficina 360,
Urbanizacion Chuao, Apartado 2224,
CARACAS, Venezuela.

5. Dienst Bodemkartering Suriname,
P.O. Box 160, PARAMARIBO, Suriname.

6. Landbouw Proefstation Suriname,
P.O. Box 160, PARAMARIBO, Suriname.

Africa

7. International Institute of Tropical Agriculture,
Oyo Road, P.O. Box 5370, IBADAN, Nigeria.

8. University of Nigeria,
Department of Soil Science,
NSUKKA, Nigeria.
Dr W.O. Enwezor.

9. Soil Research Institute,
Academy Post office, KWADOSO, KUMASI, Ghana.

10. Ministry of Agriculture,
National Agricultural Laboratories,
P.O. Box 30028, NAIROBI, Kenya.
C. Hinga, senior soil chemist.

11. Head Kenya Soil Surveys,
P.O. Box 25272, NAIROBI, Kenya.

Asia

12. Indian Agricultural Research Institute,
Division of Soil Science and Agricultural Chemistry,
NEW DELHI - 2, India.

13. N.E. Agricultural Centre,
Tha Phra,
KHON KAEN, Thailand.

14. Northern Region Agricultural Development Centre,
CHIANG MAY, Thailand.
Mr Veldman.

15. Department of Agriculture, Soils Division,
Swettenham Road, KUALA LUMPUR, Malaysia.

16. Malaysian Agriculture Research and Development Centre,
Bag Berkunci no 202,
Pejabat Pos Universiti Pertanian,
SERDAN, SELANGOR, Malaysia.

17. Semongkok Agricultural Research Station,
Department of Agriculture,
KUCHING, SERAWAK, East Malaysia.

18. Rubber Research Institute of Sri Lanka,
AGALAWATTA, Sri Lanka.

19. Department of Agricultural and Natural Resources,
Bureau of Soils,
Sunvesco Building, Taft Ave. cor.T.M., Kalaw Street,
MANILA, Philippines.
Mr G.M. Jonas.

20. Soil Research Institute,
Jalan Haji Juanda 98, BOGOR, Indonesia.
Soil Survey Division.

KONINKLIJK INSTITUUT VOOR DE TROPEN

ROYAL TROPICAL INSTITUTE
AMSTERDAM-OOST / 63 MAURITSKADE / TELEPHONE 92 49 49
BANKERS: ALGEMENE BANK NEDERLAND N.V. AMSTERDAM
TELEGRAMS: INTROPEN / POSTGIRO 24548 / GEM. GIRO S 10074
TELEX 15080 KIT NL

YOUR REF. :

REF. NO. 3/AB/847.77/Mu/AB

ENCLOSURES:

SUBJECT Cont. Bula Inst.
3.04/506

Amsterdam,

Dear Sir,

Thank you very much for the positive response on our circular letter concerning the research project: "Cooperative study on possibilities of standardization and improvement of laboratory soil testing methods for soils from the Humid Tropics, with emphasis on soil phosphate".

Also on behalf of the Institute of Soil Fertility at Haren, I have pleasure in presenting you herewith:
A general outline of the researchproject with in appendix I Instructions for standardized sample collection and packing; in appendix II Documentation form A/B and in appendix III an example for soil and site description.

We would appreciate to hear from you at your earliest convenience whether
a) on the basis of the received information you are able to cooperate,
b) you can indicate approximately at which period samples A/B can reach our Institute in Amsterdam
c) you can indicate the approximate costs of freight for sending the samples to Amsterdam.

As stated in the "general outline" we expect to receive a maximum of 2x15 samples from each participating country. In some cases positive responses were received from 2 institutes in the same country. We would appreciate if the 2 organizations concerned would consult and cooperate with each other in the selection, collection and despatch of the samples.

-2-

Thanking you once more, also on behalf of the Institute of Soil Fertility,

Yours sincerely,

DEPARTMENT OF AGRICULTURAL RESEARCH
Soil Science and Agrochemistry Divisio

Ir. A. Muller
Head

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Yours sincerely,

DEPARTMENT OF AGRICULTURAL RESEARCH
Soil Science and Agrochemistry Divisio

Ir. A. Muller
Head

General outline of the Research Project:

"Cooperative study on possibilities of standardization of laboratory soil testing methods for soils from the Humid Tropics with emphasis on soil phosphate"

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1. Restrictions in scope

The study will initially be restricted to soils:

a. in use or having potential for rainfed (non-irrigated) agriculture (particularly food crops),

b. belonging to the Orders (Soil Taxonomy, USDA 1976) of Alfisols, Ultisols, Oxisols and Inceptisols or related units in other classification systems excluding the hydromorphic soils, peat soils and paddy soils.

The study is to encompass not more than 5 soil classification units for each country of which 2 to 3 fields need to be selected.

2. Site selection

For purposes of sampling the following criteria serve for the selection of fields and sites.

a. The fields should be on well drained, level to moderately sloping land and of a size sufficiently large to carry out field experiments in the future (about 2000 m^2).

b. the legal status of the land should be such that in future no problems will arise concerning the use of the field for experimental work,

c. existing field experimental areas, particularly those on which much information has already been collected should be given preference,

d. fields having a known range in nutrient status, although belonging to the same soil unit, would be highly appropriate for the study.

3. Sample collection

Detailed instructions for the sampling procedure will be presented (see appendix I). These details are necessary for ensuring a standardization in securing the sample materials.

Soils samples will be required in two distinctly separate phases of the project of which the first phase is designed to screen the selected fields and soils on suitability for the pot trials to be conducted in the second phase.

Samples required in phase I

Samples A - from the A1 horizon (generally the intensively rooted toplayer).

Samples B - from a 10 cm thick layer immediately underlying the A1 horizon.

Both samples A and B together would represent that part of the solum generally supplying plant food for annual crops The amount of samples A, respectively B should be at least 1 liter.

Samples A and B which collectively should not number more than 30, e.g. 5 (soil units) x 3 fields (replicates of soil units with preferably different nutrient status) x 2 samples (A plus B), will be analysed both at the Institute for Soil Fertility (ISF) and the Royal Tropical Institute (RTI). Based on the results of these investigations, fields will be selected for large soil samples to be taken for carrying out pot trials.

Samples required in phase II

Samples C - bulk samples of at least 100 liter for the pot trials collected at fields selected in phase 1

Samples D - these are 1 liter samples collected from each genetic horizon of profile pits dug and studied at representative locations in the fields where also samples C are collected.

The collection of samples C and D and the profile study should take place simultaneously.

In a later stage of the study one or two fields per country will be selected for a study of the vertical phosphate distribution in the profile. For this, samples will be required from successive 10 cm thick layers in the profiles. Details on this study will be provided later on.

Of importance is that the exact locations of the selected fields and the sites of sampling will be indicated on maps during collection of samples in phase 1 so that they can be retraced for collecting samples in phase 2.

4. Despatch of samples

For packing and despatch see detailed instructions in appendix I. The samples should be forwarded to:

Soil Science and Agrochemistry Division
Dept. of Agricultural Research
Royal Tropical Institute
Mauritskade 63
Amsterdam - Holland.

5. Phasing of programme

1977/78	Collection and analysis of samples A and B. Selection of fields for samples C and D.
1978/79	Collection and analysis of samples C and D. Pot trials with samples C
1979/?	Continuation of the study. Depending on progress, to make preparations for field trials in participating countries (after consultation) aimed at testing the most promising methods of analysis, particularly in relation to phosphate, with crop responses.

Yearly progress reports will inform all participating institutes on the development of the project.

6. Contacts

To facilitate communication, the two Institutes in the Netherlands responsible for carrying out the projects have designated each one project leader in their respective institutes. Participating institutes, universities and research stations in other countries can directly communicate with the project leaders on matters concerning this project.

These project leaders are:

a. Dr. Ir. H.A. Sissingh
Senior Research Officer — for — Institute for Soil Fertility
Oosterweg 92
Haren (Gr.)
The Netherlands

b. Ir. A. Muller
Head of the Soil Science and Agrochemistry Division — for — Royal Tropical Institute
Department of Agricultural Research
Mauritskade 63
Amsterdam
The Netherlands.

Appendix I.

Instructions for standardized sample collection and packing

1. Concerning collection of samples A and B

At each selected field make a small furrow at 5 places, sufficiently deep and wide to enable to study the upper soil layer. Remove the surface litter, cut off aerial parts of plant cover.

a. Note down the thickness of the intensively rooted layer at these 5 places and take samples at each place. Mix these samples thoroughly and take a sample of 1 liter of the homogenized material - Sample A.

b. Collect in a similar way 5 samples of the subsequent layer of 10 cm thickness, homogenize and take 1 liter of this material - Sample B.

c. Store remaining soil material for reference purposes.

2. Numbering

Each sample-pair (A and B) is given a roman number related to the field of origin. Labels should give the kind of sample (A or B), followed by the fieldnumber and the depth in cm, such as:

A I (0 - .... cm)

B I (... + 10 cm)

Since the depth of sample A is related to possibly 5 different depths recorded for the 5 sample sites, a mean depth should be given

The depth of sample B is then the mean depth for sample A plus 10 cm.

One label wrapped in plastic foil should be put inside the bag, another label with the corresponding number should be attached to the string used for tying the bag. For sample bags please use strong plastic.

3. Documentation

For each sampled field a documentation form should be filled in. It is not necessary to complete all the forms for all fields. Do fill in the known data and cross-reference can then be made to information already given for other fields if applicable. A copy of the documentation form with the checklist of information required is attached (see appendix II and III).

4. Packing and despatch

Please air-dry samples (out of the sun) before shipping. The batch of samples should be packed in sturdy containers. Insert a packing list in each container, giving the numbers of samples as indicated on the labels. A copy of the complete packing list should be send by airmail to the addressee together with the "Bill of Lading" and/or other documentation necessary for taking delivery in the Netherlands.

The Bill of Lading should contain the statement: Soil samples with no commercial value. For scientific purposes only.

(N.B. So far, there are no quarantaine restrictions for importing soil samples into the Netherlands).

All bills and documents concerning transportation expenses should be send to the Royal Tropical Institute. Freight to be paid on delivery.

Please arrange for the cheapest possible means of transportation.

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Appendix II — Documentation form A/B

N.B. This documentation form is based on the FAO Guidelines for soil description (see example in Appendix III).

Sample nr. A....

nr. B....

I. Country:

Administrative unit:
(state, province etc.)

II. Location

a. map coordinates or reference to villages, minor roads etc.

b. physiographic position

c. surrounding landform

d. elevation in meters

c. slope

III. Classification

a. local name

b. higher category classification:
local
USDA Soil Taxonomy 1976

IV. Climate

a. average annual rainfall

b. average monthly rainfall distribution

c. average annual temperature

d. average monthly temperature distribution

e. seasonal diurnal temperature changes

Annex our letter nr. 3/AB/847.77/Mu/AB

Appendix II (continued)

V. Vegetation/land use

Non-cropped land:

a. form (forest-primary, secondary; bush; grass land; fallow in shifting cultivation cycle etc.)

b. components (most important plant species)

Cropped land:

a. form (pasture, food crops, cash crops etc.)

b. components (plant species)

c. cultivation systems (monoculture, rotation, mixed cropping, cropped land in shifting cultivation cycle etc.)

d. fertilizer practices/response

e. yields per crop

f. available data on soil properties, particularly concerning P-status.

VI. Literature

Indicate official publications in which particulars on the soil samples can be found.

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Appendix III — Example of documentation required

Sample nr. A I 0 - 15 cm
B I 15- 25 cm

I. Country: (relevant information)
Administrative unit : (relevant information)

II. Location

a. map coordinates or reference to villages, minor roads etc. : approximately 6° 12' S. 15° 30' E, on left side of footpath leading to Bangi village, about 200 meters north of village of Chapa. Approximately 65 km east of Port Cabot.

b. physiographic position : on gentle convex summit

c. surrounding landform : undulating

d. elevation in meters : 350 m.

e. slope : gently sloping 3-4 %

III. Classification

a. local soil name : Chapa series

b. higher category classification: local : Ferruginous Tropical Soil /
USDA Soil Taxonomy 1976: probably Paleustalfs

IV. Climate

a. average annual rainfall: 1,050 mm

b. monthly rainfall distribution (mm) : (average of 35 years)

J	F	M	A	M	J	J	A	S	O	N	D
10	25	75	110	125	125	120	125	160	155	30	10

c. average annual temperature °C : 30

d. monthly temperature distribution °C : 33 34 34 32 31 30 28 28 29 30 31 31

e. seasonal diurnal temperature changes : in rainy season less than 5°C, in dry season 5 - 10°C difference in temperature between early morning and mid-day temperature.

Annex our letter nr. 3/AB/847.77/Mu/AB

Appendix III (continued)

V. Vegetation/land use

Non-cropped land:

a. form	:	savanna fallow regrowth
b. components	:	shrubs include Anona spp. and Payetta spp., grasses are Andropogon spp. Scattered trees (mainly Lophira) and a few oil palms (Elaeis guinensis).

Cropped land:

a. form	:	subsistence food crops
b. components	:	yams, tall sorghum, some maize and cassava
c. cultivation systems	:	fallow is cleared after burning, first crop is usually yams. Land is left to fallow regrowth usually after three years of cultivation and may remain under fallow during 10 years or longer.
d. fertilizer practices/ response	:	no fertilizers are used by the farmers, but field experiments in the area have shown an economic response by yams to a 40-40-40 fertilizer mixture.
e. yields per crop	:	only known for yams avarage 9,000 kg/ha
f. available date soil properties	:	(relevant information)

VI. Literature : (relevant information)

Annex II

INFORMATION ON SOILS RECEIVED IN THE FRAME WORK OF THE CSST PROJECT

Table I : Colombia, Kenya I

Table II : The Philippines, Nigeria

Table III : Surinam

Table IV : Sri Lanka
Though the sampling sites do not agree with the criteria for site selection (too steep slopes), it was decided to include these samples in the study because they represent an important group of soils in the humid tropics.

Table V : Kenya II, Kisii student project
These samples were already collected before the initiation of the CSST-project. They were used for preliminary studies.

Table I : Information on soils received in the frame work of the CSST-project

Country and CSST no.	Sample no.	Depth cm	Location	Physiogr.pos.- sourrounding land-	% slope	Classification High level (as stated by sender)	Local name	Land use vegetation
Colombia								
Co- 1	I A	0-15	La Libertad,ICA exp. station	high terrace-flat 336 m	0-1	Kaolinitic,Iso-hiperthermic Tropeptic Haplorthox	Serie La Libertad	grass savanna fallow regrowth
- 2	I B	10-25						
- 3	II A	0-15	La Libertad,ICA exp. station	middle terrace-flat, 336 m	0-1	Mix clayey Iso-hiperthermic oxic Dystro-pept	Serie El Retiro	grass savanna fallow regrowth
- 4	II B	15-25						
- 5	III A	0-15	Carimagua,ICA exp. station	high flat plains-flat 175 m	0-1	Oxisol	La Reserva	grass savanna
- 6	III B	15-25						
- 7	IV A	0-15	Carimagua,ICA exp. station	high undulating plains-undulating, 175 m	3-4	Oxisol	Tabaquera	grass savanna
- 8	IV B	15-25						
- 9	V A	0-10	Macagual,ICA exp. station	river bottom(Vega)-flat, 280 m	0-1	Entisol	High river bottom	shrubs and gasses
-10	V B	10-20						
Kenya I								
KE-35	A 1-J	0-15	Agr.Res.St.Katumani Eastern Prov. Machakos Distr.	gently undulating-undulating upland	3	chromic luvisol oxic paleustalf	-	fallow in shift.cult. acacia bushland cleared for cultivation
-36	B Bit-J	15-25						
-37	A 1-N_3	0-22	Agr.Res.St.Kitale,Rift valley Prov.,Trans-Nzoia Distr.	on interfluve-slightly undulating upland	3	orthic ferralsol, typic haplustox	-	fallow in shift.cult. paddock in pasture
-38	B 1-N_3	22-32						
-39	A 1	0-25	Agr.Res.St.Kikambala,Coast Prov. Mombasa Distr.	slightly elevated area-gently undulating coastal plain	1	orthic ferralsol, typic eutrostox	-	fallow in shift.cult. bare land
-40	B 1	15-35						
-41	A 1-F2	0-28	Agr.Res.St.Kakamega,WesternProv. Kakamega Distr.	linear to concave slope	2	eutric nitosol typic plaeudalf	-	grass land,paddock in pasture (rhodes, star-grass desdemonium)
-42	B Bit-F2	28-38						

Table II : Information on soils received in the frame work of the CSST-project

Country and CSST no.	Sample no.	Depth cm	Location	Physiogr.pos.-sourrounding land-form,elevation	% slope	Classification high level (as stated by sender)	Classification local name (as stated by sender)	Land use,vegetation
Philippines								
PH- 1	A I	0-22.5	Bago-Oshiro,Davao City,proposed Soil Conservation and Research Station	lower part of volcanic piedmont plain-undulating 60-70 m	gently sloping	Typic Paleodult or Rhodic Paleodult	Tugbok series	subsistence food-crops,intercropping with cacao, banana,rubber
- 2	B I	22.5-32.5						
- 3	A II	0-20	Malagos,Davao City Piatos Farm	volcanic piedmont plain-moderately undulating,230 m	gently sloping	Typic Paleodult or Rhodic Paleodult	Tugbok series	subsistence food-crops,corn intercropped with upland rice and peanut; cassava,pineapple
- 4	B II	20-30						
- 5	A III	0-18	Catigan,Davao City Davao Inst.of Agr. Found.Area	volcanic piedmont plain-slightly to moderately undulating,170 m	gently sloping	Typic Tropodult	-	native grassland, Imperata cylindrica with some scattered trees
- 6	B III	18-28						
Nigeria								
NI- 1	A 1	0-20	Undike Agr.Res.St. Olokoro Extension IMO STATE	gentle upper slope-rolling, 200 m	2	Ferrallitic tropical soil, probably Ultisol	-	Bush regrowth,Eupatorium odoratum and Andropogon spp.
- 2	B 1	20-30						
- 3	A 2	0-20	Undike Agr.Res.St. opposite station maingate,IMO STATE	lower slope-rolling 200 m	4	Ferrallitic tropical soil probably Ultisol		Fallow after cassava, mainly panicum max.
- 4	B 2	20-40						
- 5	A 3	0-20	Nsukka Univ.Fac.of Agr.Farm,ANAMBRA STATE	gently undulating hill top-hilly	2	Ferrallitic tropical soil	Nkpologu sandy soil	Fallow in exp.plot grasses,Panicum spp. with Eupatorium odoratum
- 6	B 3	20-30						
- 7	A 4	0-20	Nsukka Univ.Fac.of Agr.Farm,ANAMBRA STATE,800 m east of A/B 3	gently undulating hill top-hilly	2	Ferrallitic tropical soil	Nkpologu sandy soil	Fallow in exp.plot grasses,Cyhodon spp. with Eupatorium odoratum
- 8	B 4	20-30						
- 9	A 5	0-20	As A/B 3 but on north facing slope	upper slope-hilly	6	Ferrallitic tropical soil	Nkpologu sandy loam	Fallow exp.plot, grasses
-10	B 5	20-30						

Table III : Information on soils received in the frame work of the CSST-project

Country and CSST no.	Sample no.	Depth cm	Location	Physiogr.pos.- sourrounding land-form, elevation	% slope	Classification high level (as stated by sender)	local name	Land use, vegetation
Surinam								
SU- 1	A I	0-21	District Saramacca, Exp.garden La Poule	clay plain - flat, 0.75 m	< 2%	young coastal plain,Plintic sulfic Tropaquept	Saramacca series	Cash crop cacao in monoculture
- 2	B I	21-31						
- 3	A II	0-14	←		as A/B I	→		
- 4	B II	14-24						
- 5	A III	0-16	←		as A/B I	→		as A/B I but citrus instead of cacao
- 6	B III	16-26						
- 7	A IV	0-28	as A/B I	as A/B I,but 1.50 m	as A/B I	Young coastal plain,Typic Tropaquept	as A/B I	Cash crop coffee
- 8	B IV	28-30						
- 9	A V	0-23	←		as A/B IV	→		Secondary forest
-10	B V	23-33						
-11	A VI	0-21	←		as A/B IV	→		Cashcrop rubber
-12	A VI	21-31						
-13	A VII	0-20	District Saramacca, Exp.garden Coebiti	plateau slightly undulating,21 m	2%	Plateau soil Haplortox	Powisie	Crass fallow in cultivated land
-14	B VII	20-30						
-15	A VIII	0-19	←		as A/B VII	→		Kudzu fallow in cultivated land
-16	B VIII	19-29						
-17	A IX	0-30	District Marowijne, Patamacca	plateau-slightly undulating,elevation unknown	2%	Tibity landscape,well drained(not yet classified)	-	Primary forest
-18	B IX	30-40						

Table IV : Information on soils received in the frame work of the CSST-project

Country and CSST no.	Sample no.	Depth cm	Location	Physiogr.pos.-sourrounding land-form, elevation	% slope	Classification high level (as stated by sender)	Classification local name (as stated by sender)	Land use, vegetation
Sri Lanka								
SL- 1	A I	0-15	Lowmont Estate, plot 17+18	moderately steep convex slope-flat rice land, 18 m	14-18	Red Yellow Podzolic with plinthite	Boralu series	immature rubber, 1977, response to NPKMg
- 2	B I	15-25						
- 3	A II	0-20	Lowmont Estate, plot 15+16	←	as A/B I	←		
- 4	B II	20-30						
- 5	A III	0-20	Lowmont Estate, plot 13+14	←	as A/B I	←		
- 6	B III	20-30						
- 7	A IV	0-20	Atherfield Estate, plot 1+2	moderately steep convex summit-undulating, 18 m	18-20	Red Yellow Podzolic	Homagana series	as A/B I
- 8	B IV	20-30						
- 9	A V	0-15	Atherfield Estate plot 3+4	←	as A/B IV	←		
-10	B V	15-20						
-11	A VI	0-17	Atherfield Estate plot 5+6	sloping convex summit-undulating, 18 m	8-13	as A/B IV	←	
-12	B VI	17-27						
-13	A VII	0-15	Nivitigala, Ratnapura Estate, plot 9+10	steep convex summit-hilly, 137 m	25-50	Red Yellow Podzolic	Ratnapura series	mature rubber, 1000-1200 lbs/acre/y NPK fertilizer exp. in progress
-14	B VII	15-25						
-15	A VIII	0-18	Nivitigala, Ratnapura Estate, plot 18+16	←	as A/B VII	←		
-16	B VIII	18-28						
-17	A IX	0-20	Nivitigala, Ratnapura Estate, plot 19+20	←	as A/B VII	←		
-18	B IX	20-30						

Table IV : Information on soils received in the frame work of the CSST-project (continued)

Country and CSST no.	Sample no.	Depth cm	Location	Physiogr.pos.- sourrounding land- form, elevation	% slope	Classification high lavel (as stated by sender)	Classification local name (as stated by sender)	Land use, vegetation
Sri Lanka (continued)								
SL-19	A X	0-17	Eduragala Estate,	steep convex summit-	40-50	Red Yellow	Agalawatta	immature rubber, 1977
-20	B X	17-27	plot 29+30	hilly, 122 m		Podzolic	series	
-21	A XI	0-19	Eduragala Estate,	←	as A/B X	←		
-22	B XI	19-29	plot 31+32					
-23	A XII	0-15	Eduragala Estate,	←	as A/B X	←		
-24	B XII	15-25	plot 33-34					
-25	A XIII	0-16	Parambe Estate,	steep convex summit-	30-50	Reddish Brown	Parambe	immature rubber,
-26	B XIII	16-26	plot 1+2	hilly, 140 m		Latosolic	series	response on NPKMg
-27	A XIV	0-17	Parambe Estate,	←	as A/B XIII	←		
-28	B XIV	17-27	plot 3+4					
-29	A XV	0-17	Parambe Estate	←	as A/B XII	←		
-30	B XV		plot 5+6					

Table V : Information on soils received in the frame work of the CSST-project

CSST no.	Sample no.	Location	Parent material	Elevation m
Kenya II				
KE- 1	1	Nyachogochogo	felsite/andesite	1890
- 2	2	Magombo Mkt	felsite/andesite	1900
- 3	3	Bogetenga	basalt	1600
- 4	4	Koderopara	granite	1495
- 5	5	Bochi	basalt	1635
- 6	6	Nyandigwa	granite	1500
- 7	7	Boikanga	felsite/andesite	1850
- 8	8	Bochi	basalt	1715
- 9	9	Kanyaluth	rhyolite	1375
-10	10	Mwongoris	volcanic ashes	2150
-11	11	Nyasiongo	volcanic ashes	1860
-12	12	Ranen	rhyolite	1430
-13	13	Ranen	rhyolite	1415
-14	14	Bomariba	granite	1465
-15	15	Bogitaa	granite	1550
-16	16	Nyamasibi	volcanic ashes	2170
-17	17	Kerindo	volcanic ashes (other vocanos than previous sites)	1150

CSST no.	Sample no.	Location	Parent material	Profile depth	Crops
KE-18	403	Ria Kwara	volcanic ashes admixture	deep	no crop
-19	103	Keroka	" "	shallow/stony	maize
-20	101	Keroka	" "	deep	maize
-21	404	Magombo	probably andesite	shallow/stony	no crop
-22	203	Magombo	" "	deep	maize
-23	304	Kisii	basalt	shallow/stony	coffee
-24	303	Kisii	"	deep	coffee
-25	121	Wanjare	granite	shallow/ gravelly	maize
-26	108	Wanjare	"	moderately deep	maize
-27	305	Wanjare	"	deep	coffee
-28	309	Marongo	pyrophilite	shallow/stony	coffee
-29	122	Ranen	rhyolite	moderately deep	maize
-30	116	Ranen	"	moderately deep	maize

Annex III

RESULTS OF SOIL ANALYSES CARRIED OUT BY SSAD/KIT

Table I : Colombia and Kenya I

Table II : The Philippines and Nigeria

Table III : Sri Lanka

Table IV : Surinam

Table V : Kenya II

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Table : I

ANALYTICAL RESULTS

SOIL SAMPLES FROM: Colombia and Kenya I

CSST no.	Sample nó	Depth cm	Location	Granulometric analysis in % of dry soil: 2 mm - 200 µ	200 µ - 60 µ	60 µ - 20 µ	20 µ - 2 µ	< 2 µ	Soil texture class.	% moisture	pH H_2O	pH KCL	EC 25 x 10^3	NH_4-acetate / acetic acid extraction; pH = 4.8; me/100 g soil: Ca	Mg	K	Na	ppm/kg soil: Fe	Al	Mn	SO_4	Cl	N-NO_3	P	mg N-NH_4/kg soil in 1N KCL	mg/kg soil P -Olsen	1) % C	% N	mg/kg soil P-Bray II
Colombia																													
CO- 1	I A	0-15	La Liber-	23.5	21.5	7.4	18.5	29.2	sa.cl.l.	1.3	5.0	4.0	0.09	0.20	0.15	0.28	0.13	14	251	30	18	tr	5.8		27.9	3	1.88	0.14	4.8
- 2	I B	15-25	tad, ICA	20.4	20.5	6.7	15.9	36.5	sa.cl.l.	1.3	5.0	4.0	0.04	0.12	0.11	0.14	0.04	9	251	38	10	tr	5.5		32.8	2	1.55	0.11	3.3
- 3	II A	0-15	La Liber-	8.9	19.0	11.9	27.3	32.9	cl.l.	1.1	5.1	3.8	0.03	1.04	0.11	0.10	0.03	25	174	16	10	tr	3.5		23.8	3	1.27	0.12	4.6
- 4	II B	15-25	tad, ICA	9.8	19.5	11.0	24.6	35.2	cl.l.	1.1	5.0	3.8	0.03	0.70	0.05	0.07	0.03	9	207	13	8	tr	3.7		18.0	1	0.97	0.09	3.0
- 5	III A	0-15	Carimagua	7.1	7.3	42.5	34.9	8.2	si.l.	1.3	5.1	4.0	0.03	0.07	0.05	0.04	0.02	6	189	16	10	tr	3.7		34.4	1	1.36	0.10	1.3
- 6	III B	15-25	ICA	6.7	6.5	40.1	18.7	28.0	si.l.	0.9	5.4	4.1	0.03	0.12	0.04	0.03	0.04	3	171	12	4	tr	3.2		29.5	1	0.69	0.04	1.7
- 7	IV A	0-15	Carimagua	34.4	13.1	24.7	9.6	18.3	sa.l/l.	0.9	5.1	4.1	0.03	0.07	0.05	0.04	0.02	5	161	8	16	tr	5.1		28.7	1	1.12	0.08	3.0
- 8	IV B	15-25	ICA	26.7	14.4	21.1	17.6	20.1	l.	0.5	5.4	4.2	0.02	0.07	0.03	0.02	0.03	2	128	7	4	tr	1.4		18.9	1	0.45	0.05	0.9
- 9	V A	0-10	Macagual	45.5	16.0	7.8	19.0	11.6	sa.l.	1.2	5.1	4.1	0.10	2.23	0.47	0.19	0.03	15	119	31	20	tr	11.3		51.7	11	1.70	0.22	10.8
-10	V B	10-20	ICA	46.3	15.9	4.3	14.6	18.9	sa.l.	1.2	5.1	4.1	0.05	0.77	0.21	0.16	0.02	16	157	40	13	tr	6.7		27.1	5	0.97	0.14	5.2
Kenya I																													
KE-35	A I-J	0-15	Katumani	33.0	31.2	5.6	6.2	23.9	sa.cl.l.	2.1	6.3	5.0	0.08	3.24	1.34	1.21	0.03	tr	6	16	8	tr	2.3		22.1	11	0.75	0.07	21.3
-36	BBit-J	15-25	Machakos	41.2	21.8	5.0	5.8	26.2	sa.cl.l.	3.6	6.4	4.9	0.06	4.03	1.56	1.00	0.03	tr	7	5	5	tr	1.4		12.3	3	0.78	0.06	6.7
-37	A $I-N_3$	0-22	Kitale	31.7	15.9	4.8	12.5	35.1	sa.cl.l.	2.5	5.9	4.7	0.06	4.41	1.23	0.63	0.03	1	19	43	9	tr	1.2		29.5	4	1.62	0.15	5.5
-38	B $I-N_3$	22-32	Trans-Nzoia	34.4	13.1	3.9	9.7	38.8	sa.cl.l.	2.4	5.9	4.8	0.08	2.97	1.23	0.37	0.03	1	51	30	95	tr	1.2		16.4	tr	0.90	0.08	0.9
-39	A I	0-25	Kikambala	56.5	33.8	2.9	2.2	4.5	sa.	0.3	6.3	5.2	0.08	1.02	0.38	0.29	0.04	tr	8	32	8	tr	7.1		9.8	10	0.51	0.03	23.4
-40	B I	25-35	Mombasa	49.5	41.5	2.9	1.0	5.0	sa.	0.2	6.5	5.6	0.09	1.55	0.29	0.41	0.06	tr	7	21	107	tr	4.4		4.9	20	0.36	0.03	44.5
-41	A $I-F_2$	0-25	Kakamega	9.5	4.9	9.9	25.1	51.5	cl.	5.2	6.3	5.1	0.08	8.22	1.69	1.49	0.07	tr	17	66	8	tr	1.4		26.2	2	1.77	0.25	2.2
-42	B $I-F_2$	25-35	Kakamega	6.8	5.3	8.3	28.0	51.6	cl.	4.9	6.2	4.9	0.06	8.72	1.53	0.81	0.06	1	20	84	9	tr	1.6		29.5	2	1.77	0.30	1.9

cl. : clay
cl.l. : clay loam
sa.cl.l. : sandy clay loam
sa.l. : sandy loam
sa. : sand
l. : loam
si.l. : silty loam

1) % C : no conversion factor used

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Table : II

ANALYTICAL RESULTS

SOIL SAMPLES FROM: The Philippines and Nigeria

CSST no.	Sample no.	Depth cm	Location	Granulometric analysis in % of dry soil: 2 mm - 200 µ	200 µ - 50 µ	50 µ - 20 µ	20 µ - 2 µ	< 2 µ	Soil texture class.	% moisture	pH H_2O	pH KCl	EC 25 x 10^3	me/100 g soil: Ca	Mg	K	Na	mg/kg soil: Fe	Al	Mn	SO_4	Cl	$N\text{-}NO_3$	P	mg N- NH_4/kg soil in 1N KCl	mg/kg soil P-Olsen	1) % C	% N	mg/kg soil P-Bray II
Philippines																												
PH- 1	A I	0-22^5	Bago-Oshi	6.3	15.1	10.2	26.6	41.8	cl./cl.l	5.8	6.0	5.1	0.09	7.0	3.9	1.8	0.03	tr	10	13	tr	tr	6.7		4.9	8	0.71	0.13	4.0
- 2	B I	22^5-32^5	Davao City	6.3	11.7	6.6	27.1	48.3	cl.	6.4	6.0	4.8	0.06	5.7	3.6	1.9	0.05	tr	21	20	61	tr	3.7		5.7	6	0.43	0.09	2.2
- 3	A II	0-20	Malagos	5.2	13.8	12.5	24.6	43.9	cl./cl.l	7.6	6.2	5.1	0.06	5.4	2.8	0.6	0.05	tr	8	5	tr	tr	83		6.6	11	1.07	0.15	3.8
- 4	B II	20-30	Davao City	5.6	11.2	8.7	25.1	49.4	cl.	8.1	6.7	5.5	0.05	6.1	3.1	0.6	0.06	tr	6	2	tr	tr	3.9		6.6	8	0.76	0.11	2.0
- 5	A III	0-18	Catigan	5.8	16.3	10.2	26.4	41.3	cl./cl.l	4.8	5.0	4.2	0.08	2.5	1.9	0.3	0.04	2	75	75	3	tr	17.5		16.4	3	1.46	0.16	3.5
- 6	B III	18-28	Davao City	1.1	6.7	5.9	20.9	65.4	cl.	8.4	5.3	4.7	0.05	3.4	3.1	0.2	0.14	1	97	31	100	tr	10.4		7.4	1	0.90	0.10	1.2
Nigeria																												
NI- 1	A 1	0-20	Undike	46.1	13.8	6.4	9.7	24.0	sa.cl.l.	5.1	4.9	4.0	0.03	0.28	0.09	0.05	0.03	7	108	15	38	tr	3.9		15.6	3	1.23	0.10	6.1
- 2	B 1	20-30	Imo State	38.4	16.9	4.8	8.2	31.7	sa.cl.l.	1.6	4.6	4.0	0.04	0.14	0.08	0.03	0.03	7	114	8	24	tr	5.1		3.3	tr	0.81	0.08	1.4
- 3	A 2	0-20	Undike	65.3	12.6	1.2	6.4	14.5	sa.l.	2.1	5.2	4.1	0.04	0.41	0.08	0.10	0.03	6	89	10	22	tr	3.5		6.6	7	1.05	0.11	21.9
- 4	B 2	20-30	Imo State	57.8	15.3	2.0	5.1	19.6	sa.l.	1.1	5.0	4.1	0.02	0.23	0.07	0.05	0.03	4	68	13	16	tr	1.4		0.8	2	0.54	0.04	3.7
- 5	A 3	0-20	Nsukka	34.3	19.9	3.1	9.1	33.5	sa.cl.l.	3.8	4.9	4.3	0.29	0.12	0.35	0.22	0.09	1	60	20	12	tr	69		23	4	0.87	0.08	13.9
- 6	B 3	20-30	Anambra St.	33.2	18.4	3.2	8.0	37.0	sa.cl.l.	5.3	4.4	4.1	0.39	1.15	0.13	0.27	0.13	1	97	19	158	tr	118		24.6	1	0.69	0.07	1.8
- 7	A 4	0-20	Nsukka	50.1	21.5	3.1	7.8	17.5	sa.l.	1.6	5.5	4.3	0.07	1.23	0.34	0.03	0.03	1	53	25	9	tr	1.4		8.2	2	0.75	0.09	2.7
- 8	B 4	20-30	Anambra St.	39.5	19.7	6.2	7.5	27.1	sa.cl.l.	2.1	5.3	4.2	0.03	0.99	0.28	0.02	0.02	1	73	39	55	tr	1.6		12.3	tr	0.63	0.04	1.5
- 9	A 5	0-20	Nsukka	47.0	20.1	4.7	5.3	23.0	sa.cl.l.	1.5	5.1	4.2	0.04	0.45	0.04	0.06	0.03	3	68	13	22	tr	3.0		4.1	2	0.90	0.06	4.5
-10	B 5	20-30	Anambra St.	49.2	18.7	2.7	6.0	23.3	sa.cl.l.	2.5	5.2	4.2	0.02	0.34	0.03	0.03	0.03	2	76	5	24	tr	1.6		3.3	tr	0.66	0.04	1.5

cl. : clay
cl.l. : clay loam
sa.cl.l. : sandy clay loam
sa.l. : sandy loam

1) % C : no conversion factor used

ROYAL TROPICAL INSTITUTE AMSTERDAM
DEPARTMENT OF AGRICULTURAL RESEARCH
SOILS LABORATORY

G-nr. 7809

Table :III

ANALYTICAL RESULTS

SOIL SAMPLES FROM: Sri Lanka

CSST no.	Sample no.	Depth	Location	Granulometric analysis in % of dry soil: 2 mm - 200 µ	200 µ - 50 µ	50 µ - 20 µ	20 µ - 2 µ	< 2 µ	Soil texture class.	% moisture	pH: H_2O	KCL	EC 25 x 10^3	NH_4-acetate/acetic acid extraction; pH = 4.8; me/100g soil: Ca	Mg	K	Na	mg/kg soil: Fe	Al	Mn	SO_4	Cl	$N-NO_3$	P	mg N-NH_4/kg soil in 1N KCL	mg/kg soil P - Olsen	1) % C	% N	mgP/kg soil P-Bray-II
SL- 1	A I	0-15	Lowmont	41.9	23.2	0.2	11.3	24.4	sa.cl.l.	2.8	4.6	3.9	0.05	0.12	0.08	0.05	0.02	10	164	6	239	tr	7.6		5.6	2	1.11	0.11	5.2
- 2	B I	15-25	Estate	43.8	20.4	0.4	10.2	25.2	sa.cl.l.	2.0	4.5	4.0	0.05	0.08	0.04	0.03	0.02	9	155	6	94	tr	6.0		4.9	1	0.83	0.08	2.2
- 3	A II	0-20	"	49.3	13.6	0.2	10.7	26.2	sa.cl.l.	2.4	4.6	3.9	0.05	0.11	0.07	0.05	0.02	8	173	7	95	tr	6.0		5.7	3	1.14	0.12	3.4
- 4	B II	20-30	"	40.4	18.8	0.8	10.6	29.5	sa.cl.l.	2.8	4.5	3.9	0.04	0.04	0.03	0.04	0.02	7	184	6	173	tr	5.5		5.7	2	0.96	0.11	2.8
- 5	A III	0-20	"	40.4	22.2	2.0	10.6	24.8	sa.cl.l.	2.1	4.6	4.1	0.04	0.05	0.03	0.03	0.02	9	172	9	69	tr	4.6		4.1	2	0.98	0.12	2.4
- 6	B III	20-30	"	42.4	21.1	2.4	10.5	23.6	sa.cl.l.	2.1	4.6	4.1	0.03	0.05	0.01	0.03	0.02	8	183	9	133	tr	3.2		4.9	3	0.70	0.08	1.8
SL- 7	A IV	0-20	Atherfield	58.2	15.4	0.0	10.6	15.8	sa.l.	1.8	5.0	3.9	0.04	0.51	0.11	0.08	0.03	12	111	6	39	tr	4.4		4.9	20	0.20	0.13	60
- 8	B IV	20-30	Estate	49.7	15.1	0.2	9.8	25.2	sa.cl.l.	1.9	4.8	3.9	0.04	0.32	0.08	0.07	0.03	14	148	7	102	tr	2.1		4.1	5	0.86	0.09	13
- 9	A V	0-15	"	49.6	20.0	3.2	9.6	20.8	sa.cl.l.	1.8	4.9	4.0	0.03	0.26	0.08	0.04	0.02	14	132	6	59	tr	5.1		4.9	10	0.82	0.10	21
-10	B V	15-25	"	51.5	15.0	1.0	8.7	23.8	sa.cl.l.	2.6	4.8	4.0	0.03	0.23	0.07	0.03	0.03	19	141	9	100	tr	4.4		6.6	20	0.80	0.10	44
-11	A VI	0-17	"	58.7	12.7	1.8	9.9	16.9	sa.cl.l.	2.1	5.1	4.1	0.04	0.68	0.17	0.08	0.01	10	102	6	67	tr	5.1		4.9	10	0.83	0.12	25
-12	B VI	17-27	"	48.0	11.7	2.4	9.2	28.6	sa.cl.l.	2.1	4.8	4.0	0.05	0.13	0.07	0.08	0.04	9	133	7	247	tr	4.1		7.4	4	0.83	0.09	6.8
SL-13	A VII	0-15	Kiribath-	44.8	18.4	2.1	16.0	18.7	sa.l.	2.7	4.5	4.0	0.05	0.03	0.03	0.08	0.02	8	125	6	69	tr	7.6		7.4	3	1.02	0.10	3.8
-14	B VII	15-25	galla	42.2	18.1	1.2	15.3	23.1	sa.cl.l.	2.1	4.6	4.1	0.04	0.02	0.01	0.02	0.01	9	140	9	196	tr	4.4		4.9	1	0.86	0.08	1.8
-15	A VIII	0-18	Estate	44.2	15.4	1.5	18.2	20.7	sa.cl.l.	4.6	4.5	4.0	0.06	0.03	0.03	0.08	0.03	6	136	9	281	tr	6.0		5.7	2	1.13	0.15	3.4
-16	B VIII	18-28	"	36.5	14.6	3.8	18.6	26.4	sa.cl.l.	3.8	4.5	4.1	0.04	0.02	0.01	0.02	0.02	4	142	9	421	tr	4.1		4.9	1	0.87	0.09	1.8
-17	A IX	0-20	"	42.9	12.2	4.4	16.5	24.1	sa.cl.l.	4.5	4.8	4.2	0.04	0.06	0.04	0.05	0.05	6	178	12	319	tr	6.0		8.2	3	1.04	0.15	6.0
-18	B IX	20-30	"	42.3	11.6	4.7	14.9	26.5	sa.cl.l.	3.2	4.5	4.0	0.05	0.03	0.03	0.03	0.05	6	155	12	496	tr	3.7		6.6	2	0.87	0.09	2.6
SL-19	A X	0-17	Eduragalla	62.5	16.1	3.7	5.5	12.3	sa.l.	1.7	4.9	4.0	0.04	0.18	0.08	0.07	0.02	9	117	6	49	tr	5.5		5.7	4	0.92	0.08	6.2
-20	B X	17-27	Estate	61.7	14.6	2.9	5.7	15.2	sa.l.	2.3	4.7	4.1	0.04	0.05	0.02	0.04	0.01	10	140	6	35	tr	7.4		4.1	2	0.71	0.09	3.4
-21	A XI	0-19	"	64.3	11.9	3.1	8.6	12.2	sa.l.	3.7	4.9	4.0	0.05	0.34	0.19	0.12	0.02	6	106	6	46	tr	9.4		9.0	3	0.75	0.09	3.2
-22	B XI	19-29	"	53.2	15.9	3.2	8.9	18.8	sa.l.	4.1	4.8	4.1	0.04	0.08	0.08	0.05	0.02	6	136	7	104	tr	6.0		7.4	2	0.75	0.11	2.4
-23	A XII	0-15	"	60.8	17.8	3.3	9.2	9.0	sa.l.	4.1	5.1	4.0	0.05	0.35	0.23	0.12	0.02	10	120	6	11	tr	9.4		10.7	8	1.19	0.13	11
-24	B XII		"	54.3	18.5	4.5	9.2	13.5	sa.l.	3.7	4.9	4.0	0.04	0.17	0.11	0.08	0.02	10	156	9	33	tr	12.7		7.4	6	1.00	0.11	10
-25	A XIII	0-16	Parambe	26.3	7.0	3.0	17.6	46.1	cl.	8.0	4.8	4.0	0.05	0.48	0.24	0.13	0.03	4	234	15	209	tr	7.8		17.2	2	1.14	0.16	4.2
-26	B XIII	16-26	Estate	26.2	5.0	3.4	13.4	52.0	cl.	12.6	4.8	4.0	0.04	0.16	0.09	0.09	0.03	2	286	16	620	tr	3.5		8.2	1	0.76	9.11	0.8
-27	A XIV	0-17	"	24.1	3.3	2.2	16.8	53.6	cl.	7.5	4.6	4.0	0.07	0.42	0.18	0.17	0.03	2	202	20	586	tr	14.7		14.8	4	0.91	0.13	8
-28	B XIV	17-27	"	23.4	3.3	1.8	12.6	58.9	cl.	9.4	4.7	4.0	0.05	0.20	0.09	0.11	0.03	1	206	16	985	tr	6.2		9.0	1	0.60	0.10	1.2
-29	A XV	0-17	"	39.0	6.6	3.4	18.8	32.2	cl.l.	5.8	4.9	4.1	0.04	0.35	0.13	0.09	0.02	2	145	18	244	tr	9.7		9.8	5	0.61	0.12	18
-30	B XV	17-27	"	36.9	6.0	3.0	21.8	32.3	cl.l.	5.3	5.0	4.1	0.04	0.36	0.08	0.08	0.03	1	148	16	467	tr	6.0		9.0	1	0.41	0.10	4.2

sa.cl.l. : sandy clay loam; sa.l. : sandy loam; cl. : clay; cl.l. : clay loam

1) % C : no conversion factor used

ROYAL TROPICAL INSTITUTE AMSTERDAM
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Table : IV

ANALYTICAL RESULTS

SOIL SAMPLES FROM: Surinam

CSST no.	Sample no.	Depth	Location	Granulometric analysis in % of dry soil					Soil texture class.	% moisture	pH		EC 2:5 x 10^3	NH_4 - acetate / acetic acid extraction; pH=4,8; me/100 g soil				mg/kg soil							$N-NH_4$/kg soil in 1N KCL	mg/kg soil P - Olsen	1) % C	% N	mg/kg soil P-Bray II
				2 mm - 200 µ	200 µ - 50 µ	50 µ - 20 µ	20 µ - 2 µ	< 2 µ			H_2O	KCL		Ca	Mg	K	Na	Fe	Al	Mn	SO_4	Cl	$N-NO_3$	P					
U- 1	A I	0-21	Saramacca	0.5	0.7	2.1	46.1	50.6	si.cl.	6.7	1.6	3.5	0.12	3.5	6.7	0.52	0.27	236	815	136	54	tr	27.4		20.5	5	1.45	0.29	8.0
- 2	B I	21-31	La Poule	0.4	0.7	1.3	43.5	54.1	si.cl.	6.7	4.5	3.4	0.19	3.3	4.7	0.41	0.59	204	890	118	319	tr	2.1		22.1	3	1.03	0.21	4.8
- 3	A II	0-14	"	0.7	0.9	3.8	45.3	49.3	si.cl.	5.8	4.7	3.4	0.13	4.0	6.5	0.58	0.20	329	616	165	48	tr	14.5		13.9	6	1.53	0.32	9.0
- 4	B II	14-24	"	0.3	0.5	1.7	40.4	57.1	si.cl.	6.2	4.6	3.4	0.13	3.3	6.5	0.37	0.81	261	949	144	199	tr	9.7		19.7	2	0.96	0.18	4.2
- 5	A III	0-16	"	0.9	1.2	14.8	34.3	48.8	si.cl.	5.0	4.5	3.5	0.08	2.5	2.5	0.35	0.09	145	553	42	82	tr	8.3		13.9	3	1.26	0.24	5.4
- 6	B III	16-26	"	0.9	0.9	9.9	39.2	49.1	si.cl.	4.8	4.5	3.5	0.09	1.7	1.8	0.26	0.11	100	914	27	204	tr	5.8		15.6	1	0.60	0.13	2.7
- 7	A IV	0-28	"	0.5	0.0	3.2	43.6	52.7	si.cl.	5.5	4.8	3.5	0.11	3.3	4.9	0.38	0.20	148	455	153	tr	tr	7.1		36.1	4	2.09	0.31	3.7
- 8	B IV	28-38	"	0.2	0.5	8.4	35.3	55.6	si.cl.	5.3	4.8	3.5	0.09	2.1	3.5	0.30	0.24	114	792	90	107	tr	3.5		15.6	1	0.86	0.18	1.8
- 9	A V	0-23	"	0.8	1.2	1.7	39.0	57.3	si.cl.	6.0	4.3	3.4	0.14	2.3	2.7	0.56	0.13	461	681	37	55	tr	15.4		15.6	11	2.90	0.37	15.5
-10	B V	23-33	"	0.3	0.5	1.1	36.6	61.5	si.cl.	6.2	4.3	3.4	0.11	1.1	1.4	0.31	0.12	277	1064	96	264	tr	10.8		14.8	3	1.54	0.22	5.0
-11	A VI	0-21	"	0.3	0.9	4.9	36.7	57.2	si.cl.	5.3	4.8	3.6	0.13	4.2	6.2	0.52	0.30	277	422	28	tr	tr	10.1		20.5	8	1.65	0.30	16.7
-12	B VI	21-31	"	0.2	0.6	4.3	35.3	59.6	si.cl.	5.1	4.9	3.6	0.26	4.7	9.7	0.43	0.98	105	369	13	302	79	2.3		17.2	7	0.82	0.15	8.1
U-13	A VII	0-20	Saramacca	67.1	12.1	0.0	5.5	15.3	sa.l.	1.3	4.9	4.0	0.04	0.64	0.21	0.04	0.02	43	101	4	tr	tr	3.9		8.2	2	1.28	0.10	1.6
-14	B VII	20-30	Coebiti	58.2	18.3	0.0	4.2	19.3	sa.l.	1.1	4.8	4.0	0.02	0.19	0.08	0.01	tr	30	123	6	tr	tr	2.3		4.1	tr	0.58	0.06	0.8
-15	A VIII	0-19	"	68.2	9.6	0.6	6.4	15.2	sa.l.	1.0	5.3	4.4	0.05	1.6	0.28	0.04	0.02	28	66	2	tr	tr	1.2		8.2	2	1.00	0.08	4.6
-16	B VIII	19-29	"	63.4	7.6	0.0	5.1	23.9	sa.cl.l.	1.1	5.5	4.6	0.03	1.4	0.20	0.01	0.02	12	86	3	tr	tr	0.5		3.3	tr	0.61	0.08	1.1
U-17	A IX	0-30	Maxowijne	44.7	21.2	3.8	9.8	20.5	sa.cl.l.	1.6	5.0	4.0	0.05	0.30	0.19	0.12	0.04	15	254	10	tr	tr	1.8		8.2	3	1.25	0.12	2.2
-18	B IX	30-40	Patamacca	35.4	21.3	3.8	6.9	32.6	sa.cl.l.	1.7	5.0	4.1	0.02	0.05	0.15	0.06	0.03	14	249	13	50	tr	8.1		3.3	tr	0.61	0.07	0.7
-19	A X	0-13	"	61.2	13.6	1.8	8.0	15.4	sa.l.	1.3	4.8	4.0	0.06	0.88	0.20	0.06	0.03	16	117	6	tr	tr	2.3		11.5	2	1.28	0.12	1.1
-20	B X	13-23	"	48.7	14.5	2.0	5.8	29.0	sa.cl.l.	1.7	4.7	4.1	0.03	0.21	0.07	0.03	0.02	15	203	8	76	tr	2.1		4.1	tr	0.73	0.07	0.7
-21	A XI	0-16	"	53.2	13.1	2.2	10.3	21.2	sa.cl.l.	2.1	4.5	3.9	0.06	0.26	0.23	0.09	0.04	19	205	13	tr	tr	3.2		13.1	4	1.56	0.17	4.9
-22	B XI	16-26	"	41.1	13.1	1.8	8.9	34.9	cl.l.	1.9	4.6	4.0	0.03	0.04	0.14	0.04	0.03	15	245	8	5	tr	1.2		4.9	tr	0.92	0.10	1.1
-23	A XII	0-13	"	50.2	18.0	4.1	9.7	18.0	sa.l.	2.0	4.6	3.9	0.07	0.43	0.40	0.12	0.06	19	189	8	tr	tr	2.3		18.0	3	1.90	0.18	2.3
-24	B XII	13-23	"	35.8	21.8	1.6	8.3	32.5	sa.cl.l.	1.9	4.8	4.0	0.04	0.06	0.24	0.07	0.04	19	216	9	tr	tr	1.8		6.6	1	0.79	0.07	1.0
-25	A XIII	0-15	"	53.5	24.4	2.6	8.6	10.9	sa.l.	1.4	4.9	4.0	0.08	1.0	0.35	0.09	0.05	47	122	6	tr	tr	3.2		13.9	3	1.52	0.13	1.9
-26	B XIII	15-25	"	45.6	24.5	2.6	5.9	21.4	sa.cl.l.	1.3	4.7	4.1	0.04	0.10	0.09	0.04	0.03	51	185	10	tr	tr	2.1		6.6	tr	0.79	0.07	1.0
-27	A XIX	0-18	"	61.6	21.2	1.6	6.0	9.6	l.sa	0.9	4.6	4.0	0.05	0.74	0.16	0.06	0.03	12	146	7	tr	tr	1.6		10.7	2	1.30	0.10	2.8
-28	B XIX	18-28	"	52.7	23.8	1.6	4.9	17.0	sa.l.	1.0	4.9	4.3	0.04	0.08	0.11	0.03	0.02	16	184	8	16	tr	2.1		4.1	1	0.64	0.06	2.4

si.cl. : silty clay loam; sa.l. : sandy loam; sa.cl.l. : sandy clay loam; sa.l. : sandy loam; cl.. : clay loam; l.sa. : laomy sand

1) % C : no conversion factor used

ROYAL TROPICAL INSTITUTE AMSTERDAM
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ANALYTICAL RESULTS

SOIL SAMPLES FROM: Surinam (continued)

CSST no.	Sample	Depth cm	Location	Granulometric analysis in % of dry soil: 2 mm - 200 µ	200 µ - 50 µ	50 µ - 20 µ	20 µ - 2 µ	< 2 µ	Soil texture class.	% moisture	pH: H_2O	KCL	EC 25 x 10^3	NH_4 - acetate / acetic acid extraction; pH = 4,8; me/100 g soil: Ca	Mg	K	Na	mg/kg soil: Fe	Al	Mn	SO_4	Cl	$N-NO_3$	P	µg $N-NH_4$/g soil in 1N KCL	mg/kg soil p-Olsen	1) % C	% N	mg/kg soil p-Bray II
SU-29	A XV	0-27	Surinam	0.4	17.0	2.4	25.8	54.4	cl.	5.9	4.8	3.5	0.14	2.2	5.7	0.42	0.32	200	457	14	tr	tr	3.5		18.9	4	1.79	0.29	6.2
-30	B XV	27-37	Geyers-	0.2	11.3	2.4	21.9	64.2	cl.	5.3	4.5	3.5	0.34	1.4	9.1	0.38	1.1	116	549	6	202	207	6.7		12.3	tr	0.76	0.16	1.1
-31	A XVI	0-30	vlijt	1.8	1.6	2.6	37.5	56.5	si.cl.	5.3	4.9	3.6	0.16	5.0	6.4	0.53	0.37	151	391	20	tr	tr	16.8		25.4	5	2.09	0.31	9.2
-32	B XVI	30-40	"	0.4	1.2	2.8	25.9	69.7	cl.	5.5	4.7	3.5	0.32	3.9	10.0	0.45	1.0	61	418	13	618	tr	3.0		13.1	1	0.86	0.19	3.0
-33	A XVII	0-28	"	0.7	0.8	3.4	43.9	51.2	si.cl.	6.4	4.7	3.6	0.18	4.7	8.5	0.60	0.27	246	497	139	64	tr	13.8		23.8	5	1.41	0.28	8.4
-34	B XVII	28-38	"	0.2	0.3	2.0	35.9	61.6	si.cl.	5.9	4.7	3.5	0.18	3.8	9.5	0.48	0.57	181	850	106	317	tr	4.1		16.4	2	0.77	0.16	5.1
-35	A XVIII	0-26	"	0.5	0.6	2.5	42.4	54.1	si.cl.	7.1	4.6	3.4	0.12	1.9	6.3	0.55	0.22	269	893	137	53	tr	15.9		16.4	4	1.36	0.24	7.5
-36	B XVIII	26-36	"	0.1	0.2	1.5	37.9	60.3	si.cl.	7.4	4.7	3.5	0.11	3.3	8.1	0.42	0.39	151	1123	108	173	tr	3.0		12.3	1	0.55	0.14	4.7

cl. : clay
si.cl. : silty clay

1) % C : no conversion factor used

ROYAL TROPICAL INSTITUTE AMSTERDAM
DEPARTMENT OF AGRICULTURAL RESEARCH
SOILS LABORATORY

Table V

G-nr. ...

ANALYTICAL RESULTS

SOIL SAMPLES FROM: Kenya II

CSST no.	Sample no.	Depth	Location	Granulometric analysis in % of dry soil: 2 mm - 200 µ	200 µ - 50 µ	50 µ - 20 µ	20 µ - 2 µ	< 2 µ	Soil class.	% moisture	pH: H_2O	KCl	EC 2.5 x 10^3	NH_4-acetate/acetic acid extraction; pH=4.8; mg/100 g soil: Ca	Mg	K	Na	mg/kg soil: Fe	Al	Mn	SO_4	Cl	N-NO_3	P	mg N-NH_4/kg soil in 1N KCl	mg/kg soil P-Olsen	1) % C	% N	
KE- 1	1		Nyachogo-chogo	3.6	7.3	24.3	42.8	22.0	si.l.	8.6	5.6	4.6	0.14	6.5	2.6	1.7	0.08	2	84	205	73	tr	23.8		31.2	5	3.20	0.43	7
- 2	2		Nagombo	2.8	6.6	25.1	43.1	22.4	si.l.	9.5	5.6	4.6	0.12	7.8	2.3	1.8	0.05	tr	75	138	48	tr	29.9		24.6	4	3.45	0.44	4
- 3	3		Bogotenga	5.0	8.0	15.9	43.0	28.2	si.cl.l.	5.5	5.8	4.9	0.12	8.9	2.5	1.0	0.05	1	19	66	9	tr	26.9		26.2	3	2.02	0.24	5
- 4	4		Koderopara	25.4	15.6	8.6	22.7	28.3	cl.l.	3.7	5.4	4.4	0.13	3.4	1.2	0.8	0.04	2	66	195	17	tr	19.1		23.0	2	1.70	0.18	4
-31/4	pot exp. soil,		site KE-4	25.3	13.6	10.6	17.0	33.6	cl.l.	1.7	5.5	4.3	0.09	2.7	1.0	0.6	0.04	2	73	127	9	tr	35.9		18,0	3	1.74	0.18	4
- 5	5		Bochi	2.6	4.0	19.9	39.5	33.9	si.cl.l.	8.9	5.7	4.5	0.14	7.4	2.2	1.0	0.07	1	83	270	62	tr	26.9		26.2	2	2.97	0.35	3
- 6	6		Nyandigwa	17.8	12.2	8.7	22.9	38.4	cl.l.	6.1	4.9	4.2	0.13	2.4	1.1	0.4	0.06	2	137	266	10	tr	35.2		18.9	2	1.76	0.20	4
- 7	7		Boikanga	3.9	4.7	23.3	44.4	23.7	si.l.	9.8	5.9	5.0	0.19	14.4	3.2	1.6	0.07	1	21	35	46	tr	47.2		43.5	6	3.72	0.43	7
- 8	8		Bochi	2.2	3.7	18.3	42.4	33.3	si.cl.l.	7.5	5.7	4.5	0.14	7.4	2.2	1.0	0.07	1	83	270	62	tr	26.9		26.2	2	2.87	0.35	3
-32/8	pot exp. soil,		site KE-8	2.8	5.0	23.2	34.8	34.3	si.cl.l.	3.8	5.4	4.5	0.16	6.0	2.1	1.1	0.08	2	94	158	22	tr	23.2		22.9	3	2.79	0.34	3
- 9	9		Kanyalith	14.8	15.8	14.6	20.7	34.1	cl.l.	4.9	6.2	5.2	0.11	5.1	1.0	0.9	0.05	1	11	27	tr	tr	13.3		20.5	4	1.96	0.16	6
-10	10		Mwongoris	4.2	6.6	24.2	53.9	11.0	si.l.	7.6	6.1	5.3	0.19	20.9	4.0	2.1	0.07	1	7	103	9	tr	15.6		20.3	61	3.18	0.66	5
KE-33/10	pot exp.soil,		site KE-10	3.2	6.7	29.5	43.9	16.8	si.l.	3.8	6.0	5.3	0.35	19.2	4.1	2.2	0.09	1	9	52	9	tr	32.2		13.1	33	7.20	0.76	9
-11	11		Nyansigongo	3.9	6.5	22.5	51.1	16.0	si.l	3.4	6.3	5.3	0.14	13.0	2.8	1.7	0.07	1	5	365	1	tr	17.3		15.6	71	2.46	0.27	9
-12	12		Ranen	8.8	10.3	16.3	33.2	31.4	cl.l.	4.9	5.5	4.8	0.34	5.7	2.8	0.9	0.05	1	30	275	77	tr	65.1		110.7	4	2.09	0.23	9
-13	13		Ranen	7.3	18.3	16.3	34.7	23.5	l/si.l.	5.3	6.0	5.0	0.09	7.8	2.1	0.9	0.05	1	10	100	tr	tr	26.2		15.6	4	1.71	0.15	11
KE-34/13	pot exp.soil,		site KE-13	14.7	16.6	24.4	24.6	19.7	l/si.l.	1.7	6.2	5.1	0.09	8.4	2.1	0.9	0.06	1	12	64	tr	tr	14.7		11.5	4	1.74	0.15	12
-14	14		Bomariba	20.6	11.1	10.1	25.7	32.4	cl.l.	4.4	5.7	4.7	0.11	5.1	1.6	0.9	0.05	1	63	131	9	tr	15.2		18.0	2	2.21	0.22	10
-15	15		Bigitaa	28.1	14.9	8.2	19.1	29.7	cl.l.	5.2	5.3	4.3	0.12	3.2	1.2	0.4	0.05	1	91	161	23	tr	21.9		17.2	6	1.62	0.16	10
-16	16		Nyamasibi	3.2	5.7	20.2	58.2	12.7	si.l.	6.1	5.9	5.0	0.09	10.7	2.2	0.7	0.09	1	15	67	1	tr	6.9		17.2	4	3.39	0.39	9
-17	17		Kerindo	1.4	9.4	30.6	35.5	23.1	si.l.	7.6	7.8+	6.7	0.08	120.6+	9.6	3.4	0.27	1	1	10	31	tr	97.5		44.3	18	1.90	0.22	148

si.l. : silt loam; si.cl.l. : silty clay loam; cl.l. : clay loam; l/si.l. : loam silty loam

7.8+; 120.6+ : sample containing free carbonate, 4.6% $CaCO_3$

1) % C : no conversion factor used

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SOILS LABORATORY

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ANALYTICAL RESULTS

SOIL SAMPLES FROM: Kenya II (continued)

CENT no.	Sample no.	Depth	Location	Granulometric analysis in % of dry soil					Soil class.	% moisture	pH		EC 2.5 x 10^3	NH_4-acetate / acetic acid extraction; pH = 4.8; me/100 g soil				mg/kg soil							mg N – NH_4/kg soil in 1N KCL	mg/kg soil P-Olsen	% C	% N	mg/kg soil T-Bray 1
				2 mm 200 µ	200 µ - 50 µ	50 µ - 20 µ	20 µ - 2 µ	< 2 µ			H_2O	KCL		Ca	Mg	K	Na	Fe	Al	Mn	SO_4	Cl	N-NO_3	P				
KE-18	403		Ria Kwara	4.1	7.2	18.9	55.6	14.1	si.l.	5.6	5.8	5.2	0.55	17.7	3.8	2.0	0.08	1	13	351	190	tr	95.5		43.6	17	6.52	0.71	21
-19	103		Keroka	8.5	8.3	21.7	47.0	14.6	si.l.	5.9	5.8	4.9	0.11	10.5	1.9	1.0	0.05	1	23	276	9	tr	11.7		32.8	4	3.26	0.35	5
-20	101		Keroka	4.1	6.4	20.4	57.7	11.4	si.l.	6.1	6.3	5.5	0.31	13.5	2.8	1.7	0.12	1	7	399	9	tr	44.2		43.5	16	3.49	0.37	18
-21	404		Magombo	9.1	6.3	7.3	28.0	29.2	cl.	10.7	4.6	3.7	0.06	0.52	0.23	0.30	0.07	5	157	386	98	tr	18.9		41.0	4	2.72	0.29	4
-22	203		Magombo	2.7	4.8	20.3	36.9	35.3	si.cl.l.	7.5	5.6	4.7	0.15	5.9	3.0	1.8	0.10	1	59	405	55	tr	6.9		50.8	3	3.37	0.41	3
-23	304		Kisii	11.1	6.8	11.7	48.1	22.3	si.l.	3.8	6.5	5.7	0.28	13.2	3.5	2.2	0.05	1	5	159	9	tr	11.5		14.8	43	3.01	0.52	50
-24	303		Kisii	5.1	6.2	12.0	35.1	41.5	si.cl.	6.5	6.1	5.1	0.17	7.5	3.3	1.9	0.09	1	23	278	31	tr	11.7		39.4	3	2.34	0.31	7
-25	121		Wanjare	31.6	7.5	8.1	20.4	32.4	cl.l.	3.1	5.8	4.7	0.15	5.4	1.7	1.0	0.04	4	58	194	9	tr	25.5		18.9	3	2.07	0.23	3
-26	108		Wanjare	29.6	11.3	7.7	28.0	23.4	l.	3.0	6.5	5.3	0.11	8.7	1.9	1.0	0.04	1	12	158	tr	tr	19.1		18.9	4	2.03	0.24	5
-27	305		Wanjare	21.3	8.4	6.2	15.9	43.2	cl.	5.8	5.4	4.3	0.07	2.2	1.0	0.5	0.07	1	42	366	44	tr	8.5		17.2	3	1.67	0.16	3
-28	309		Marongo	6.0	9.8	8.1	29.8	45.3	cl.	3.0	5.0	4.0	0.07	3.1	0.75	0.3	0.06	4	37	158	30	tr	11.3		25.4	3	1.24	0.12	3
-29	122		Ranen	18.3	12.8	14.6	28.4	25.0	l/cl.l.	5.3	6.0	5.0	0.09	8.2	2.8	0.5	0.07	1	19	66	1	tr	21.9		21.3	2	1.91	0.22	1
-30	116		Ranen	11.5	8.9	12.9	31.6	35.1	cl.l.	3.7	6.1	5.0	0.10	6.6	3.1	0.9	0.06	1	37	325	1	tr	11.5		27.9	2	1.77	0.17	1

Annex IV

RESULTS OF SOIL ANALYSES CARRIED OUT BY ISF

Table I : Colombia and Kenya I

Table II : The Philippines and Nigeria

Table III : Sri Lanka

Table IV : Surinam

Table V : Kenya II

Table I

INSTITUTE OF SOIL FERTILITY
HAREN - GRONINGEN
THE NETHERLANDS

ANALYTICAL RESULTS

SOILS FROM Columbia

Samples	Registr. code CSST	IB/KIT	Depth cm	Total content (digest. H_2SO_4, HNO_3) P %	Al %	Fe %	Mole ratio x 1000 P/Al	P/Fe	P/Al+Fe	Pw-value 20°C mg P_2O_5/ltr. of soil	Pw-value 30°C mg P_2O_5/ltr. of soil	∇ Pw% 20°C %	∇ Pw% 30°C %
A I	CO - 1	VG 1022		0.037	7.24	3.13	4.44	21.23	3.67		0.9		4.3
B I	2	1023		0.034	7.48	3.23	3.97	19.02	3.28		0.7		3.1
A II	3	1024		0.039	5.98	2.80	5.69	25.13	4.64		0.4		6.2
B II	4	1025		0.030	6.86	3.15	3.82	17.20	3.12		0.4		3.9
A III	5	1026		0.017	4.84	2.58	3.07	11.90	2.44		0.4		5.5
B III	6	1027		0.015	5.21	2.75	2.49	9.75	1.98		0.4		1.8
A IV	7	1028		0.016	4.01	2.91	3.50	9.98	2.59		0.4		8.2
B IV	8	1029		0.013	4.32	2.94	2.63	7.98	1.98		0.4		1.8
A V	9	1030		0.077	3.76	2.89	17.88	48.12	13.04		0.7		11.1
B V	10	1031		0.073	4.15	3.18	15.35	41.45	11.20		0.4		3.2
										SOILS FROM Kenya I			
A - I T	KE 35	VG 1000		0.045	3.21	2.33	12.19	34.76	9.02		17.3		54.8
B - I T	36	1001		0.045	4.75	3.04	8.24	26.64	6.29		0.7		40.7
A - I n^3	37	1002		0.051	6.88	4.12	6.47	22.37	5.02		0.4		18.2
B - I n^3	38	1003		0.032	8.06	4.59	3.45	12.53	2.70		0.4		1.2
A - I	39	1004		0.015	0.82	0.36	15.79	74.42	13.03		22.4		67.4
B - I	40	1005		0.017	0.83	0.35	17.88	87.72	14.85		48.4		76.7
A - I F2	41	1006		0.089	12.00	9.54	6.45	16.80	4.66		0.7		6.0
B - I F2	42	1007		0.091	11.30	9.91	7.02	16.57	4.93		0.4		6.1

Table II

INSTITUTE OF SOIL FERTILITY
HAREN - GRONINGEN
THE NETHERLANDS

ANALYTICAL RESULTS

SOILS FROM Philippines

Samples	Registr. code CSST	Registr. code IB/KIT	Depth cm	Total content (digest. H_2SO_4, HNO_3) P %	Al %	Fe %	Mole ratio x 1000 P/Al	P/Fe	P/Al+Fe	Pw-value 20°C mg P_2O_5/ltr. of soil	Pw-value 30°C mg P_2O_5/ltr. of soil	∇ Pw% 20°C %	∇ Pw% 30°C %
A I	PH 1	VG 943	0-22.5	0.075	10.3	8.4	6.34	16.09	4.55	2.8	1.3	3.1	4.1
B I	2	944	22.5-32.5	0.068	11.2	8.5	5.28	14.39	3.86	1.9	0.9	2.1	1.5
A II	3	945	0-20	0.110	11.2	9.6	8.56	20.65	6.05	7.1	2.7	4.2	6.3
B II	4	946	20-30	0.097	11.6	9.5	7.29	18.40	5.22	1.9	1.6	3.9	2.8
A III	5	947	0-18	0.085	10.2	7.7	7.25	19.87	5.31	1.2	0.9	4.3	2.6
B III	6	948	18-28	0.065	14.9	9.1	3.81	12.89	2.94	1.0	0.4	0.9	0.2
										SOILS FROM NIGERIA			
A - I	NIG 1	VG 990		0.022	4.30	1.47	4.45	33.89	3.94		0.4		9.2
B - I	2	991		0.021	5.21	1.90	3.52	19.99	2.99		0.4		4.2
A - II	3	992		0.022	2.75	1.14	6.97	34.79	5.80		0.9		23.6
B - II	4	993		0.020	3.81	1.40	4.60	25.93	3.91		0.4		14.0
A - III	5	994		0.040	7.04	4.27	4.94	16.87	3.82		0.7		7.8
B - III	6	995		0.033	7.59	4.52	3.77	13.19	2.93		0.7		3.9
A - IV	7	996		0.030	3.59	3.05	7.29	17.76	5.17		0.9		15.6
B - IV	8	997		0.034	5.80	3.99	5.12	15.40	3.84		0.9		3.4
A - V	9	998		0.030	4.65	3.32	5.63	16.32	4.18		0.9		7.3
B - V	10	999		0.027	4.62	3.36	5.08	14.46	3.76		0.4		3.5

Table III

INSTITUTE OF SOIL FERTILITY
HAREN - GRONINGEN
THE NETHERLANDS

ANALYTICAL RESULTS

SOILS FROM Sri Lanka

Samples	Registr. code CSST	IB/KIT	Depth cm	Total content (digest. H_2SO_4, HNO_3) P %	Al %	Fe %	Mole ratio x 1000 P/Al	P/Fe	P/Al+Fe	Pw-value 20°C mg P_2O_5/ltr. of soil	Pw-value 30°C mg P_2O_5/ltr. of soil	∇ Pw% 20°C %	∇ Pw% 30°C %
A I	SL 1	VG 913	0 - 15	0.027	7.19	3.48	3.27	13.98	2.65	0.9	0.9	2.6	1.9
B I	2	914	15 - 25	0.018	6.95	3.49	2.26	9.29	1.82	0.9	0.7	1.9	1.9
A II	3	915	0 - 20	0.026	7.58	4.15	2.99	11.29	2.68	0.9	0.9	2.8	1.7
B II	4	916	20 - 30	0.021	8.03	4.22	2.28	8.97	1.82	0.9	0.4	1.1	1.3
A III	5	917	0 - 20	0.020	6.85	3.64	2.53	9.90	2.02	1.1	0.4	1.3	1.1
B III	6	918	20 - 30	0.018	7.11	4.00	2.21	8.11	1.73	1.1	0.4	0.7	0.9
A IV	7	919	0 - 20	0.046	3.69	2.85	10.86	29.08	7.91	6.4	4.9	26.5	12.9
B IV	8	920	20 - 30	0.031	5.06	3.56	5.34	15.69	3.98	2.7	0.7	0.9	1.7
A V	9	921	0 - 15	0.035	4.35	3.47	7.01	18.18	5.06	2.7	1.1	4.5	5.4
B V	10	922	15 - 25	0.042	5.22	3.48	7.01	21.75	5.30	3.6	1.6	2.6	4.1
A VI	11	923	0 - 17	0.033	4.30	3.03	6.68	19.63	4.99	2.2	2.0	9.1	7.8
B VI	12	924	17 - 27	0.027	6.39	4.53	3.68	10.74	2.74	0.9	0.4	0.9	1.1
A VII	13	925	0 - 15	0.031	6.69	4.02	3.98	13.90	3.09	0.7	0.4	2.6	1.7
B VII	14	926	15 - 25	0.028	7.35	4.19	3.32	12.04	2.60	0.9	0.4	1.1	1.1
A VIII	15	927	0 - 18	0.049	8.15	5.51	5.24	16.03	3.95	0.9	0.7	1.7	1.3
B VIII	16	928	18 - 28	0.045	9.09	5.98	4.31	13.56	3.27	0.9	0.9	0	0.2
A IX	17	929	0 - 20	0.028	8.57	4.32	2.85	11.68	2.29	0.9	0.9	0.9	0.4
B IX	18	930	20 - 30	0.024	9.19	4.48	2.27	9.65	1.84	0.9	0.9	0	0
A X	19	931	0 - 17	0.023	2.89	1.78	6.93	23.28	5.34	1.6	1.3	7.5	11.2
B X	20	932	17 - 27	0.022	3.85	2.46	4.98	16.12	3.80	0.7	0.7	3.0	2.4
A XI	21	933	0 - 19	0.024	3.68	2.99	5.68	14.46	4.80	1.1	1.1	6.3	6.9
B XI	22	934	19 - 29	0.024	4.86	4.12	4.30	10.50	3.05	0.7	0.9	1.5	0.9
A XII	23	935	0 - 15	0.026	2.50	1.50	9.06	31.23	7.02	2.2	2.4	15.3	15.3
B XII	24	936	15 - 25	0.026	3.10	1.92	7.31	24.40	5.62	1.6	1.6	6.7	6.7
A XIII	25	937	0 - 16	0.035	10.51	5.50	2.90	11.47	2.31	1.1	1.8	1.3	0.2
B XIII	26	938	16 - 26	0.025	11.06	5.94	1.97	7.58	1.56	0.4	0.4	0.4	0.4
A XIV	27	939	0 - 17	0.037	11.93	6.47	2.70	10.31	2.14	0.7	0.7	0.2	0.4
B XIV	28	940	17 - 27	0.028	12.27	6.73	1.99	7.50	0.87	0.9	0.7	0	0
A XV	29	941	0 - 17	0.042	9.46	5.01	3.87	15.11	3.08	0.7	0.9	1.1	1.5
B XV	30	942	17 - 27	0.034	10.80	5.69	2.74	10.77	2.19	0.9	0.7	0.2	0.4

Table IV

INSTITUTE OF SOIL FERTILITY
HAREN - GRONINGEN
THE NETHERLANDS

ANALYTICAL RESULTS

SOILS FROM Surinam

Samples	Registr. code CSST	IB/KIT	Depth cm	Total content (digest.H_2SO_4,HNO_3) P %	Al %	Fe %	Mole ratio x 1000 P/Al	P/Fe	P/Al+Fe	Pw-value 20°C mg P_2O_5/ltr. of soil	Pw-value 30°C mg P_2O_5/ltr. of soil	∇ Pw% 20°C %	∇ Pw% 30°C %
A - I	SU 1	VG 949	0 - 21	0.053	9.53	3.37	4.84	28.50	4.14	1.1	0.7	2.1	2.2
B - I	2	950	21 - 31	0.033	9.25	3.68	3.09	16.06	2.59	0.9	0.4	0.6	0.7
A - II	3	951	0 - 14	0.073	10.57	4.62	5.99	28.31	4.95	2.0	1.1	4.1	3.9
B - II	4	952	14 - 21	0.053	11.82	4.79	3.90	19.88	3.26	1.6	0.7	0.9	1.1
A - III	5	953	0 - 16	0.086	10.83	4.42	6.91	35.06	5.77	2.2	1.6	2.3	2.6
B - III	6	954	16 - 26	0.062	12.21	4.28	4.41	25.97	3.77	0.9	0.9	0.4	1.3
A - IV	7	955	0 - 28	0.066	10.36	3.43	5.55	34.92	4.79	2.9	2.2	7.5	8.8
B - IV	8	956	28 - 38	0.044	10.57	3.87	3.62	20.58	3.08	1.1	0.4	2.6	2.8
A - V	9	957	0 - 23	0.037	9.20	2.85	3.49	23.33	3.04	2.7	1.3	6.4	9.3
B - V	10	958	23 - 33	0.028	11.04	4.23	2.20	11.84	1.86	1.1	0.4	2.1	2.6
A - VI	11	959	0 - 21	0.075	10.99	4. 2	5.95	33.61	5.05	1.3	1.6	3.4	3.5
B - VI	12	960	21 - 31	0.043	11.41	4.99	3.29	15.62	2.71	0.9	0.4	0.-	0.2
A - VII	13	961	0 - 20	0.013	3.79	1.45	3.00	16.15	2.53	0.9	0.4	11.5	11.2
B - VII	14	962	20 - 30	0.011	4.92	1.71	1.92	11.29	1.64	0.9	0.7	7.7	12.3
A - VIII	15	963	0 - 19	0.014	3.80	1.27	3.19	19.57	2.74	0.9	0.9	19.2	16.4
B - VIII	16	964	19 - 29	0.013	5.61	1.65	2.02	14.00	1.76	1.1	0.4	10.5	11.4
A - IX	17	965	0 - 30	0.017	5.75	1.04	2.58	28.95	2.37	1.6	0.2	5.8	6.3
B - IX	18	966	30 - 40	0.018	7.98	1.44	1.96	22.30	1.80	1.3	0.4	2.1	1.9
A - X	19	967	0 - 13	0.009	4.48	0.98	1.75	16.11	1.58	1.8	0.4	16.9	13.4
B - X	20	968	13 - 23	0.009	7.51	1.58	1.04	10.36	0.95	0.7	0.4	4.7	2.6
A - XI	21	969	0 - 16	0.019	6.75	1.23	2.44	27.73	2.24	2.7	0.2	10.7	10.8
B - XI	22	970	16 - 26	0.019	9.20	1.67	1.79	20.33	1.64	1.1	0.4	3.9	3.7
A - XII	23	971	0 - 13	0.012	5.75	1.22	1.83	17.73	1.66	2.4	0.4	12.2	8.6
B - XII	24	972	13 - 23	0.011	7.83	1.76	1.21	10.94	1.09	1.1	0.4	4.9	3.2
A - XIII	25	973	0 - 15	0.008	3.35	0.76	2.10	18.57	1.88	3.3	0.4	15.8	14.0
B - XIII	26	974	15 - 25	0.006	4.88	1.10	1.05	9.50	0.95	1.3	0.4	6.2	4.3
A - XIV	27	975	0 - 18	0.008	2.73	0.59	2.57	23.64	2.32	2.7	0.9	16.7	17.7
B - XIV	28	976	18 - 28	0.007	4.14	0.73	1.50	17.69	1.39	1.3	1.1	5.3	5.2

Table IV (Continuation)

INSTITUTE OF SOIL FERTILITY
HAREN - GRONINGEN
THE NETHERLANDS

ANALYTICAL RESULTS

SOILS FROM SURINAM

Samples	Registr. code CSST	Registr. code IB/KIT	Depth cm	Total content (digest. H_2SO_4, HNO_3) P %	Al %	Fe %	Mole ratio x 1000 P/Al	P/Fe	P/Al+Fe	Pw-value 20°C mg P_2O_5/ltr. of soil	Pw-value 30°C mg P_2O_5/ltr. of soil	∇ Pw% 20°C %	∇ Pw% 30°C %
A - XV	SU 29	VG 977	0 - 27	0.068	11.18	4.50	5.29	27.04	4.42	1.3	2.4	4.7	4.5
B - XV	30	978	27 - 37	0.054	11.48	5.04	4.08	19.33	3.37	0.9	2.2	1.3	2.2
A - XVI	31	979	0 - 30	0.058	11.21	4.40	4.51	23.67	3.79	0.9	2.7	3.4	2.8
B - XVI	32	980	30 - 40	0.039	11.64	4.19	2.92	16.80	2.49	0.4	1.6	2.3	1.5
A - XVII	33	981	0 - 28	0.068	11.25	4.79	5.25	25.47	4.35	0.9	2.4	3.2	4.3
B - XVII	34	982	28 - 38	0.054	11.51	4.60	4.07	21.22	3.42	0.7	2.4	1.9	3.0
A - XVIII	35	983	0 - 26	0.072	10.95	4.82	5.71	26.98	4.72	0.7	2.7	3.6	3.7
B - XVIII	36	984	26 - 36	0.045	11.77	4.42	3.33	18.35	2.82	0.4	1.1	1.5	2.4

Table V

INSTITUTE OF SOIL FERTILITY
HAREN - GRONINGEN
THE NETHERLANDS

ANALYTICAL RESULTS

SOILS FROM KENYA II

Samples	Registr. code CSST	IB/KIT	Depth cm	Total content (digest. H_2SO_4, HNO_3) P %	Al %	Fe %	Mole ratio x 1000 P/Al	P/Fe	P/Al+Fe	Pw-value 20°C mg P_2O_5/ltr. of soil	Pw-value 30°C mg P_2O_5/ltr. of soil	∇ Pw% 20°C %	∇ Pw% 30°C %
Kenya (vd.Eyk)	KE 1	TG 1632		NIET BEPAALD.							4.0		2.20
	2	1633									4.9		2.45
	3	1634									8.8		5.12
	4	1635									5.3		8.24
	5	1636									4.4		5.57
	6	1637									4.6		2.45
	7	1638									4.6		6.24
	8	1639									3.8		2.68
	9	1640									8.2		15.14
	10	1641									35.3		25.84
	11	1642									49.0		32.96
	12	1643									4.4		7.13
	13	1644									4.6		17.60
	14	1645									4.4		7.35
	15	1646									3.3		5.79
	16	1647									2.2		13.15
	17	1648									17.4		38.31
Kenya (Duykers)	KE 18	2491									14.6		21.61
	19	2492									2.2		12.03
	20	2493									17.4		17.60
	21	2494									3.3		1.33
	22	2495									3.3		2.90
	23	2496									15.0		20.26
	24	2497									6.6		8.69
	25	2498									6.2		9.13
	26	2499									3.8		12.52
	27	2500									4.0		4.01
	28	2501									2.3		8.23
	29	2502									5.5		10.25
	30	2503									4.9		4.68

Annex V

YIELDS OF ABOVE GROUND PARTS OF PLANTS FROM POT EXPERIMENTS CARRIED OUT AT ISF AND RESULTS OF PLANT ANALYSES CARRIED OUT AT SSAD/KIT

Table I : Maize (leaves + stalks, cobs + husks

Table II : Arachis (vegetative part, pods + kernels)

Table III : Amaranthus (whole plant)

Table IV : Soybean (whole plant)

Table I

Nutrient composition of plant material from pot experiments with Maize

Plant Sample no.KIT	Pot no. ISF	Soil no.	Treatment	leaves + stalks % N	P	K	Ca	Mg	ppm Fe	Mn	B	Cu	Zn	Plant Sample no.KIT	cobs + husks % N	P	K	Ca	Mg	ppm Fe	Mn	B	Cu	Zn	yield, g dry matter leaves + stalks	cobs + husks
1	1	KE 34/13	+ P	0.60	0.03	1.60	0.25	0.18	36	140	8	1.5	7.5	2	1.31	0.20	0.55	0	0.06	30	12	2	0	13	203.7	179.5
3	21	"	+ P	0.66	0.03	1.75	0.26	0.17	47	142	11	2.5	11	4	1.34	0.20	0.55	0	0.08	31	13	0.6	2.4	13.1	215.5	190.5
5	2	"	O P	2.13	0.08	2.35	0.30	0.29	86	204	16	8.0	66	6	2.42	0.20	0.95	0.05	0.18	86	55	2	8.2	80	37.4	21.1
7	22	"	O P	2.27	0.07	2.45	0.29	0.30	69	184	11	6.0	77	8	2.47	0.18	1.30	0.10	0.05	79	68	6	8.3	68	57.0	15.9
9	3	KE 33/10	+ P	1.18	0.07	2.15	0.40	0.14	92	105	14	6.0	42	10	2.08	0.25	0.60	0	0.10	44	13	4	2.5	24	199.5	261.9
11	23	"	+ P	1.36	0.07	2.50	0.30	0.10	74	89	14	0	36.5	12	2.27	0.25	0.50	0	0.09	39	10	2	0	22.5	174.8	245.4
13	4	"	O P	1.63	0.05	2.25	0.22	0.13	38	70	13	1.0	36	14	2.71	0.18	0.55	0.31	0.13	34	12	4	0	20.5	207.0	224.0
15	24	"	O P	2.24	0.04	2.95	0.30	0.16	36	86	18	0	47	16	1.70	0.18	0.55	0	0.10	59	15	3	0	24.5	132.8	249.2
17	5	KE 32/8	+ P	1.09	0.02	1.80	0.20	0.15	79	173	13	0	24.5	18	1.85	0.15	0.60	0	0.08	35	31	2	0	21.5	146.0	223.7
19	25	"	+ P	1.01	0.02	1.75	0.35	0.16	58	187	9	0	27.5	20	1.72	0.18	0.55	0	0.08	36	16	3	1.0	23.5	211.5	190.9
														20d	1.68	0.18	0.55	0	0.08	39	14	1	2.4	22.5		
21	6	"	O P	1.66	0.08	2.30	0.25	0.26	63	398	18	8.3	105	22	1.85	0.21	0.85	0	0.15	45	90	2	5.9	87.5	23.7	19.1
23	26	"	O P	2.29	0.10	2.25	0.30	0.29	51	512	15	6.0	165	24	1.96	0.21	1.10	0	0.19	45	144	3	7.5	125	23.5	9.9
														24d	1.92	0.21	1.05	0	0.19	45	140	3	8.2	125		
25	7	KE 31/4	+ P	0.59	0.04	1.30	0.22	0.19	64	592	15	2.5	20	26	1.39	0.18	0.55	0	0.08	35	74	1.0	1.0	19.5	174.6	77.1
27	27	"	+ P	0.59	0.03	0.95	0.23	0.18	48	496	16	0	22.5	28	1.48	0.18	0.50	0	0.08	30	31	0.6	0	18.5	162.7	118.5
29	8	"	O P	2.27	0.06	2.05	0.44	0.30	49	124	16	2.5	192	30	2.10	0.16	0.90	0.03	0.12	37	158	2	1.0	55	46.0	26.4
														30d	2.15	0.16	0.82	0.03	0.12	34	140	3	1.5			
31	28	"	O P	2.02	0.07	2.60	0.31	0.28	72	107	21	1.4	175	32	2.11	0.15	1.20	0.05	0.13	115	181	0	0	66	30.9	23.2
33	9	NE - 1	+ P	0.26	0.14	0.75	0.40	0.24	36	234	19	0	37.5	34	0.90	0.24	0.50	0.04	0.10	47	34	1.0	0	30	156.3	223.5
35	29	"	+ P	0.30	0.16	0.80	0.42	0.25	35	233	18	0	43	36	1.10	0.26	0.50	0.10	0.10	31	20	1.0	0	27	178.3	170.3
35d				0.30	0.16	0.80	0.41	0.25	38	238	18	0	43.1													
37	10	"	O P	0.38	0.04	0.80	0.31	0.24	32	207	15	0	40	38	1.14	0.20	0.50	0	0.10	31	17	3	0	24	178.6	173.0
39	30	"	O P	0.45	0.05	0.65	0.25	0.20	31	166	18	0	39	40	1.00	0.22	0.55	0.05	0.12	35	32	4	0	26.5	191.4	161.2

KE = Kenya - NE = Netherlands

Table II

Nutrient composition of plant material from pot experiments with Arachis

Plant sample nr KIT	Pot nr ISF	Soil nr	Treat-ment	whole plant (vegetative part)										Plant sample nr KIT	pods + kernels										yield, g dry matter	
				%					ppm						%					ppm					vegetative parts	pods + kernels
				N	P	K	Ca	Mg	Fe	Mn	B	Cu	Zn		N	P	K	Ca	Mg	Fe	Mn	B	Cu	Zn		
61	41	KE /13	+P	1.65	0.10	0.90	1.22	0.30	161	425	14	5	31	62	3.11	0.23	0.59	0.15	0.12	70	95	15	3.5	22.5	249.1	38.8
63	61	,,	+P	1.44	0.10	0.93	1.15	0.26	87	400	19	0	29	64	3.32	0.24	0.52	0.12	0.12	30	72	17	3.0	22.5	236.7	44.3
65	42	,,	OP	1.27	0.05	1.37	1.30	0.20	200	200	22	0	34	66	3.15	0.13	0.49	0.20	0.13	30	22	18	9.5	21	80.0	12.0
65d				1.29	0.05	1.37	1.30	0.22	186	280	24	0	35													
67	62	,,	OP	1.17	0.05	1.49	1.30	0.22	172	280	22	1.0	33	68	3.39	0.13	0.44	0.20	0.12	45	28	21	9.0	24	85.8	14.5
69	43	KE33/10	+P	1.66	0.14	0.96	1.22	0.25	48	215	27	0	59	70	3.78	0.38	0.74	0.15	0.17	86	60	21	0	59	294.1	12.2
71	63	,,	+P	1.68	0.14	0.91	1.20	0.26	40	250	25	0	50	72	3.85	0.36	0.66	0.15	0.16	40	55	20	0	35	297.4	17.5
73	44	,,	OP	1.64	0.10	1.00	1.25	0.26	45	250		0	30	74	3.20	0.25	0.64	0.20	0.16	68	50	17	1.5	38	245.3	15.6
75	64	,,	OP	1.58	0.10	0.93	1.20	0.26	68	240	24	0	58	76	3.62	0.26	0.54	0.15	0.15	35	40	20	1.5	33.5	285.7	18.0
75d				1.57	0.10	0.93	1.20	0.26	58	240	24	0	58													
77	45	KE32/8	+P	1.39	0.09	1.20	1.15	0.27	98	720	22	0	80	78	3.18	0.22	0.49	0.10	0.13	36	50	15	7.5	33	180.5	35.6
79	65	,,	+P	1.33	0.07	0.93	1.10	0.26	45	620	17	0	70	80	3.56	0.21	0.54	0.10	0.13	50	55	17	6.5	35	267.3	34.5
81	46	,,	OP	1.31	0.06	0.78	1.50	0.24	150	500	24	2.5	63	82	2.89	0.12	0.54	0.15	0.12	30	30	16	12.5	28.5	78.5	12.1
83	66	,,	OP	1.27	0.05	0.78	1.40	0.24	140	540	25	2.5	67	84	3.37	0.14	0.54	0.14	0.13	37	30	18	11.5	32	81.6	10.7
85	47	KE31/4	+P	1.46	0.08	0.76	1.05	0.26	85	1270	17	3.5	44	86	3.56	0.22	0.54	0.10	0.12	68	94	17	6.0	26.5	237.4	35.3
85d				1.47	0.08	0.76	1.05	0.26	75	1270	19	1.5	42	88	3.38	0.20	0.52	0.08	0.11	38	94	18	4.0	25	235.5	46.3
87	67	,,	+P	1.33	0.07	0.69	0.95	0.24	100	1230	15	0	39													
89	48	,,	OP	1.30	0.05	1.40	1.08	0.28	170	935	29	1.5	44	90	3.00	0.12	0.66	0.14	0.14	37	52	19	9.5	24.5	72.3	11.3
91	68	,,	OP	1.26	0.05	1.47	1.20	0.30	155	980	25	0	42	92	3.13	0.12	0.59	0.13	0.12	32	44	18	6.0	26.5	66.3	13.1
93	49	NE - 1	+P	0.87	0.28	0.78	1.25	0.30	65	367	26	0	70	94	2.66	0.48	0.78	0.13	0.14	40	42	20	7.0	41	126.1	24.3
95	69	,,	+P	1.00	0.24	0.71	1.15	0.28	58	331	17	1.0	84	96	2.64	0.45	0.78	0.14	0.13	30	37	24	5.0	38	131.9	22.3
97	50	,,	OP	1.52	0.11	0.75	0.85	0.22	42	310	18	0	90	98	3.05	0.31	0.81	0.15	0.12	24	35	15	1.5	38	123.7	20.7
99	70	,,	OP	1.01	0.13	0.81	1.00	0.26	68	392	24	0	108	100	3.85	0.36	0.85	0.10	0.14	18	37	15	1.5	44	117.1	17.3

KE: Kenya
NE: Netherlands

Table III

Nutrient composition of plant material from pot experiments with Amaranthus

Plant sample nr KIT	Pot nr ISF	Soil nr	Treat-ment	whole plant										yield g,dry matter
				%					ppm					
				N	P	K	Ca	Mg	Fe	Mn	B	Cu	Zn	
41	11	KE34/13	+P	4.10	0.48	5.48	1.04	0.80	130	640	21	7.3	44	38.12
42	31	,,	+P	2.85	0.35	3.65	1.20	0.63	78	640	19	4.0	37.5	57.28
43	12	,,	OP	---------- no sufficient material ----------										2.13
44	32	,,	OP	---------- no sufficient material ----------										1.00
45	13	KE33/10	+P	1.70	0.38	4.10	1.28	0.37	78	449	28	3.0	95	80.39
45d				1.75	0.38	4.05	1.35	0.37	65	445	28	2.5	110	
46	33	,,	+P	1.73	0.36	4.30	1.15	0.34	50	332	26	3.0	82.5	78.72
47	14	,,	OP	1.65	0.24	4.45	1.33	0.38	60	453	31	3.5	128	78.59
48	34	,,	OP	1.60	0.22	4.40	1.25	0.40	60	405	24	4.5	122	81.22
49	15	KE32/8	+P	2.20	0.19	4.90	1.75	0.66	105	2010	32	5.5	162	41.60
50	35	,,	+P	1.90	0.16	4.35	1.65	0.63	60	1760	30	5.0	160	55.20
51	16	,,	OP	---------- no sufficient material ----------										0
52	36	,,	OP	---------- no sufficient material ----------										0.90
53	17	KE31/4	+P	2.00	0.23	3.80	0.92	0.40	158	2450	16	4.5	48	48.25
53d				2.00	0.23	3.85	0.92	0.42	158	2410	18	4.5	48	
54	37	,,	+P	2.05	0.26	3.80	0.90	0.40	82	2620	15	5.0	72	48.42
55	18	,,	OP	---------- no sufficient material ----------										0.05
56	38	,,	OP	---------- no sufficient material ----------										0.90
57	19	NE - 1	+P	1.85	0.49	3.10	0.85	0.35	100	880	18.5	7.5	110	53.16
57d				1.90	0.49	3.20	0.85	0.36	90	900	23	7.5	110	
58	39	,,	+P	1.92	0.53	3.35	1.05	0.38	110	1290	23	8.0	152	39.08
59	20	,,	OP	2.85	0.44	5.10	1.40	0.55	215	1130	27	11.5	200	26.23
60	40	,,	OP	2.90	0.42	4.95	1.20	0.58	170	1040	25	11	180	26.05

KE : Kenya
NE : Netherlands

Table IV

Nutrient composition of plant material from pot experiments with soybean

Plant sample nr KIT	Pot nr ISF	Soil nr	Treat-ment	whole plant (vegetative part)										Yield g, dry matter
				%					ppm					
				N	P	K	Ca	Mg	Fe	Mn	B	Cu	Zn	
101	51	KE34/13	+P	1.40	0.27	1.79	1.25	0.44	47	247	19	7.5	52	91.6
102	71	,,	+P	1.40	0.27	1.79	1.30	0.46	44	287	20	2.0	47	87.6
103	52	,,	OP	2.60	0.17	2.19	1.25	0.39	68	214	20	2.5	55	19.5
104	72	,,	OP	1.95	0.16	1.97	1.30	0.39	41	233	23	1.0	54	19.8
105	53	KE33/10	+P	1.70	0.37	2.17	1.50	0.48	55	183	25	0	100	106.1
106	73	,,	+P	1.50	0.36	2.07	1.45	0.45	63	182	24	0	90	105.6
107	54	,,	OP	1.90	0.33	2.21	1.44	0.43	52	152	27	1.0	96	84.8
108	74	,,	OP	2.00	0.34	2.24	1.40	0.46	95	148	24	1.5	94	69.6
109	55	KE32/8	+P	1.35	0.23	1.73	1.20	0.41	51	399	18	12.6	76	83.0
110	75	,,	+P	1.85	0.31	2.01	1.50	0.56	100	501	25	16.6	96	60.4
111	56	,,	OP	4.50	0.21	2.07	1.45	0.61	142	815	31	11.0	114	9.4
112	76	,,	OP	4.50	0.22	1.99	1.35	0.56	52	705	30	9.5	110	10.4
113	57	KE31/4	+P	1.50	0.28	1.83	1.05	0.55	48	921	18	4.5	55	75.5
114	77	,,	+P	1.90	0.33	2.24	1.15	0.55	65	1050	24	5.5	60	55.9
115	58	,,	OP	4.10	0.14	2.03	1.05	0.48	74	1860	25	5.0	80	14.6
116	78	,,	OP	4.65	0.26	2.28	1.05	0.58	54	1540	31	8.0	80	5.4
117	59	NE - 1	+P	1.00	0.32	0.65	0.95	0.34	76	297	22	0.5	74	105.6
118	79	,,	+P	1.00	0.30	1.01	0.80	0.30	49	237	20	1.0	67	107.6
119	60	,,	OP	1.10	0.21	1.26	0.90	0.38	84	460	25	2.0	90	95.1
120	80	,,	OP	1.15	0.24	1.28	0.95	0.40	107	311	26	4.0	94	79.4

KE: Kenya
NE: Netherlands

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UW REF. :

ONZE REF. : 3/AB/206.80/Mu/MS

BIJLAGEN : 2

ONDERWERP: CSST Report no.1
3.07/3036

Amsterdam, 4th March 1980

Dear Sir,

./S I have pleasure in informing you that by separate post we will send you our First Progress Report on the Cooperative study of possibilities of standardization and improvement of soil testing methods of soils from the humid tropics with emphasis on soil phosphate (CSST) 1978-first half 1979 together with CSST Report no.1 concerning the soils of Sri Lanka. A report concerning the results of analyses carried out at our division of soils from Colombia, Kenya I, the Philippines, Nigeria, Surinam and Kenya II is in preparation. The Institute of Soil Fertility will report separately on the results of pot experiments carried out in 1978.

Also on behalf of the Institute of Soil Fertility, we thank you for your cooperation.

Yours sincerely,

DEPARTMENT OF AGRICULTURAL RESEARCH
Soil Science and Agrochemistry Division

Ir A.Muller
Head