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RESEARCH ON ACID SULPHATE SOILS IN THE HUMID TROPICS
- Second mission report modelling component -

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1. INTRODUCTION

In 1987, the joint LAWOO/AARD Research Project on Acid Sulfate Soils in the Humid Tropics was started. As part of this project, the Institute for Land and Water Management Research (ICW) is responsible for the modeling component, i.e. the modeling of physical and chemical processes in acid sulfate soils. Within the modeling component, ICW, CSR-Bogor and BARIF-Banjarbaru closely cooperate in laboratory and field experiments, and computer modeling.
The laboratory and field experiments are meant:

- to study physical and chemical processes in acid sulfate soils in detail;
- to collect input data for the model;
- to collect data to verify the model results.

To ensure a wide applicability of the model, parallel laboratory experiments are carried out at the BARIF and ICW laboratory using undisturbed columns of respectively Indonesian and Dutch acid sulfate soils.
The set up of the column experiments and the physical and chemical measurements to be carried out during these column experiments were described in report:

- RITSEMA C.J., J.J.B. BRONSWIJK and K. NUGROHO (1988), Proposal for column experiments to study physical and chemical processes in acid sulfate soils (with Indonesian summary). ICW-Note 1835, 22 p.

The chemical laboratory methods to apply in these column experiments were described in report:

- TOORN A. VAN DEN, K. NUGROHO, J. HARMSEN (1988), Methods for the determination of chemical composition of water samples from column experiments (English and Indonesian version). ICW-Note 1963, 77 p.

In order to start the first laboratory experiments in South Kalimantan, ir. J.J.B. Bronswijk and drs. C.J. Ritsema, both of ICW, paid a visit to the counterpart institutes CSR and BARIF. This mission took place from 12 April to 11 May 1988.

Together with mr. Bronswijk and mr. Ritsema, drs. C. Konsten traveled to BARIF-Banjarbaru. mrs. Konsten, DGIS associate expert, will lead the modeling team in Banjarbaru for the next two years. In the four weeks of the mission, mrs. Konsten was introduced at CSR-Bogor and BARIF-Banjarbaru.

The main objectives of the mission of Bronswijk and Ritsema were:

- To support the associate expert, drs. Konsten and her Indonesian counterparts at implementation of the column experiments to promote a fluent start.
- Supplemented training of the associate expert and her CSR/BARIF-counterparts in sampling, instrumentation, operation of the columns, measuring techniques and data base management.
- Selection of two sites in the Pulau Petak area where seven undisturbed soil cores (100x25 cm) for column experiments could be sampled.
- Collection of these seven undisturbed soils cores in the field.
- Transportation of the columns into the laboratory of BARIF-Banjarbaru and the waterproof connection of each column to a gravel-filled bottom with a drainage system.
- The instalation of tensiometers, moisture extraction cups, redox-elektrodes and air-chambers in the seven columns.
- The execution of the first series of soil physical and chemical analysis.
- Set up of a data base system.

With the help of many people, all these objectives could be achieved, so that the column experiment can be managed by drs. Konsten with help of CSR/BARIF-counterparts, in spite of restricted availability during the first six months.

The contents of this mission report are limited to a schedule of activities (chapter 2) and an appendix. This is caused by the fact that the major activities carried out during the mission concern the collection, installation and instrumentation of the seven undisturbed soil columns, training in running the experiments, sampling/measuring techniques and data collection/processing. These activities will be reported in detail in a scientific report on the column experiments.

2. SCHEDULE OF ACTIVITIES

12 April - Arrival Ritsema Jakarta.

13 April - Arrival Konsten Jakarta. Contacting Centre for Soil Research (CSR) Bogor.

14 April - Arrival Bronswijk Jakarta. Contacting Banjarbaru Research Institute for Food Crops (BARIF) Banjarmasin.
Arranging flights Jakarta - Banjarmasin vv.

15 April - Bogor: Centre for Soil Research, visiting dr. Putu Gedjer Widjaja Ahdi. Announce visit of drs. Konsten to CSR, Bogor.
Elucidation/discussion on aim of column experiments at BARIF, Banjarbaru and practicability of fieldwork.
Presentation of CSR-participant in modeling component ir. Ida Bagus Aribawa (counterpart of associate expert, mrs. Konsten).
Appointments made for departure of ir. Ida Bagus Aribawa and visit of dr. Putu Gedjer Wijaja Adhi to Banjarbaru, Kalimantan.
Jakarta: Visiting branch Euroconsult.
Flight Jakarta - Banjarmasin Ritsema and Bronswijk.

16 April - Banjarbaru: Introduction to dr. Lande Mansoer, Director of Banjarbaru Research Institute for Food Crops.
Meeting with participants of acid sulfate soils project, Andriesse (STIBOKA), Jansen (STIBOKA), Hamming (EUROCONSULT), Van den Toorn (ICW), Supardi Suping (CSR) and Hussin (BARIF).
Introduction and explanation of Van den Toorn about installed ICW laboratory facilities and running activities.
Inventarisation of field equipment and preparation of gravel-filled bottoms for columns.
Arrival mrs. Konsten in Banjarmasin.

17 April - Banjarmasin: Meeting with Andriesse, Jansen, Konsten.
Presentation of running and forthcoming activities of STIBOKA component. Introduction in Pulau Petak field knowledge of STIBOKA participants. Selection of sites for collecting soil columns by ICW-participants. Appointments made for visiting selected sites under guidance of Jansen.

18 april - Banjarbaru: Discussing DSA for Indonesian analysts, mr. Hussin (BARIF) and ms. Rahmiati (BARIF) both participating in ICW component, with Van den Toorn and Supardi Suping.
Set up of proposed pay system is in correspondence with applied system of STIBOKA.
Meeting with Jansen about work schedule Konsten up to November 1988. The associate expert is available two days a week (Fridays and Saturdays) up to 1th of November 1988 for the modeling component. The other days she is involved in the survey component. It has been agreed that on Thursdays through Saturdays mrs. Konsten mutually can carry out coordination work for the other components, not exceeding one hour in total for each component per week.
Carrying out laboratory preparations for column experiments.

19 April - Ordering supplementary goods for column experiments.
Arranging drivers and boats for field trips.
Formulating tasks for the several participants of the ICW-component.

20 April - Field trip Anjir Konoko, Barito levee, Belawang, Barambai and Anjir Talaran. Participants: Jansen, Konsten, Ritsema, Bronswijk, Hendro, Alkasuma, Sutresno, Supardi Suping.

21 April - Field trip Anjir Tabunganem and crossing of the Barito river and Anjir Tamban. Participants: Jansen, Konsten, Bronswijk, Ritsema, Hendro, Alkasuma, Sutresno, Ida Bagus Aribawa, Supardi Suping.

22 April - Preparations in laboratory for installing columns.
Discussion on field findings resulting in the choice of Belawang and Barambai for collecting soil columns.
Designing of data base for results of column experiments.

23 April - Preparations in laboratory for installing columns.
Preparations for field work.

25 April - Field work Belawang, collecting of four columns of potential acid sulfate soil and duplo soil samples out of direct neighbourhood. Participants: Hamming, Ritsema, Klepper, Bronswijk, Konsten, Supardi Suping, Ida Bagus Aribawa, Hendro.

26-30 April - Installing columns in laboratory. Provide columns with tensiometers, soil moisture extraction cups, redox electrodes, soil air chambers. Freeze drying of soil collected out of the columns when installing tensiometers etc. and freeze drying of duplo field soil samples. Training of associate expert, mrs. Konsten, and CSR/BARIF-counterparts in abovementioned activities.

2 May - Field work Barambai, collecting of three columns of acid sulfate soil and duplo soil samples out of direct neighbourhood.
Participants: Konsten, Bronswijk, Ritsema, Klepper, Supardi Suping, Ida Bagus Aribawa, Sutresno.

3 May - Installing columns in laboratory. Provide columns with tensiometers, soil moisture extraction cups, redox electrodes, soil air chambers. Freeze drying of soil collected out of the columns when installing tensiometers etc. and freeze drying of duplo soil field samples. Training of associate expert, mrs. Konsten, and CSR/BARIF-counterparts in above mentioned activities.

6 July - Visit of dr. Putu Gedjer Adhi Wijaja to BARIF to keep abreast of progress in starting up column experiments.
Doing first complete (initial) physical and chemical measurements for all columns. Training of associate expert, mrs. Konsten, and CSR/BARIF-counterparts in carrying out physical measurements, extracting soil moisture and analyzing its chemical composition.
Making appointments about further handling of experiments and transfer of results to ICW-Wageningen.

9 July - Starting of respectively irrigation and drainage practises on the different columns. Checking of pH of ponding water.
Collecting of all up till then freeze dried soil samples for transport to the Netherlands.
Short visit to dr. Lande Mansoer.
Flight Banjarmasin - Jakarta.
Meeting with Linda Baas, HBCS-student, which will temporary participate in ICW research on acid sulfate soils in the humid tropics.

10-11 July Flight Jakarta - Amsterdam

APPENDIX A

PARTICIPANTS IN MODELING COMPONENT ACID SULFATE SOILS PROJECT

Carla Konsten:	- Teamleader modeling component Banjarbaru
(DGW)	- Coordination/interpretation of all measurements from column experiments
	- Conducting of soil physical measurements during column experiments
	- Data processing with PC
	- Supporting of work Linda Baas
	- Preparation and coordination of field experiments and interpretation of results
	- Taking water samples and measuring pressure heads in ASS field plots (starting november 1988)
Ida Bagus Aribawa:	- Introduction acid sulfate soils with emphasis on soil physical processes
	- Assisting in soil physical measurements during column experiments
	- Data processing with PC
	- Study: relation pH-nutrient availibility - rice production
	- Taking water samples and measuring pressure heads in ASS field plots (starting november 1988)
Supardi Suping:	- Coordination of chemical analysis of samples from
(CSR)	columns and field plots
	- Taking of water samples from column experiments
	- Assisting in soil physical measurements during column experiments
	- Analysis of water samples from column experiments
	- Analysis of water samples from field plots (starting november 1988)
Hussin:	- Analysis of water samples from column experiments
(BARIF)	- Analysis of water samples from field plots (starting november 1988)

APPENDIX A (continued)

Rahmiati:	- Analysis of water samples from column experiments
(BARIF)	- Analysis of water samples from field plots (starting november 1988)
Isdianto:	- Assisting Linda Baas during field work
(BARIF)	- Taking water samples and measuring pressure heads in ASS field plots (after november 1988)
Linda Baas:	- Determination of shrinkage characteristics (including pressure heads) of several ASS (including sites of column experiments)
	- Determination of specific area of soil matrix in contact with air in several ASS (including sites of column experiments)

APPENDIX B

PROPOSAL PAYMENT BALITTAN PERSONNEL FOR CHEMICAL DETERMINATIONS FOR COLUMN EXPERIMENTS

pH	250	
O_2	250	
HCO_3	250	
EC	250	
Na	250	
K	250	
Ca	250	
Mg	250	
Mn	250	
Fe	250	
Cl	400	
NO_3	700	
SO_4	700	
Al	700	
	5000	rupiah for one sample

Approximately 105 water samples per month.
Supardi Suping will analyse about 20 samples per month.
Hussin and Rahmiati will analyse 85 samples per month.
Total amount = 85 * 5000 = 425000 rph/month.
This will probably continue until may 1990.
Conditions:

Taking of sample	: Day 1
O_2, pH, EC, HCO_3, Fe, Mn	: Determination on day 1
SO_4, Cl, NO_3, Al, Na, K, Ca, Mg	: If possible determination on day 1, otherwise on day 2
O_2, pH, EC, HCO_3, Fe, Mn	: Results written on form at day 3
SO_4, Cl, NO_3, Al, Na, K, Ca, Mg	: Results written on form at day 4

Two weekly water quality samples from cups are normally taken on monday and tuesday. This means that the forms must be complete on friday.

APPENDIX C

COLUMN NR ..... DATE:.....

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********** PHYSICAL DETERMINATIONS **********
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********* AIR TEMPERATURE *******

temperature (oC)			time of day	
min./max. temp. (oC)				

********** SOIL COLUMN **********

depth - soil s. (cm)	2.5	12.5	22.5	42.5	82.5	time
total head (cm)						
pressure head (cm)						

* = tensiometer is flushed after measurement

depth - soil s. (cm)	5.0	25.0	45.0	65.0	85.0	time
redox pot. (mV)						
pe						

depth - soil s. (cm)	5.0	15.0	25.0	45.0	65.0	time
O2 con. soil air(v%)						

groundwaterlevel (cm - soil s.)	
water layer on soil s.(cm)	

remarks:

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********** CHEMICAL DETERMINATIONS **********
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******** IRRIGATION WATER ********

amount (mm)		time of day	

conc. in mmol.l-1:

pH	
HCO3-/H2CO3	
Dissolved O2	
EC (uS/cm)	
Fe2+	
Mn2+	
Na+	
K+	
Ca2+	
Mg2+	
Al3+	
Cl-	
NO3-	
SO4--	
sum of cations (meq.)	
sum of anions (meq.)	

remarks:

APPENDIX C (continued)

********* PONDING WATER *********

	time of day				sum
amount sampled (ml)					

conc. in mmol.l-1:

pH					
HCO3-/H2CO3					
Dissolved O2					
EC (uS/cm)					
Fe2+					
Mn2+					
Na+					
K+					
Ca2+					
Mg2+					
Al3+					
Cl-					
NO3-					
SO4--					
sum of cations (meq.)					
sum of anions (meq.)					

remarks:

********* SOIL MOISTURE *******

	5.0	25.0	45.0	65.0	85.0	st.
depth - soil s. (cm)						
suct. applied at time						
sample taken at time						
amount extracted (ml)						

conc. in mmol.l-1:

pH						
HCO3-/H2CO3						
Dissolved O2						
EC (uS/cm)						
Fe2+						
Mn2+						
Na+						
K+						
Ca2+						
Mg2+						
Al3+						
Cl-						
NO3-						
SO4--						
sum of cations (meq.)						
sum of anions (meq.)						

remarks:

APPENDIX C (continued)

********** DRAINAGE WATER **********

	time of day					
						sum
amount sampled (ml)						

conc. in mmol.l-1:

pH					
HCO3-/H2CO3					
Dissolved O2					
EC (uS/cm)					
Fe2+					
Mn2+					
Na+					
K+					
Ca2+					
Mg2+					
Al3+					
Cl-					
NO3-					
SO4--					
sum of cations (meq.)					
sum of anions (meq.)					

remarks:

********** WATER BALANCE **********

open water evaporation (mm)	
column weight (kg)	
change in water storage of column since last weighing (mm)	
cumulative open water evaporation since last weighing (mm)	
moisture extraction trough cups since last weighing (mm)	
cumulative drain discharge since last weighing (mm)	
cumulative irrigation since last weighing (mm)	
actual evapotranspiration (mm)	

remarks: