UNITED REPUBLIC OF TANZANIA

DANISH INTERNATIONAL DEVELOPMENT AGENCY • DANIDA

IMPLEMENTATION OF WATER MASTER PLANS FOR IRINGA, RUVUMA AND MBEYA REGIONS

IMPROVEMENT TO REGIONAL WATER LABORATORIES

1986

CARL BRO • COWICONSULT • KAMPSAX - KRÜGER • CCKK

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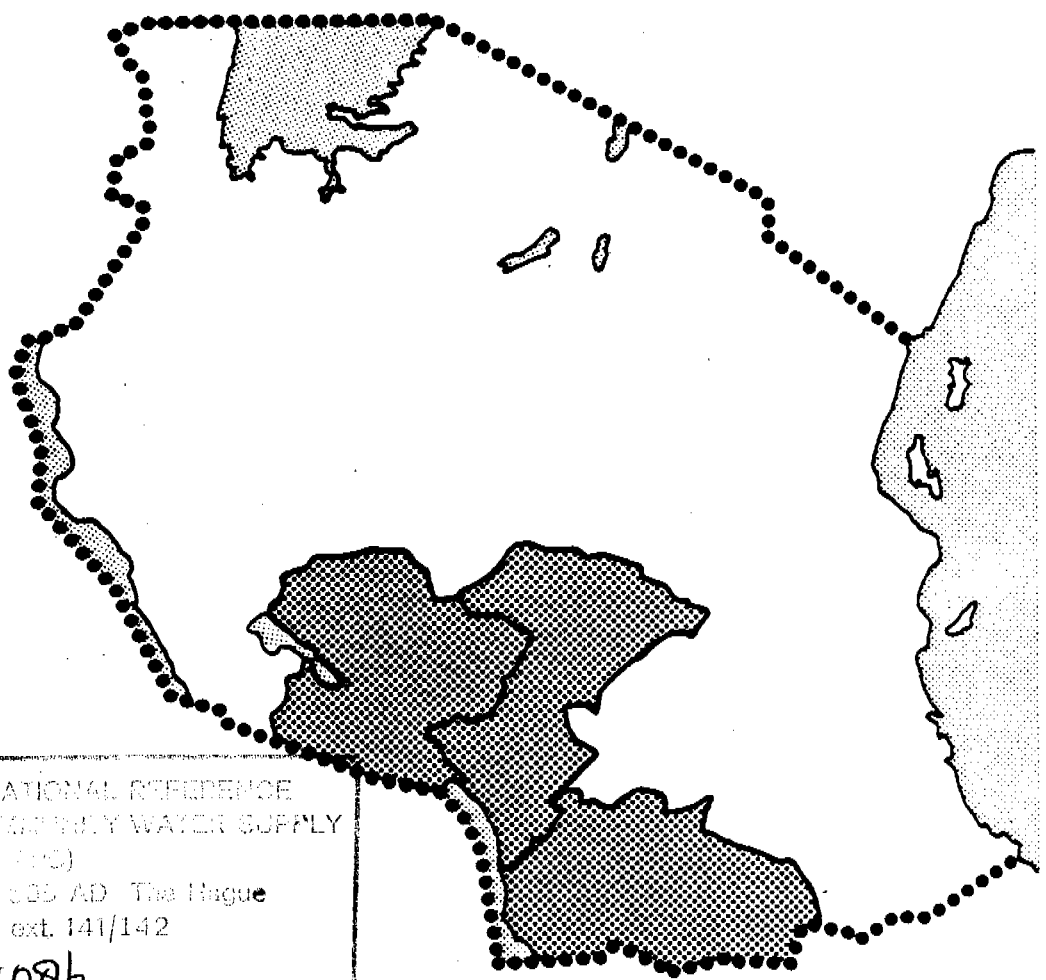

CARL BRO • COWICONSULT • KAMPSAX - KRÜGER • CCKK

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IMPROVEMENT TO REGIONAL LABORATORIES, 1986

1. BACKGROUND

Previous investigations of the Water Quality Surveillance programme for the Implementation of Water Master Plans in Iringa, Ruvuma and Mbeya Regions have documented the necessity of an investigation of the three regional laboratories. The investigation should cover equipments, chemicals, analyses, calibration systems, report standards etc.

Furthermore it is acknowledged that bacteriological quality is much more significant in developing countries than the physical/chemical quality, and therefore the former should take predominance. According to this it has been decided to introduce bacteriological tests in the Water Quality Surveillance Programme and to purchase bacteriological test kits to the three regional laboratories.

2. TERMS OF REFERENCES AND TIME SCHEDULE

2.1 Terms of Reference

Based on the above concept, the following "Terms of Reference" for a chemist/laboratory technician was worked out:

- To prepare specifications for the necessary laboratory equipment to be purchased for the 3 regional laboratories for performing bacteriological tests. The equipment should then be brought to Tanzania from Denmark by air by the Short Term Specialist.

When arrived in Tanzania the specialist should:

- Visit the 3 regional laboratories and repair as necessary and calibrate or establish calibration systems for the appropriate equipment.
- Identify all additional necessary repairs or replacements and prepare specifications for repair and/or procurement.
- Instruct and train the laboratory staff in the correct use and maintenance of relevant equipment.
- Prepare a priced list of consumables for each of the 3 laboratories for 2 years of operation.
- Establish analysis control standards.
- Establish report standards, forms and documentation practice.

A time schedule for the work was given for 2-3 man months in the period from 16th September, 1985, till 14th December, 1985, incl. approximately 3 weeks in Denmark for preparations and reporting. Due to various problems the study was not carried out before Jan.-Feb. 1986.

2.2 Time Schedule

The work stipulated in the TOR was carried out by the Consultants' nominated candidate, Mr. Kjær Andreasen, who visited Tanzania from 24th January to 20th February 1986.

The effected schedule was as follows:

24.1.86	Travel to Dar-es-Salaam
25.1.-27.1.86	Dar-es-Salaam. Briefing with Danida Steering Unit staff.
27.1.86	Travel to Mikumi.
28.1.86	Travel to Iringa.
28.1.-30.1.86	Iringa. Work in lab. Visiting schemes. Discussions with Maji laboratory staff and Danida Implementation office.
31.1.86	Travel to Mbeya.
31.1..4.2.86	Mbeya. Work in lab. Making standard solution for tests of Hach equipment. Discussions with Maji laboratory staff, the head of the three regional laboratories, Mr. R.A. Materu, and the Danida Implementation office.

5.2.86	Travel to Songea.
6.2.-7.2.86	Songea. Work in lab. Test and repair of equipment. Discussions with Maji laboratory staff and the Danida Implementation office.
8.2.86	Travel to Iringa.
4.2.-13.2.86	Iringa. Test of equipment. Preparation for work-shop on bacteriological testing and good craftsmanship in the laboratory.
13.2.-15.2.86	Work-shop with laboratory staff from the three regional laboratories. Training in bacteriological testing.
16.2.86	Travel to Dar-es-Salaam. Discussion with Maji laboratory, Ubungo.
17.2.-20.2.86	Report writing and debriefing with Danida Steering Unit.
20.2.86	Travel to Denmark.

The short term specialist was assisted by Mr. Pascal S. Kimaro, retired head of the MAJI Instrumental Work-shop, Ubungo.

3. TESTING CAPABILITY

The aim of a water quality surveillance programme is manifold, but the following points are among the most important.

- Sampling and testing before construction af new schemes to provide sufficient information to ensure that the selection af source from health/quality consideration is the best for the scheme in question, and to ensure that the new source provides an improvement of The existing water sources quality.

- Sampling and testing after construction of the scheme and during operation to establish a basic knowledge about the water quality of each scheme.

  After having established a basic knowledge about water quality, a monitoring programme has to be introduced to ensure that the health risk does not exceed an acceptable limit.

The necessary testing capabilities according to the water quality programme could be divided into three levels.

3.1 Health Risks

Chemical : Flouride, Nitrate.
Bacteriological: Indicator Organism - Faecal Coliform.

3.2 Quality Considerations

This level.only includes chemical/physical tests.

pH
Conductivity
Suspended solid (possibly turbidity).

Ionic balance

Total hardness ($Ca^{++}+Ms^{++}$)
Calcium (Ca^{++})
Magnesium (Mg^{++})
Sodium (Na^{+})
Potassium (K^{+})
Iron (Fe^{++})
Manganese (Mn^{++})
Ammonia (NH_4^{+})

Alkalinity (HCO_3+CO_3)
Chloride (Cl^{-})
Sulphate (SO_4^{--})
Nitrate (NO_3^{-})
Flouride (F^{-})

3.3 Health risks of considered minor importance in the three regions

Heavy metals
Pesticides

The equipment for monitoring these parameters is very expensive and difficult to handle. Because of this and because of the estimated minor health risks, it is far beyond the scope of the water quality programme to include these parameters at present. It should also be born in mind that analyses for heavy metals could be performed at the Ubungo Laboratory.

4. STATUS OF THE THREE REGIONAL LABORATORIES

To investigate the capability of the three laboratories to perform the tests mentioned in 3.1 and 3.2, and listed in Table 4.1, the laboratories were visited for a check-up of equipment, chemicals and staff.

Table 4.1 Proposed Testing Capacity

pH	
Conductivity	
Suspended solid or turbidity	
Total hardness	
Alkalinity	
Calcium	
Magnesium	
Potassium	By calculation from ionic balance in the Iringa and Songea laboratories.
Sodium	
Iron	
Ammonia	
Manganese	
Chloride	
Flouride	
Nitrate	
Sulphate	

4.1 Water Laboratory, Iringa

4.1.1 General Findings

The laboratory was found to be in running condition. Approximately 140 samples have been brought to the laboratory and tested during 1985. Due to lack of transport facilities no sampling has been

carried out directly by the laboratory staff. Most of the chemical testings are performed with the Hach equipment, and the examination of the equipment using standard solutions, showed that new solutions must be procured. Especially the chemicals for iron tests have only a validity of 1 year. The Hach equipment is found sufficient for the chemical testing in the surveillance programme. Due to the normal lack of batteries, the pH-meters were supplied with an AC/DC converter. However, as the main voltage is sometimes very unstable it is proposed that the equipment is provided with rechargeable batteries. The staff was found capable of testing, however some improvements around the use of standard solutions and checking results were introduced. Equipment for bacteriological testing (Faecal Coliform) was introduced and the staff was trained in correct sampling and testing.

4.1.2 Examination of Testing Capacity

Test	Condition	Comments
pH		
Equipment		
pH-meter (Hach 1975) incl. probe	working	
pH-meter (Hach 1975) incl. probe	working	
pH-meter (Hach 1975) incl. probe	broken	Repair if possible
Chemicals		
Buffer solution pH 7.00	Restock	
Buffer solution pH 4.01	Restock	
Conductivity		
Equipment		
Hach conductivity meter incl. probe	Working	Supply rechargeable batteries 6x1.5V small size AA.
Hach conductivity meter incl. probe	Broken	Taken to DK for repair
Chemicals		
Standard solution 1000 mg NaCl/l	Restock	
Various		
10 K resistance for calibrating instruments.		New purchase

Test	Condition	Comments
Total hardness (EDTA titration)		
Equipment		
Burrets	Working	
Chemicals		
Calcium standards	Restock	
Indicator, Erio-chrome black-T	from labo-	
Ammonia, conc. (NH_3)	ratory in-	
Ammonia chloride (NH_4Cl)	Mbeya or	
EDTA (disodium salt)	Ubungo.	
Magnesium sulphate ($MgSO_4$)		
Calcium (EDTA titration)		
Equipment		
Burrets	Working	
Chemicals Calcium standards (0,01 ml/l)		
HHSNN indicator mixture	Restock from	
Sodium hydroxide, NaOH	laboratory in	
EDTA (disodium salt)	Mbeya or Ubungo	

Test	Condition	Comments

Magnesium

Calculated in the following way:

Total hardness = Calcium + Magnesium

be careful with units, normally hardness is expressed in mg $CaCO_3$/l and Calcium, Magnesium in mg/l. This gives the following expression:

Total hardness (mg $CaCO_3$/l) =

2.5 x Calcium mg/l + 4.1 x Magnesium mg/l.

Alkalinity

Equipment

pH-meter or indicator solutions	Working	
Burrets	Working	See under pH.

Chemicals

Standard acid solution	Restock	
Indicators: Phenol phthaline indicator	Working	
Methyl orange indicator	Working	

Test		Conditions	Comments

Turbidity, Iron, Manganese
Chloride, Sulphate, Nitrate, Flouride (Hach-methods)

Equipment

DREL 4	Hach spectrophotometer	Working	
or DR 2	Hach spectrophotometer	Working	
or DR 1	Colourimeter	Working	Bad accuracy
Chemicals		Expired	Restock

Turbidity (Range 0-500 NTU)

Hydrazine sulphate.

Iron

Ferro Ver Iron Reagent Powder Pillows
Iron Standard Solution 1 mg/l as Fe
RoVer Rust remover.

Manganese

Buffer Powder Pillows
Sodium Perodate Powder Pillows
Manganese Standard Solution 1000 mg/l as Mn.

Chloride

Mercuric Nitrate Standard Solution.
Diphenyl Carbazone Reagent Powder Pillows.
Hydrogen Perioxide 30%.

Sulphate

SulphaVer IV Sulphate Reagent Powder Pillows.
Sulphate Standard Solution 50 mg/l as SO_4.

Nitrate

NitraVer V Nitrate Reagent Powder Pillows.
Nitrate Nitrogen Standard Solution (10 mg/L as N).

Flouride

SPADNS Reagent
Flouride Standard Solution 10 mg/l.

Ammonia

Nessler Reagent
Ammonia Nitrogen Standard 1,0 mg/l.
Rochelle Salt Reagent.

Test	Condition	Comments
Bacteriological test		
Equipment		
Millipore Faecal Coliform Fieldkit (Filtration unit)	Working	
Millipore Portable Incubator	Working	
Millipore Portable Incubator	Working	
Autoclave for sterilizing	Working	
15 nos. of 120 ml Pyrex Sample Bottle	Working	
1 magnifier	Working	
Chemicals etc.		
Filters 0,45 mm including absorptions pads	300 nos.	
Petri dishes/pre-sterilized	300 nos.	
Media for Faecal Coliform	300 nos.	
Sodium thiosulphate for dechlorination (10% solution)	250 g	
Methanol for sterilizing in field	1.5 liter	

4.2 Water Laboratory, Songea

4.2.1 General Findings

The laboratory was found to be in running condition. Approximately 100 samples have been tested during 1985. As for the Iringa laboratory, no direct sampling has been carried out by the laboratory staff.

The laboratory facilities were found to be very poor. The laboratory room was too small to contain all the equipment and the laboratory was very often without power supply. Especially when considering bacteriological testing, a stable power supply is of vital importance, and the problem must be solved by connection to a stand-by generator or by installing battery-powered facilities. The later is recommended. Equipment for bacteriological testing (faecal coliform) was introduced and the staff was trained in correct sampling and testing. Examination of the capability of the staff resulted in some improvement around the Hardness-Calcium-Magnesium determination and the staff was trained in checking results etc. As for the laboratory in Iringa, purchase of new chemicals is essential.

4.1.2 Examination of Testing Capacity

The following list only includes equipment as the chemicals are the same as those used in the laboratory in Iringa.

Test	Condition	Comments
pH		
Equipment		
pH-meter (Hach 1975) incl. probe	Working	
or pH-meter (portable) - -	Working	
Conductivity		
Equipment		
Hach Conductivity Meter incl. probe	Working	
Hach Conductivity Meter incl. probe	Working	
Total Hardness (EDTA-titration)		
Equipment		
Burrets	Working	
Calcium		
Equipment		
Burrets	Working	
Alkalinity		
Equipment		
pH-meter	Working	See under pH
or indicator solutions		

Test	Condition	Comments
Turbidity, Iron, Manganese Chloride Sulphate, Nitrate, Flouride (Hach-methods)		
Equipment		
DREL/4 Hach Spectrophotometer og DRl Colourimeter	Working bulp missing	Supply one
Bacteriological test		
Equipment		
As for the laboratory in Iringa.		

4.3 Water Laboratory, Mbeya

4.3.1 General Findings

The laboratory was found to be in bad running condition. Only very few water samples have been tested during 1985. The main reason for this was given as lack of transport facilities. Obviously, this was not the only reason as the transport situation was not worse for this laboratory, than for the laboratories in Iringa and Songea. The testing capacity was also found very limitied due to lack of various chemicals and equipment. It is recommended that the missing chemicals and equipment are purchased.

The staff was found capable in testing.

Equipment for bacteriological testing was introduced, but the laboratory already has some equipment for testing (supplied from Ubungo).

4.3.2 Examination of Testing Capacity

Test	Condition	Comments
pH		
Equipment		
pH-meter, Knick-microzossor	Working	
or pH-meter, Hach 1975	Working	
Chemicals		
Buffer solution pH 7.00	Restock	
Buffer solution pH 4.01	Restock	
Conductivity		
Equipment		
Hach-conductivity meters incl. probe.	Working	
Chemicals		
Standard solution	Working	Can be made in lab.
Total Hardness (Ca+Mg)		
Equipment		
Burrets	Working	

Test	Condition	Comments
Chemicals		
EDTA (disodium salt)	Restock	
$MgSO_4x7H_2O$	Restock	
NH_4Cl	Restock	
NH_3-conc.	Restock	
Erio-chrome black-T	Restock	
Calcium		
Equipment		
Burrets	Working	
Chemicals		
EDTA (disodium salt)	Restock	
Sodiumhydroxide, NaOH	Restock	
HHSNN-indicator	Restock	
Magnesium		
Estimated by calculation.		
Alkalinity		
Equipment		
pH-meter or indicators	Working	See under pH
Chemicals		
HCl or H_2SO_4 standard solutions	Working	Can be made in lab.

Test	Condition	Comments
Chemicals		
Iron, Manganese, Sulphate, Ammonia, Nitrate, Turbidity		
Equipment		
Spectro photometer Bausch and Lumb.	Working	
Iron		
Hydroxylamine (NH_2OH)	Restock	
Ammonium acetate ($NHyC_2H_3O_2$)	Working	
Glacial acetic acid (conc.)	Working	
Sodium acetate ($NaC_2H_3O_2x3H_2O$)	Working	
1,10-Phenantholine monohydrate ($C_{12}H_8N_2xH_2O$)	Working	
Ammonium Ferras sulphate Fe $(NH_4)_2\ (SO_4)_2 \times 6H_2O$	Working	
Manganese		
Mercury sulphate $HgSO_4$ or HgCl	Working	
Nitricacid HNO_3 (konc.)	Working	
Phosphoric acid H_3PO_4 (konc.)	Restock	
Silver nitrate $AgNO_3$	Working	
Potassium persulphate	Restock	
Potassium permanganate $KMnO_4$	Working	
Hydrogen peroxide H_2O_2	Restock	
Sulphuric acid H_2SO_4	Working	
Sodium nitrite $NaNO_2$	Working	
Sodium oxalate $Na_2C_2O_4$	Restock	
Sodium bisulfite $NaHSO_3$	Restock	

Test	Conditon	Comments
Sulphate		
Chlorine acid, HCl	Working	
Ethanol (96%), C_2H_5OH	Restock	
Sodiumchloride, NaCl	Working	
Glycerol	Restock	
Barium chloride, $BaCl_2$	Working	
Sodium sulphate, Na_2SO_4	Working	
Ammonia		
Manganese Sulphate,	Working	
$MnSO_4xH_2O$	Restock	
Phenol, C_6H_5OH	Restock	
Nitrate		
Acetone	Restock	
Sulphanilic acid	Working	
Naphylamine	Working	
Borax	Restock	
Hydrazine sulphate	Restock	
Copper sulphate, $CuSO_4$	Restock	
Sodium acetate, $NaC_2H_3O_2$	Working	
Chloride		
Potassium chromate, $K_2Cr_2O_4$	Working	
Silver nitrate, $AgNO_3$	Working	

Test	Condition	Comments
Flouride		
Equipment		
Knick-pH-meter	Working	
Selective flouride probe		New purchase
Chemicals		
Sodium flouride, NaF		New purchase
Potassium and Sodium		
Equipment		
Perkins Elmer flame photometer	Not working	Test tubes and cylinders for acetylene and oxygen missing purchase in Tanzania.

4.4 General Recommendations About Equipment

As the distillation units are of vital importance for the functioning of the three laboratories, it is recommended to purchase the following spare parts for the distillation units (Kottermann 1030).

2 nos heating element
1 nos main switch
1 nos Excess Temperature Protection
and one complete unit for replacement.

It is furthermore recommended to purchase spare parts for the Hach Spectrophotometer in the Iringa and Songea laboratories.

3 nos Lamp assembly
2 nos Photocell Assembly
1 nos Metre Scale Set compl.
10 nos Sample Cell

It will be necessary to replace the filters in Hach Spectrophotometers in a year or two since they have a limited lifetime especially in the tropics. As one Hach Spectrophotometer just has been upgraded in Denmark, it is recommended to use this as a spare unit, and bring the Hack DREL4 Instrument from Iringa and Songea for upgrading. Otherwise should two filters and necessary calibration equipment be purchased, but the first solution is recommended.

Various glass articles etc.

6 burrets for titration 25 ml (Iringa, Songea)

Batteries - Rechargable 1.2 V Cadmium Cells

Mbeya 12 size AA (long small), charging unit
Iringa 18 size AA (long small), 8 size D, charging unit
Songea 12 size AA (long small), 8 size D, charging unit

It has not been possible to find a charging unit with variable voltage and if the batteries have to be fixed inside the equipment, a charging unit must be purchased for the necessary voltage. This problem should be discussed with Mr. P. Kimaro before purchasing.

Gas cylinders for AAS - Perkins Elmer, Mbeya

1 nos Acetylene - cylinder (purchase in Tanzania).
1 nos Oxygene - cylinder (purchase in Tanzania).
1000 nos sample cell for Perkins Elmer flame photometer (coleman 51-CA) (Mbeya).

Other equipment, Mbeya

20 nos tubes for centrifuge 48 ml Kartell 1383
10 nos tubes for centrifuge 25 ml, Kartell 1383
3 nos dry media for Faecal Coliform tests.
100 nos Petri dished 55 mm.

A prices list of the necessary equipment and chemicals is included in the app. 5.

4.5 Future Purchase Of Equipment And Chemicals

To avoid long delivery time and purchasing mistakes it is recommended to order chemicals and equipment through CCCK.

This report include chemicals and equipment for approxiately two years, but it may be necessary to restock various equipment and chemicals within this period. It is therefore recommended to allocate approximately 20.000 Dkr. for that purpose.

5. RECOMMENDATION ABOUT THE SAMPLING PROBLEMS

5.1 Transport Facilities

With regards to sampling, there is a great problem with transport facilities. Due to lack of transport means the laboratory has been dependent on other sources to bring in samples, and no sampling has been directly carried out by the laboratory staff. This is not ideal when considering chemical tests, but when considering bacteriological tests it is out of question, that it will function. The sampling procedure for bacteriological testing is complex and can only be handled by a skilled staff, and, furthermore, the samples must be stored cold and analysed within approx. 8 hours.

The laboratory staff could of course sometimes accompany the implementation staff, when they are visiting schemes, but if the surveillance programme shall function, it is necessary that the laboratory also can act independently. It is, therefore, recommended to provide transport facilities to the laboratory. The transport facilities should be introduced stepwise:

1. Allocate vehicles from the existing regional pool, f.ex. 5 days a month. The laboratory could then plan sampling trips of an estimated kilometre lenght.
2. After level one has been working satisfactorily for about half a year, it should be considered to purchase a motorbike for each laboratory. The motorbike could be used to collect samples from shcemes situated near the regional towns.
3. After levels one and two have been working for a reasonable periode, it should be considered to purchase a vehicle for each laboratory. Before this step is done, the condition of the Water Quality Surveillance Programme should be closely examinated and an input from a short term specialist is proposed.

It is further recommended that most water analyses should be performed at the existing regional laboratories, but in this respect it should be borne in mind, that, if necessary, most of the laboratory equipment is portable and the analyses could be performed in the field.

5.2. Sampling Places and Fregency

The ideal sampling programme is given in Ref. 1. For the bacteriological testings it is obviously not possible to fulfil this programme at present, and it is recommended that the laboratory starts with a close investigation of selected schemes rather than spot sampling on many schemes. A close investigation of a few schemes could also help to establish a basic knowledge about annual variations of the bacterial levels in different kinds of schemes. The bacteriological sampling should include both source, storage tank, and domestic points.

6. RECOMMENDATIONS ON REPORT STANDARDS, FORMS AND DOCUMENTATION PRACTICE

6.1 Report Standards

It is recommended that all three laboratories use the report standard from the Ministry of Water and Energy (Appendix a). The reports should be organized in a scheme file system, so it is easy to compare testing results from the same scheme. A copy of each report should be sent to the laboratory in Mbeya and Ubungo for central registration and statistical processing.

6.2 Documentation Practice

Annual reports should be made from each laboratory. The content of such a report should be a detailed going through of the investigations carried out during the latest year and the scope of the coming years' work.

6.3 Proposed Organization

There must obviously be some cooperation between the laboratories, the health authority, and the implementation unit. The laboratories and the health authority should evaluate a specific health problem which could result in necessary actions from the implementation unit, f.ex. cleaning, repair and chlorination. The organisation could be established as mentioned in Ref. 2 Cpt. 5. With respect to bacteriological quality, it is obviously impossible to observe even the Temporary Water Quality Standard when considering surface sources. It is advisable to boil the water before drinking, but considering the status of normal cooking and storage facilities in villages, such an approach is unlikely to be feasible.

App. 1 Analysis report for physical, chemical and bacteriological testing.

App. 2 Programme for the seminar/workshop on bacteriological and chemical testing. Held in Iringa from 13th-15th February 1986.

App. 3 Tools supplied to the instrument maintenance workshop.

App. 4 Equipment delivered to the three regional laboratories.

App. 5 Priced list of necessary equipment and chemicals.

App. 6 Safari report.

References

1. CCKK Draft Report for "Water Quality Surveillance" Nov. 1984.

2. CCKK supplement to Ref. 1, June 1985.

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER AND ENERGY

Telegrams: ....LABORATORY

Telephone: ....

In reply please quote: .....

Laboratory No. ..... Dated .....19.....

PHYSICAL AND CHEMICAL WATER ANALYSIS REPORT

(1) ORIGIN OF THE SAMPLE

Analysis requested by.....Ref. No. .....

Dated.....Date received at the Laboratory.....

Date collected for analysis.....Time.....

Temp.....°C water source.....

Region.....District.....Ward.....

.....Purpose of sampling.....

Sampling position.....

Preservative added/type of treatment to water before sampling.....

.....

(2) PHYSICAL EXAMINATION

Appearance: Colour.....mg Pt/1

Turbidity.....N.T.U. Odour.....

Settleable matter.....Ml/1 pH.....

Taste..... Conductivity at 25°C .....uS/cm.

Total filtrable residue at 105°C.....mg/1 Total Nonfiltrable residue at 105°C.....mg/1

Total volatile and fixed residue at 550°C.....mg/1 .....

(3) CHEMICAL EXAMINATION (In milligrams per litre)

Alkalinity (as $CaCO_3$)	Hardness (as $CaCO_3$).....	Calcium.....
Phenophthalein.....	Carbonate.....	Magnesium.....
Total.....	Non Carbonate.....	Sodium.....
.....	Total.....	Potassium.....

Cadmium.....	Total Nitrogen.....	Chloride.....
Chromium.....	Ammonical Nitrogen.....	Fluoride.....
Copper.....	Organic Nitrogen.....	Permanganate Value
Iron.....	Nitrate Nitrogen.....	(as mg $KMnO_4$/l.....
Lead.....	Nitrite Nitrogen.....	B.O.D.(5 days).....
Manganese.....	Total phosphorus.....	Others.....
Mercury	Ortho-phosphate.....	
Zinc.....	Sulphate.....	

(4) REMARKS

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(5) RECOMMENDATION

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.....

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.....

....

Date *Reporting Officer* *Head of the Laboratory*

P Dem 17870/1-86/Com/2up

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER, ENERGY AND MINERALS

Telegrams .....
Telephone .....
In reply please quote
LABORATORY No.....of .....

SOIL AND WATER LABORATORY,
PROJECT PREPARATION DIVISION,
P. O. Box 35066,
DAR ES SALAAM.

BACTERIOLOGICAL WATER ANALYSIS REPORT

Analysis requested by:.....

Ref. No.....Dated .....

Source:.....

Dated collected for analysis.....Date analysed.....

Lab. No.	Site of Sampling	Total Coliform Bact 100 ml (35°C)	Fecal Coli/ 100 ml (44.50°C)	Residual Chlorine mg/l	Comments

G P Dam 9666/2-78/20m/4up

Date.....

.....
Senior Research Officer

PROGRAMME FOR THE SEMINAR/WORKSHOP ON BACTERIAL AND CHEMICAL TESTING HOLD IN IRINGA FROM 13th - 15th FEBRUARY 1986.

13/2/86	9.oo -	9.15	Introduction
	9.15 -	9.3o	Administration of the laboratory
	9.3o -	lo.3o	Craftmanship in the laboratory
	lo.3o -	11.oo	Break
	11.oo -	14.3o	Microbiology testing
			Introduction to methods and equipment
			Sterilization Procedures
			Training in laboratory
14/2/86	8.oo -	8.3o	Introductions to sampling methods
	8.3o -	lo.3o	Field sampling
	lo.3o -	11.oo	Break
	11.oo -	14.3o	Laboratory work
15/2/86	8.oo -	lo.oo	Final discussion

Participants

Mr. R.A. Materu	-	R.O. MAJI Laboratory Mbeya (In-charge)
Mr. L. Ruratze	-	Tech. MAJI Laborayory Mbeya
Mr. P. Portas	-	Tech. MAJI Laboratory Songea
Mr. I. Bulemela	-	Tech. MAJI Laboratory Iringa
Mr. C. Hamidani	-	Tech. MAJI Laboratory Iringa
Mr. M. Msami	-	Tech. MAJI Laboratory Iringa
Mrs. R. Kalinga	-	Lab. Attendant MAJI Laboratory Iringa
Mr. P.S. Kimario	-	Senior Tech. DANIDA/Ubungo
Mr. K. Andreasen	-	Process Engineer CCKK

16/02-86

DANIDA STEERING UNIT TOOLS FOR INSTRUMENT MAINTAINANCE WORKSHOP.

NO	DESCRIPTION	QUANTITY.
I.	Volt Meter (HC -20I0BZ)	3.
2.	Bosch Electric Drilling Machine	3.
3.	Drill Bit Set Imm-7mm	3.
4.	Adjastable Spanner 0mm-30mm I0"	3.
5.	Adjastable Spanner 0mm-I3mm 4"	I.
6.	Junior Hacksaw	3.
7.	Electrician xmk combination plier.	3.
8.	Water pump Plier.	3.
9.	Cutting Nipper.	3.
I0.	Soldering Iron. 220v 24w.	3.
II.	Adaptor 220v. 4.5-I2v DC.	6.
I2.	Screw Driver II7/I20.	3.
I3.	Screw Driver I05/I00.	3.
I4.	Screw Driver I03/80.	3.
I5.	Philips Screw Driver GR2/I00.	3.
I6.	Philips Screw Driver GRI/80.	I.
I7.	Pholips Screw Driver GR0/60.	I.
I8.	Fuses 5A.	20.
I9.	Banana Plugs Red.(Male).	9.
20.	Banana Plugs Black.(Male).	9.
2I.	Banana Plugs Red. (Female).	9.
22.	Banana Plugs Black. (Female).	9.
23.	Triming Knife Blade.	I.
24.	Tongle Swiech.	6.
25.	Soldering Wire.	3.
26.	Screw/Nuts. 2x20mm.	I2.
27.	Screw/Nuts. 3x20mm.	II.
28.	Adapter Plugs. (Male).	6.
29.	Adapter Plugs. (Female).	6.
30.	Allen Keys. (Setof8Nos).	I.
3I.	Wall Drill Bit. 5/I6".	I.
32.	Wall Plugs.	I6.
33.	Self Tapping Screws.	(Pack) I.
34.	Long Nose Plier.	I.
35.	Bend Nose Twizeer	I.

DANIDA WATER PROJECT

DANISH INTERNATIONAL DEVELOPMENT AGENCY

MAJI LABORATORY - MBEYA

Your ref. Our ref. Date

FOLLOWING ITEMS HAS BEEN DELIVERED FEBRUARY 1986

1. FECAL COLIFORM FIELD KIT XKFC 00100
2. 15 SAMPLE CONTAINERS 100 ML PYREX
3. 300 FILTERS + PETRI DISHES.
4. 300 MEDIA FOR FECAL COLIFORM TEST.
5. 1 MAGNIFIER.
6. INSULATED BOXES + COOLING ELEMENTS.
7. STANDARD METHODS FOR EXAMINATION OF WATER AND WASTE WASTE. 14 ed.
8. 1 HOT PLATE.
9. 1 AUTO CLAVE.

FOR RECIEVING THOSE ITEMS

Rauttera
m.beya Laboratory i/c
14/2/86

DANIDA WATER PROJECT

DANISH INTERNATIONAL DEVELOPMENT AGENCY

MAJI LABORATORY - IRINGA

Your ref. Our ref. Date

FOLLOWING ITEMS HAS BEEN DELIVERED FEBRUARY 1986

1. FECAL COLIFORM FIELD KIT . XKFC 00100
2. 15 SAMPLE CONTAINERS 100 ML PYREX.
3. 300 FILTERS + PETRI DISHES.
4. 300 MEDIA FOR FECAL COLIFORM TEST.
5. 1 POWER SUPPLY 4,5 - R v (6v - 18 v OUTPUT).
6. 1 MAGNIFIED.
7. 5 NOS INSULATED BOXES + COOLING ELEMENTS
8. 1 HOT PLATE
9. 1 OUTOCLAVE

FOR RECIEVING THOSE ITEMS

Hamis

14/2/86

DANIDA WATER PROJECT

DANISH INTERNATIONAL DEVELOPMENT AGENCY

MAJI LABORATORY - SONGEA

Your ref. Our ref. Date

FOLLOWING ITEMS HAS BEEN DELIVERED FEBRUARY 1986

1.	FECAL COLIFORM FIELD KIT.	XKFC 00100
2.	15 SAMPLE CONTRAINERS 100 ML PYREX.	
3.	300 FILTERS + PETRI DISHES.	
4.	300 MEDIA FOR FECAL COLIFORM TEST.	
5.	1 POWER SUPPLY 4,5 - 12v (6 - 18 v output).	
6.	1 MAGNIFIER.	
7.	5 NOS INSULATED BOXES & COLLING ELEMENTS	
8.	1 HOT PLATE	
9.	1 OUTOCLAVE	

FOR RECIEVING THOSE ITEMS

P. Pwela

Tukuyu 14/2/1986

STRUERS A/S
APPARATER OG KEMIKALIER TIL LABORATORIER, UNDERVISNING OG INDUSTRI
Valhøjs Allé 176 · 2610 Rødovre/København · Telefon: 01-70 80 90 · Telex: 19625 · Telefax: 01-41 65 44 · Giro 5 40 14 02 · A/S reg.nr. 55730

A/S I. Krüger
Mars Allé 50

8700 Horsens

13 MRS. 1986

ÅRHUS
Skanderborgvej 277 C, Postboks 2321, 8260 Viby J
Telefon 06-28 34 00

ODENSE
Klokkestøbervej 12, Postboks 777, 5230 Odense M
Telefon 09-15 80 30

Deres ref.	Vor ref.	Dato
Hr. Kjær Andreasen	Sch/ug	12. marts 1986

Idet vi henviser til Deres forespørgsel af 7.3.1986, har vi herved fornøjelsen at tilbyde:

Laboratorieudstyr i henhold til vedlagte specifikationer.

De anførte priser er gældende for ordre modtaget inden 15.6.1986.

Dog må vi indtil betalingsdagen tage forbehold for udsving udover +/- 2% i valutakurserne i forhold til de i dag gældende.

På de anførte priser yder vi Dem 10% rabat.

For sømæssig emballering beregner vi os 5% af totalbeløbet.

Leveringstid : ca. 4-6 uger fra modtagelse af ordre.
Levering : fragtfrit Deres adresse eller speditør i Danmark.

Betaling: Netto kontant

Priser og leveringstid gælder med forbehold for ændringer, som skyldes forhold uden for vor kontrol.

Priserne er *exclusive omsætningsafgift (moms)*. Salgsbetingelser iøvrigt er anført på bagsiden.

Med venlig hilsen
STRUERS

Afdeling: A / Exp.

A/S I. Krüger

12.03.86
Sch/ug

Cat.No.	Quant.	Description	Dkr.ea.	Dkr. total
		PART 1:		
		Chemicals to Iringa for 300 analysis of:		
		Turbidity:		
	1	Formazin Stock Solution 4000 NTU for turbidity standardization 0,5 lt. Cat.No. 2461-11		428,00
		Iron:		
	3	FerroVer Iron Reagent Cat.No. 854-99	119,00	357,00
	1	Iron Standard Solution 100 mg/lt. as Fe 118 ml Cat.No. 14175-14		173,00
	1	RoVer Rust Remover 28 g Cat.No. 300-20		29,90
		Manganese:		
	6	Buffer Powder Pillows, citrate Cat.No. 983-66	116,00	696,00
	3	Pillows Cat.No. 984-99	159,00	477,00
	1	Manganese Standard Solution 1000 mg/lt. as Mn, 118 ml Cat.No. 12791-14		165,00
		Chloride:		
	5	Mercuric Nitrate Standard Solution 0,014 N, 946 ml Cat.No. 285-16	177,00	885,00
	6	Diphenylcarbazone Reagent Powder Pillows. Cat.No. 836-96	205,00	1.230,00
31073704	1	Hydrogen Peroxide 35%, 1 lt.		29,10
		Sulfate:		
	6	SulfaVer 4 Sulfate Reagent Cat.No. 12065-66	91,00	546,00
	1	Sulfate Standard Solution 50 mg/lt. as SO_4, 0,5 lt. Cat.No. 2578-11		230,00

/2

A/S I. Krüger

12.03.86
Sch/ug

Cat.No.	Quant.	Description	Dkr.ea.	Dkr. total
		Nitrate:		
	6	NitraVer 5 Nitrate Reagent Powder Pillows. Cat.No. 14034-66	143,00	858,00
	1	Nitrogen Nitrate Standard Solution 10 mg/l as N, 0,5 lt. Cat.No. 307-11		230,00
		Fluoride:		
	3	SPADNS Reagent, 0,5 lt. Cat.No. 444-11	111,00	333,00
	14	Fluoride Standard Solution 10 mg/lt, 0,5 lt. Cat.No. 359-11	176,00	2.464,00
		Ammonia:		
	3	Nessler Reagent Cat.No. 151-37	25,80	77,40
	1	Ammonia Nitrogen Standard 1 mg/lt., 0,5 lt. Cat.No. 1891-11		230,00
	1	Rochelle Salt Reagent Cat.No. 1725-33		91,00
		Conductivity:		
	2	Standard Solution Sodium Chloride 1 g/lt. as NaCl Cat.No. 2105-14	106,00	212,00
112090-34	3	Burette, 25 ml, Schilling	169,00	507,00
		PART 2		
		Chemicals to Songea for 300 analysis of:		
		Turbidity:		
	1	Formazin Stock Solution 4000 NTU for turbidity standardization 0,5 lt. Cat.No. 2461-11		428,00
		Iron:		
	3	FerroVer Iron Reagent, Cat.No. 854-99	119,00	357,00

A/S I. Krüger.

12.03.86
Sch/ug

Cat.No.	Quant.	Description	Dkr.ea.	Dkr. total
	1	Iron Standard Solution 100 mg/lt. as Fe, 118 ml Cat.No. 14175-14		173,00
	1	RoVer Rust Remover, 28 g Cat.No. 300-20		29,90
		Manganese:		
	6	Buffer Powder Pillows, citrate Cat.No. 983-66	116,00	696,00
	3	Sodium Periodate Powder Pillows Cat.No. 984-99	159,00	477,00
	1	Manganese Standard Solution 1000 mg/lt. as Mn, 118 ml Cat.No.12791-14		165,00
		Chloride:		
	5	Mercuric Nitrate Standard Solution 0,014 N, ; 946 ml Cat.No. 285-16	177,00	885,00
	6	Diphenylcarbazone Reagent Powder Pillows Cat.No. 836-96	205,00	1.230,00
31073704	1	Hydrogen Peroxide 35% 1 lt.		29,10
		Sulfate:		
	6	SulfaVer 4 Sulfate Reagent Cat.No. 12065-66	91,00	546,00
	1	Sulfate Standard Solution 50 mg/lt. as SO_4, 0,5 lt. Cat.No. 2578-11		230,00
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	1	Nitrogen Nitrate Standard Solution 10 mg/lt. as N, 0,5 lt. Cat.No. 307-11		230,00
		Fluoride:		
	3	SPADNS Reagent, 0,5 lt. Cat.No. 444-11	111,00	333,00
	14	Fluoride Standard Solution 10 mg/lt., 0,5 lt. Cat.No. 359-11	176,00	2.464,00

A/S I. Krüger

12.03.86
Sch/ug

Cat.No.	Quant.	Description	Dkr.ea.	Dkr. total
		Ammonia:		
	3	Nessler Reagent Cat.No. 151-37	25,80	77,40
	1	Ammonia Nitrogen Standard 1 mg/lt., 0,5 lt. Cat.No. 1891-11		230,00
	1	Rochelle Salt Reagent Cat.No. 1725-33		91,00
		Conductivity:		
	2	Standard Solution Sodium Chloride 1 g/lt., as NaCl Cat.No. 2105-14	106,00	212,00
112090-34	3	Burette, 25 ml, Schilling	169,00	507,00
		PART 3		
		Chemicals to Mbeya Laboratory:		
		pH:		
	6	x 500 ml Buffer sol. pH 7,00	47,00	282,00
	6	x 500 ml Buffer sol. pH 4,00	47,00	282,00
		Total hardness + Ca		
310487121	1	x 1 kg Eriochrome Black T - Sodium chloride 1:400		195,00
31089602	2	x 1 kg Magnesium sulfate, M 5886	118,00	236,00
31006402	2	x 1 kg Ammonium chloride, M 1145	125,00	250,00
31005902	1	x 2,5 lt. Ammonia solution, M 5432		155,00
31158504	1	x 1 kg Titriplex III, M 8418 (EDTA Disodium salt)		600,00
31110503	3	x 1 kg Sodium hydroxide , M 6498	106,00	318,00
K.9	1	x 1 kg Calconsarbonsyre 0,2% in Sodium chloride		225,00
		Manganese:		
31137002	1	x 2,5 lt. Phosphoric acid, M 573		390,00
31112301	1	x 250 g Sodium oxalate, M 6557		136,00
31110401	1	x 500 g Sodium Bisulfite, Baker 0266		305,00
31073701	4	x 250 ml Hydrogenperoxide, M 7209	77,00	308,00

A/S I. Krüger

12.03.86
Sch/ug

Cat.No.	Quant.	Description	Dkr.ea.	Dkr. total
31082604	1	x 1 kg Potassium Peroxidisulfate, M 5091		182,00
		Iron:		
31074502	1	x 250 g Hydroxylammonium Chloride, M 4616		215,00
31083601	1	x 250 g Potassium Thiocyanate, M 5125		96,00
		Sulphate:		
	1	x 5 lt. Ethanol 96% pure - cannot be offered, referred to Danisco.		
31057407	2	x 1 lt. Glycerol pure	74,00	148,00
		Ammonia:		
31091002	1	x 1 kg Manganese (II) sulfate, M 5963		235,00
31134701	2	x 250 g Phenol, M 206	106,00	212,00
		Nitrate:		
31000402	1	x 2,5 lt. Acetone, M 14		225,00
31106603	1	x 1 kg Sodium Tetraborate, M 6308		125,00
31073101	1	x 100 g Hydrazinium Sulfate, M 4603		68,00
31034401	1	x 250 g Copper (II) sulfate, M 2790		71,00
		Fluoride:		
31108802	1	x 250 g Sodium Fluoride, M 6449		108,00
		Nitrite:		
31303501	1	x 100 g 1-Naphthylammonium Chloride, MSC 820866		205,00
31093415	2	x 5 lt. Methanol pure	61,00	122,00
11235509	1	x 1000 Technicon Sample Cups		81,00
	20	Test tubes 48 ml, Kartell 1384	11,00	220,00
	10	Do., 26 ml, Kartell 1383	7,20	72,00

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A/S I. Krüger

12.03.1986
Sch/ug

Cat.No.	Quant.	Description	Dkr.ea.	Dkr. total
		Variuos Equipment:		
	10	Sample Cells for Hach DREL/4 Cat.No. 13537-00	220,00	2.200,00
	3	Lamps for Hach DREL/4, Cat.No. 11493-33	400,00	1.200,00
	2	Photo Cells for Hach DREL/4 Cat.No. 11496-23	1.320,00	2.640,00
	1	Set of Meter Scales, Cat.No. 12043-00		317,00
	1	Ionselective Electrode for Fluoride incl. ref. electrode (to fit Knick microprocessor pH-meter) cat.No. 152153000		3.500,00
	1	Cable for electrode Cat.No. 10030100		140,00
	1	Ref. electrode Cat.No. 103733145		800,00
	1	Cable for ref. electrode Cat.No. 1004010		80,00
		Spare parts for Köttermann No. 1030		
113512-01	2	Heaters, 1600 Watt, No. 522127	245,00	490,00
113512-15	1	Main switch, No. 524550		33,90
113512-10	1	Excess Temperature Protection No. 515507		36,20
		TOTAL:		Dkr. 38.000,90

STRUERS A/S
APPARATER OG KEMIKALIER TIL LABORATORIER, UNDERVISNING OG INDUSTRI
Valhøjs Allé 176 · 2610 Rødovre/København · Telefon: 01-70 80 90 · Telex: 19625 · Telefax: 01-41 65 44 · Giro 5 40 14 02 · A/S reg.nr. 55730

ÅRHUS
Skanderborgvej 277 C, Postboks 2321, 8260 Viby J
Telefon 06-28 34 00

ODENSE
Klokkestøbervej 12, Postboks 777, 5230 Odense M
Telefon 09-15 80 30

22 APR. 1986

I. Krüger A/S
Att. hr Kjær Andersen
Mars Alle 50
8700 Horsens

Deres ref.	Vor ref.	Dato
	CC/ax	Viby J. den 21. april 1986

Idet vi henviser til aftale med P.E. Madsen, har vi hrved fornøjelsen at tilbyde:

1 stk	Filter, Hach kat. nr. 19296-01 for spektrofotometer. Pris.....	kr.	4.890,00
1 stk	Kalibreringsstandard, Hach kat. nr. 14210-14 Pris.....	kr.	300,00
	Petriskåle af glas, 80x15 mm. Pris pr. stk..... Pris pr. stk. v/10 stk..... Pris pr. stk. v/72 stk.....	kr. kr. kr.	5,10 4,59 4,13
1 stk	Destillationsapparat, Köttermann model 1030 kap. 4 ltr. pr. time, uden forrådsbeholder, 220 volt, 3,2 kW. Pris.....	kr.	5.050,00

Priserne er anført excl. moms. p.t. 22 %.

Leveringstid efter nærmere aftale.
Levering frit Deres adresse.

Betaling: Netto kontant

Priser og leveringstid gælder med forbehold for ændringer, som skyldes forhold uden for vor kontrol.

Priserne er *exclusive omsætningsafgift (moms).* Salgsbetingelser iøvrigt er anført på bagsiden.

Vi håber at modtage Deres ordre.

Med venlig hilsen
STRUERS

Afdeling: A+T

BIRKMARK · SKOVLUNDE Struers 87-85

11 APR. 1986

I. Krüger A/S
Mars Alle 50
8700 Horsens

Att.: Hr. Kjær Andreasen

Tilbud nr. 86529.

8. april 1986
RP/Bip

I forlængelse af telefonsamtale d.d. har vi hermed fornøjelsen at tilbyde følgende:

3 pk. M-FC Broth dehydreret 1/4 lb.
Kat.nr. MB000000F á kr. 350,00 ..... kr. 1.050,00

1 pk. Rosalic Acid, 25 gram.
Kat.nr. MB000000R ..... kr. 340,00

Ovennævnte priser er excl. moms.

Leveringstid: 2 uger.

Leveringsbetingelser: Frit leveret Deres adresse.

Betalingsbetingelser: 30 dage fakturadato.

Tilbudet er gældende til 1. juni 1986.

Med venlig hilsen
MILLIPORE A/S

Rikardt Pedersen

WATER QUALITY LABORATORIES IN IRINGA - MBEYA - SONGEA

SAFAPI REPORT.

The above mentioned water quality laboratories, were visited as from 27/01/86 to 13/02/86. The purpose of the trip was to evaluate the laboratory equipments, chemicals, repair services, calibration of instruments, sampling for bacteriological testing as well as seminar in new techniques to laboratory staff, by the Expartiate from Denmark, assisted by me in maintanance sector.

Instrument maintanance duties were carried out as follow:-

IRINGA W.Q. LABORATORY:-

No.	Description.	Serial No.	Condition.	Remarks.
I:	Hach DR-EL74 Spectophotometer.	327.	Working.	Serviced & Callibrated.
2:	Millipore Incubator.	682/4765.	Working.	Serviced, Callibrated & New bulb installed.
3:	Koterman Distillation Unit.	I030	Working.	Spare Element required.
4:	Dry Oven.	-	Working.	O.KK
5:	Water Demineralisor.	-	Working.	O.K.
6:	4 Plate Hot Oven.	-	Working.	O.K.
7:	Water Bath.	-	Working.	O.K.
8:	Hach Cunductivity meter.	I726I/00.	Working.	Serviced & callibrated.
9:	Hach Cunductivity meter.	-	Diffective.	To be repaired in Denmark.
I0:	Hach DR/I Colorimeter.	I275.	Working.	Serviced & Equiped with Adaptor.
II:	Hach DR/2 Spectophotometer.	3484.	Working.	Serviced & callibrated
I2:	Hach ph Meter.	I727.	Working.	Brought back to Ubungo for storage.
I3:	Hach ph Meter.	I729.	Working.	Serviced & callibrated
I4:	Hach ph Meter.	22I5.	Working.	Serviced & callibrated

COMMENT:-

The above equipments were serviced, and left in top condition for use, together with additional of new equipments. But it should be noted that, if no imediate action, they will be unable to utilize the equipments, as there had been no complition of electricity fittings in the laboratory for more than one year, as well as working benches and cupboards to store the equipments.

(-2-) Cont...

MBEYA V.S. LABORATORYP-

No.	Description.	Serial No.	Condition.	Remarks.
I:	Semi-micro analytical Mettler Balance.	-	Working.	O.K.
2:	Precision electronic Mettler Balance.	-	Working.	O.K.
3:	Spectrophotometer, Bausch and Lumb.	-	Working.	O.K.
4:	Perilius Elmor flame photometer.	-	Working.	One gas regulator brought to Dar for modification, to Tanzania Oxygen
5:	Fisher Centrific Centrifuge.	-	Working.	To supply tubes.
6:	Water Bath.	-	Working.	To supply stand andspare element.
7:	Fisher isotemp oven.	-	Working.	To supply spare ki
8:	Refrigerator- 2I0 litres (2Nos)	-	Working.	O.K.
9:	Hotplates (2Nos)	-	Working.	O.K.
I0:	GCA vacum pump.	-	Working.	O.K.
II:	Fisher isotemp incubator.	-	Working.	O:K.
I2:	Magnetic Stirrer.	-	Working.	O.K.
I3:	Fisher variable speed stirrer.	-	Working.	O.K.
I4:	Fisher incubator I80 litres.	-	Working.	To supply spare kit.
I5:	Tuner Fluormeter.	-	Instruction book missing.	To supply one.
I6:	Knick Mikrozessor ph meter.	-	Working.	To supply thermo-meterfor temp.- from 22°c.
I7:	Autoclave.	-	Working.	O.K.
I8:	Kottorman Distillation.	6	Working.	To Supply heating element.
19:	Hach Cunductity meter. (2Nos)	-	Working.	To supply rechar-gerable batteries
20:	Millipore Incubator, (3Nos).	-	Working.	Serviced & calibr ted. One was with drawn to [redacted]. IRIDGA

(-3-) Cont.....

COMMENT:-

It should be noted from the list of equipment Mbeya W.Q.Laboratory has quite a good number of equipments; but they are missing some parts, as well as instruction manuals to utilize fully their equipments. In this respect an imediate action should be considered. One of the millipore incubator was brought to Iringa W.Q. Laboratory. The Laboratory was also issued with new equipments brought in by the Expartiate.

SONGEA W.Q. LABORATORY:-

No.	Description.	Serial No.	Condition.	Remarks.
I:	Hach DRI Colorimeter.	I273.	Working.	Serviced, calibrated and installed adapter To supply bulbs.
2:	Hach DR-EL/4 Spectophotometer.	306.	Working.	Serviced, calibrated, and supplied with card scales from Iringa Lab.
3:	Milpore Incubator.	682-4765.	Brocken.	Was sent to Ubungo Laboratory for repair.
4:	Milipore Incubator.	-	Broken.	- do-
5:	Milipore Incubator.	-	Working.	Serviced and calibrate
6:	Hach ph Meter.	2I7I.	Working.	Serviced & calibrated. supplied with bateries
7:	Hach portable ph meter.	-	Working.	Serviced & calibrated supplied with battery.
8:	Hach portable cunductivity meter.	-	Working.	Serviced & calibrated. supplied with adapter.
9:	Hach portable cunductivity meter.	-	-do-	-do-
IO:	Hach digital titrator, (3Nos)	-	Working.	O.K.
II:	Hach comperator	-	Working.	To supply test tubes.
I2:	Kotterman Distillation Unit.	-	Working.	To supply fillter, and spare element.

COMMENT:-

This Laboratory is situated in a very dust area, where as; its difficulty to cunduct a clean labs. tests, as well as keeping the equipments clean;,mostly during sunny days. This also applies with the room being too small to accomodate staff as well as working benches and cupboards. Possibly a better place would be of a great use.

By: Pascal S. Kimaro.(Senior Technician.)
DANIDA Steering Unit.
19/02/86