Food and Agriculture Organization of the United Nations

STANDARD OPERATING PROCEDURE FOR SOIL ELECTRICAL CONDUCTIVITY (SOIL/WATER, 1:5)

Gina P. Nilo, Ph.D.
Bergil Bernaldo
Florfina Sanchez
Neil Ivan Baribe
Laboratory Services Division, Bureau of Soils and Water Management, Philippines

Riham Zahalan (General Commission for Scientific Agricultural Research - GCSAR, Syria)
Muhammad Manhal Al-Zoubi (Natural Resources Research Administration - ANRR Syria)

GLOSOLAN training sessions

2021

Laboratory Services Division- Bureau of Soils and Water Management, Philippines

25 Accredited Parameters
2021-2026

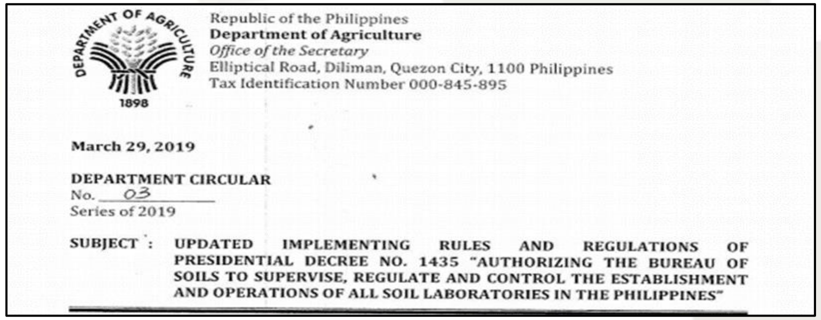
LABORATORY SERVICES DIVISION

ISO/IEC 17025:2017
ACCREDITED
ACCREDITATION OF REFERENCE
NO. PAB-LA-2020-268

PHIL NASOLAN
Philippines National Soil Laboratory Network Est. 2019

SEALNET
SOUTH-EAST ASIA LABORATORY NETWORK

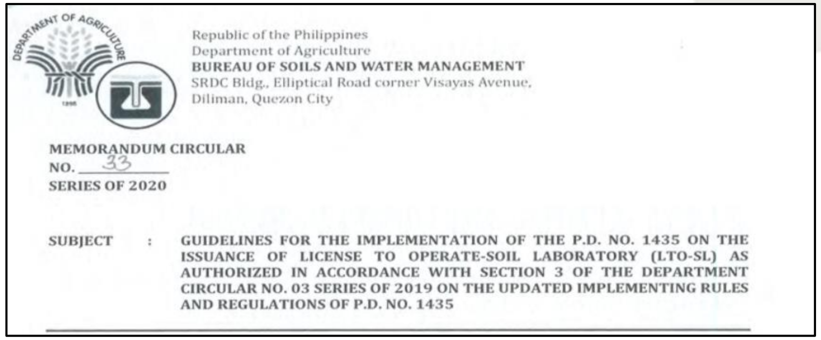
43 laboratories are registered with GLOSOLAN as of December 13, 2021.


Republic of the Philippines
Department of Agriculture
Office of the Secretary
Elliptical Road, Diliman, Quezon City, 1100 Philippines
Tax Identification Number 000-845-895

March 29, 2019

DEPARTMENT CIRCULAR
No. 03
Series of 2019

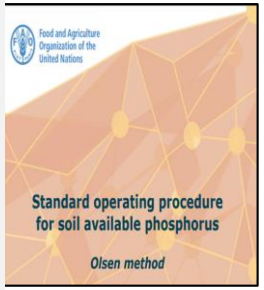
SUBJECT : UPDATED IMPLEMENTING RULES AND REGULATIONS OF PRESIDENTIAL DECREE NO. 1435 "AUTHORIZING THE BUREAU OF SOILS TO SUPERVISE, REGULATE AND CONTROL THE ESTABLISHMENT AND OPERATIONS OF ALL SOIL LABORATORIES IN THE PHILIPPINES"

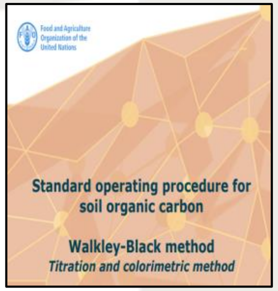

Republic of the Philippines
Department of Agriculture
BUREAU OF SOILS AND WATER MANAGEMENT
SRDC Bldg., Elliptical Road corner Visayas Avenue,
Diliman, Quezon City

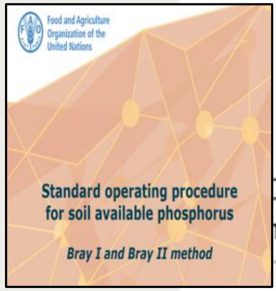
MEMORANDUM CIRCULAR
NO. 33
SERIES OF 2020

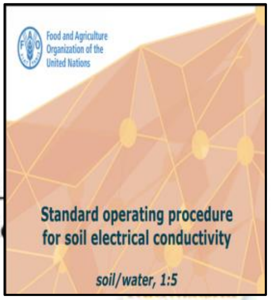
SUBJECT : GUIDELINES FOR THE IMPLEMENTATION OF THE P.D. NO. 1435 ON THE ISSUANCE OF LICENSE TO OPERATE-SOIL LABORATORY (LTO-SL) AS AUTHORIZED IN ACCORDANCE WITH SECTION 3 OF THE DEPARTMENT CIRCULAR NO. 03 SERIES OF 2019 ON THE UPDATED IMPLEMENTING RULES AND REGULATIONS OF P.D. NO. 1435

PRRD okays P523-M nat'l soil health program, boosting food security efforts

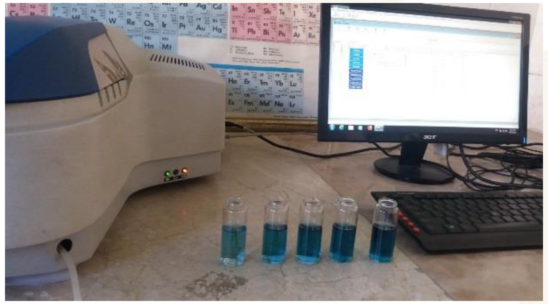








Laboratory of the general commission for scientific agricultural research
Administration of natural resource research
Syria



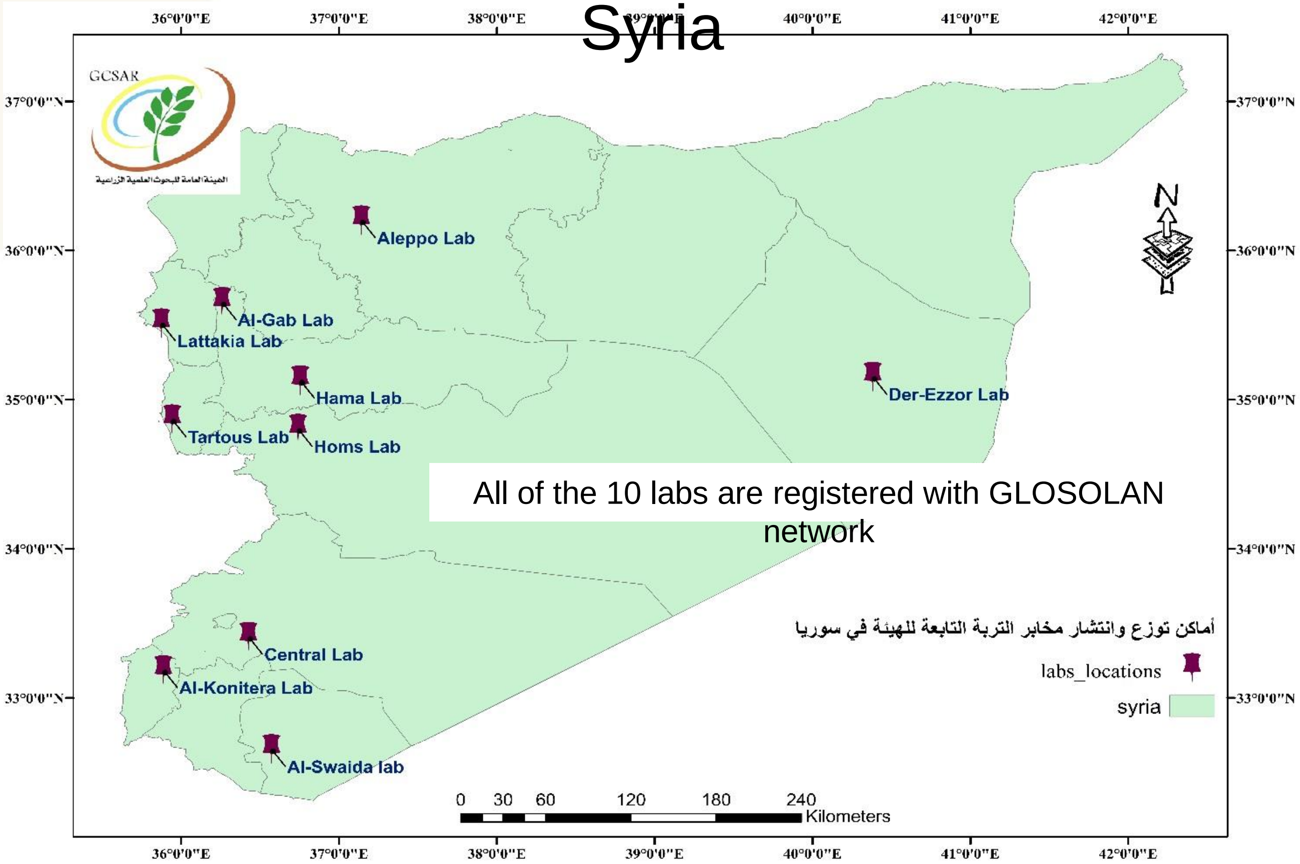
Soil physical analysis

Soil chemical analysis

Water analysis

Plant analysis

Fertilizer analysis



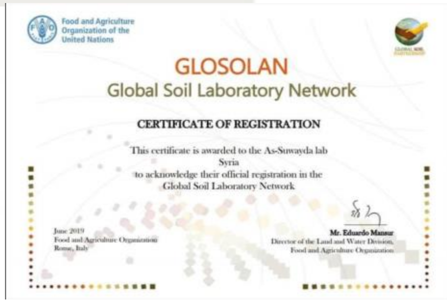
All of the 10 labs are registered with GLOSOLAN network


Food and Agriculture Organization of the United Nations
GLOSOLAN
Global Soil Laboratory Network
CERTIFICATE OF REGISTRATION
This certificate is awarded to the Lab of Alhanadi research station
Syria
to acknowledge their official registration in the
Global Soil Laboratory Network
June 2019
Food and Agriculture Organization
Rome, Italy
Mr. Eduardo Mansur
Director of the Land and Water Division,
Food and Agriculture Organization


Food and Agriculture Organization of the United Nations
GLOSOLAN
Global Soil Laboratory Network
CERTIFICATE OF REGISTRATION
This certificate is awarded to Damascus lab
Syria
to acknowledge their official registration in the
Global Soil Laboratory Network
June 2019
Food and Agriculture Organization
Rome, Italy
Mr. Eduardo Mansur
Director of the Land and Water Division,
Food and Agriculture Organization

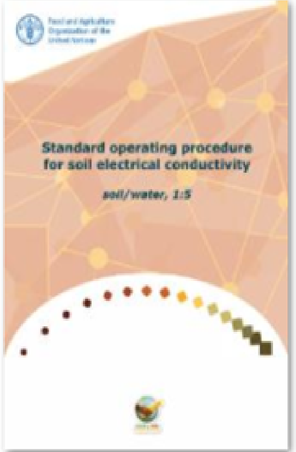

Food and Agriculture Organization of the United Nations
GLOSOLAN
Global Soil Laboratory Network
CERTIFICATE OF REGISTRATION
This certificate is awarded to the Tartous lab
Syria
to acknowledge their official registration in the
Global Soil Laboratory Network
June 2019
Food and Agriculture Organization
Rome, Italy
Mr. Eduardo Mansur
Director of the Land and Water Division,
Food and Agriculture Organization


Food and Agriculture Organization of the United Nations
GLOSOLAN
Global Soil Laboratory Network
CERTIFICATE OF REGISTRATION
This certificate is awarded to the Homs lab
Syria
to acknowledge their official registration in the
Global Soil Laboratory Network
June 2019
Food and Agriculture Organization
Rome, Italy
Mr. Eduardo Mansur
Director of the Land and Water Division,
Food and Agriculture Organization


Food and Agriculture Organization of the United Nations
GLOSOLAN
Global Soil Laboratory Network
CERTIFICATE OF REGISTRATION
This certificate is awarded to the As-Suwayda lab
Syria
to acknowledge their official registration in the
Global Soil Laboratory Network
June 2019
Food and Agriculture Organization
Rome, Italy
Mr. Eduardo Mansur
Director of the Land and Water Division,
Food and Agriculture Organization


Food and Agriculture Organization of the United Nations
GLOSOLAN
Global Soil Laboratory Network
CERTIFICATE OF REGISTRATION
This certificate is awarded to the Aleppo lab
Syria
to acknowledge their official registration in the
Global Soil Laboratory Network
June 2019
Food and Agriculture Organization
Rome, Italy
Mr. Eduardo Mansur
Director of the Land and Water Division,
Food and Agriculture Organization

Standard operating procedure for soil electrical conductivity (soil/water, 1:5)



Download:

Year of publication: 2021
Place of publication: Rome, Italy
Pages: #17 p.
Author: FAO
Publisher: FAO
Agrovoc: soil salinity; electrical conductivity; measurement; soil management

Abstract:
This method determines the electrical conductivity (EC) of a soil/water suspension in the ratio of one:five (1:5). Aqueous extracts of soil samples are usually made at higher than normal water content for routine characterization purposes, as obtaining soil samples at typical field water contents are not very practical.

Considering that the amounts of various solutes are influenced by the soil/water ratio at which the extract is made, the soil:water ratio should be standardized to obtain results that can be applied and reasonably interpreted.

Last updated 24/03/2021

Cite this content as:
FAO. 2021. *Standard operating procedure for soil electrical conductivity, soil/water, 1:5*. Rome.

Also Available in:
Arabic

GLOSOLAN
training sessions
2021

GLOBAL SOIL PARTNERSHIP

Content

1. Brief Introduction to soil electrical conductivity (EC)
2. Scope and field of application
3. Principles
4. Apparatus
5. Materials
6. Health and safety
    6.1 Personnel safety
    6.2 Chemical hazard
7. Sample Preparation

Content

Content

1. Introduction

1. Introduction

The levels of soluble salts found in the soil solution can be classified by **EC** of the solution or soil solution can be assayed for its elemental content.

Figure 1. Small bud growing in spring in different stages. *Retrieved in: Electrical Conductivity: The Pulse of the Soil | EcoFarming Daily*

1. Introduction

High soluble salt concentration in soil decreases plant growth due to reverse osmosis.

Figure 1. Small bud growing in spring in different stages. Retrieved in: *Electrical Conductivity: The Pulse of the Soil | EcoFarming Daily*

1. Introduction

High soluble salt content are usually found in low-rainfall areas and where sea water intrusion occurs.

Figure 1. Small bud growing in spring in different stages. *Retrieved in:* Electrical Conductivity: The Pulse of the Soil | EcoFarming Daily

2. Scope and Field of Application

2. Scope and Field of Application

This method presents common measurement of soil electrical conductivity (EC) of a soil/water suspension in the ratio of 1:5.

It also standardizes the results obtained and can be reasonably interpreted.

Figure 2. Scientists. Retrieved in: [Admin – Page 3 – Integrated Chemists of the Philippines (icp.org.ph)]

3. Principle

3. Principle

EC is a measurement of amount of electrical current a material can carry and is generally related to total solute concentration of the sample but is also affected by mobility, valence, and relative concentrations of the individual ions present in the solution.

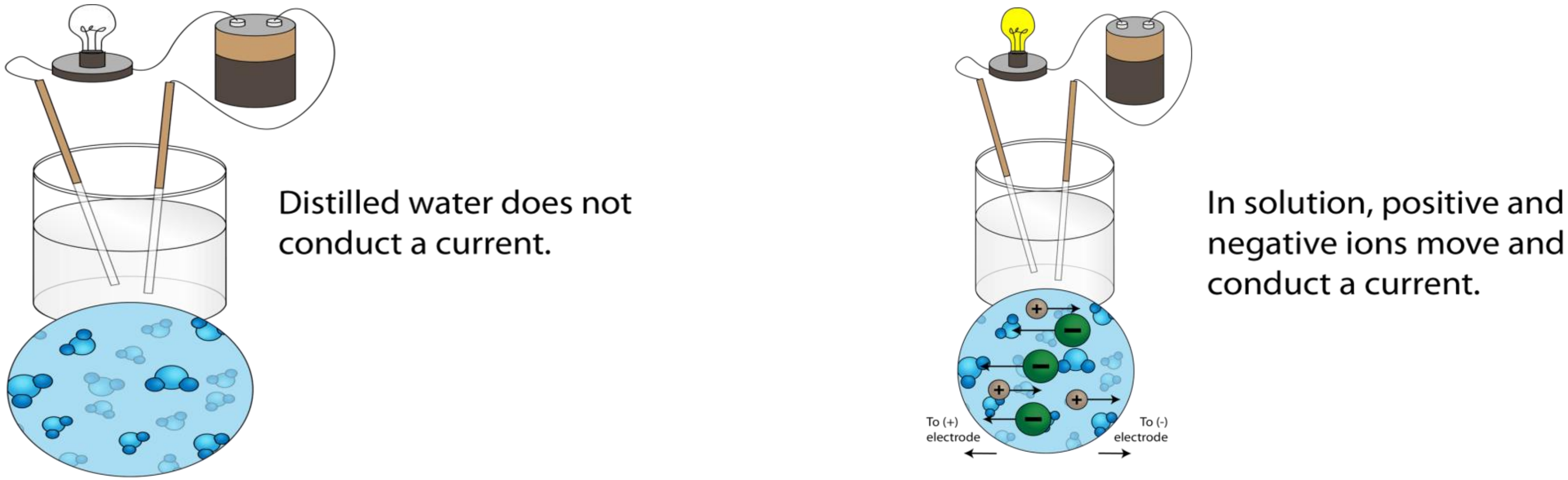


Figure 3. Ionic compound Sodium Chloride in water. Retrieved in: [Ionic compound Sodium chloride Electrical conductivity Water, water, glass, chemistry, material png | PNGWing]()

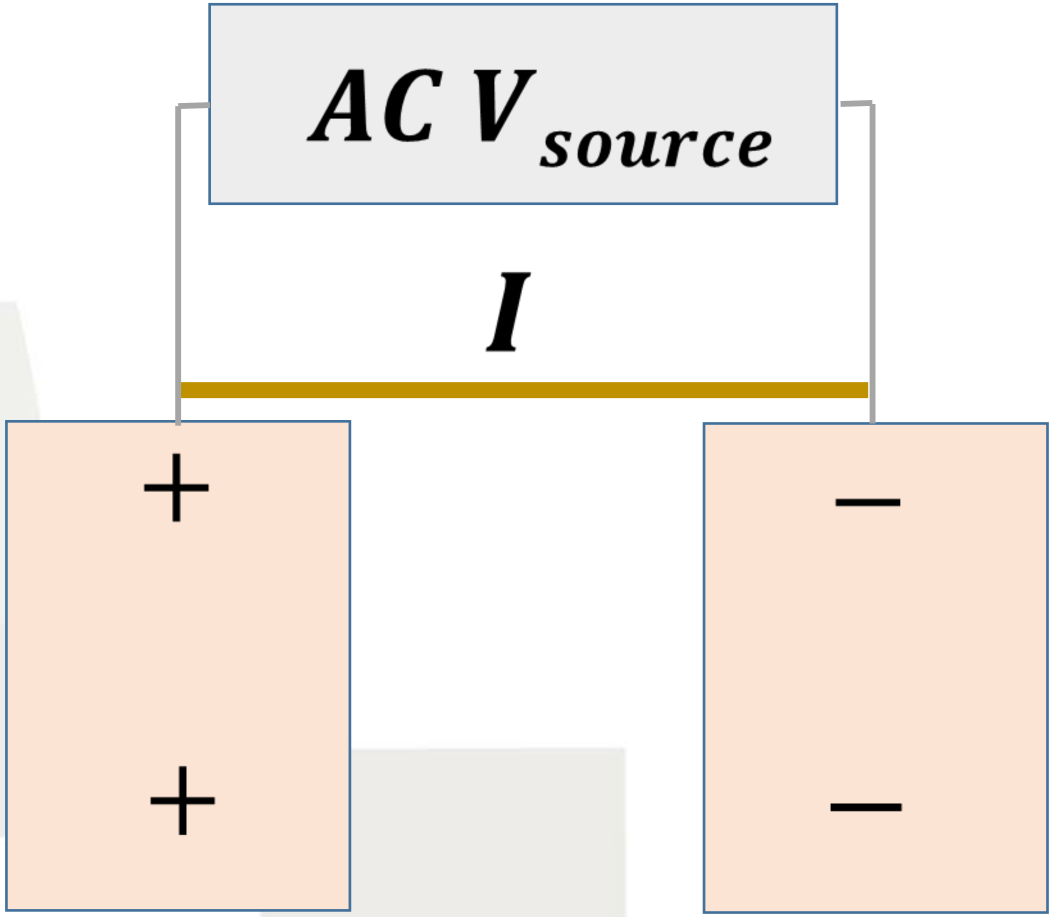
3. Principle

The determination of EC involves the physical measurement of resistance. The reciprocal of resistance is conductance.

Where;

$$R = VI^{-1}$$

V = Voltage
I = Current
R = Resistance



3. Principle

$$R = \rho K$$

Where;

K = Cell constant
ρ = Specific Resistance
R= Resistance

Figure 4. EC meter. Retrieved in: *Eutech CON 2700 Meter Conductivity/TDS/Temp With 4-Cell Conductivity Probe (CONSEN9201D), Integral Electrode Holder & 100/240 VAC Adapter, RS232 cable - Trafalgar Scientific Ltd* .

3. Principle

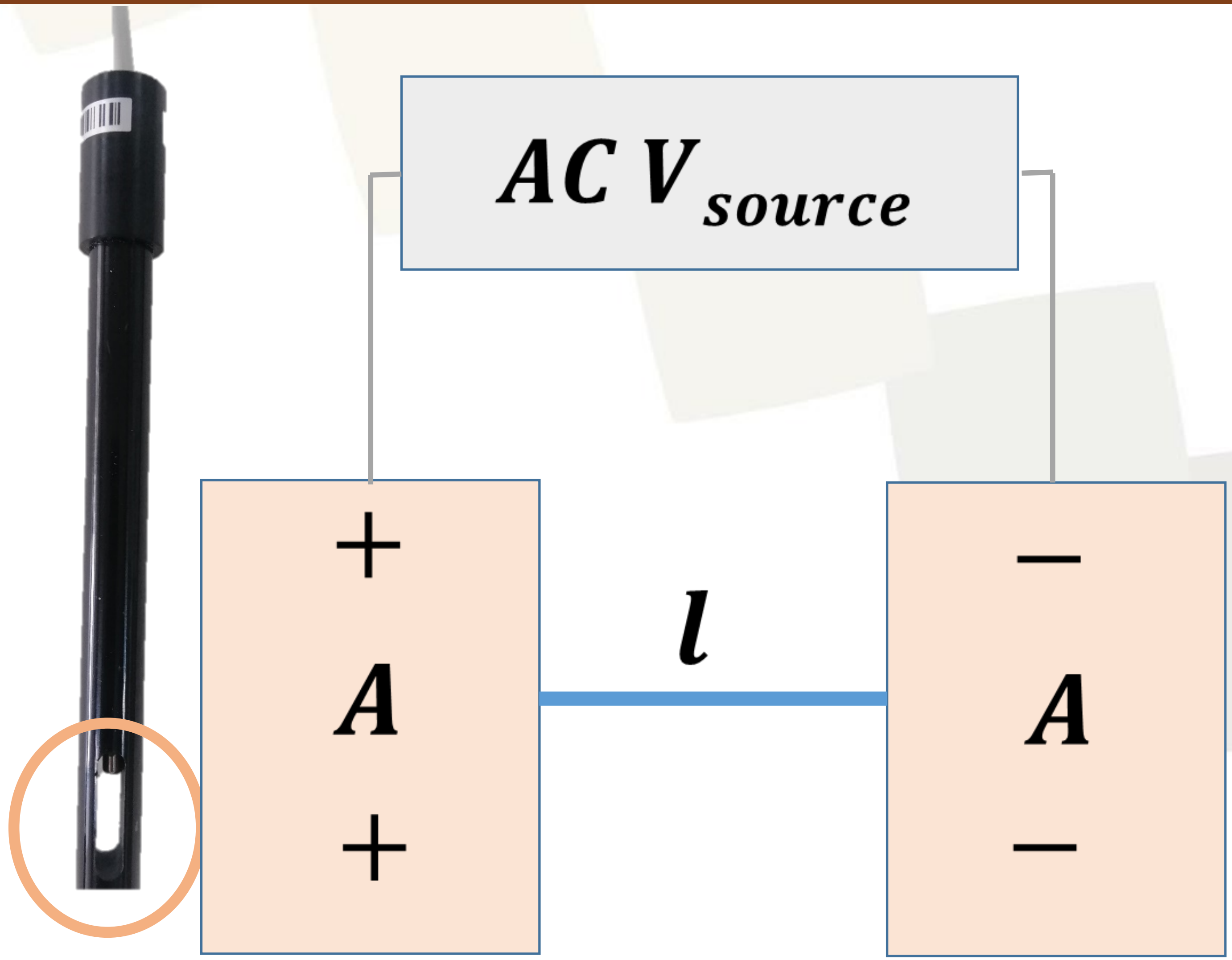
$$\rho = RK^{-1}$$

Where;

K = Cell constant
ρ = Specific Resistance
R= Resistance

Figure 4. EC meter. Retrieved in: *Eutech CON 2700 Meter Conductivity/TDS/Temp With 4-Cell Conductivity Probe (CONSEN9201D), Integral Electrode Holder & 100/240 VAC Adapter, RS232 cable - Trafalgar Scientific Ltd* .

3. Principle



$$K = lA^{-1}$$

Where;

K = Cell constant
l = distance
A = Surface area

3. Principle

$$\sigma = \rho^{-1}$$

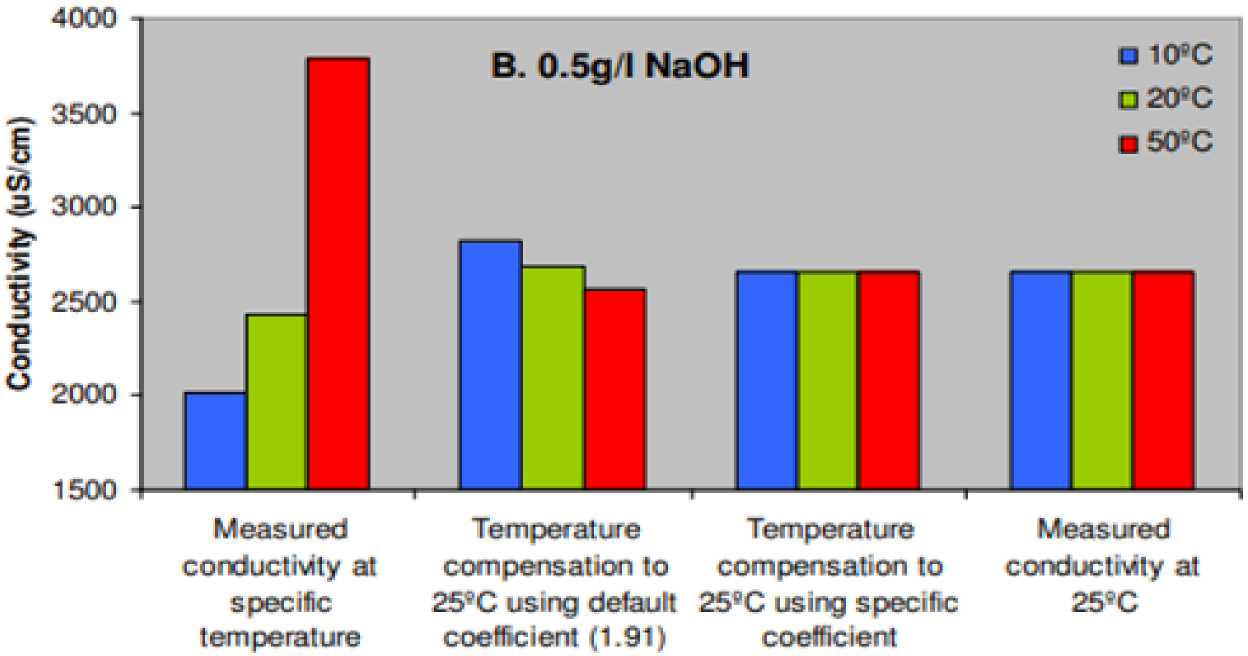
Where;

ρ = Specific Resistance
σ = Specific Conductance

Figure 4. EC meter. Retrieved in: *Eutech CON 2700 Meter Conductivity/TDS/Temp With 4-Cell Conductivity Probe (CONSEN9201D), Integral Electrode Holder & 100/240 VAC Adapter, RS232 cable - Trafalgar Scientific Ltd* .

3. Principle

EC (specific conductance) increases with temperature. Ideally, 25 °C is the temperature of measurement but EC can also be determined at other known temperatures using appropriate temperature coefficients.



0.5g/l NaOH	% Error using default coefficient	% Error using specific coefficient
10ºC	6.72	0.00
20ºC	1.58	0.00
50ºC	3.40	0.00

Figure 5. Effect of temperature on conductivity. Retrieved in: Microsoft Word - A02-001A Effect of temperture on conductivity.doc (jenway.com)

Table 2. Percent error at each temperature as a result of using a linear default temperature coefficient compared to a specific temperature coefficient. Retrieved in: Microsoft Word - A02-001A Effect of temperture on conductivity.doc (jenway.com)

3. Principle

EC (specific conductance) increases with temperature. Ideally, 25 °C is the temperature of measurement but EC can also be determined at other known temperatures using appropriate temperature coefficients.

The EC determination is often sufficient to diagnose, survey, and monitory soil salinity and assess the capability of leaching and drainage system.

4. Apparatus

4. Apparatus

ANALYTICAL BALANCE
0.0001g Precision

RECIPROCATING SHAKER

Conductivity meter
With automatic temperature compensator at 25 ±0.1 °C

Figure 6. Analytical Balance. Retrieved in: [OHAUS | Pioneer™ Analytical Analytical Balance PX124].

Figure 7. Digital Reciprocating Shaker. Retrieved in: [E6003 Mid Range Digital Reciprocal Shaker from Eberbach | Lab.Equipment]

Figure 8. EC meter without arm. Retrieved in: *[EC meter Con2700_without_arm_b.jpg (400×440) (eutechinst.com)]*

4. Apparatus

Polyethylene bottles with lid, wide-mouth type, 250 mL capacity

Beaker, 250 mL, 500 mL, 1 L.

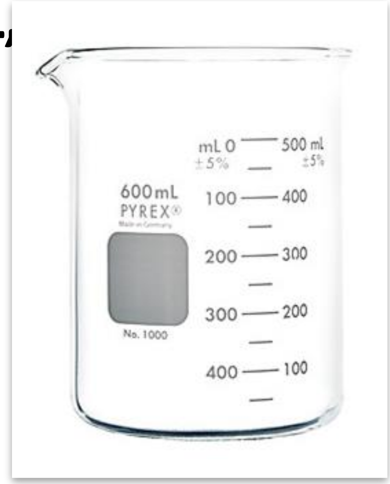


Figure 9. 250 mL Polyethylene Wide Mouth Bottles with Caps. Retrieved in: 250 mL Polyethylene Wide Mouth Bottles with Caps PerkinElmer

Figure 10. Beaker. Retrieved in: PYREX® Griffin Low-Form Beakers (thomassci.com)

4. Apparatus

Graduated Cylinder, 50 mL or 100 mL

Calibrated Dispenser, 50 mL or 100 mL

Figure 11. 100 mL Graduated Cylinder. Retrieved in: [100 ml Graduated Measuring Cylinder, ASTM, Class A, Single - M2 Sci]

Figure 12. Bottle-Top Dispenser. Retrieved in: [Slamed Bottle-Top Dispenser D6 (10-100 ml), Slamed Cat.No. 8.6. - Ratiolab]

5. Materials

5. Materials

Deionized Water

EC < 0.001 dS/m (ASTM D1193-91 and ISO 3696: 1987)

KCl Solution (NIST traceable or equivalent): 0.084, 0.147, 1.413, and 12.880 (for higher EC reading) dS/m at 25 °C.

Alternatively, to prepare the reagent (0.01M potassium chloride solution), dry a small quantity of AR-grade potassium chloride at 60 °C for 2 hours. Weigh 0.7456 g of it, dissolve it in freshly prepared deionized/distilled water, and make the volume up to 1 L. This solution gives an EC of 1 411.8 × 10-3 , i.e. 1.412 dS m-1 at 25 °C. Other standards can be prepared by factoring out from this method. For best results, select a conductivity standard (KCl solution) close to the sample value.

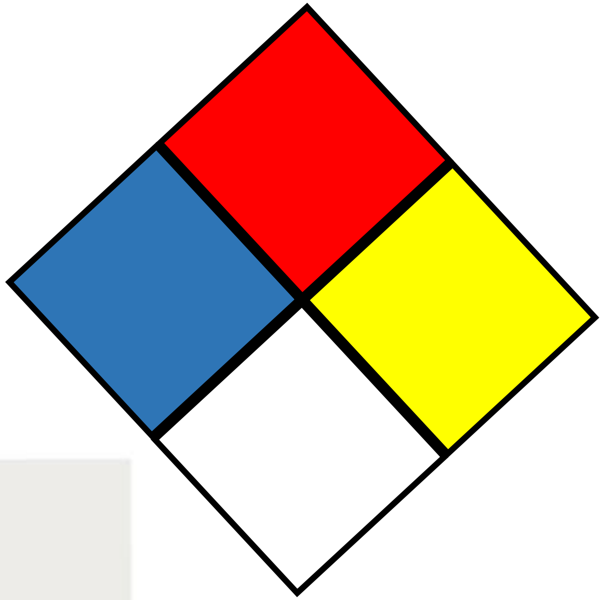
6. Health and Safety

6. Health and Safety

This procedure involves the use of hazardous chemicals. Refer to the laboratory safety guidelines or the Safety Data Sheet (SDS) before proceeding.

1. **Personnel Safety**

2. **Chemical Hazard**



6. Health and Safety

Personnel Safety

- Laboratory coat
- Closed shoes
- Gas or dust mask
- Appropriate gloves
- Safety glasses

Figure 13. Scientist with PPE. Retrieved in: [Vector Illustration of a Scientist with Surgical Mask and Latex Gloves As Protection Against a Health Emergency Stock Vector - Illustration of laboratory, disposable: 179836467 (dreamstime.com)]

6. Health and Safety

Personnel Safety

Wash hands and clean exposed areas with mild soap and running water after using all chemical reagents.

Figure 13. Scientist with PPE. Retrieved in: *Vector Illustration of a Scientist with Surgical Mask and Latex Gloves As Protection Against a Health Emergency Stock Vector - Illustration of laboratory, disposable: 179836467 (dreamstime.com)*

6. Health and Safety

Chemical Hazard

Potassium Chloride

- Eye and skin irritant
- Store KCl away from oxidizing agents, strong acids and bases, and with bromine trifluoride.

Figure 14. Potassium Chloride. Retrieved in: [Potassium chloride for analysis EMSURE® | 7447-40-7 (sigmaaldrich.com)]

7. Sample Preparation

7. Sample Preparation

1 Air dry, or dry in an air forced oven below 35(±5 °C)

2 Grind and sieve to ≤ 2.0 mm size

Figure 15. Soil before air drying. Retrieved in: *Soil before Air drying. Soil nitrate testing supports nitrogen management in irrigated annual crops.* *https://doi.org/10.3733/ca.2016a0027*

Figure 16. Soil after grinding and sieving. Retrieved in: Soil after grinding and sieving. The Influence of Microbiology on Soil Aggregation Stability. DOI:10.1088/1757-899X/870/1/012110.

8. Procedure (GLOSOLAN SOP-07, 2021)

8. Procedure (GLOSOLAN SOP-07, 2021)

A. CALIBRATION OF CONDUCTIVITY METER

B. ELECTRICAL CONDUCTIVITY DETERMINATION

C. CALCULATION

8.1 Calibration of conductivity meter (Determination of the cell constant)

1. Calibrate according to instrument instructions using NIST or equivalent traceable 0.147 dS/m or higher concentration of KCl solution.

2. Rinse the conductivity cell with deionized or distilled water.

8.2 Electrical Conductivity Determination

1. Weigh 20 g of air-dry soil into a 250 ml capacity polyethylene bottle.

2. Add 100 mL deionized or distilled water (1:5 w/v) to the container, cover with bottle caps and place horizontally in the reciprocating shaker. shake for 60 mins. at 180 osc/min.

3. After shaking, remove from the shaker and stand for 30 mins.

8.2 Electrical Conductivity Determination

4 Dip the conductivity cell in the supernatant without disturbing the sediment. take the reading when stable.

5 Rinse the probe with deionized/ distilled water thoroughly and blot up the excess water.

6 Report EC (dS/m) at 25 °c.

9. Computation

9. Computation

$$1\ uS\ cm^{-1} = \frac{1\ \cancel{uS}}{\cancel{cm}}\ x\ \frac{1\ dS}{100000\ \cancel{uS}}\ x\ \frac{100\ \cancel{cm}}{1\ m} = 0.001\ dS\ m^{-1}$$

10. Remarks

The sample **may** be **scaled down** but always keep the w/v-ratio on **1:5**.

Note: Scaling down of w/v ratio should be supported by your own method verification data.

Figure 17 250 mL Polyethylene Wide Mouth Bottles with Caps. Retrieved in: 250 mL Polyethylene Wide Mouth Bottles with Caps PerkinElmer

10. Remarks

The sample must be done at **room temperature** between **20** and **25 °C**.

Figure 18. Digital Thermometer Retrieved in: [Portable digital thermometer / hygrometer with high precision, temperature and hygrometer for room temperature control, room air control, climate – Buildiro]

10. Remarks

Rinse the probe thoroughly after measurement before proceeding to the next sample.

Figure 19. Wash Bottle. Retrieved in: Cole-Parmer Essentials PL-W500-PE Narrow-Mouth LDPE/PP Wash Bottles, 500 mL (16 oz); from Cole-Parmer (coleparmer.com)

Figure 20. Water droplet. Retrieved in: Water droplet illustration, Drop Bubble Transparency and translucency, Beautiful water drops, blue, water Glass png | PNGEgg

11. Quality Assurance/ Quality Control

11. Quality Assurance/ Quality Control

11.1 Accuracy Test

Participate in **Interlaboratory Proficiency Testing Program** at least **once a year** with PT **z-score** less than **2**. If not, identify root cause, and perform the **correction** and develop a **corrective action plan** to address the problem.

Quality Assurance/ Quality Control

11.1 Accuracy Test

Perform **replicate** analyses of the check reference method. Compare the results of your own laboratory with the results of other laboratories, as provided in the performance analysis report or certified reference material certificate. Results from your own laboratory is considered **accurate** when it falls within the reported **95 % confidence interval** or the target value.

11.2 Precision test

Perform **duplicate** of 10% of the samples in a test batch. Calculate the **Relative Percent Difference (RPD)** to determine if the precision of duplicate analyses is within specification.

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} \times 100$$

where,

RPD = Relative Percent Difference (as percentage)

$|X_1 - X_2|$ = Absolute value (always positive) of $X_1 - X_2$

X_1 = Original sample

X_2 = Duplicate sample

Quality Assurance/ Quality Control

11.3 Control Chart

Analyze at least a **duplicate** of the quality control material or check sample for every batch analysis. **Plot** the result in the control chart. **Monitor** for **out of specified limits**. If out of specified limit is observed, **identify** the **root cause**, perform the correction and develop a corrective action plan, and address the problem.

12. References

ASTM International 2018. ASTM D1193 – 06: Standard specification for reagent water. https://www.astm.org/Standards/D1193.htm

Estefan, G., R. Sommer and J. Ryan. 2013. Methods of soil, plant, and water analysis. A manual for the West Asia and North Africa region.

International Organization for Standardization. 2018. Water for analytical laboratory use – Specification and test methods (ISO Standard No. 3696:1987). https://www.iso.org/standard/9169.html

J. Benton Jones, Jr. 2001. Laboratory Guide For Conducting Soil Test and Plant Analysis

Motsara, M. R. and R. N., Roy. 2008. Guide to laboratory establishment for plant nutrient analysis (Vol. 19). Rome: Food and Agriculture Organization of the United Nations.

Rayment, G.E. and F.R. Higginson. 1992. Australian laboratory handbook of soil and water chemicals methods. Australian soil and land survey handbook. Inkata Press, Melbourne, Sydney. p. 330.

Richards, L.A., Ed. 1969. Diagnosis and Improvement of Saline and Alkali Soils, U.S.D.A. Agricultural Handbook Number 60, U.S. Government Printing Office, Washington, D.C

Rhoades, J.D. 1996. Salinity: Electrical Conductivity and Total Dissolved Solids In D.L. Sparks (Ed.-inChief), Soil Science Society of America, Book Series 5. Methods of Soil Analysis Part 3, Chemical Methods. Madison, Wisconsin: Soil Science Society of America, Inc.

Shaw, R.J. 1999. Soil salinity — electrical conductivity and chloride, in K.I. Peverill, L.A. Sparrow, and D.J. Reuter, Eds., Soil Analysis: An Interpretation Manual, CSIRO Publishing, Collingwood, Australia, 129–145.

The effect of temperature on conductivity measurement. A02-001A. Jenway. Retrieved in http://www.jenway.com/adminimages/A02_001A_Effect_of_temperature_on_conductivity.pdf.

Tokudome, Shoichi. 1981. Methods of Soil Analysis in the Laboratory for Soil Survey

13. Modified Method for Heavy Clay Soil Sample

Presented by: Riham Zahalan

GLOSOLAN
training sessions
2021

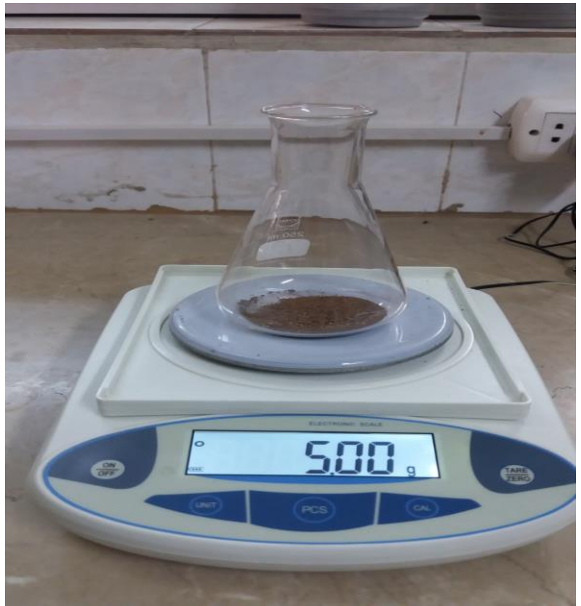
GLOBAL SOIL PARTNERSHIP

1 Weigh 20 g of air-dry soil into a 250 ml capacity polyethylene bottle.

20 g is the best amount for adequate soil solution

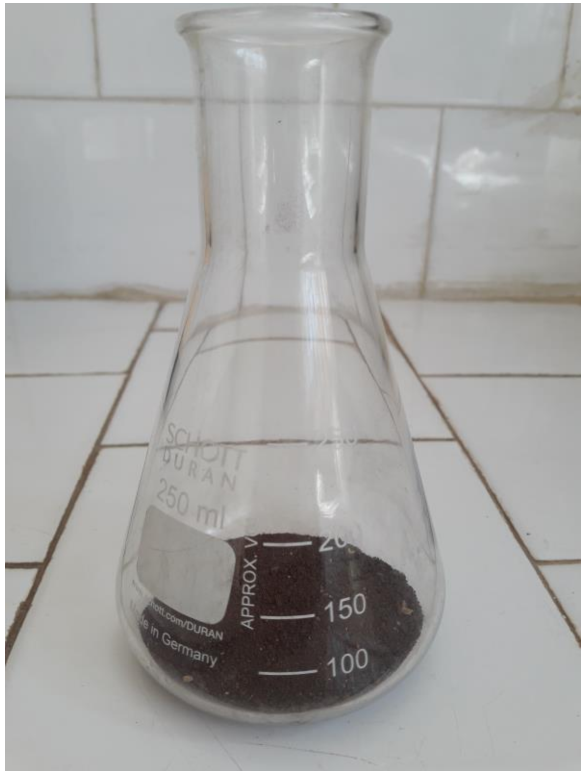
The sample **may** be **scaled down** but always keep the w/v-ratio on **1:5**.

Note: Scaling down of w/v ratio should be supported by your own method verification data.



2 Add 100 mL deionized or distilled water (1:5 w/v) to the container cover with bottle caps and place horizontally in the reciprocating shaker. shake for 60 mins. at 180 osc/min.

1



2

3

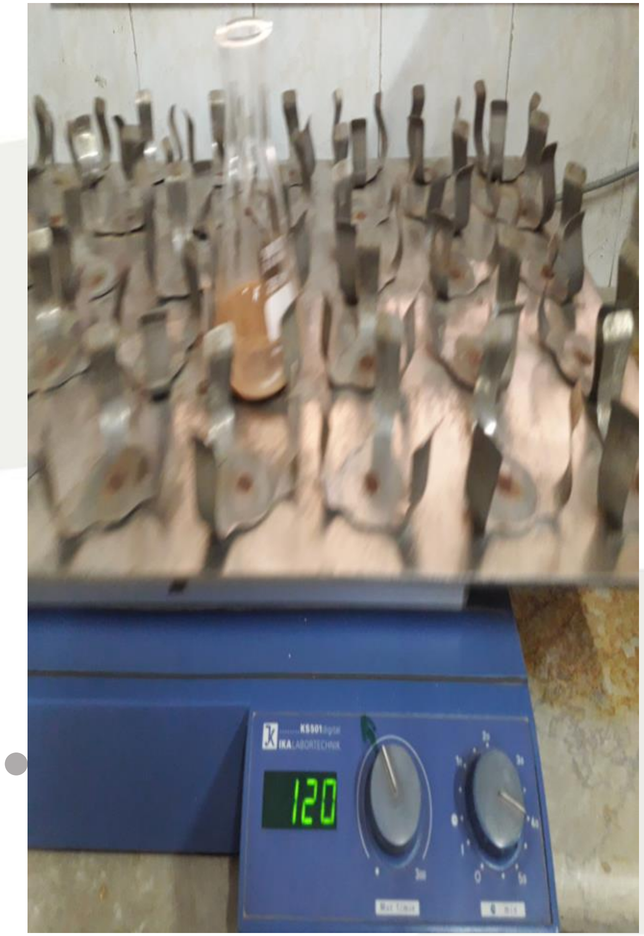
4

3 cover with bottle caps and place horizontally in the reciprocating shaker. shake for 60 mins. at 180 osc/min.

1

2

3



4

3 After shaking, remove from the shaker and stand for 30 min.

4 Dip the conductivity cell in the supernatant without disturbing the sediment. take the reading when stable.

30 min

- The finer the soil , the slower the process Because fine soil particles may need from 1 to 2 hours to settle down.

- The smaller the soil amount , the faster the process.

Heavy clay soil sample , with 58% of clay

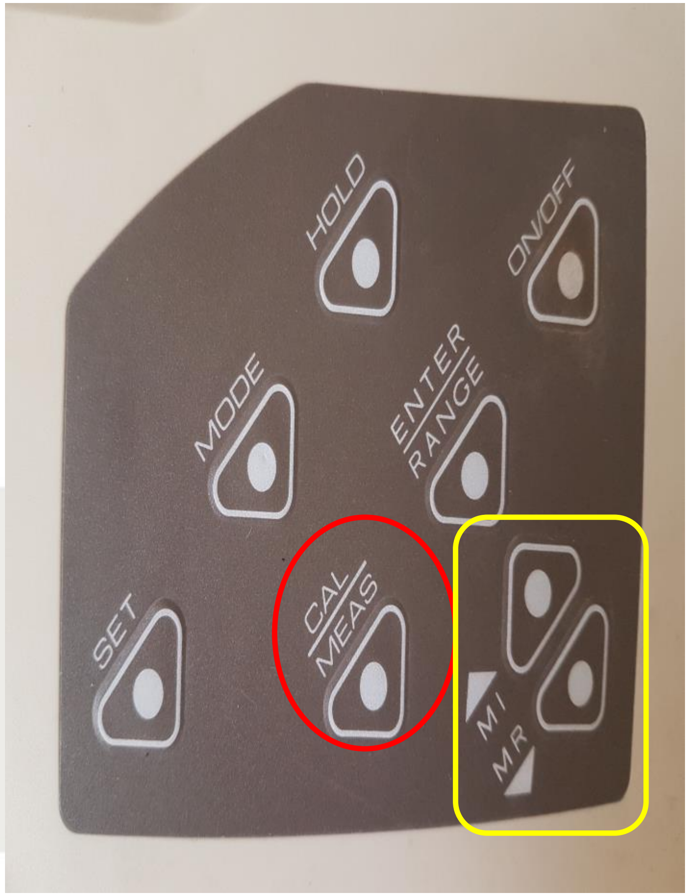
After 5 min

After 15 min

Perfect and clear soil extract , ready to be use

Calibration of conductivity meter (Determination of the cell constant)

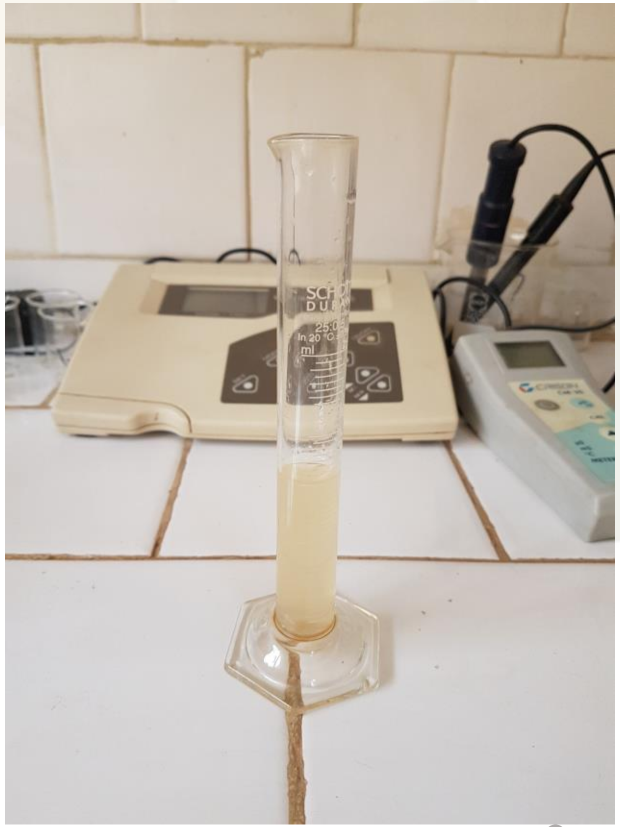
1 Calibrate according to instrument instructions using NIST or equivalent traceable 0.147 dS/m or higher concentration of KCl solution.



Complete the volume to 1 l

4 Dip the conductivity cell in the supernatant without disturbing the sediment. take the reading when stable.

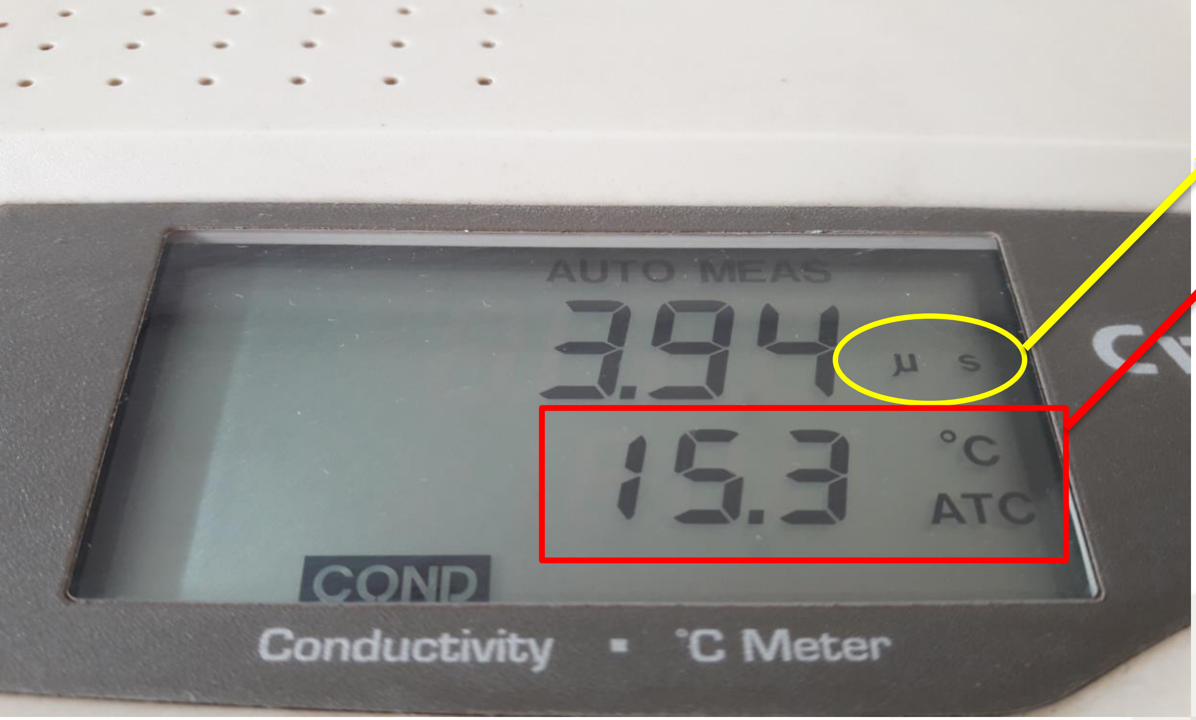
Electrode in distilled water



Clear soil solution 1:5

Turn on the EC meter

Dip the electrode in the solution



1- Notice the unite of measurement

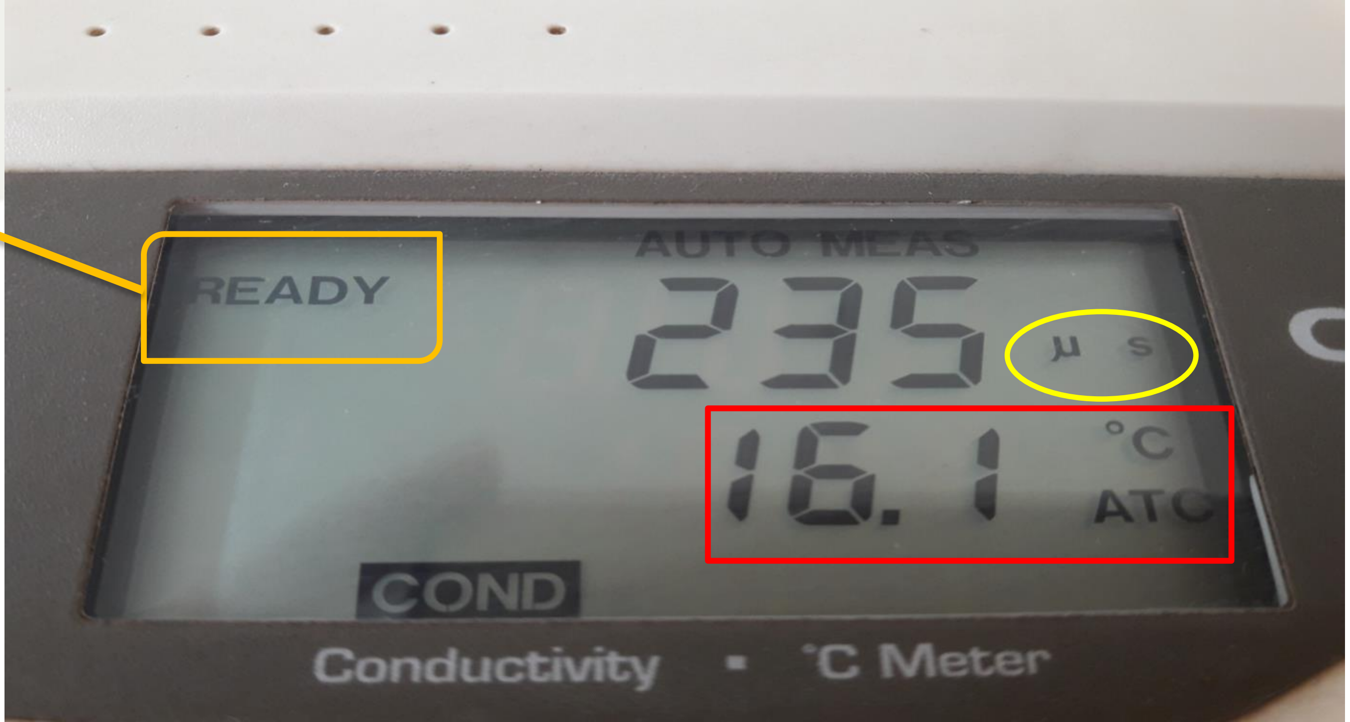
2- Notice the temperature at measuring time

- Electrical conductivity increases at approximately 1.9 % per degree centigrade increase in temperature
- EC meter is standardized and results expressed at a reference temperature for purposes of comparison and accurate salinity interpretations.
- The commonly used reference temperature is 25 °C.

3- wait for the reading to stable , you will know from the word ready that appears on the screen.

4- write down : the EC value , the unit , the temperature

5- Go for EC value correction



5

Rinse the electrode with deionized/ distilled water thoroughly and blot up the excess water.

6 Report EC (dS/m) at 25 °c.

Computation

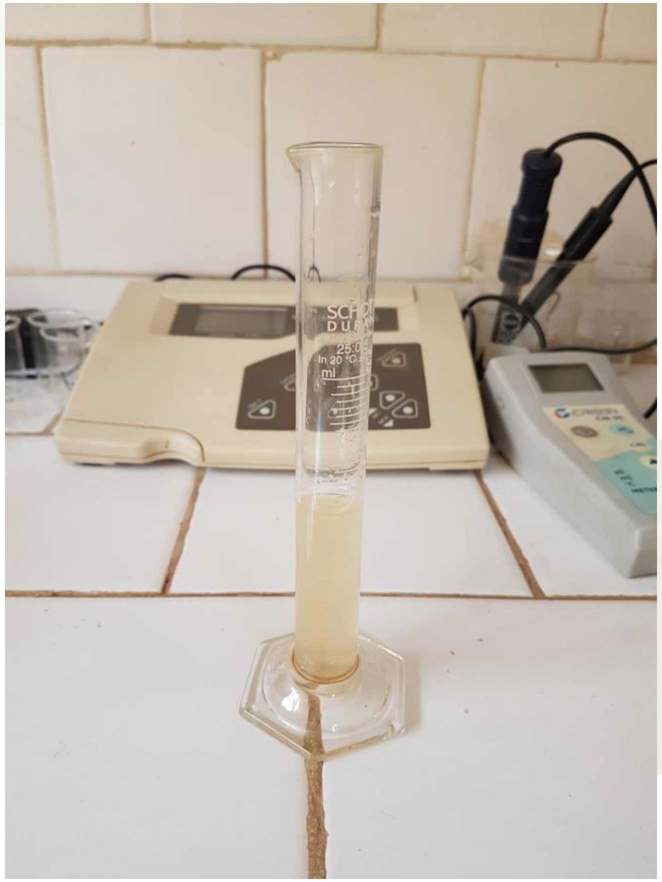
Computation

$$1\ uS\ cm^{-1} = \frac{1\ \cancel{uS}}{\cancel{cm}}\ x\ \frac{1\ dS}{100000\ \cancel{uS}}\ x\ \frac{100\ \cancel{cm}}{1\ m} = 0.001\ dS\ m^{-1}$$

From/to	dS/m	mS/m	µS/m	mS/cm	µS/cm	TDI mg/L	Meq/L
dS/m	1	100	100,000	1	1,000	667	10
mS/m	0.01	1	1,000	0.01	10	6.7	0.1
µS/m	0.00001	0.001	1	0.00001	0.01	0.0067	0.0001
mS/cm	1	100	100,000	1	1,000	667	10
µS/cm	0.001	0.1	100	0.001	1	0.67	0.01
TDI mg/L	0.0015	0.15	150	0.0015	1.5	1	0.015
Meq/L	0.1	10	10,000	0.1	100	66.7	1

TDI total dissolved ions (note conversion is approx and based on the composition of seawater), *Meq/L* milliequivalent per Liter

14. Common mistakes



- Reasons:
- Needs more time to settle down/ fine texture soils
- Misuse of filtration paper
- Wrong Type of filtration paper

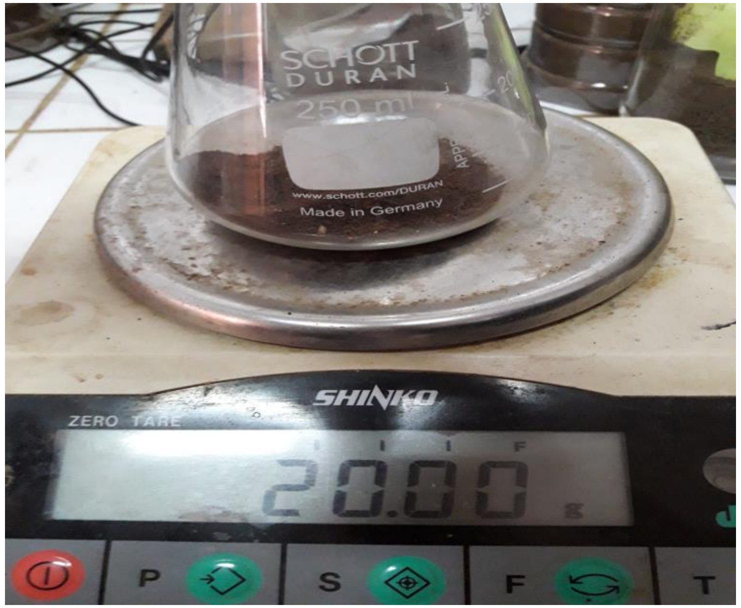
Solution:

- Re- Filtration.
- Waite longer

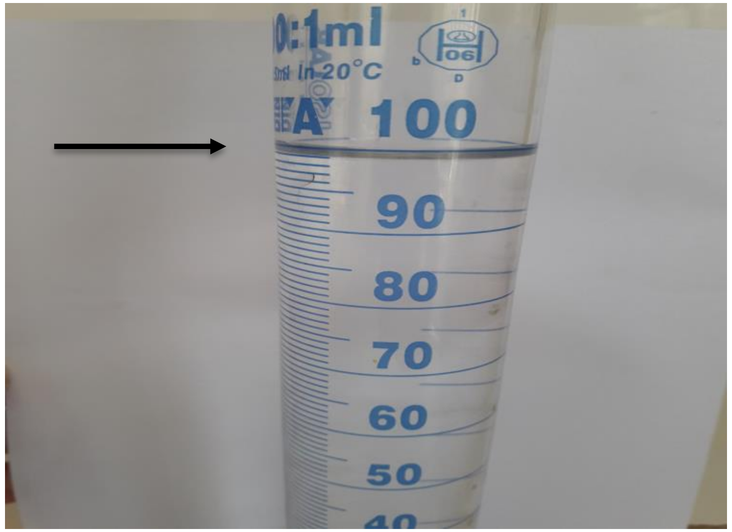
GLOSOLAN training sessions 2021

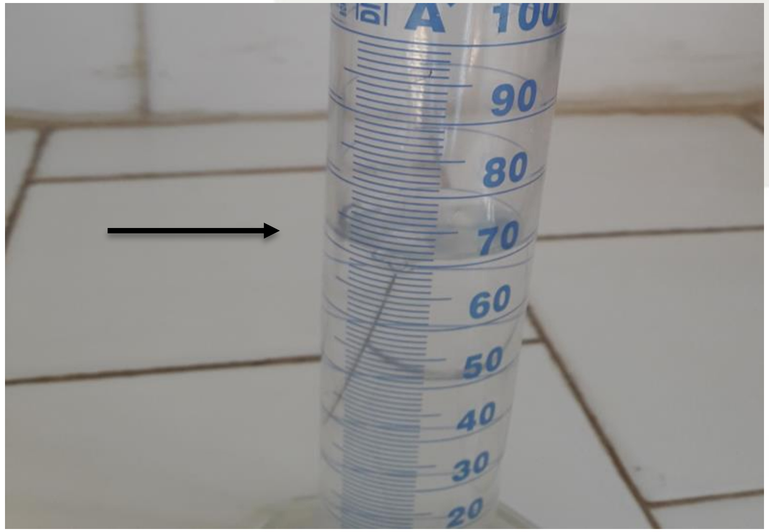
GLOBAL SOIL PARTNERSHIP

Precise and accuracy in weight : especially when you scale down the sample weight



Precise and accuracy in added water volume





A soil extract 1: 5

5 g soil 25 ml distilled water

10 g soil 50 ml distilled water

15 g soil 75 ml distilled water

20 g soil 100 ml distilled water

Errors related to measuring procedure

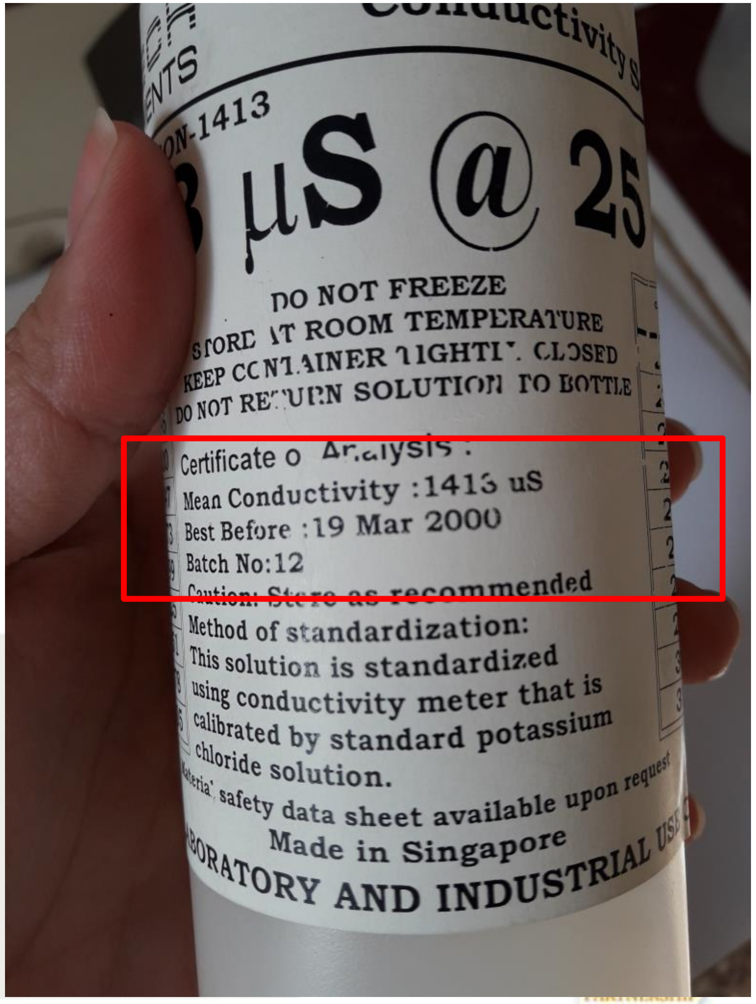
Units

Temperature

The mode

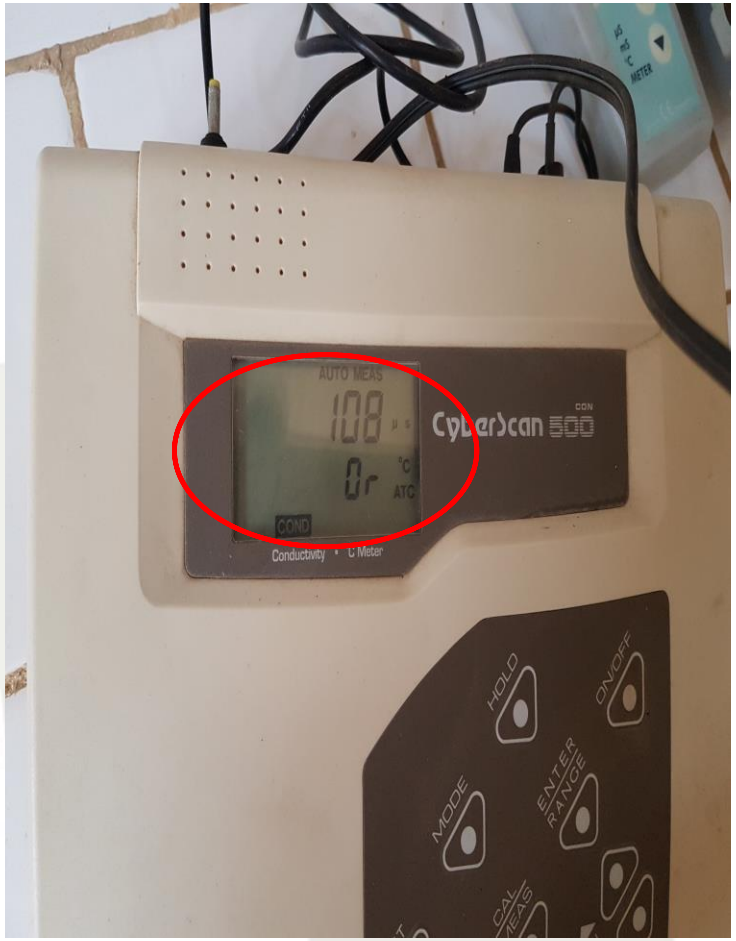
Calibration Check

Standard EC solution expired date

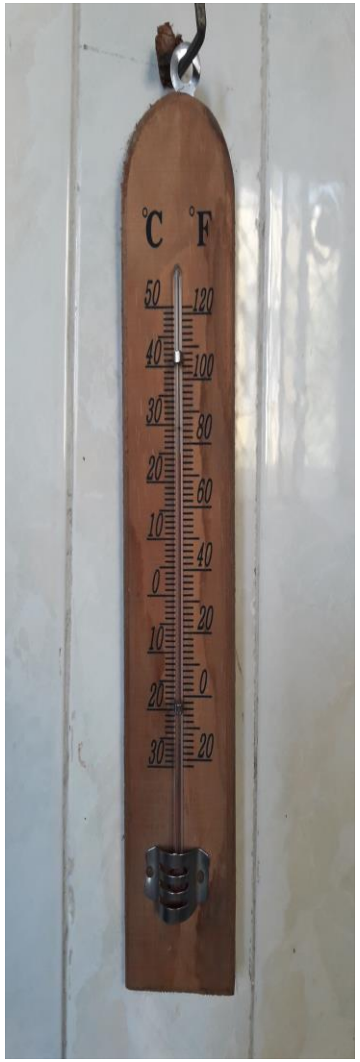


Temperature = 25 C°

Temperature < 25 C°



Temperature ≠ 0 C°



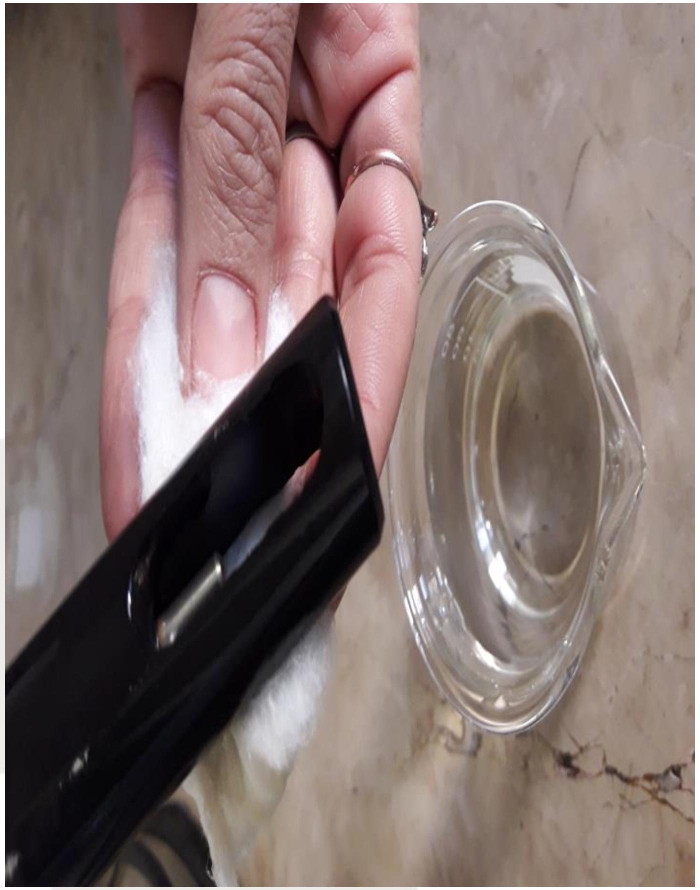
Small beaker / not suitable

Electrode should be immersed

Old/ not suitable electrode

Use/clean it gently

Fiber remains



15. Conclusion

Presented by: Muhammad Manhal Al-Zoubi

Why soil EC

- Soil salinity is a basic that to a large extent, determines soil suitability for agricultural productivity. The problem of soil salinity has increased especially in arid and semi-arid region.
- According to FAO sources more than 800 million ha of land are salt affected (6% of the world's total land area), covering a range of soils defined as saline, saline-sodic and sodic. Furthermore, almost 20% of 230 million hectars of irrigated land are salinized in a certain degree.
- Adequate knowledge of the amount and distribution of salt is required for the management of saline soils.
- The standard method is: Saturated Paste – Ece:

(Time consuming , requires trained and skilled technician and Tedious)

When to use soil extract instead of soil saturated paste?

We usually use one of the soil extract options according to several factors that include :

- The absence of necessary equipment used to conduct a saturated past like the electrical pump.
- Inadequate amount of soil sample (we need at least 200 g of soil to do the saturated past.
- Large number of soil samples with shortage of time , materials or trained technicians.
- Soils with specific conditions like: salt affected soil (highly affected) or soils with high content of fine particles.

Which of them is more accurate? → Soil saturated paste

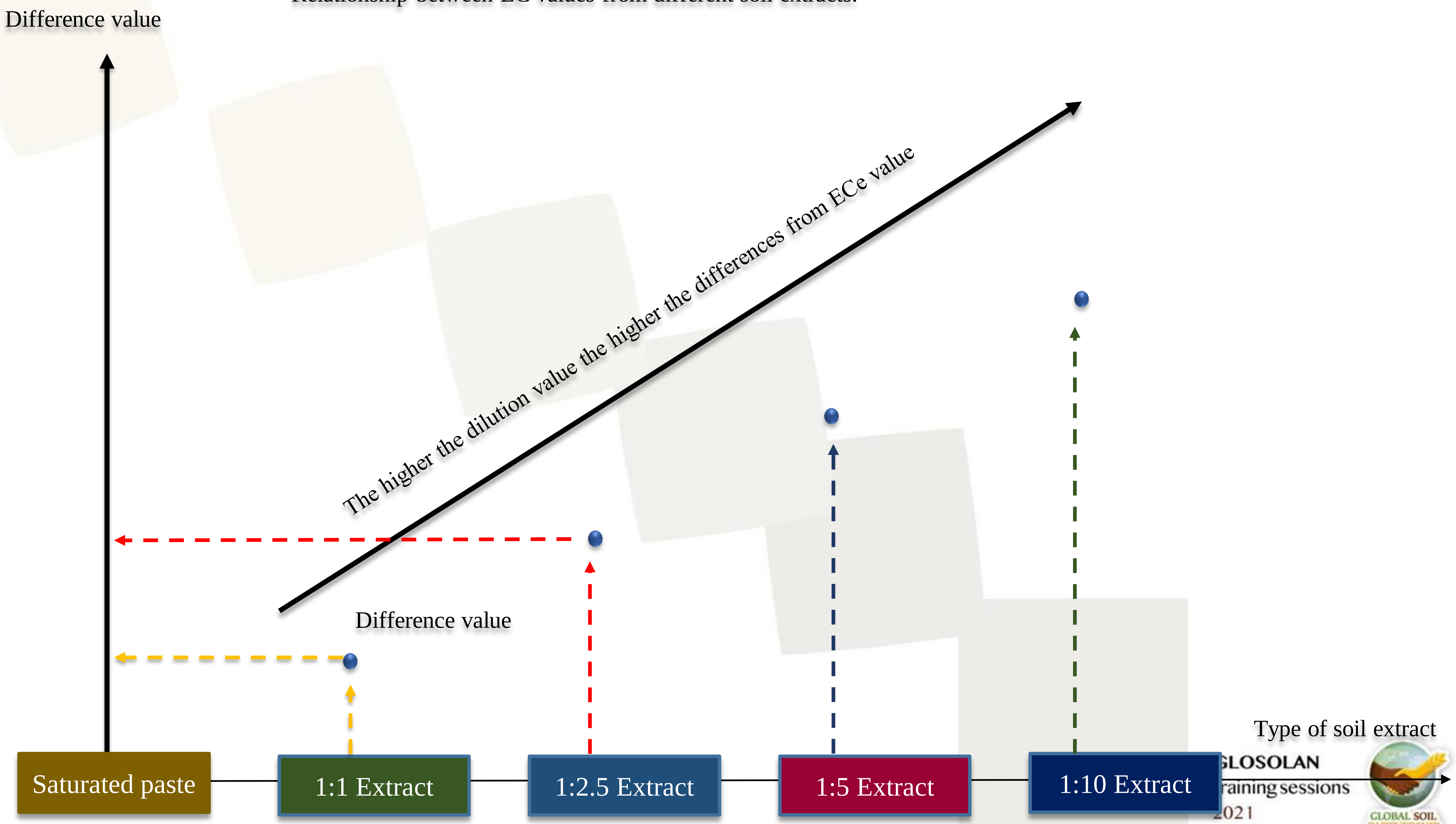
Because it represents the reality of soil conditions within soil profile and around the root system.

solution

Finding a relationship between ECe from saturated paste and the values obtained from the used soil extract (1:1 – 1:2.5 – 1:5 – 1:10)

ECe= f (EC 1:1)
ECe= K(EC1:5)

Relationship between EC values from different soil extracts.



Example:

Several values of F coefficient were reported in researches studied the relationship between ECe and EC1:1 , EC1:5. like results of Kargas *et al*., 2018 who found the equations :

ECe= 1.83×EC 1:1 – 0.117	R^2= 0.973
ECe= 6.53×EC 1:5 – 0.108	R^2= 0.931

F coefficient values vary according to:

- ✓ Dilution percentage 1:1 ,1:2.5 or 1:5
- ✓ Soil type and soil clay content (Saturated Percentage %)
- ✓ Soil physiochemical characteristics
- ✓ Number of used samples to find the equation
- ✓ Range of EC values in the used samples.

Thank you and God Bless us all

Riham Zahalan: rihamzah7@gmail.com
Muhammad Manhal Al-Zoubi: manhalzo@yahoo.com
Gina Nilo: ginapnilo@gmail.com
Bergil Bernaldo: bergil.bernaldo@gmail.com
Florfina Sanchez: popzsanchez@yahoo.com
Neil Ivan Baribe: baribeneilivan@gmail.com