Food and Agriculture Organization of the United Nations

5th Meeting of the
Near East and North African Laboratory Network
(NENALAB)

26 February 2025

Quality control (QC)

Why it is essential…

NENALAB
NEAR EAST AND NORTH AFRICAN SOIL LABORATORY NETWORK

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GLOSOLAN steering committee

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IRD
Institut de Recherche pour le Développement
FRANCE

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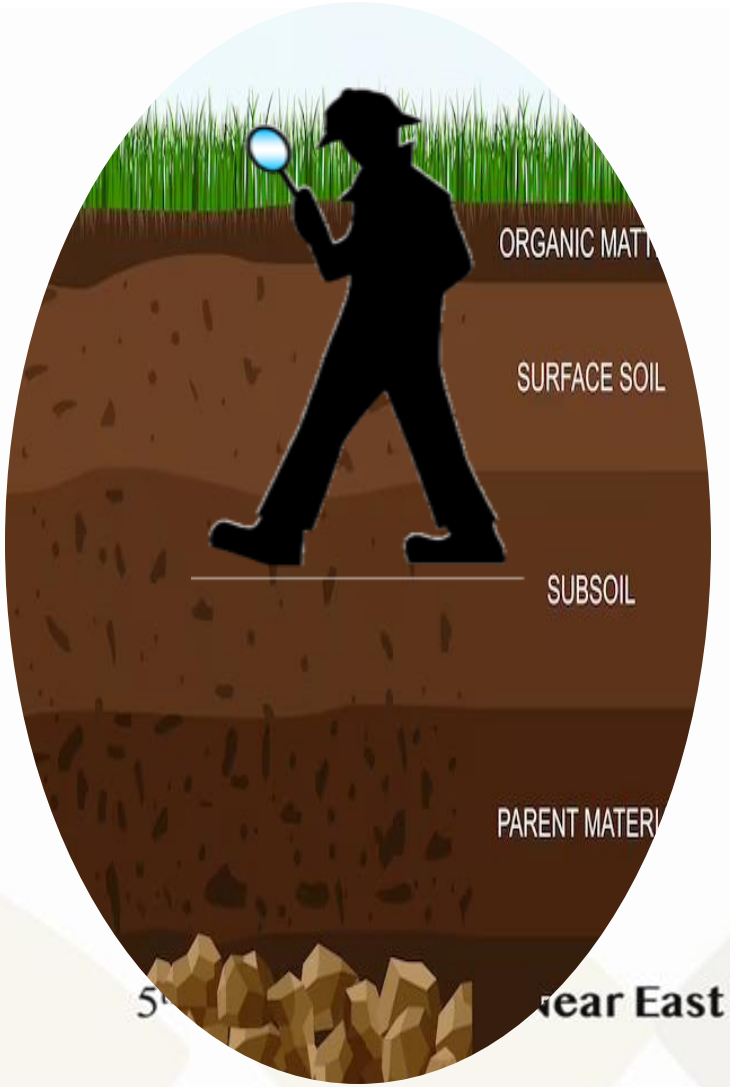
GLOBAL SOIL PARTNERSHIP

the soil is a black box !



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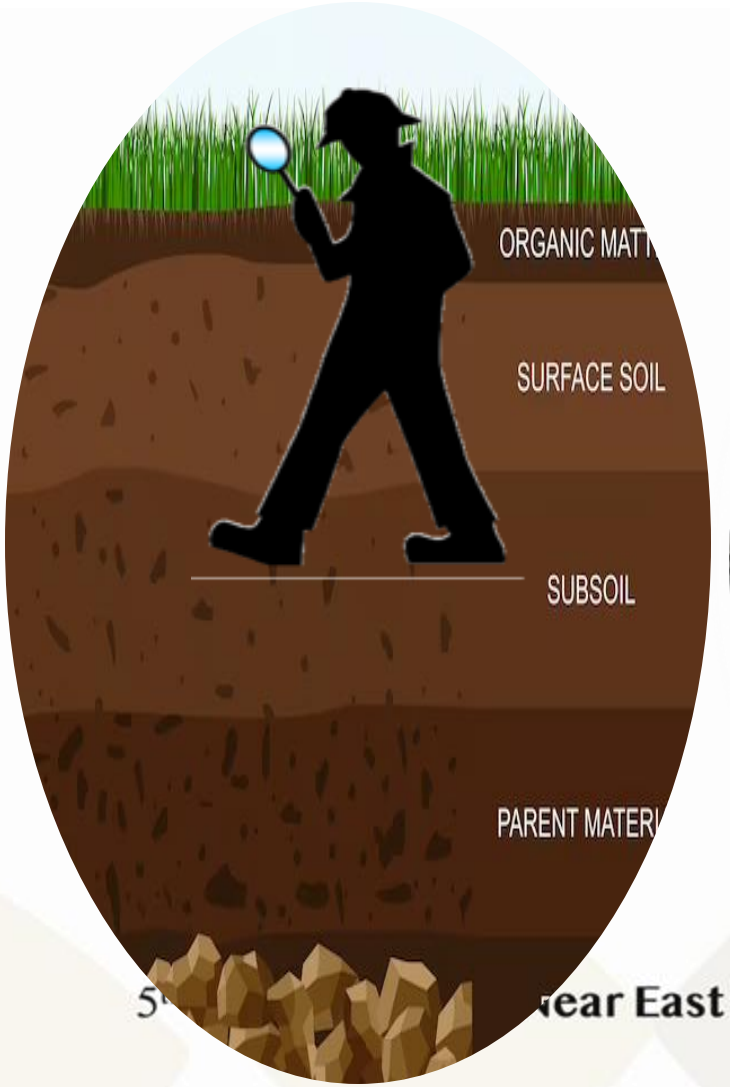

knowledge about soils needs laboratory data

When a CLIENT send a soil sample to soil laboratories,

he/she expects **to get the same results** :

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1. **If analysed several times in a single lab,**

When a CLIENT send a soil sample to soil laboratories,

he/she expects **to get the same results** :

1. If analysed **several times in a single lab,**
2. If analysed **by different labs…**

GLOSOLAN's question:

What is the situation in the 'real' life ?

REPEATABILITY?

(inside a SINGLE laboratory)

REPRODUCIBILITY?

(between DIFFERENT laboratories)

Exemple of C analysis

3 methods:

Walkley & Black (sulfochromic oxydation)

Dumas (dry combustion)

Loss of ignition

Exemple of C analysis

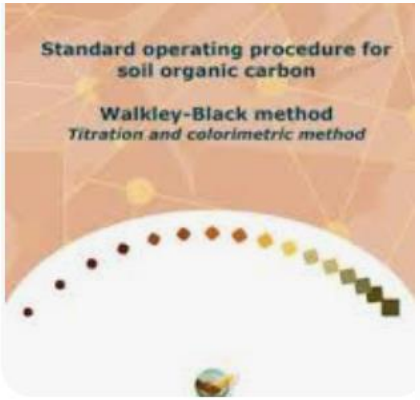
3 methods:

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

SOP

Walkley & Black *(sulfochromic oxydation)*

Dumas *(dry combustion)*



no SOP !

Loss of ignition (450-550°C)

Exemple of C analysis

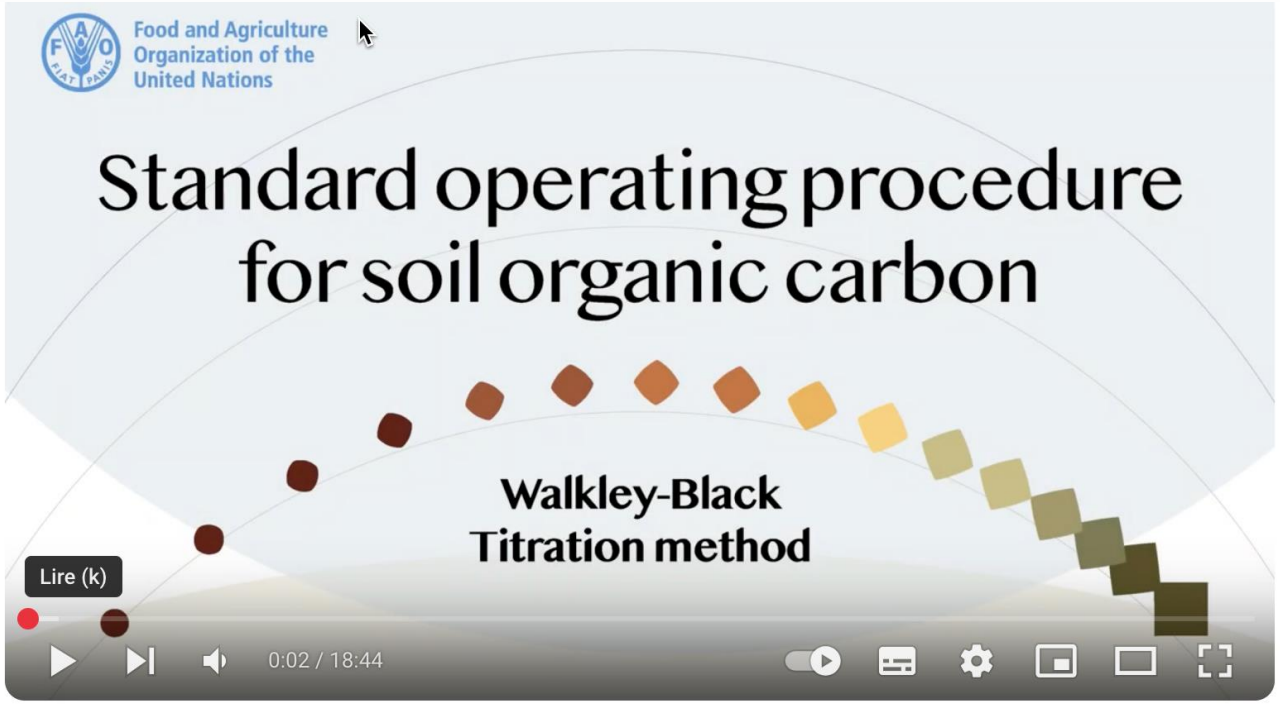
3 methods:

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

Walkley & Black

SOP

+ supporting video



GLOSOLAN – Standard operating procedure for soil organic carbon, Walkley and Black titration method

Food and Agriculture Or... S'abonner
208 k abonnés
J'aime Partager

13 k vues il y a 3 ans #Agenda2030 #SDGs #GlobalGoal
http://www.fao.org/global-soil-partne... Soil carbon is

Options pour les familles

12 views/day !!!

GLOBAL SOIL PARTNERSHIP

REPEATABILITY ?

5 replicates of the same soil sample

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5 replicates of the same soil sample

good repeatability?

C %

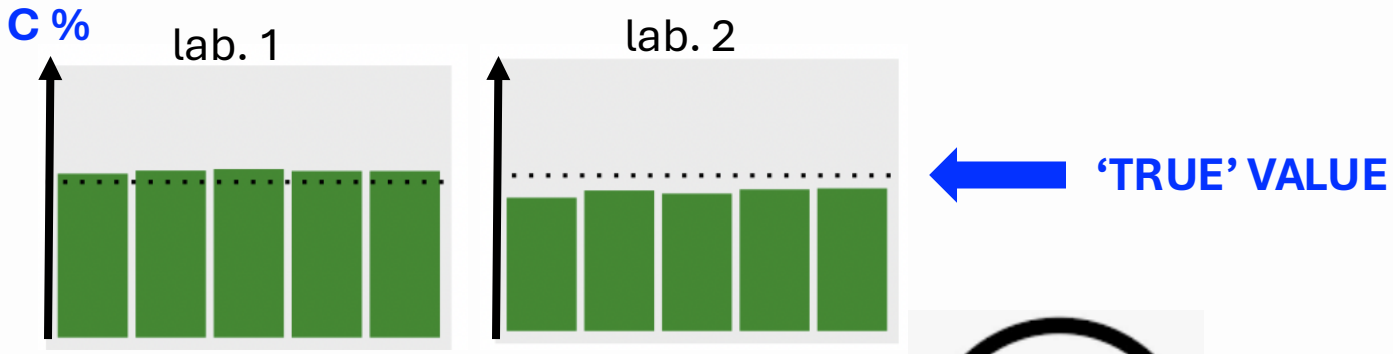
lab. 1

lab. 2

REPEATABILITY ?

5 replicates of the same soil sample

good repeatability:

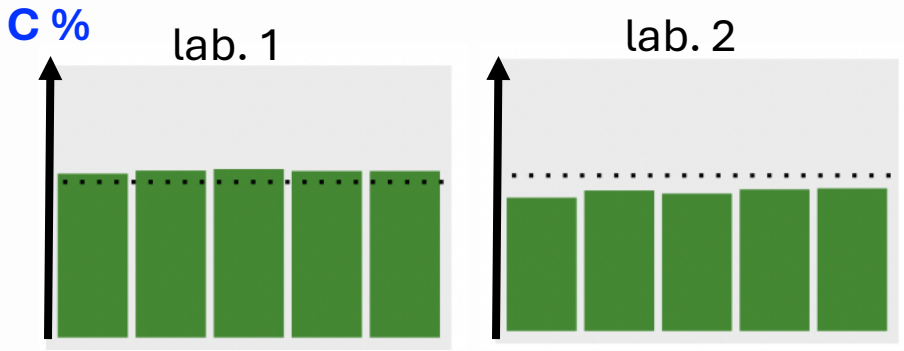


⇒GOOD control
of the analytical process

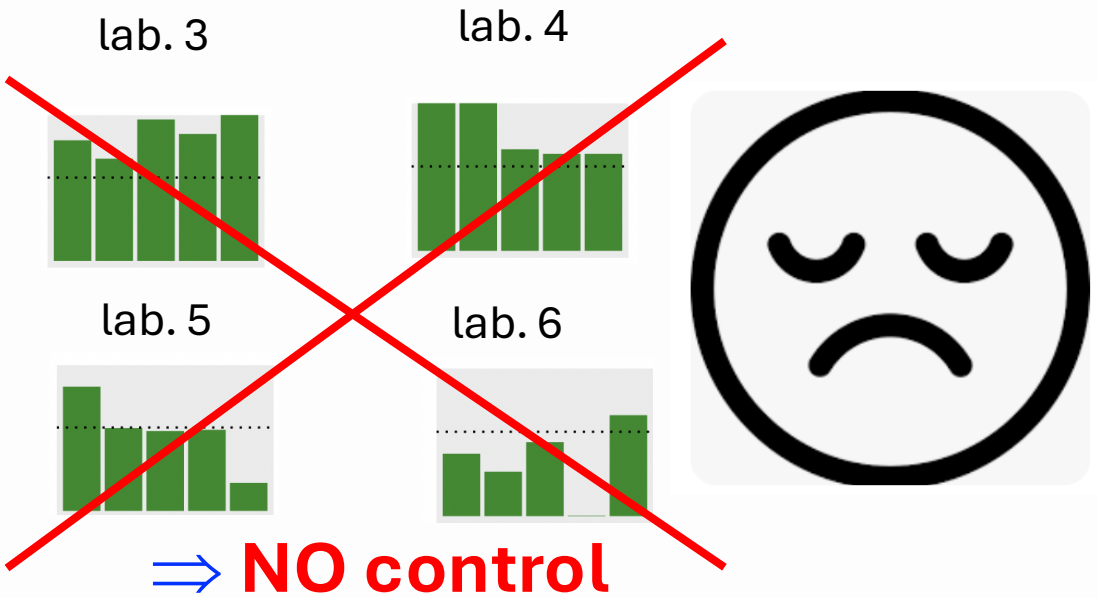
client ➡ relevant decision

REPEATABILITY ?

5 replicates of the same soil sample



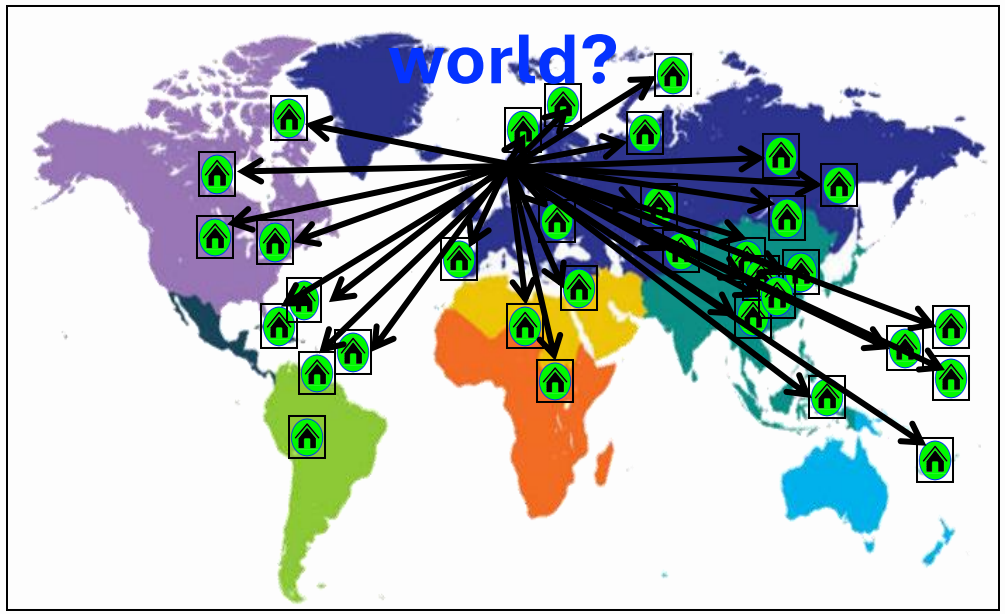
poor repeatability



⇒ **NO control of the analytical process**

client ➡ IRRELEVANT decision

current situation in the world?

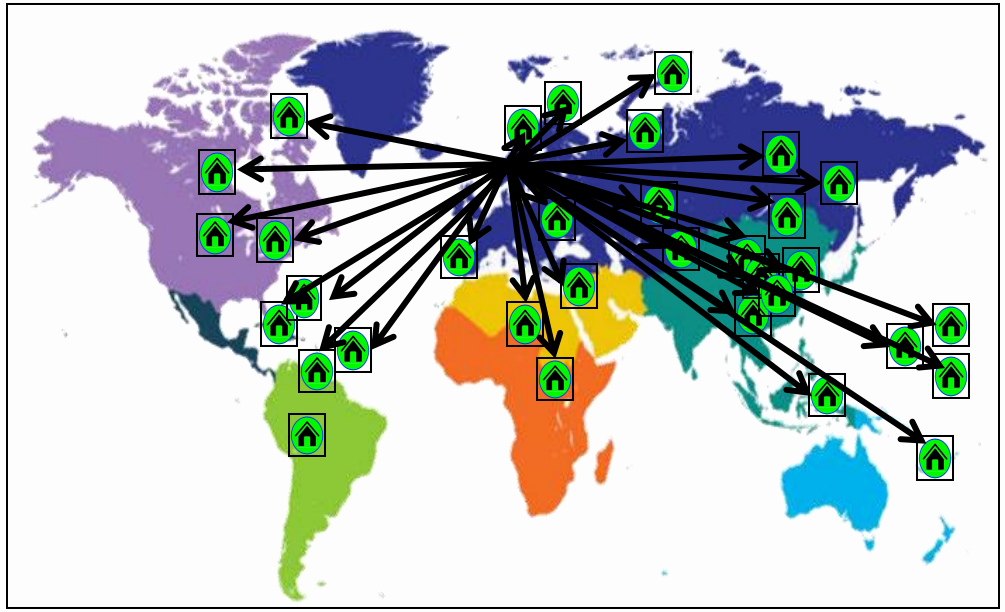


Walckley & Black method

(oxydation = wet chemistry)

160 labs

What is the worlwide situation?



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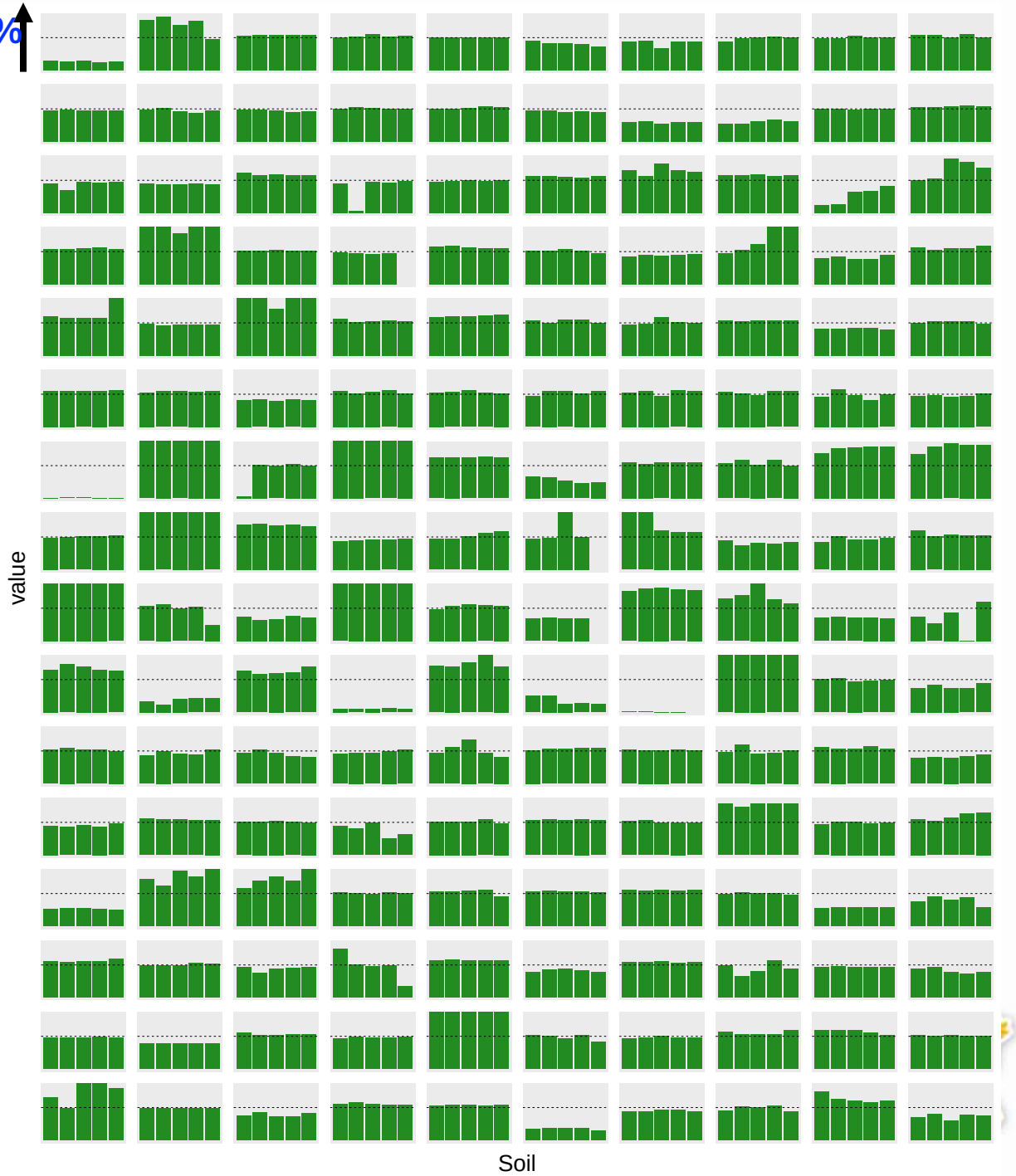

5th Meeting of the Near East and North African La

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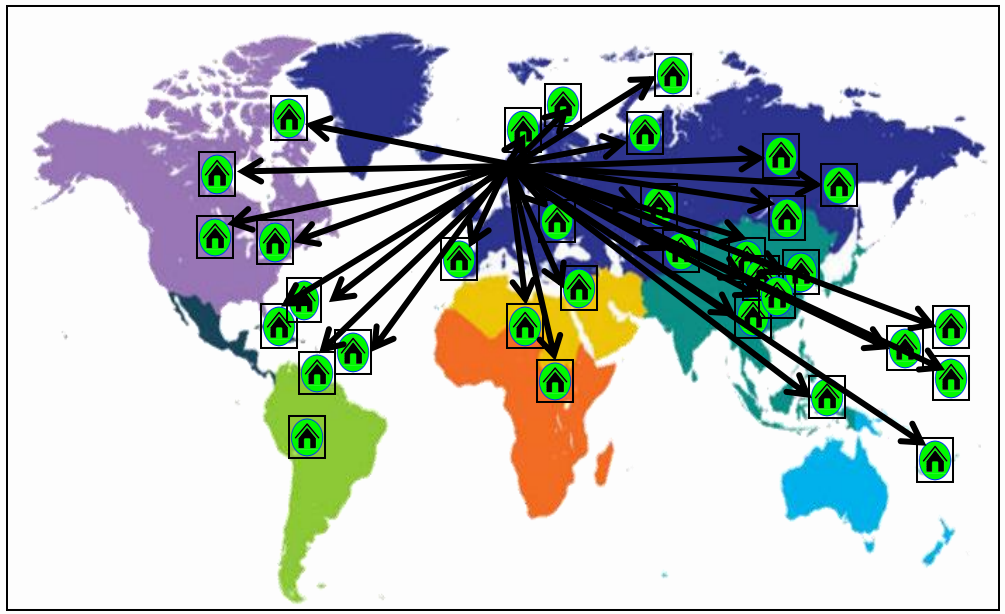
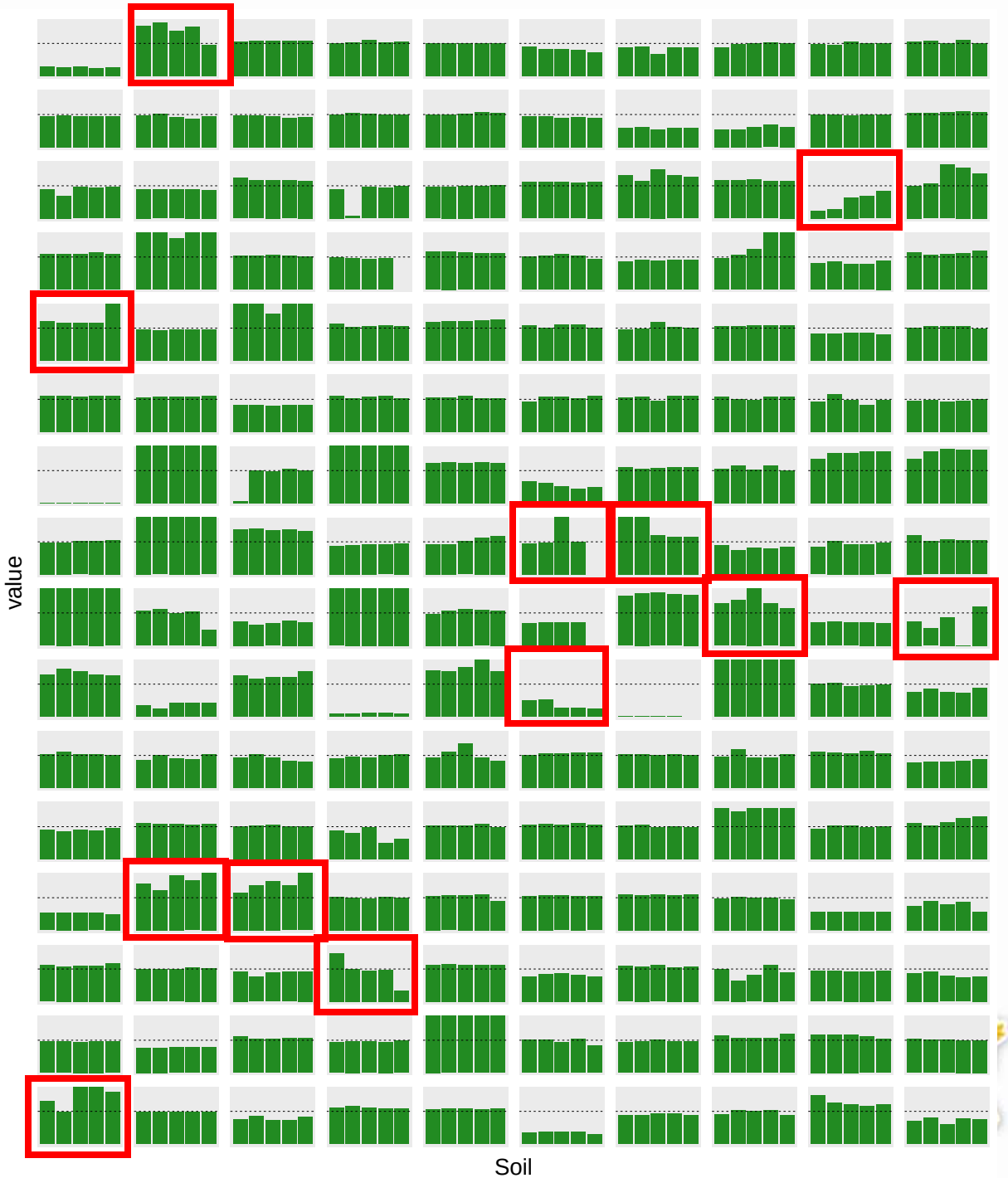


Walckley & Black method

(oxydation = wet chemistry)

problem

ir-relevant decision



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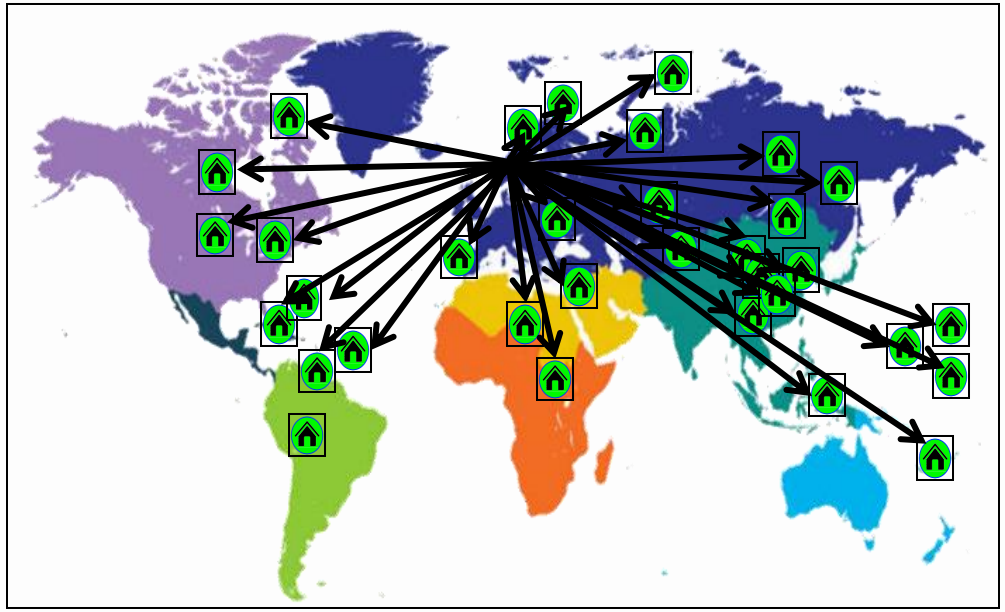
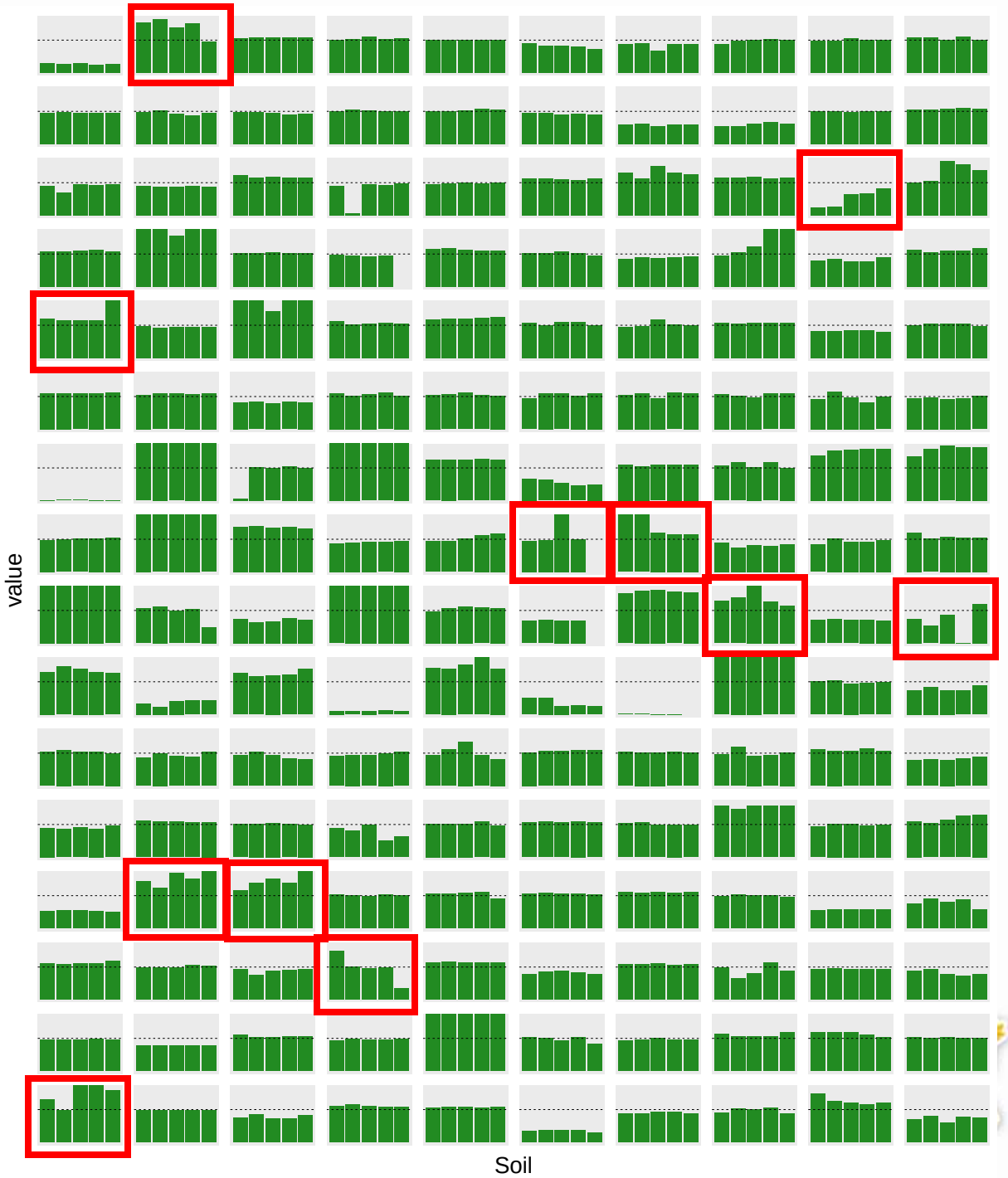


Walckley & Black method

(oxydation = wet chemistry)

problem ☐ **40 %**

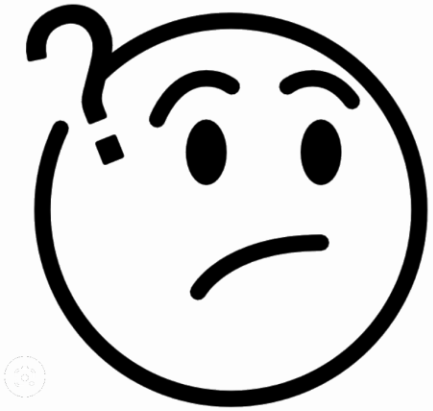
➡ **ir-relevant decision**



POOR REPEATABILITY: WHY ?

2 hypotheses:

1. No/poor internal quality control



Internal quality control:

Include a control sample (you know the result) in the analytical batches:

1 control

each

10 samples

Internal quality control:

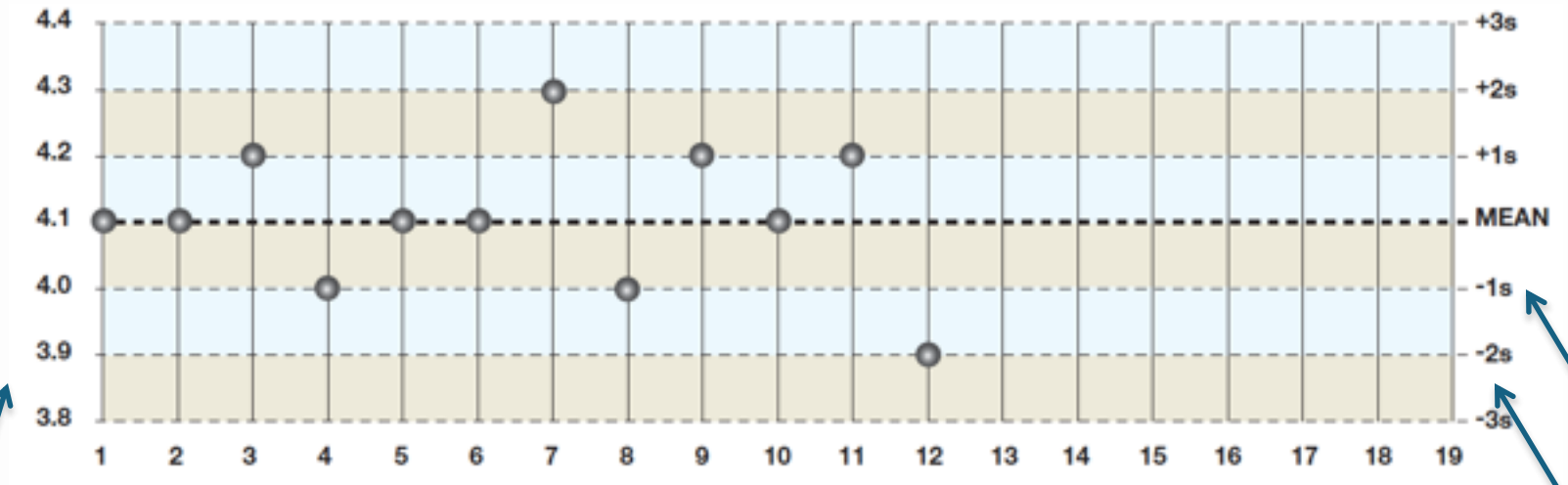
plot the results of
control samples on a

QUALITY CHART

What is and how to use a

QUALITY CHART?

plot your results:

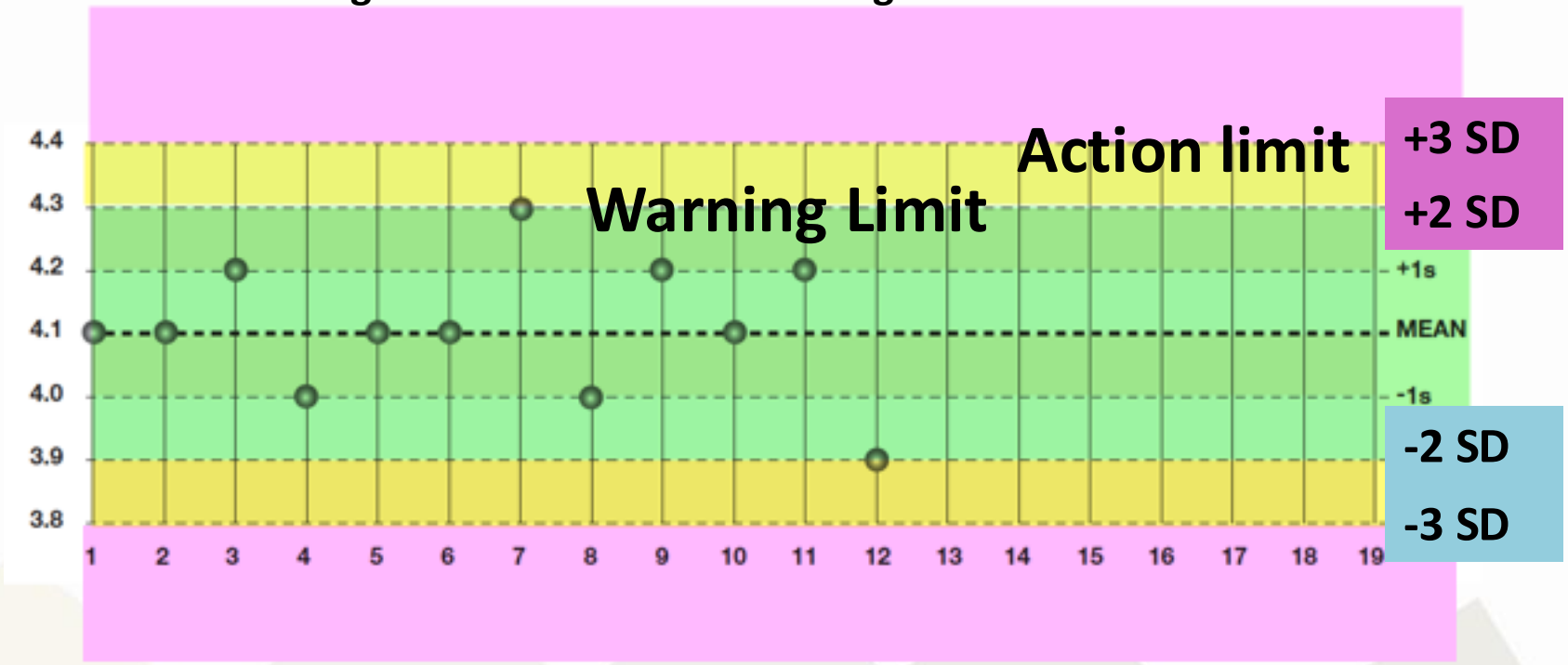


Value of your data

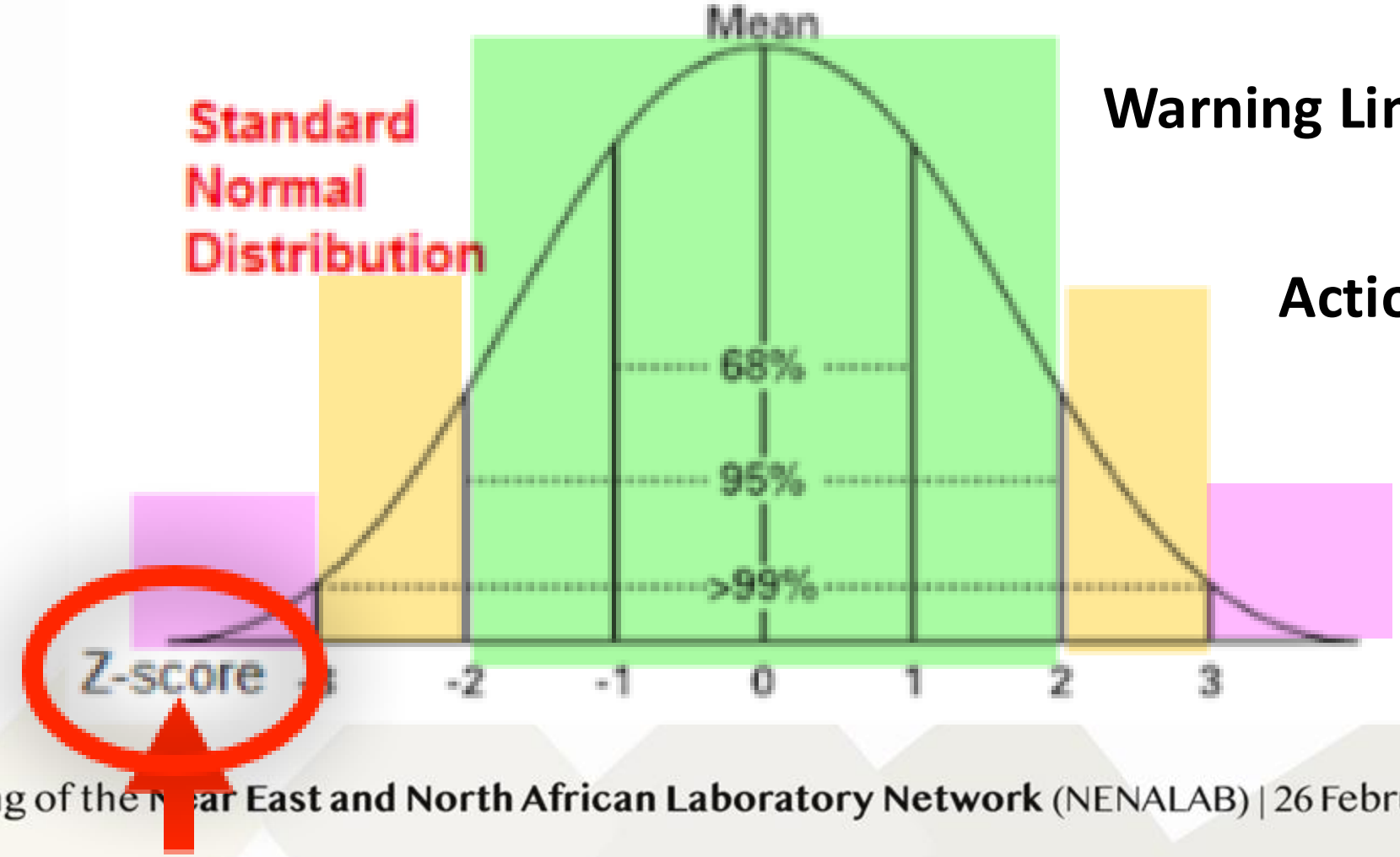
Standard deviation

indicate the different limits:

UCL = Upper Control Limit (or *Upper Action Limit).*
LCL = Lower Control Limit (or *Lower Action Limit).* UWL = Upper Warning Limit. LWL = Lower Warning Limit.



The limits come from the Normal distribution:



Warning Limit

Action limit

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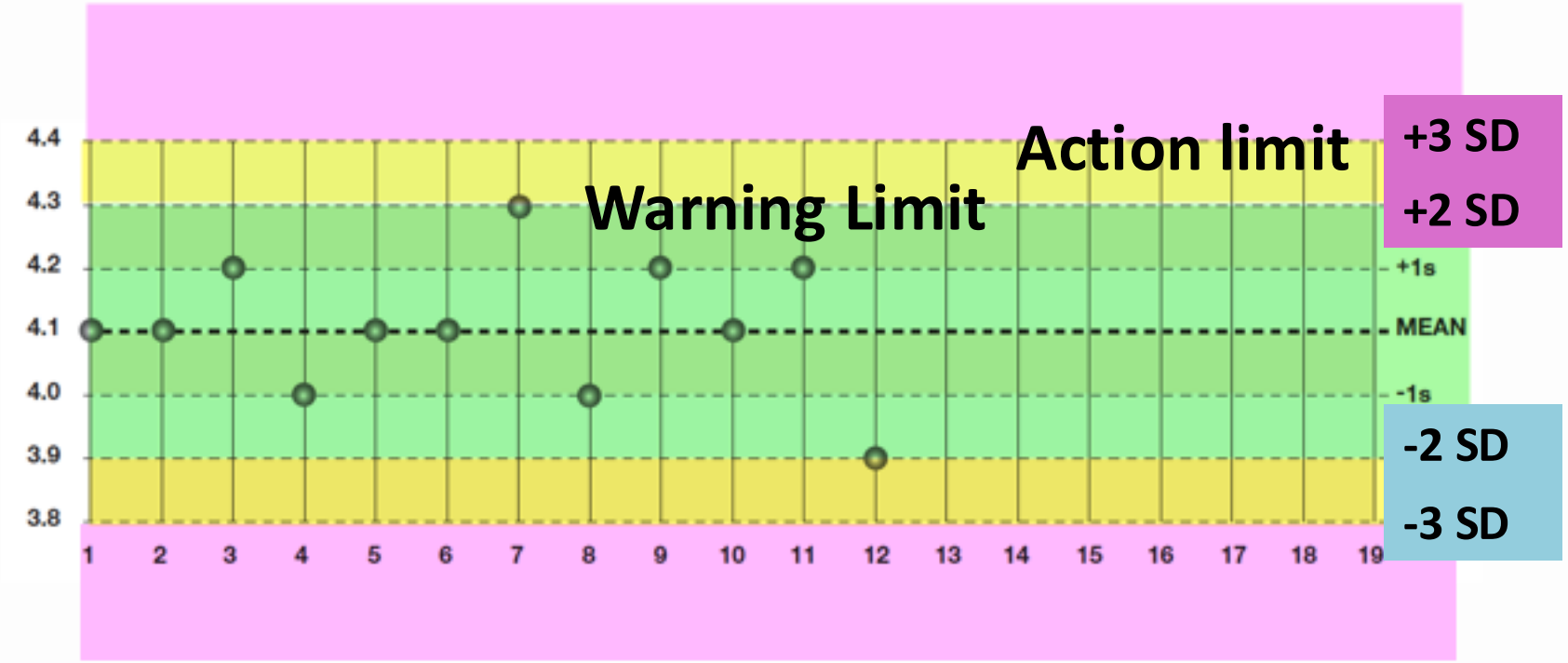

your internal control sample
is an indicator of the quality of
the results for all samples in the batch

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is an indicator of the quality of
the results for all samples in the batch

Based on these results
you must take a decision:

1. accept or reject all results of this batch;

2. find where the error(s) come from.

It is the laboratory responsibility to prepare its quality control samples !!!

See this GLOSOLAN document:

Collect 10 to 100 kg of soils that represent soils you will analyse.

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Air dry,
but not under direct sunlight.

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Air dry,
but not under direct sunlight.

Crush and sieve at 2 mm, store in smaller container (1 or 2 kg).

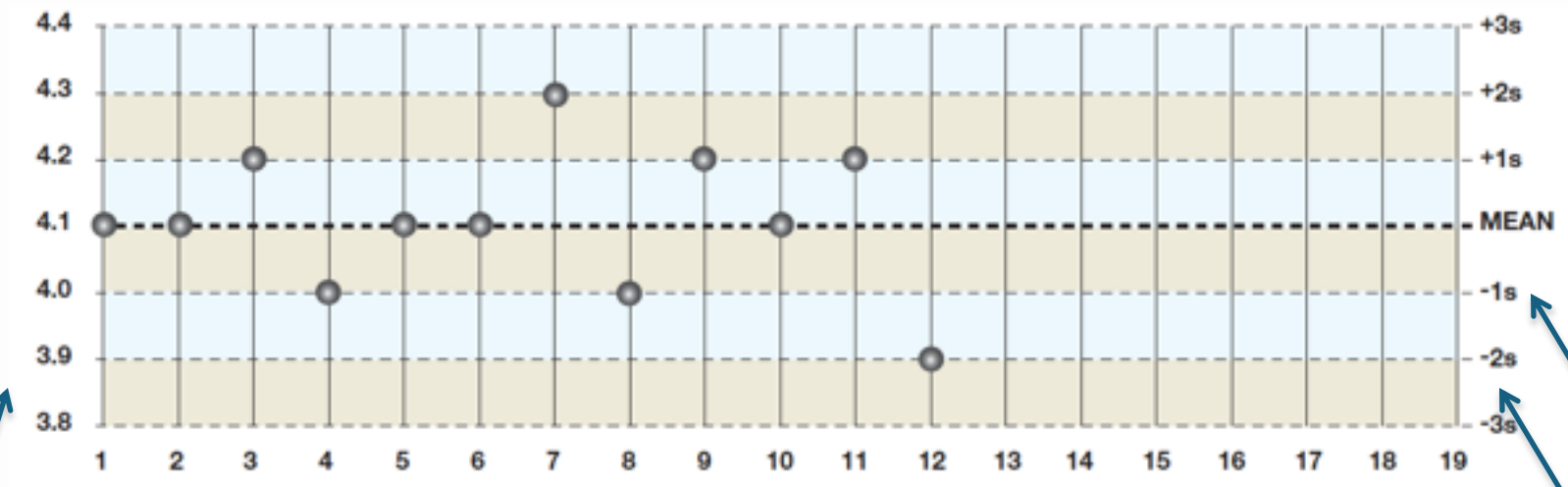
Include your control sample in the analytical batches:

1 control

each

10 samples

Essential to evaluate the lab UNCERTAINTY !



Value of your data

Standard deviation

POOR REPEATABILITY: WHY ?

2 hypotheses:

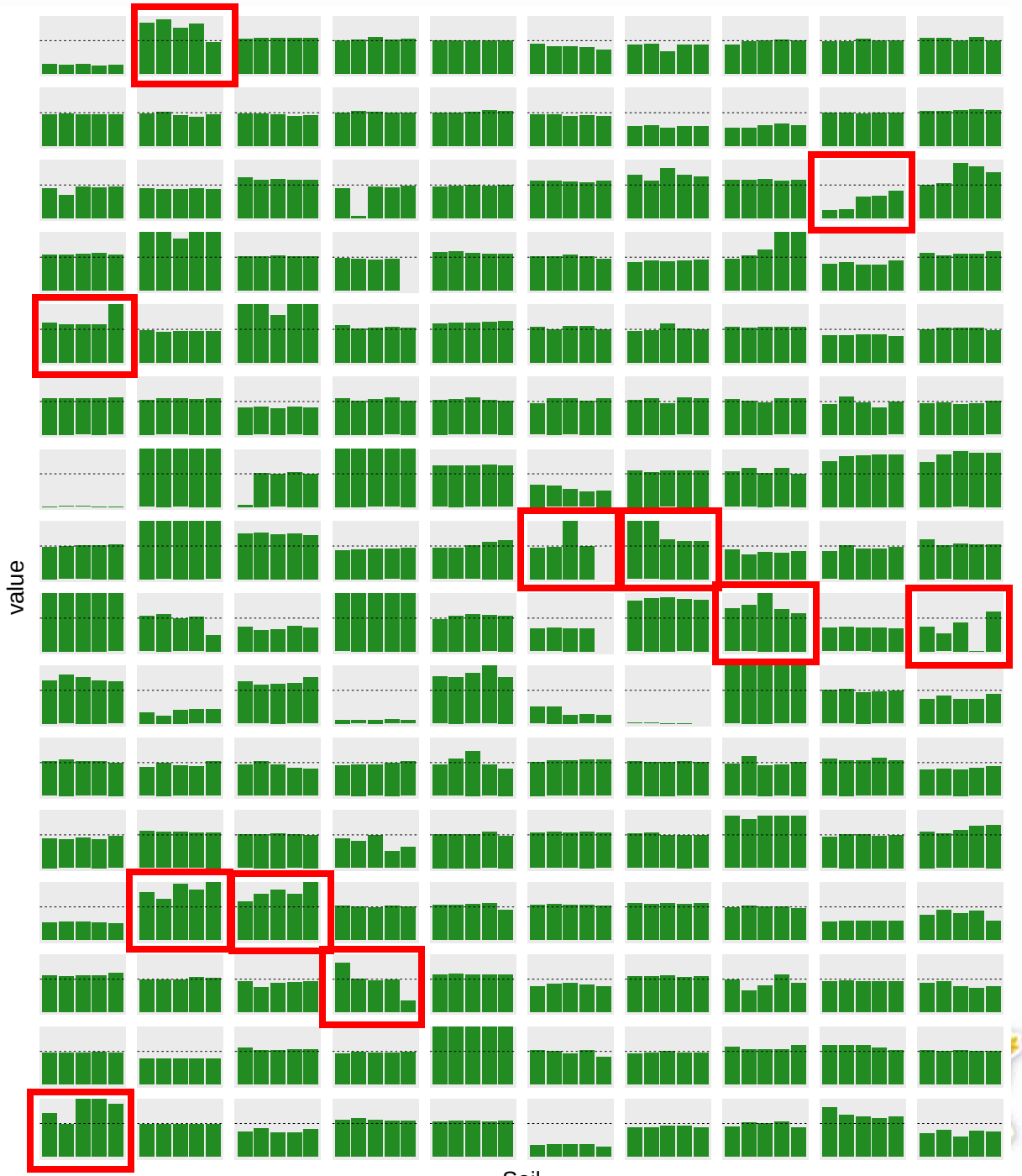
1. No/poor internal quality control

2. Transcription mistakes?

REPEATABILITY ? REPRODUCIBILITY?

REPEATABILITY

(sometimes poor)



REPEATABILITY ?

REPRODUCIBILITY?

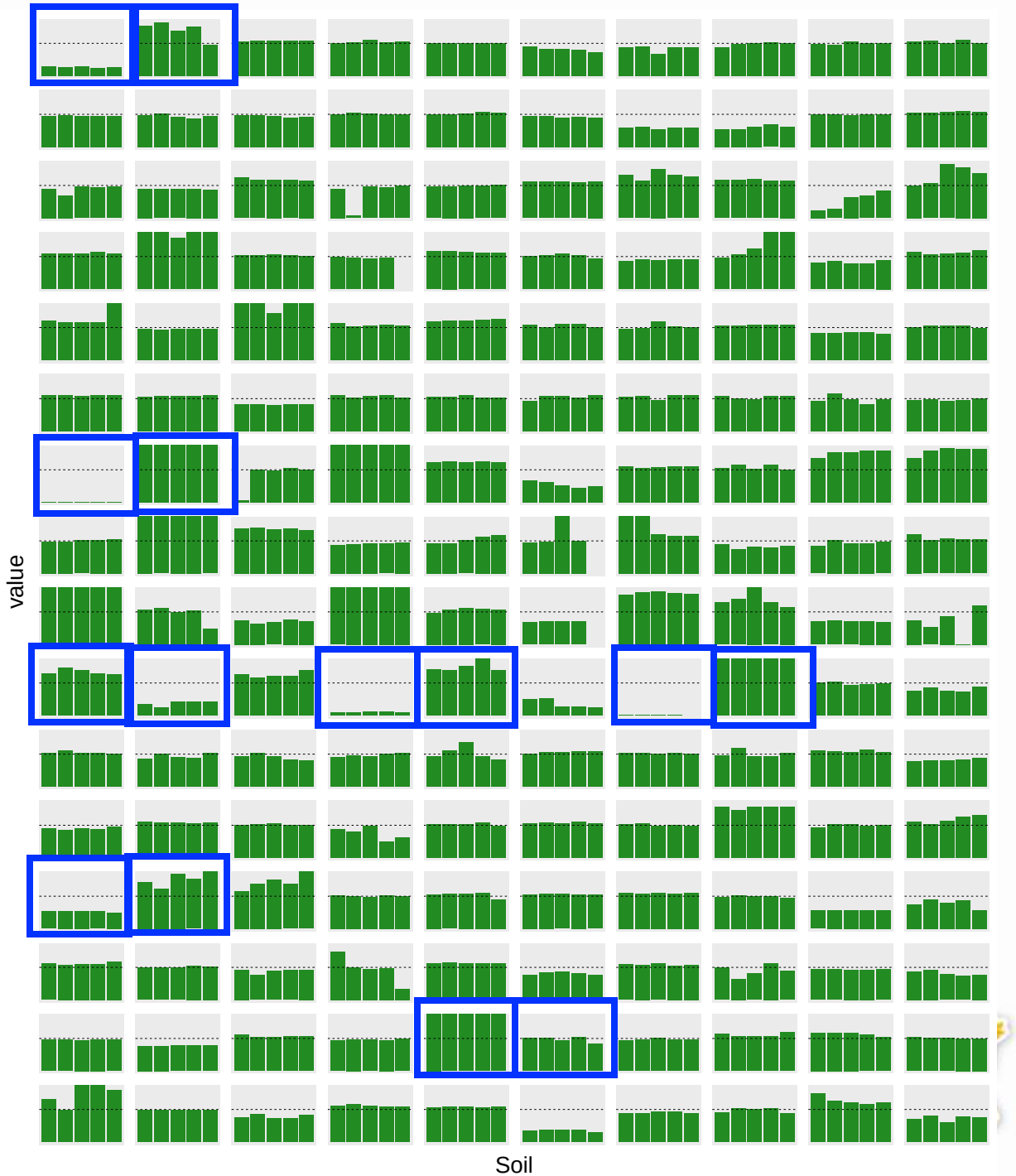
if a client send

the same samples to many labs,

how close will be the results

REPRODUCIBILITY

(sometimes poor too…)



REPRODUCIBILITY ?

10 soil sampes sent to many labs

soil sample n° 1 2 3 4 5 6 7 8 9 10 (statistical evaluation)

REPRODUCIBILITY ?

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soil sample n° 1 2 3 4 5 6 7 8 9 10 (statistical evaluation)

z score

dispersion

(uncertainty)

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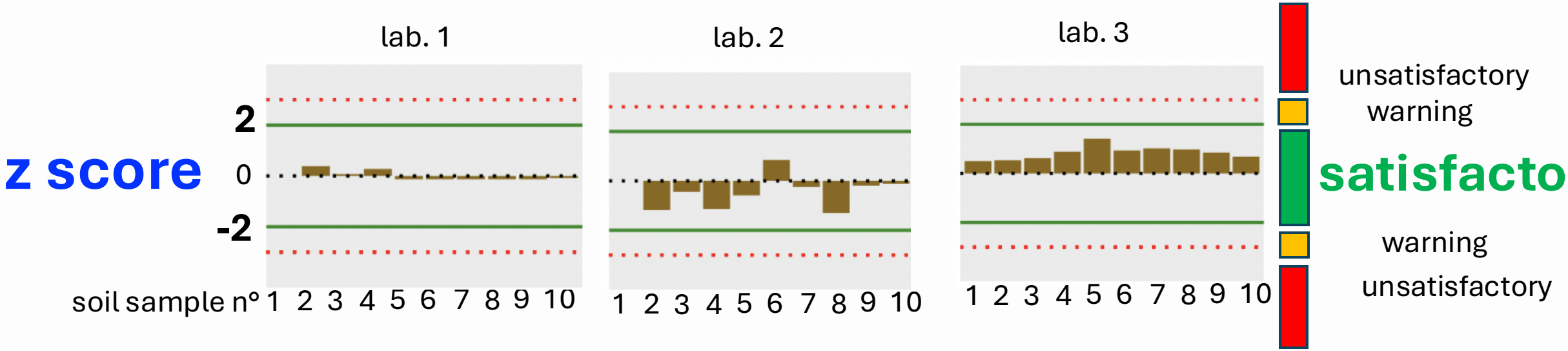

dispersion

(uncertainty)

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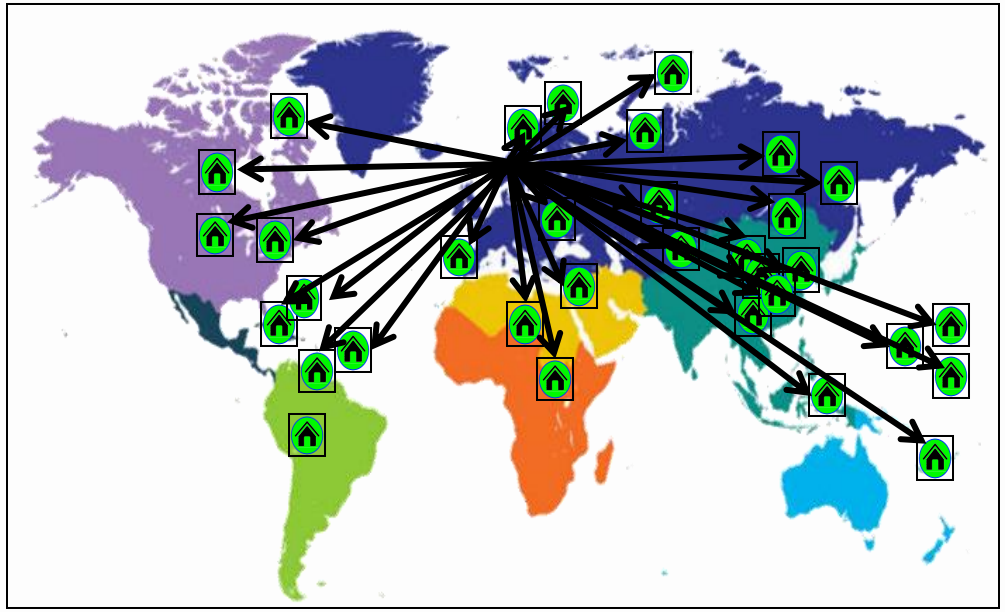

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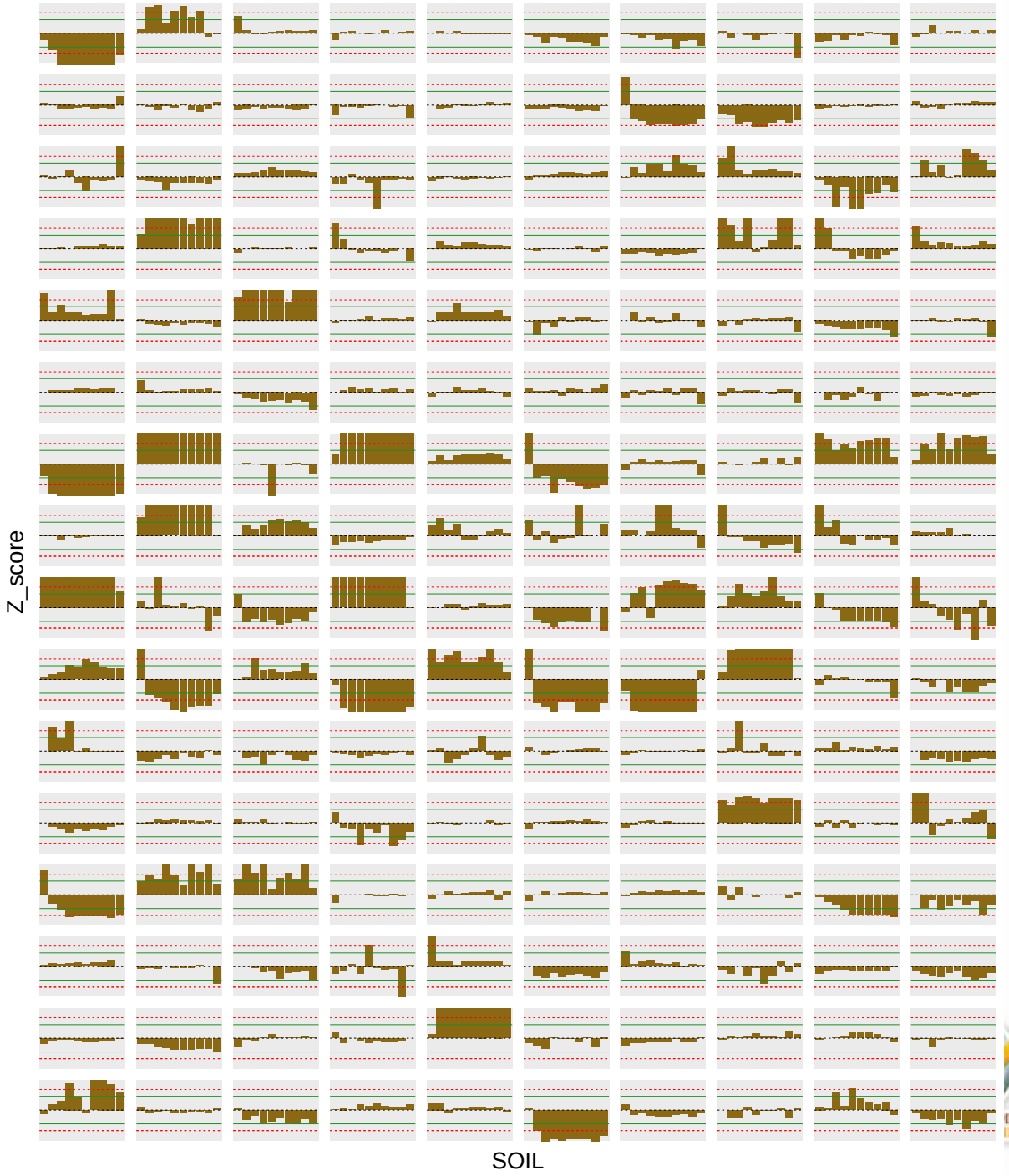

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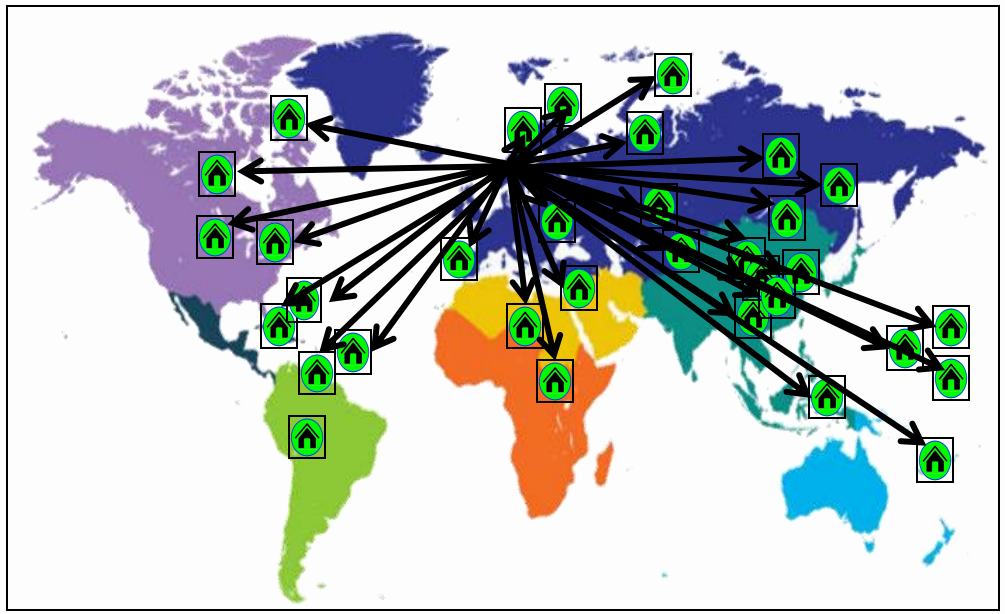

ok

Walckley & Black method

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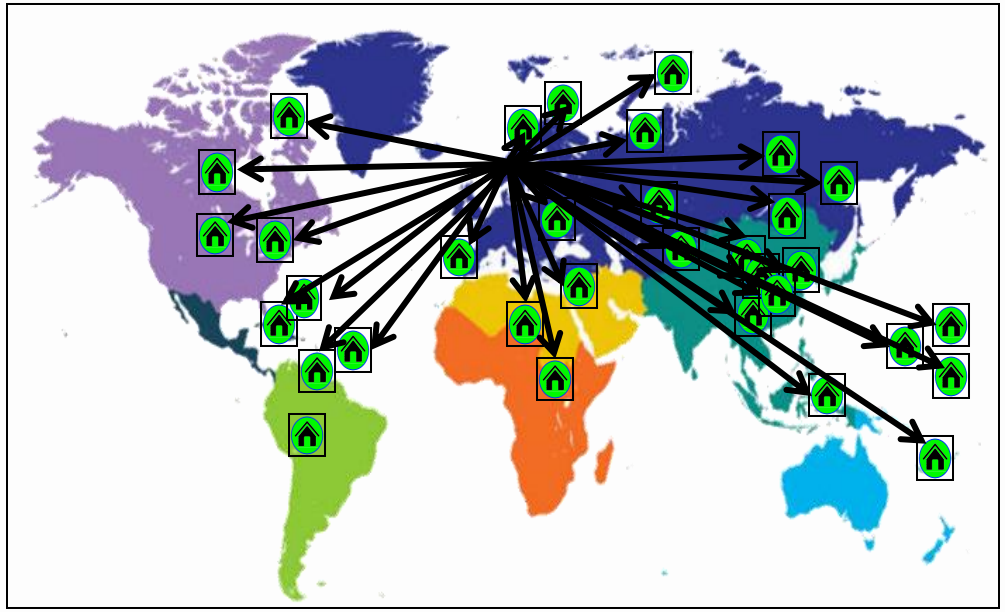
What is the worlwide situation?



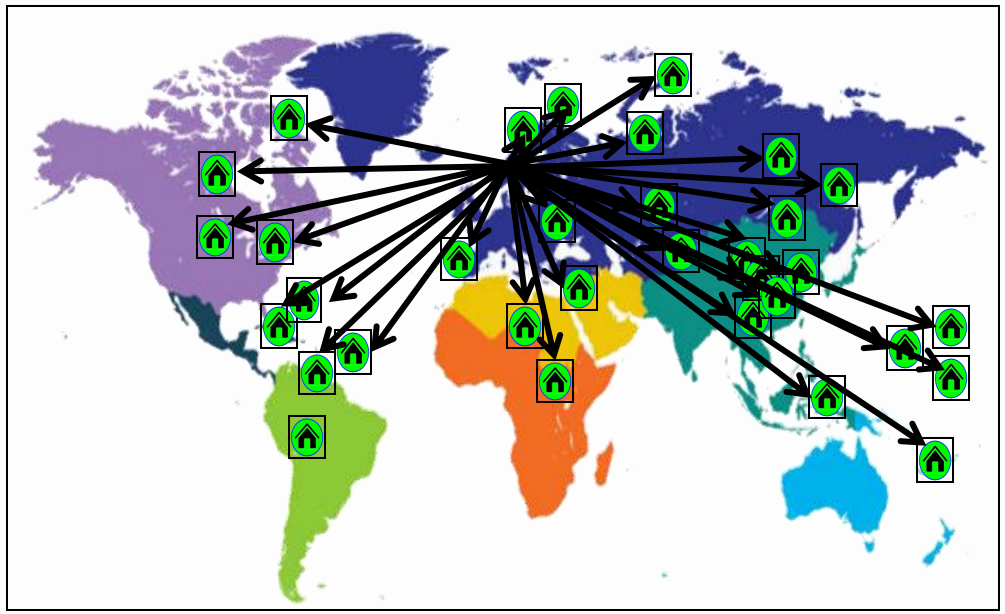
Walckley & Black method

(oxydation = wet chemistry)

problem

ir-relevant decision

What is the worlwide situation?



Walckley & Black method

(oxydation = wet chemistry)

problem □ **50%**

➡ **ir-relevant decision**

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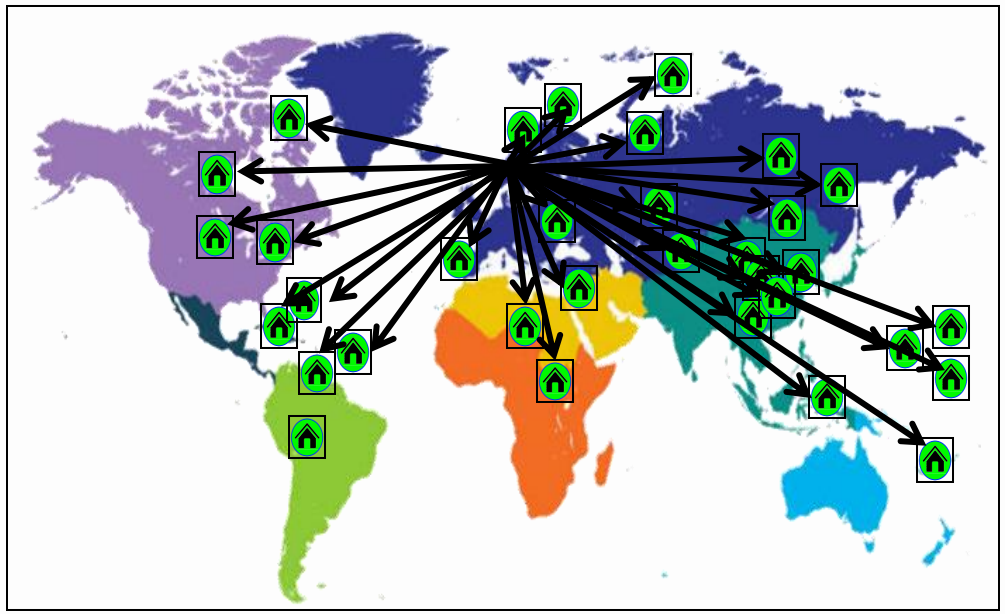
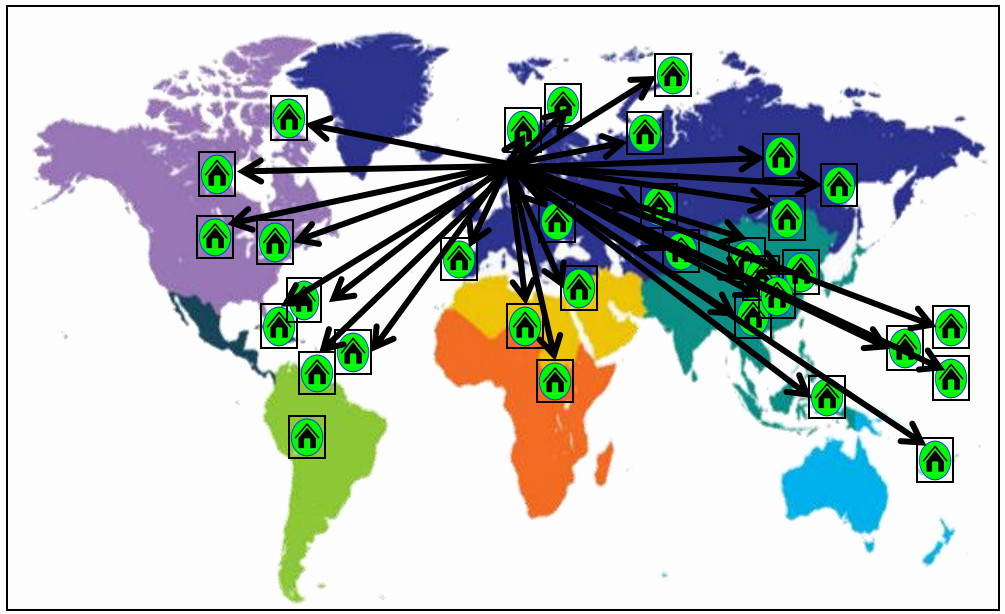


Dumas

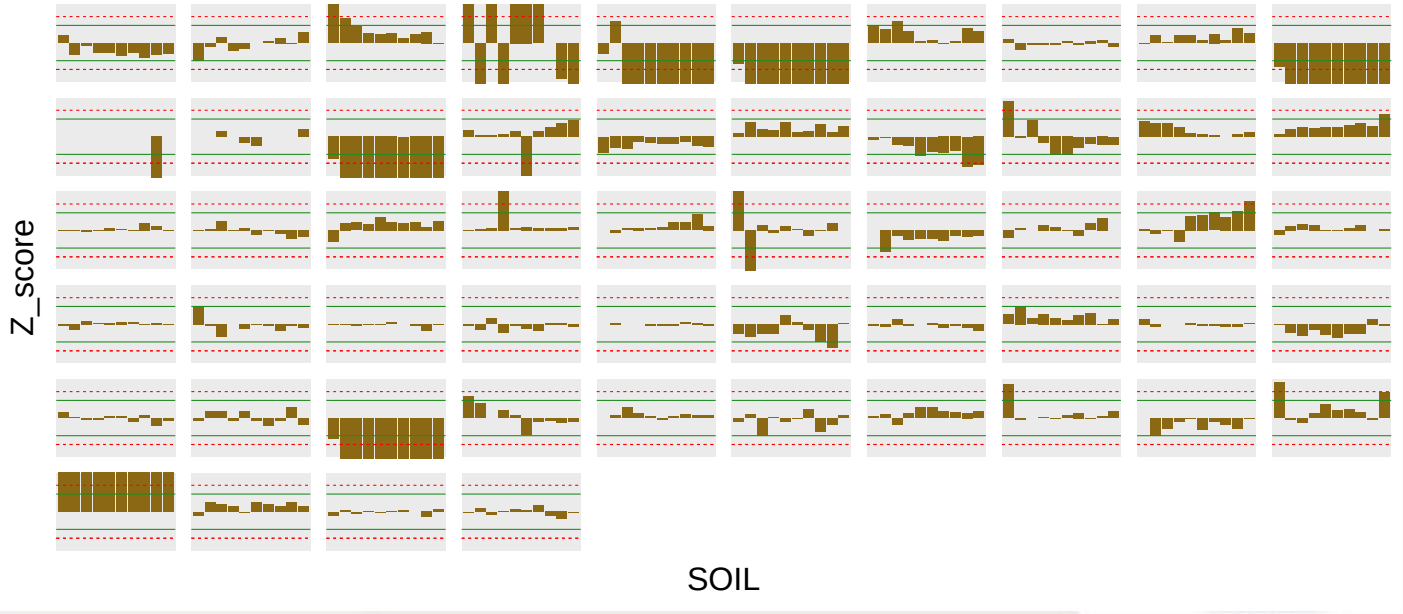
(Dry combustion: high cost & automatic machines)

What is the worlwide situation?



Dumas

54 labs



5th Meeting of the Near East and North Afric

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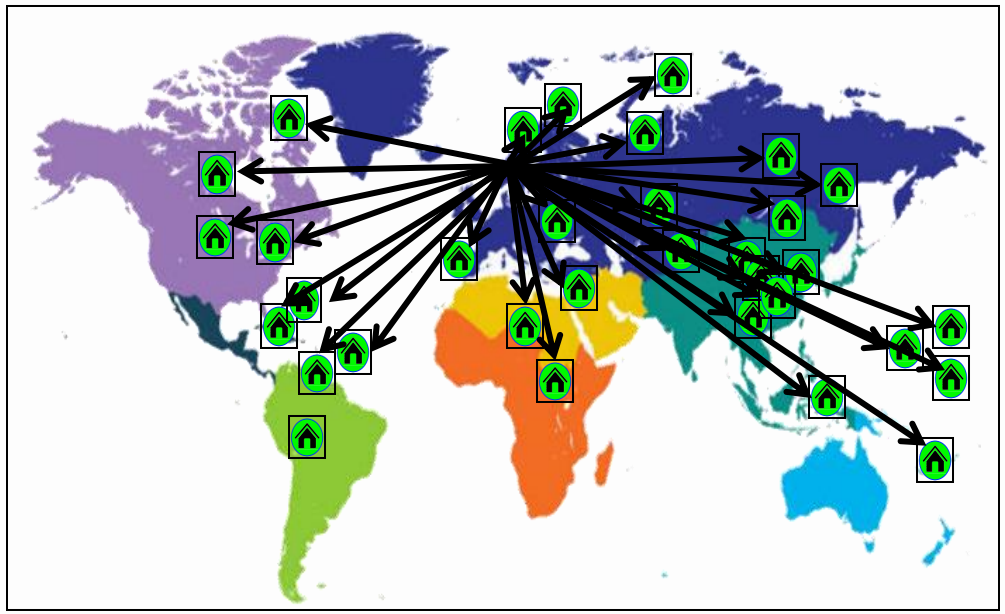
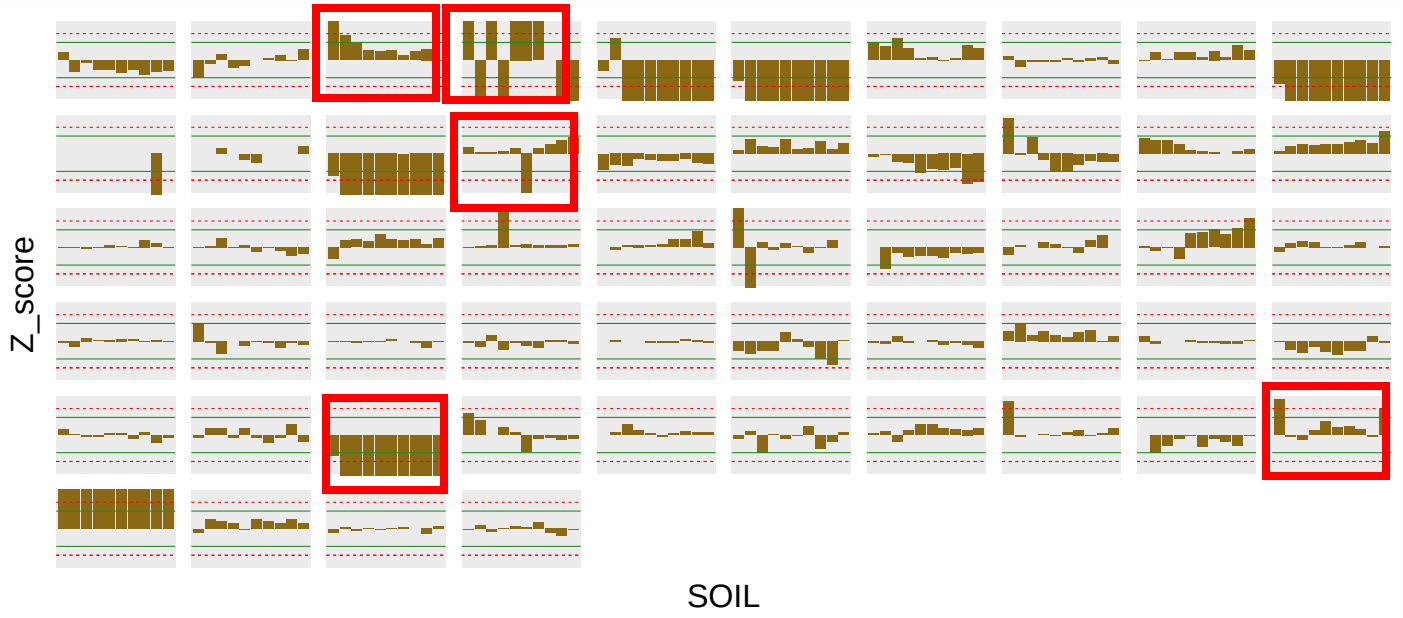


Dumas

(Dry combustion: high cost)

54 labs

problem **30 %**



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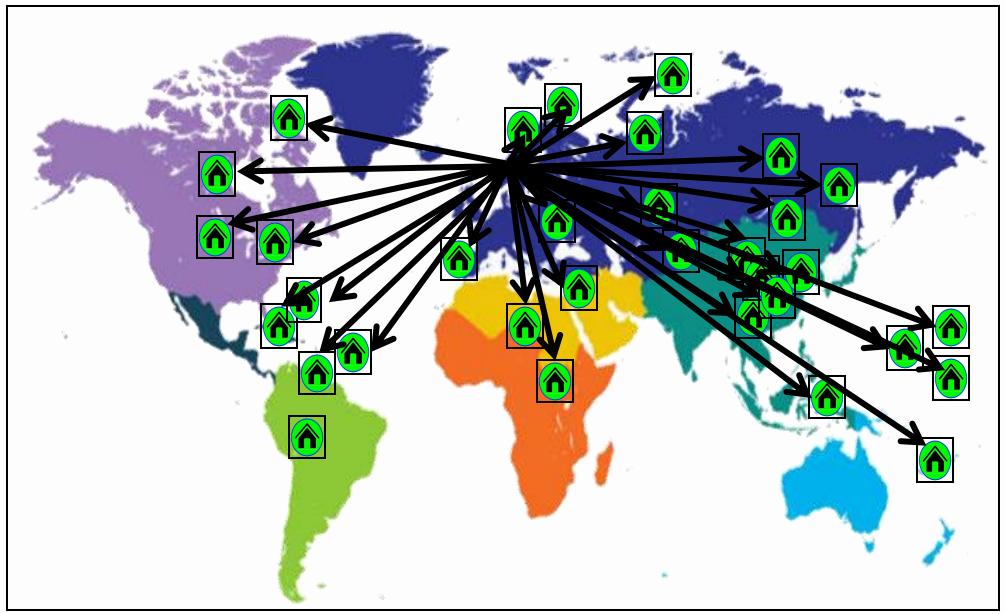


Dumas

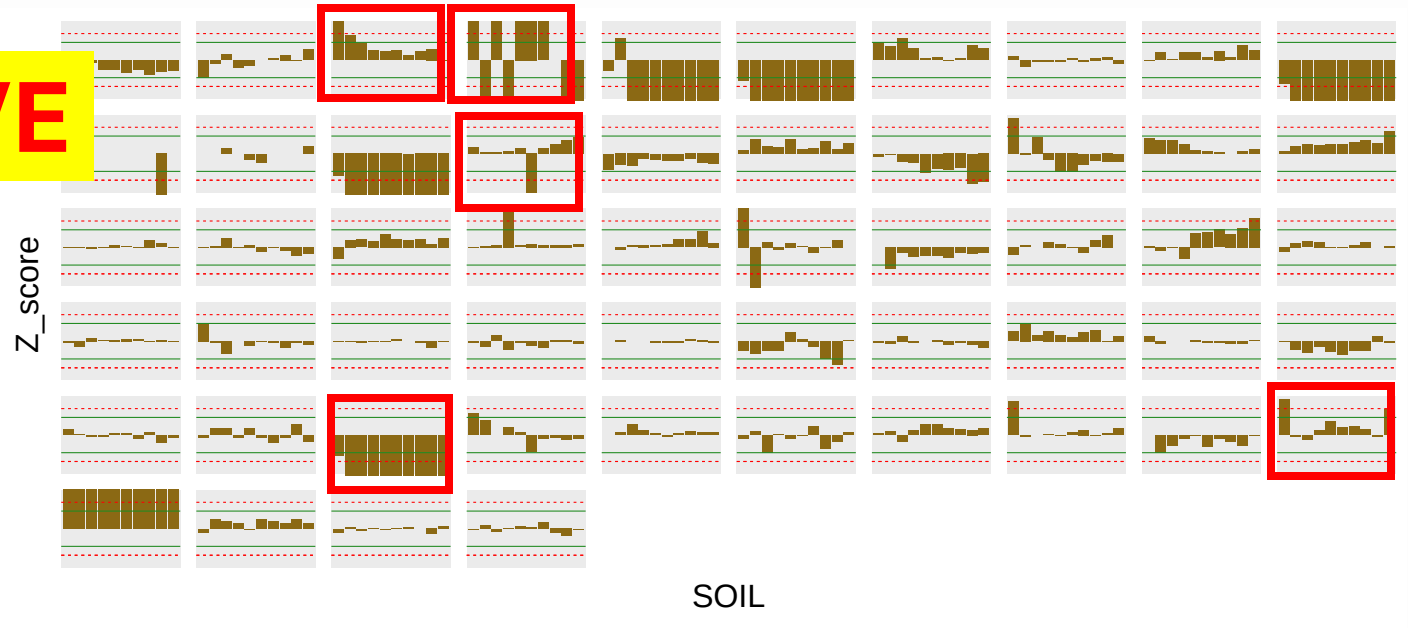
(Dry combustion: high cost)

54 labs

problem ☐ **30 %**

→

AUTOMATIC EXPENSIVE MACHINES DO NOT SOLVE ALL THE PROBLEMS



Near East and North Afric

POOR REPRODUCIBILITY: WHY ?

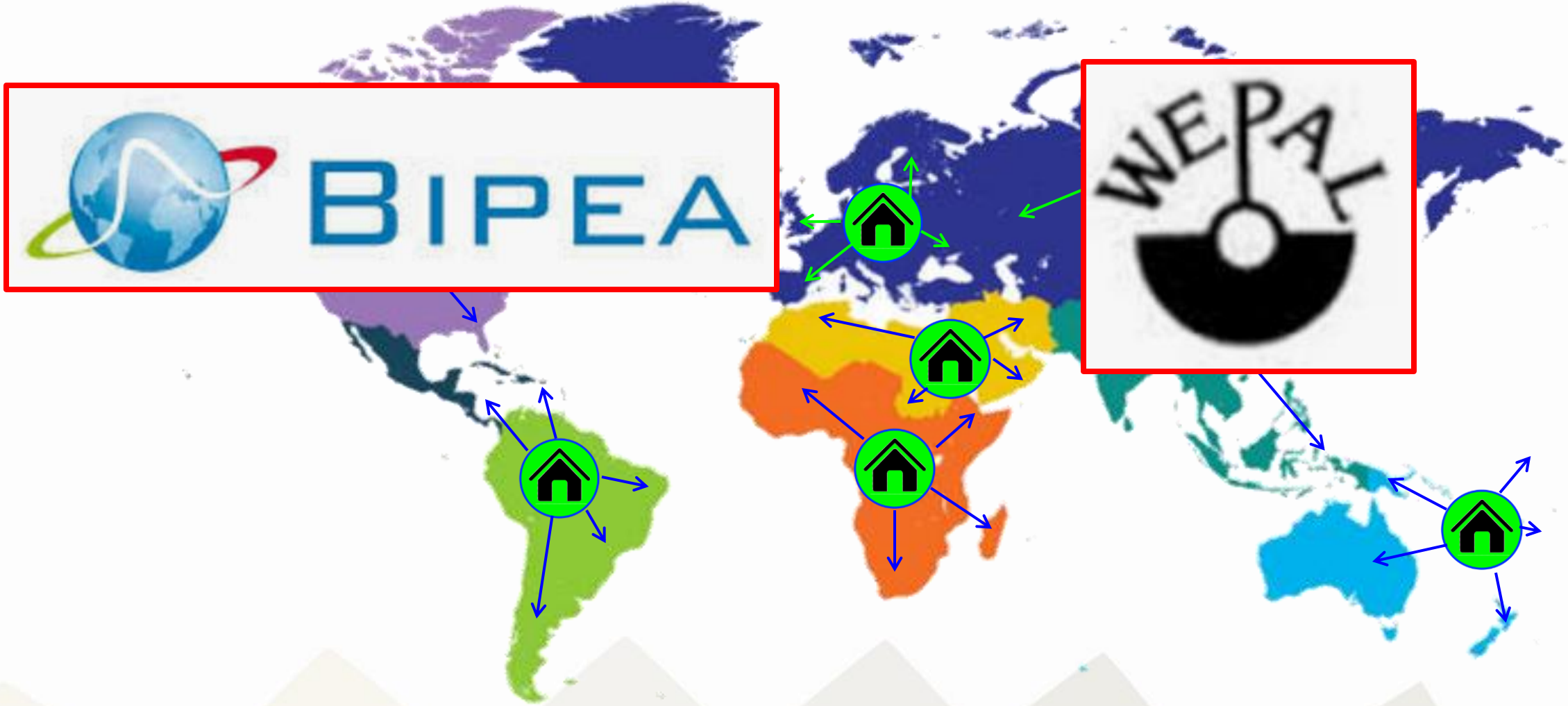
Not enough REFERENCE SAMPLES

to allow similar calibrations

in all regions…

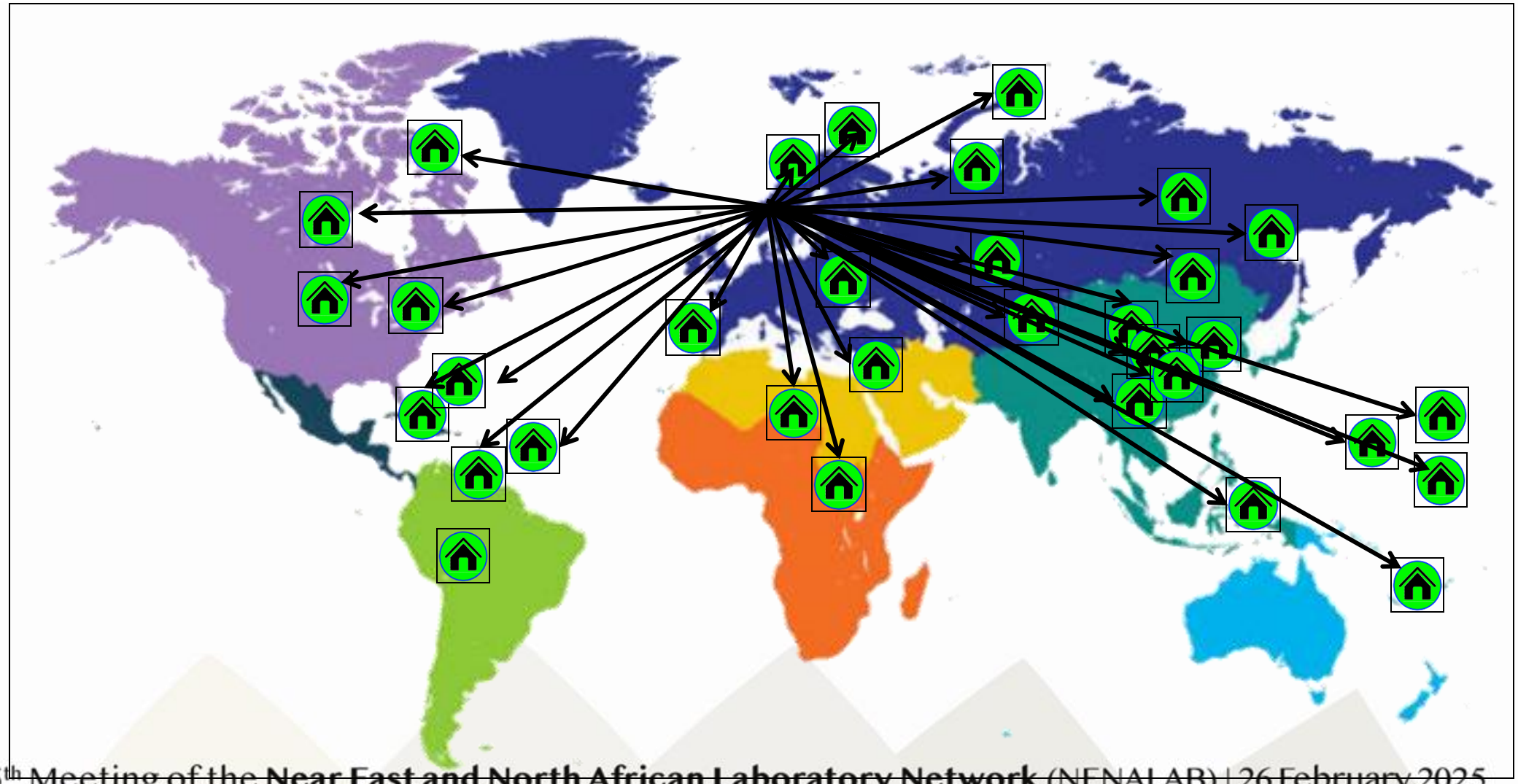
Current ILC/PTs:

activities WITHIN Regions


BIPEA
WEPAL

GLOSOLAN
OBAL SOIL LABORATORY NETWORK

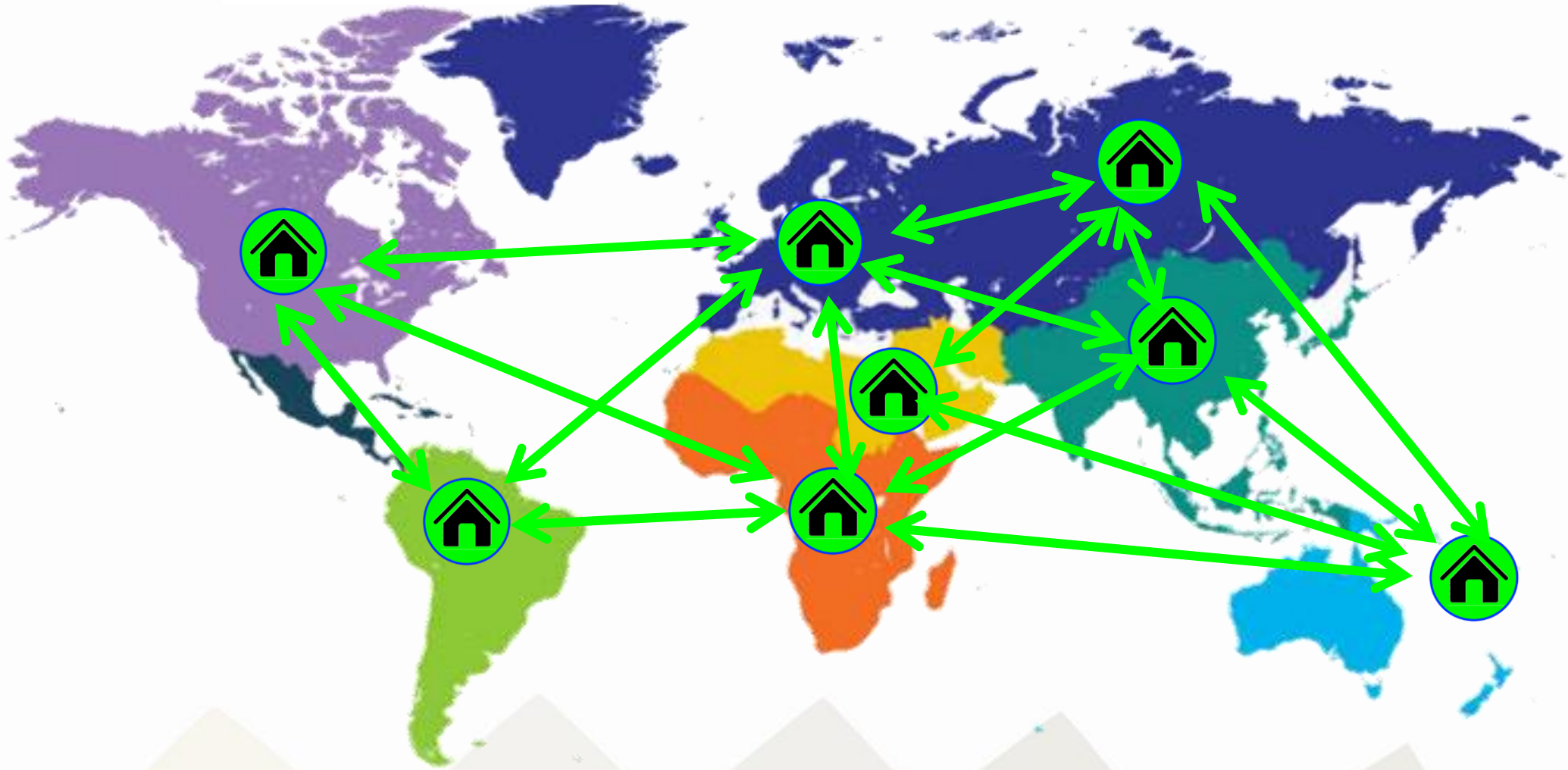
worlwide ILC/PT: not possible for all members



GLOBAL SOIL PARTNERSHIP

But GLOSOLAN can coordinate between regions

GLOBAL SOIL LABORATORY NETWORK



GLOBAL SOIL PARTNERSHIP

But GLOSOLAN can coordinate between regions

GLOBAL SOIL LABORATORY NETWORK

AFRILAB
AFRICAN SOIL LABORATORY NETWORK

SEALNET
ASIAN SOIL LABORATORY NETWORK

EUROSOLAN
EUROPEAN AND EURASIAN SOIL LABORATORY NETWORK

NENALAB
NEAR EAST AND NORTH AFRICAN SOIL LABORATORY NETWORK

LATSOLAN
LATIN AMERICAN NETWORK OF SOIL LABORATORIES

ASPAC
PACIFIC SOIL LABORATORY NETWORK

GLOBAL SOIL PARTNERSHIP

But GLOSOLAN can coordinate between regions

Suggestion: create a working group dedicated to ILC/PT and QC implementation

(need to be approved)

AFRILAB
AFRICAN SOIL LABORATORY NETWORK

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ASIAN SOIL LABORATORY NETWORK

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LATIN AMERICAN NETWORK OF SOIL LABORATORIES

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But GLOSOLAN GLOBAL SOIL LABORATORY NETWORK **can coordinate between regions**

Suggestion: create a working group dedicated to ILC/PT and QC implementation

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AFRILAB AFRICAN SOIL LABORATORY NETWORK

SEALNET ASIAN SOIL LABORATORY NETWORK

EUROSOLAN EUROPEAN AND EURASIAN SOIL LABORATORY NETWORK

NENALAB NEAR EAST AND NORTH AFRICAN SOIL LABORATORY NETWORK

LATSOLAN LATIN AMERICAN NETWORK OF SOIL LABORATORIES

ASPAC PACIFIC SOIL LABORATORY NETWORK

Suggestion : set up a 'bank' of soil reference material

=> need worlwide wide support to collect diverse soil type

(need to be approved)

GLOBAL SOIL PARTNERSHIP

CONCLUSION

When a CLIENT send a soil sample to soil laboratories,

he/she expects **to get the same results** :

1. If analysed **several times in a single lab,**
2. If analysed **by different labs…**

in the ‘real’ life ?

Poor REPEATABILITY! => What solutions ?

in the ‘real’ life ?

Poor REPEATABILITY! => What solutions ?

LABORATORIES have to take action,
challenged by the clients
supported by stackeholders + politicians

in the ‘real’ life ?

Poor REPEATABILITY!

LABORATORIES have to take action,
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Poor REPRODUCIBILITY! => What solutions ?

in the ‘real’ life ?

Poor REPEATABILITY!

LABORATORIES have to take action,
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Poor REPRODUCIBILITY! => What solutions ?

LABORATORIES need the support of GLOSOLAN
&
GLOSOLAN needs (i) the support of RESOLANs
(ii) supported of international organisations
+ politicians

Food and Agriculture Organization of the United Nations

NENALAB

NEAR EAST AND NORTH AFRICAN SOIL LABORATORY NETWORK

Thank you

GLOBAL SOIL PARTNERSHIP