Food and Agriculture Organization of the United Nations

22-24 November 2022

GLOSOLAN PT 2022: global outcomes and perspectives

Christian Hartmann

GLOSOLAN steering committee

IRD – France

6th Meeting of the Global Soil Laboratory Network (GLOSOLAN)

GLOSOLAN

GLOBAL SOIL LABORATORY NETWORK

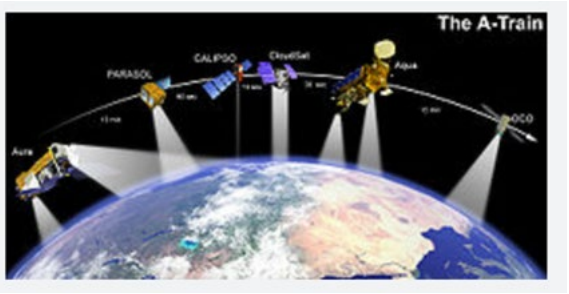
GLOBAL SOIL PARTNERSHIP

Context:

<<The mandate of the GSP is
to improve governance of the limited soil resources of the planet

**What you cannot (*correctly*) measure,
you cannot (*correctly*) manage.**

(PHOTO WIKIPEDIA)



Soil data can be obtained in different ways

(PHOTO WIKIPEDIA)

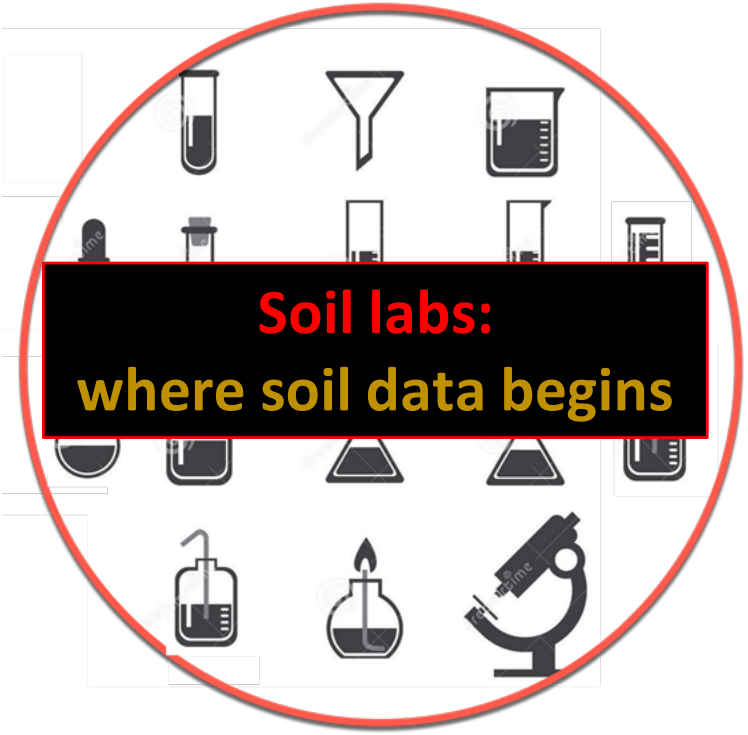
Many data come from by soil laboratory analysis

=> data provided by soil laboratories are essential for soil governance

Soils are essential for food production:

Soils are essential for food production:

Laboratories are essential for soil data production



Soils are essential for food production:

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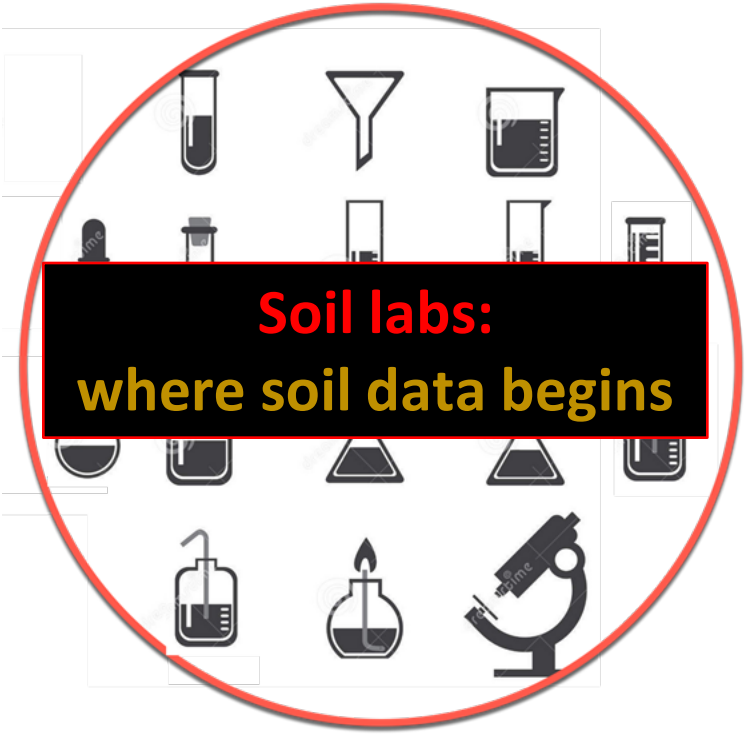
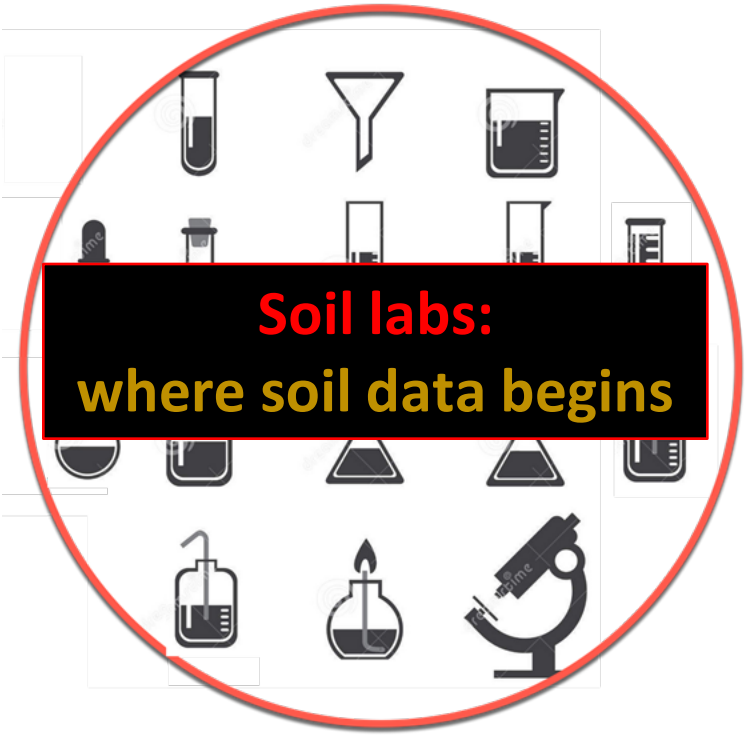


The good news : soil labs already exist all around the planet

Soils are essential for food production:

Laboratories are essential for soil data production

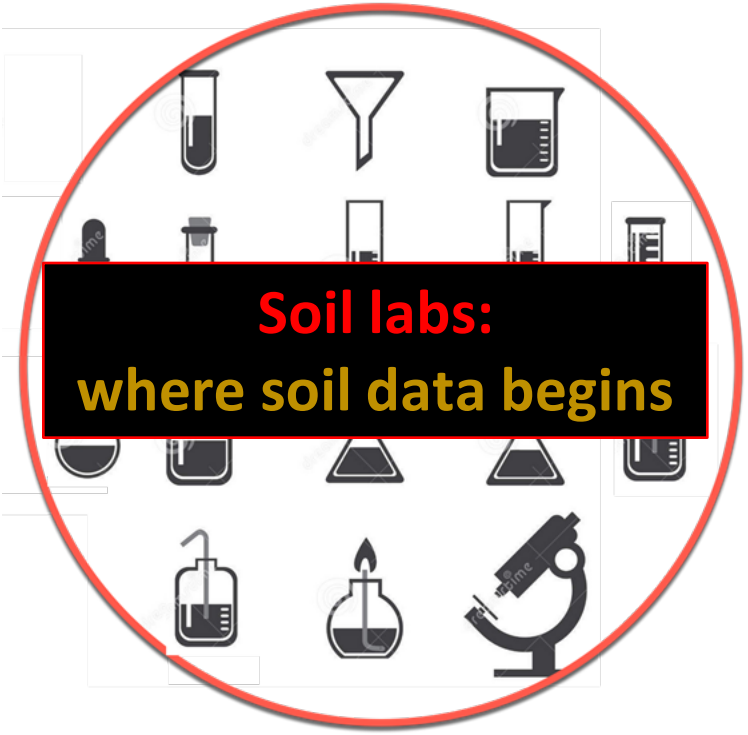


The good news : soil labs already exist all around the planet

The bad news: soil labs are working without coordination among them…

Soils are essential for food production:

Laboratories are essential for soil data production



The good news : soil labs already exist all around the planet

The bad news: soil labs are working without coordination among them…

An option for improvement:

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

GLOBAL SOIL PARTNERSHIP

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GLOBAL SOIL LABORATORY NETWORK

Purpose: to improve the quality of soil laboratory data to support decision making at field and policy levels

Objectives :

1. To strengthen the performance of laboratories through use of standardized methods and protocols.
2. To harmonize soil analysis methods so that soil information would be comparable and interpretable across laboratories, countries and regions.
3. To provide a certification for technical competencies in laboratory analysis.

The 900 labs that are GLOSOLAN members ☺

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

6th Meeting of the **Global Soil Laboratory Network** (GLOSOLAN) | 22-24 November 2022

GLOBAL SOIL PARTNERSHIP

The 900 labs that are GLOSOLAN members ☺

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

For 5 years now GLOSOLAN helped these labs producing reliable and comparable soil data by providig SOPs, video explaining SOPs, trainings, webinars, technical publications, etc…

GLOSOLAN
GLOBAL SOIL LABORATORY NETWORK

For 5 years, GLOSOLAN has been helping soil labs producing reliable and comparable soil data by providing SOPs, video explaining SOPs, trainings, webinars, technical publications, etc…

Now GLOSOLAN questions are:

1. How reliable and comparable are the data produced by soil laboratories?

2. How can GLOSOLAN help all labs to reach a minimum data quality?

Part 1 = assessment:

how reliable and comparable are the data produced by soil laboratories?

⇒ **Launching a global (planet) proficiency testing (PT) or inter-laboratory comparison**.

The PT design was decided according to:

our QUESTIONS (reliability / comparability)

& FEASABILITY

(number of soil types, cost of preparation including irradiation, cost of sending worlwide, etc)

QUESTIONS: 2 + 1 more

1. **RELIABILITY: for each lab, what is its precision?**

   (i.e. when analysing several times the same sample, how close are the results?)

2. **COMPARABILITY: among all labs, dispersion of their results?**

   (i.e. when the same sample is analysed by several labs, how close are the results?)

3.

QUESTIONS: 2 + 1 more

1. **RELIABILITY: for each lab, what is its precision?**

(i.e. when analysing several times the same sample, how close are the results?)

2. COMPARABILITY: among all labs, dispersion of their results?

(i.e. when the same sample is analysed by several labs, how close are the results?)

3. REFERENCE VALUE : at global scale, consensus value = reference value?

(i.e. on a statistical and practical view point, can we provide samples with reference values acceptable worldwide?)

FEASABILITY:

1. Which soil characteristics?

2. How many replicates?

3. Which range?

FEASABILITY:

1. Which soil characteristics?

pH: top priority but difficult because to much soil weight is needed

FEASABILITY:

1. Which soil characteristics?

pH: top priority but difficult because to much soil weight is needed

C: top priority because

- soil is a main compartment in C cycle… global warming…

- and…

Protocol for the assessment of Sustainable Soil Management

List of contributors:

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Indicator	Parameter/ metric	Measurement methods[2]	Sample characteristics[3]
Soil productivity	Agricultural productivity or biomass in dry matter (t ha^{-1} $year^{-1}$)	Dry weight of vegetation quadrats, or yield measurements	Quadrat method or yield measurement
Soil organic carbon	Organic carbon (%)	Walkley- Black method *http://www.fao.org/3/ca7471en/CA7471EN.pdf* or Dumas method *http://www.fao.org/3/ca7781en/ca7781en.pdf*	Representative soil sample
Soil physical properties	Bulk density (kg dm^{-3}) In some cases, bulk density can be complemented by available water capacity, or other relevant soil physical properties *(See additional indicators)*	The Core Method	Undisturbed representative sample with known volume
Soil biological activity	Soil respiration rate (gCO_2 m^{-2} d^{-1}) Ideally combined with at least one other biological indicator *(See soil biological activity p. 4 and 5)*	Laboratory based soil respiration measurement (static or dynamic) The most common methods will be presented in the annex.	Representative soil sample to be analyzed within hours or refrigerated

FEASABILITY:

1. Which soil characteristics?

pH: top priority but difficult because to much soil is needed…

C: top priority because

- **soil is a main compartment in C cycle**
- **and « Protocole of assessment of sustainable management »**
- **low soil amount is needed**

N & P: main factors of productivity / negative impact on environment

low soil amount is needed

FEASABILITY:

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- **low soil amount is needed**

N & P: main factors of productivity / negative impact on environment
low soil amount is needed

Which methods?

≠METHODS → ≠TOOLS

Carbon

Walckley & Black

Wet chemistry

Dumas

Combustion (controled atmosphere)

Loss of ignition

Combustion (450-550°C)

≠METHODS → ≠TOOLS

For some methods,
≠procedures are possible

Carbon

Walckley & Black
Wet chemistry

duration

Dumas
Combustion (controled atmosphere)

NA

Loss of ignition
Combustion (450-550°C)

Temperature

≠METHODS → ≠TOOLS

For some methods,
≠procedures are possible

Soil characteristic

Nitrogen

Kjeldahl

Wet chemistry

Dumas

Combustion (controled atmosphere)

≠ METHODS → ≠ EXTRACTANTS

For some methods,
≠ procedures are possible

Phosphorus

Olsen

0.5 M NaHCO3 solution, adjusted at a pH of 8.5.

Bray 1

0.03 M NH4F and **0.025 M** HCl

Bray 2

0.03 M NH4F + **0.1 M** HCl

shaking times

FEASABILITY:

1. Which soil characteristics? C N P

2. How many replicates?

2. How many replicates?

Enough rep. to be able to make a statistical analysis,
Not to much to avoid reduced efficiency

Comparability

Compare all labs

6 rep:

A B C D E F

Reliability

of each individual lab

2. How many replicates?

Enough rep. to be able to make a statistical analysis,
Not to much to avoid reduced efficiency

Comparability

Compare all labs

6 rep:

A B C D E F

Reliability

of each individual lab

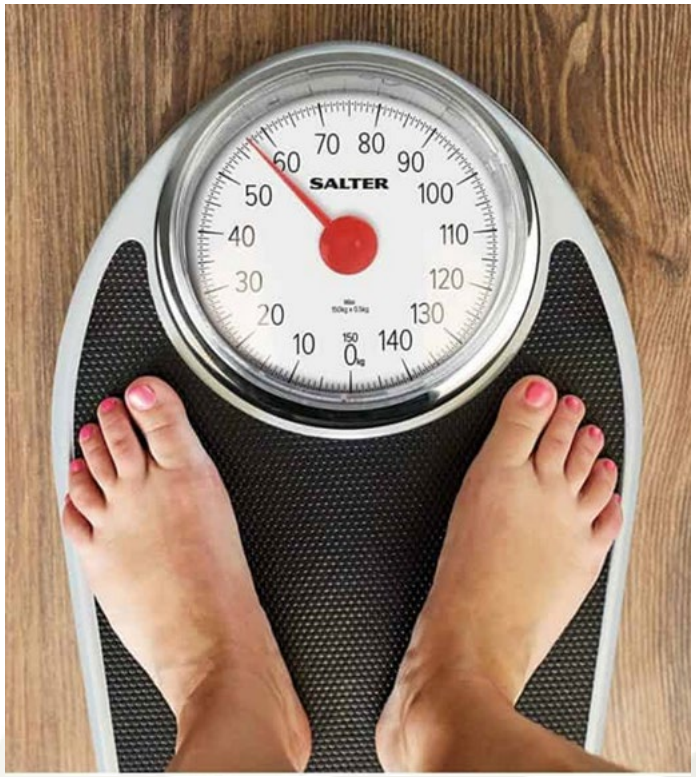
Estimated through PRECISION

⇒ **Is the analytical process under control?**

⇒ **or is random**

WHY PRECISION IS IMPORTANT:

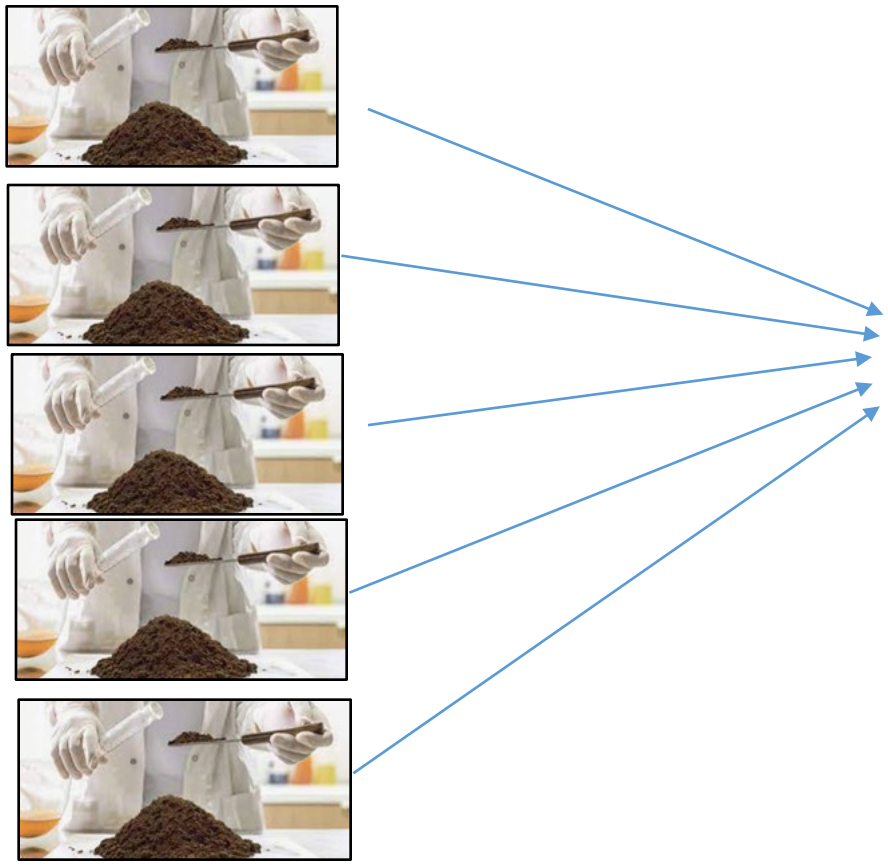
If you go up and down your balance,
you expect the same result everytime



WHY PRECISION IS IMPORTANT:

If you make several times the test (within short time)
You expect the same result

5 REPLICATES



5 times the same result?

(comment:
relevant, whatever the method
and procedures used by the labs)

FEASABILITY:

1. Which soil characteristics? C N P

2. How many replicates? 6 soil types & 5 rep for one soil

FEASABILITY:

1. Which soil characteristics? C N P

2. How many replicates? 6 soil types & 5 rep

3. Which range?

FEASABILITY:

1. Which soil characteristics? C N P

2. How many replicates? 6 soil types & 5 rep

3. Which range?

LOW to HIGH carbon content

FEASABILITY:

1. Which soil characteristics? C N P

2. How many replicates? 6 soil types & 5 rep

3. Which range?

LOW to HIGH carbon content

0.2 to 6 % carbon

FEASABILITY:

1. Which soil characteristics? C N P

2. How many replicates? 6 soil types & 5 rep

3. Which range? 0.2 to 6 % carbon

A B C D E F

E
E
E
E
E
E

10 SOIL SAMPLES

After you sent the analysis , still a lot of work was done

Processes with customs for ‘difficult’ countries

Contact the labs that were late

Contact the labs that did not follow the recommandations (no C data…)

Make the statistical analyse and check

Individual lab performances

Regional performances

etc…

GLOBAL RESULTS

Statistical procedure

Consensus values

Table 2: Global

	INcluding outliers						EXcluding outliers		
Soils	n.labs	min	max	**mad**	**median**	**mean**	sd	cv(%)	n.lab
C_WB									
A									
B									
C									
D									
E1									
E2									
E3									
E4									
E5									
F									
C_Dum									
A									
B									
C									
D									
E1									
E2									
E3									
E4									
E5									
F									
C_Ig									
A	43	0.03	0.73	**0.19**	**0.53**	**0.49**	0.22	45	35

Table 2: Global

	INcluding outliers							EXcluding outliers	
Soils	n.labs	min	max	mad	median	mean	sd	cv(%)	n.lab
C_WB									
A	150								132
B	160								137
C	160								134
D	160								132
E1	160								132
E2	160								126
E3	160								127
E4	160								128
E5	157								128
F	159								150
C_Dum									
A	49								40
B	52								44
C	53								46
D	52								44
E1	53								45
E2	53								45
E3	52								45
E4	52								46
E5	53								44
F	53								43
C_Ig									
A	42	0.03	0.73	0.19	0.53	0.49	0.22	45	35

Table 2: Global

	INcluding outliers					EXcluding outliers			
Soils	n.labs	min	max	mad	median	mean	sd	cv(%)	n.lab
C_WB									
A	150				0.18	0.18			132
B	160				1.79	1.76			137
C	160				2.36	2.32			134
D	160				2.88	2.80			132
E1	160				3.00	3.01			132
E2	160				3.08	3.00			126
E3	160				3.06	3.01			127
E4	160				3.10	3.03			128
E5	157				3.03	3.00			128
F	159				6.18	5.66			150
C_Dum									
A	49				1.20	1.17			40
B	52				18.26	18.36			44
C	53				24.10	24.28			46
D	52				28.50	28.60			44
E1	53				34.87	34.93			45
E2	53				34.58	34.50			45
E3	52				34.68	34.71			45
E4	52				34.60	34.71			46
E5	53				34.53	34.85			44
F	53				66.20	66.76			43
C_Ig									
A	43	0.03	0.73	0.19	0.52	0.49	0.22	45	35

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Table 2: Global

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Soils	n.labs	min	max	mad	median	mean	sd	cv(%)	n.lab
C_WB									
A	150			0.10	0.18	0.18	0.11		132
B	160			0.39	1.79	1.76	0.39		137
C	160			0.43	2.36	2.32	0.41		134
D	160			0.44	2.88	2.80	0.43		132
E1	160			0.50	3.00	3.01	0.46		132
E2	160			0.40	3.08	3.00	0.38		126
E3	160			0.45	3.06	3.01	0.44		127
E4	160			0.47	3.10	3.03	0.42		128
E5	157			0.50	3.03	3.00	0.47		128
F	159			1.36	6.18	5.66	1.77		150
C_Dum									
A	49			0.45	1.20	1.17	0.48		40
B	52			1.02	18.26	18.36	1.00		44
C	53			1.22	24.10	24.28	1.12		46
D	52			2.12	28.50	28.60	1.45		44
E1	53			1.68	34.87	34.93	1.48		45
E2	53			1.45	34.58	34.50	1.62		45
E3	52			2.08	34.68	34.71	1.53		45
E4	52			1.82	34.60	34.71	1.62		46
E5	53			2.42	34.53	34.85	1.92		44
F	53			2.97	66.20	66.76	2.26		43
C_Ig									
A	42	0.03	0.73	0.19	0.52	0.49	0.22	45	35

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C_WB									
A	150				0.18	0.18		61	132
B	160				1.79	1.76		22	137
C	160				2.36	2.32		18	134
D	160				2.88	2.80		15	132
E1	160				3.00	3.01		15	132
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E3	160				3.06	3.01		15	127
E4	160				3.10	3.03		14	128
E5	157				3.03	3.00		16	128
F	159				6.18	5.66		31	150
C_Dum									
A	49				1.20	1.17		41	40
B	52				18.26	18.36		5	44
C	53				24.10	24.28		5	46
D	52				28.50	28.60		5	44
E1	53				34.87	34.93		4	45
E2	53				34.58	34.50		5	45
E3	52				34.68	34.71		4	45
E4	52				34.60	34.71		5	46
E5	53				34.53	34.85		6	44
F	53				66.20	66.76		3	43
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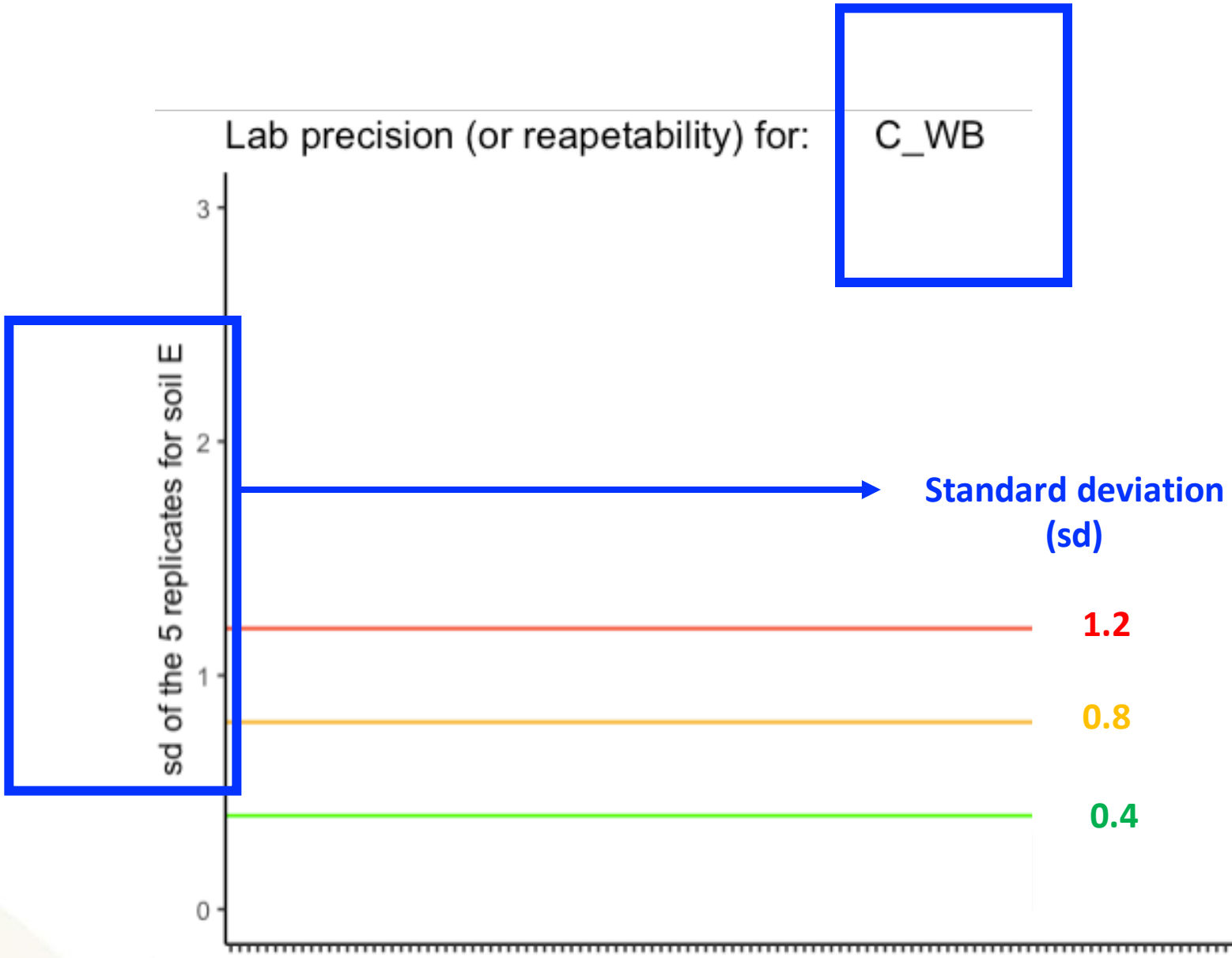
C_WB									
A	150	0.00	9.71	**0.10**	**0.18**	**0.18**	0.11	61	132
B	160	0.02	20.05	**0.39**	**1.79**	**1.76**	0.39	22	137
C	160	0.02	21.00	**0.43**	**2.36**	**2.32**	0.41	18	134
D	160	0.01	25.66	**0.44**	**2.88**	**2.80**	0.43	15	132
E1	160	0.03	33.75	**0.50**	**3.00**	**3.01**	0.46	15	132
E2	160	0.03	28.96	**0.40**	**3.08**	**3.00**	0.38	13	126
E3	160	0.02	27.82	**0.45**	**3.06**	**3.01**	0.44	15	127
E4	160	0.02	26.46	**0.47**	**3.10**	**3.03**	0.42	14	128
E5	157	0.01	27.82	**0.50**	**3.03**	**3.00**	0.47	16	128
F	159	0.11	67.85	**1.36**	**6.18**	**5.66**	1.77	31	150
C_Dum									
A	49	0.00	34.80	**0.45**	**1.20**	**1.17**	0.48	41	40
B	52	0.02	34.20	**1.02**	**18.26**	**18.36**	1.00	5	44
C	53	0.02	40.70	**1.22**	**24.10**	**24.28**	1.12	5	46
D	52	0.03	96.77	**2.12**	**28.50**	**28.60**	1.45	5	44
E1	53	0.03	104.00	**1.68**	**34.87**	**34.93**	1.48	4	45
E2	53	0.03	104.00	**1.45**	**34.58**	**34.50**	1.62	5	45
E3	52	0.03	62.20	**2.08**	**34.68**	**34.71**	1.53	4	45
E4	52	0.03	54.20	**1.82**	**34.60**	**34.71**	1.62	5	46
E5	53	0.03	66.10	**2.42**	**34.53**	**34.85**	1.92	6	44
F	53	0.07	108.00	**2.97**	**66.20**	**66.76**	2.26	3	43
C_Ig									
A	42	0.03	9.73	**0.19**	**0.52**	**0.49**	0.22	45	35
B	42	1.79	10.68	**1.51**	**6.52**	**6.22**	2.05	33	42
C	42	2.75	10.19	**1.66**	**7.92**	**7.24**	1.94	27	42
D	42	1.83	16.15	**3.88**	**10.77**	**9.98**	3.70	37	42
E1	42	3.17	10.10	**1.83**	**7.33**	**7.09**	1.63	23	42
E2	42	3.25	10.90	**1.58**	**7.44**	**7.18**	1.77	25	42
E3	42	2.75	10.40	**1.92**	**7.41**	**6.95**	1.77	25	42
E4	42	2.32	10.14	**1.62**	**7.44**	**7.26**	1.49	21	41
E5	41	2.50	11.14	**1.66**	**7.35**	**7.01**	1.48	21	39
F	42	3.57	18.07	**2.47**	**14.38**	**13.35**	3.10	23	41

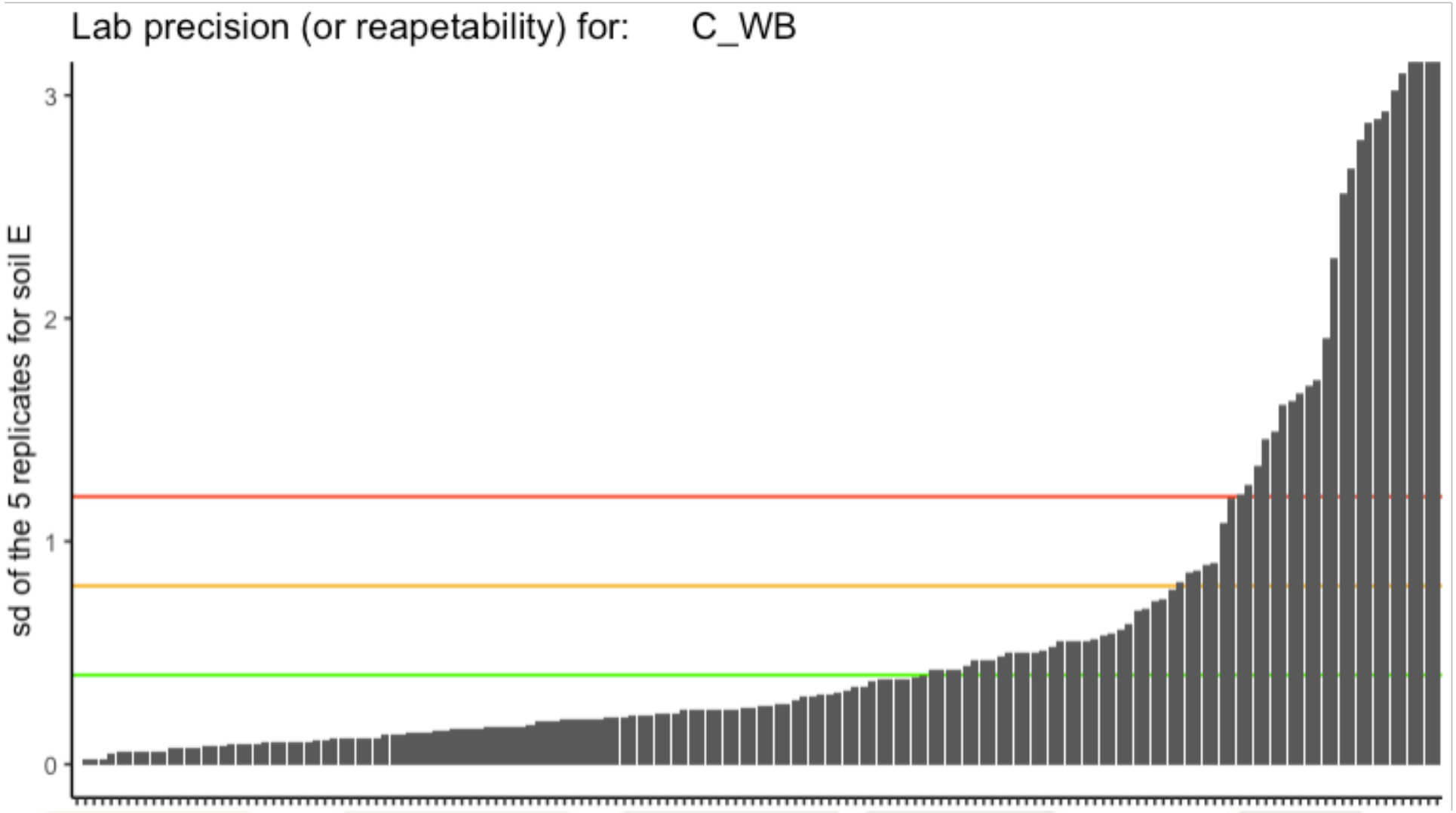
Precision

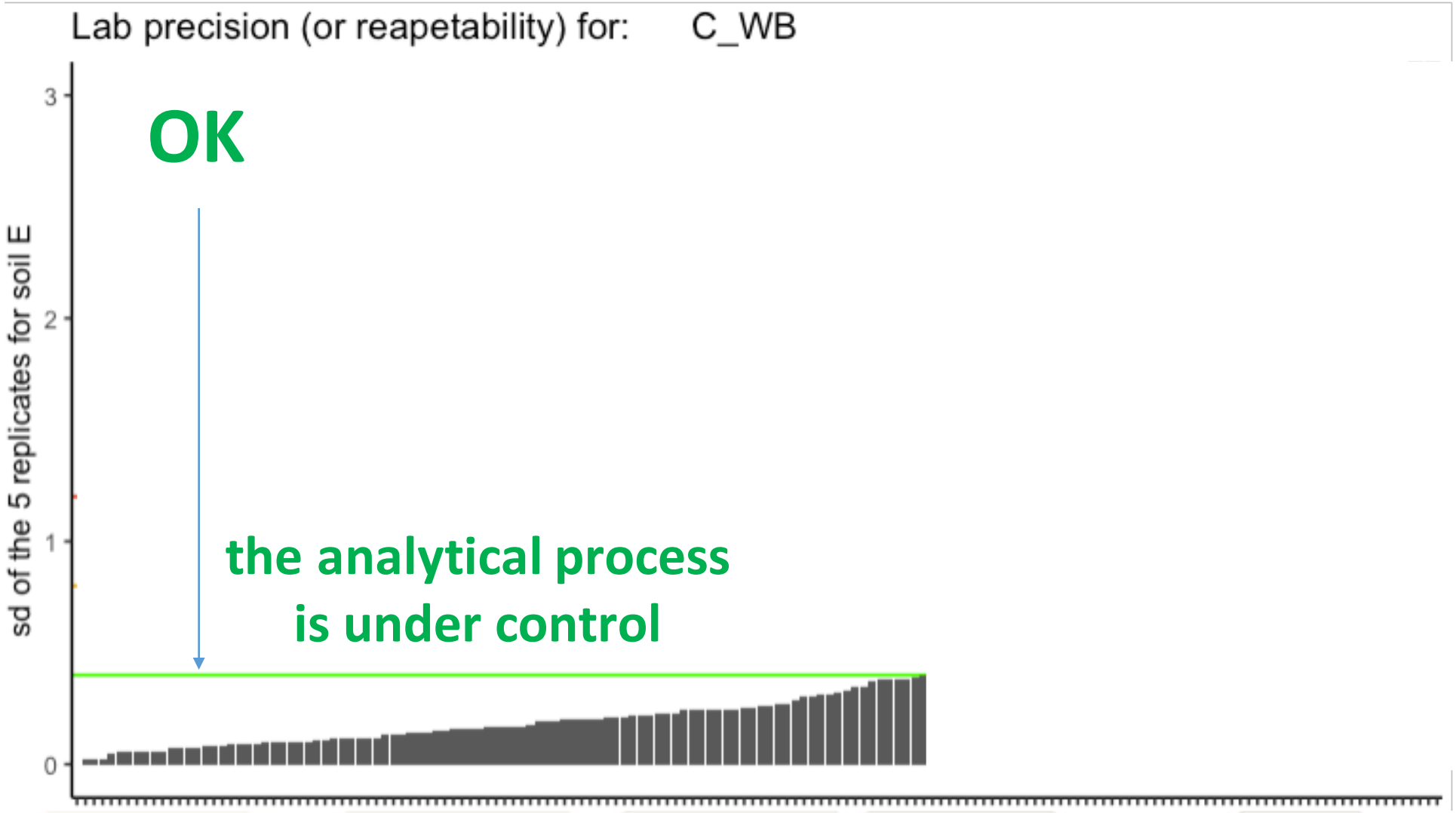
Precision: interpretation of Z-score standard deviation (sd)

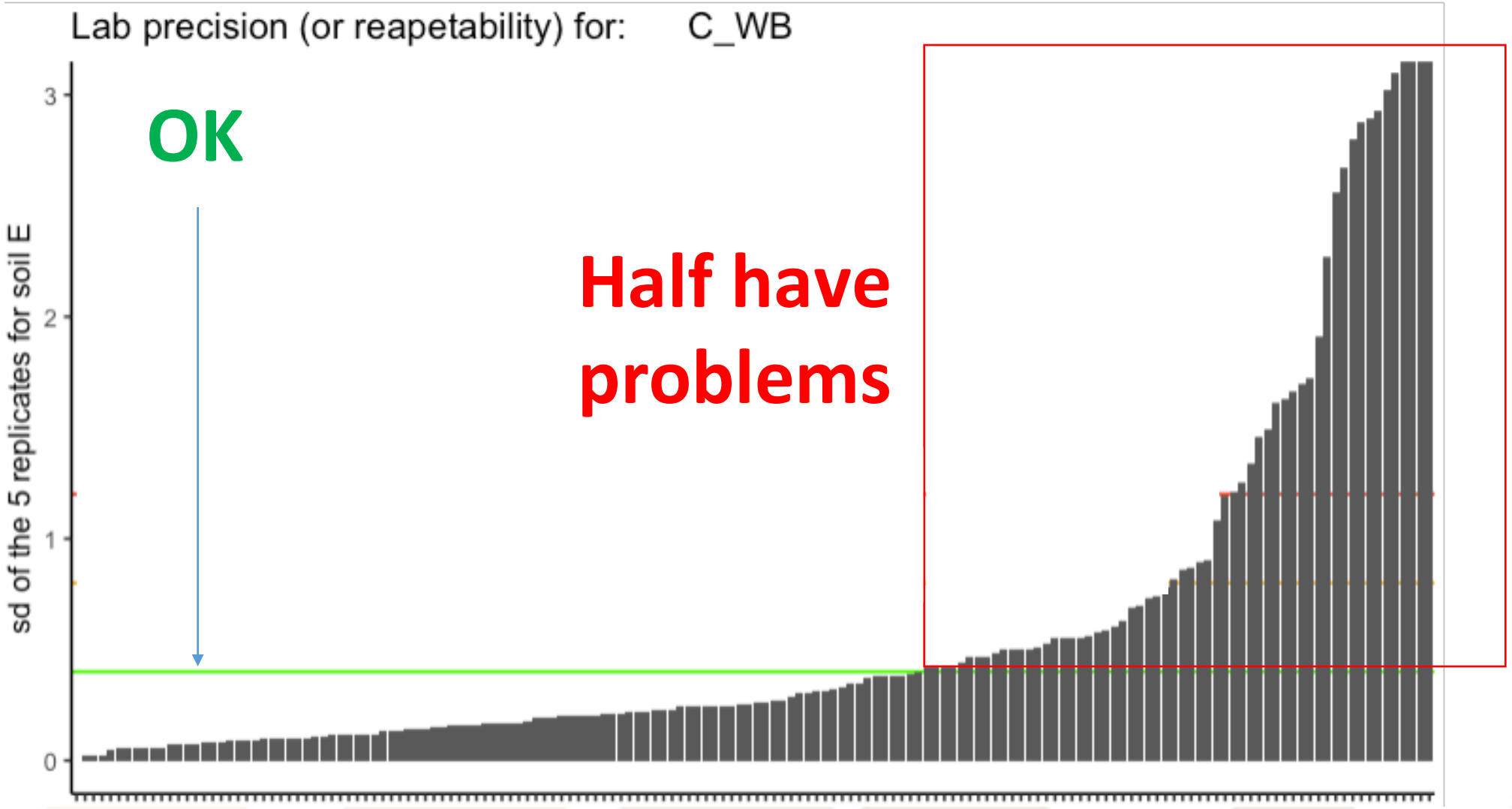
	Z scores				
	example 1	example 2	example 3	example 4	example 5
Rep 1	0	1	0,6	1,6	0,2
Rep 2	0	1	0,8	1,8	0,6
Rep 3	0	1	1	2	1
Rep 4	0	1	1,2	2,2	1,4
Rep 5	1	2	1,4	2,4	1,8
mean	0,2	1,2	1	2	1
SD	**0,4**	**0,4**	**0,3**	**0,3**	**0,6**

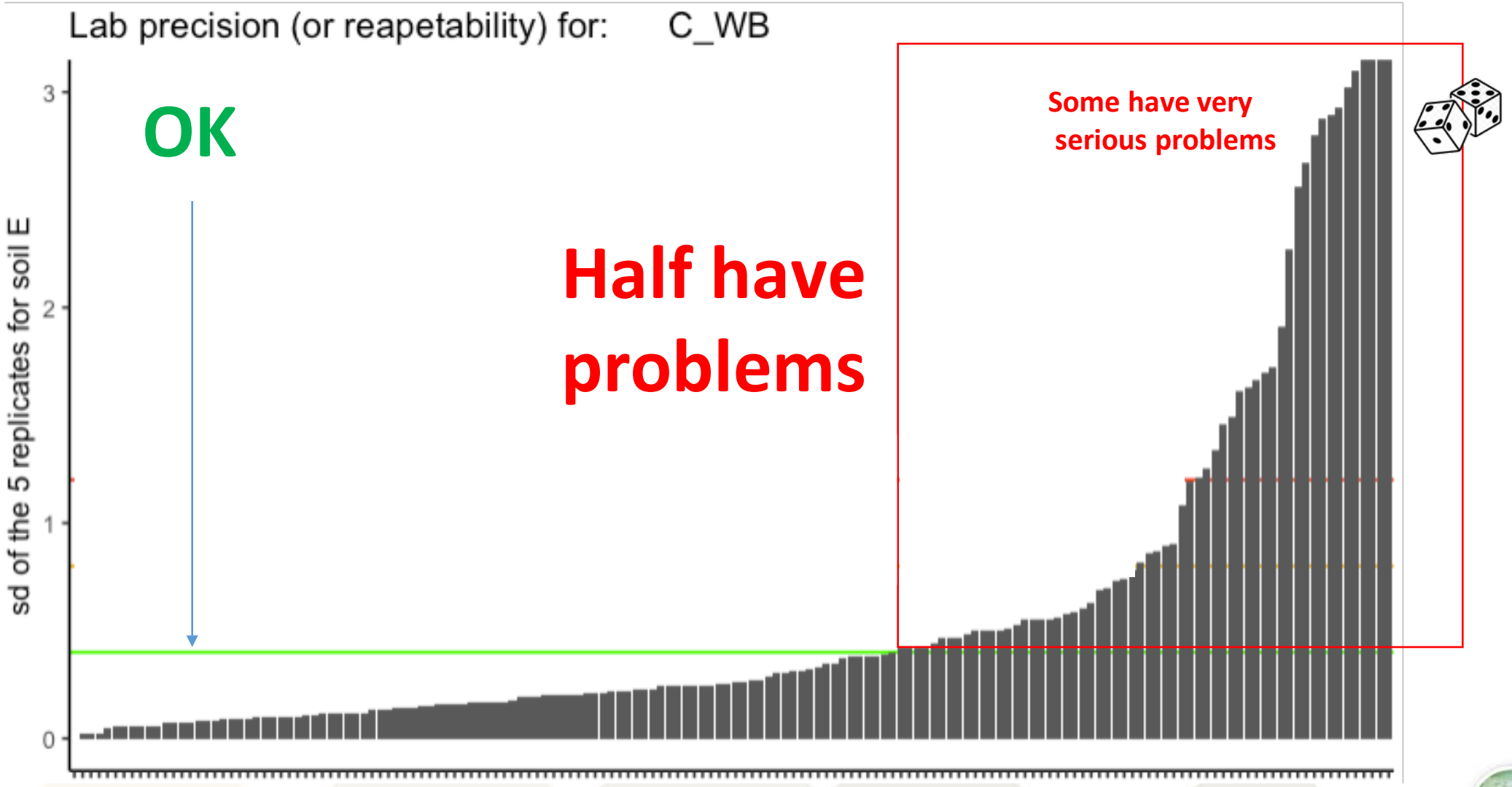
Carbon

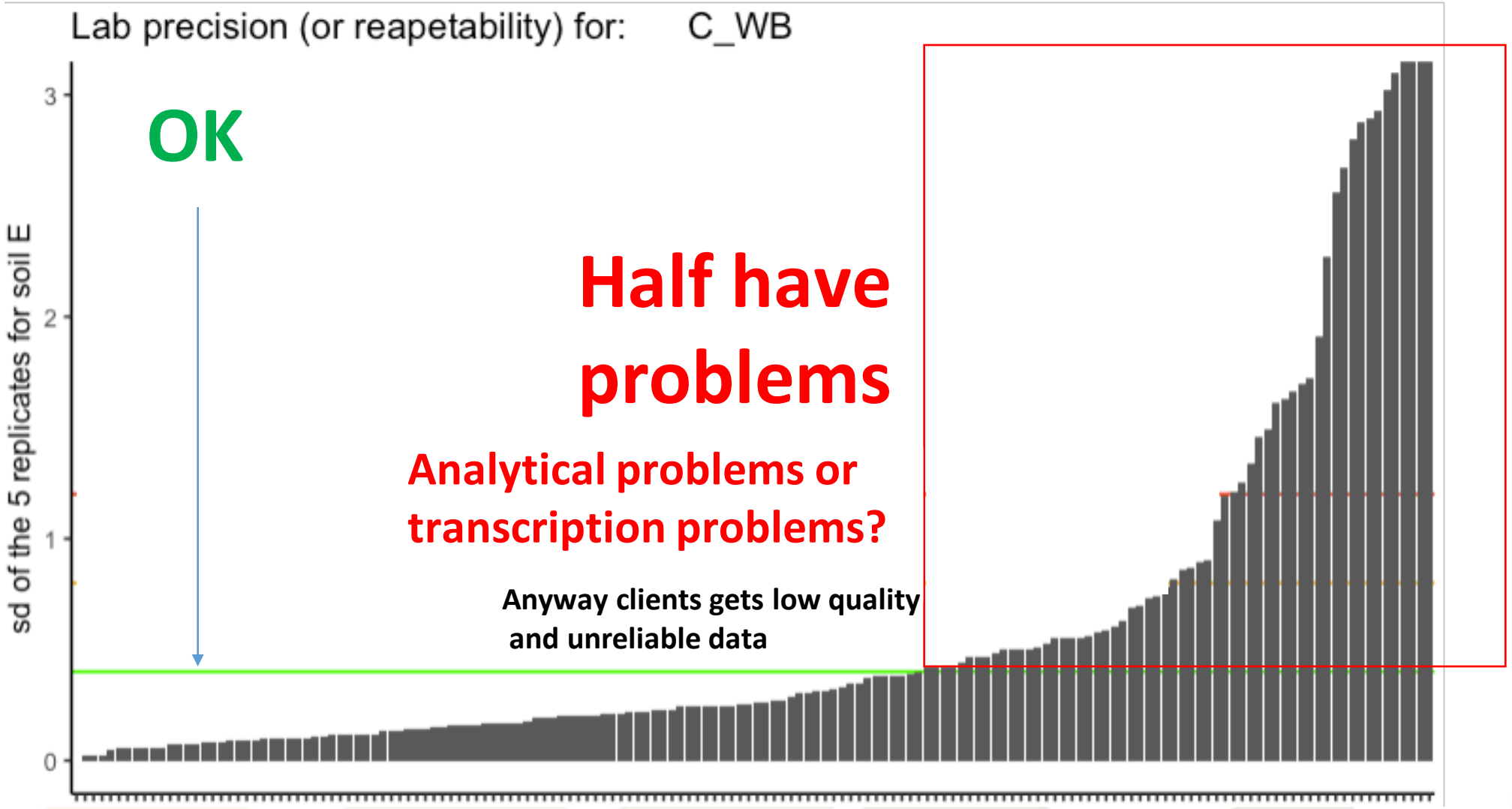

Lab precision (or reapetability) for:
C_WB
sd of the 5 replicates for soil E
3
2
1
0
Standard deviation (sd)
1.2
0.8
0.4

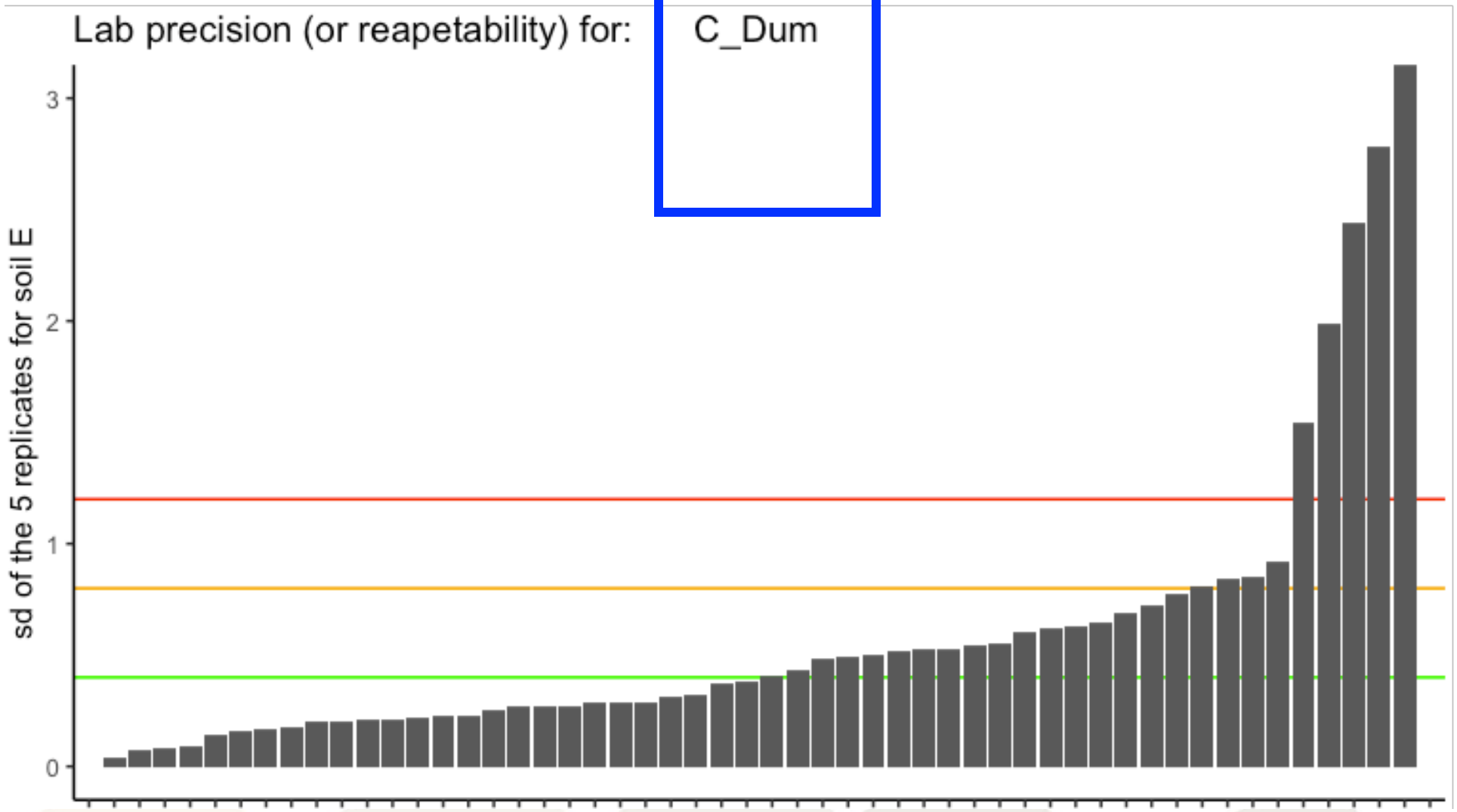

Lab precision (or reapetability) for: C_WB
sd of the 5 replicates for soil E
0
1
2
3


Lab precision (or reapetability) for: C_WB
OK
the analytical process
is under control
sd of the 5 replicates for soil E
3
2
1
0

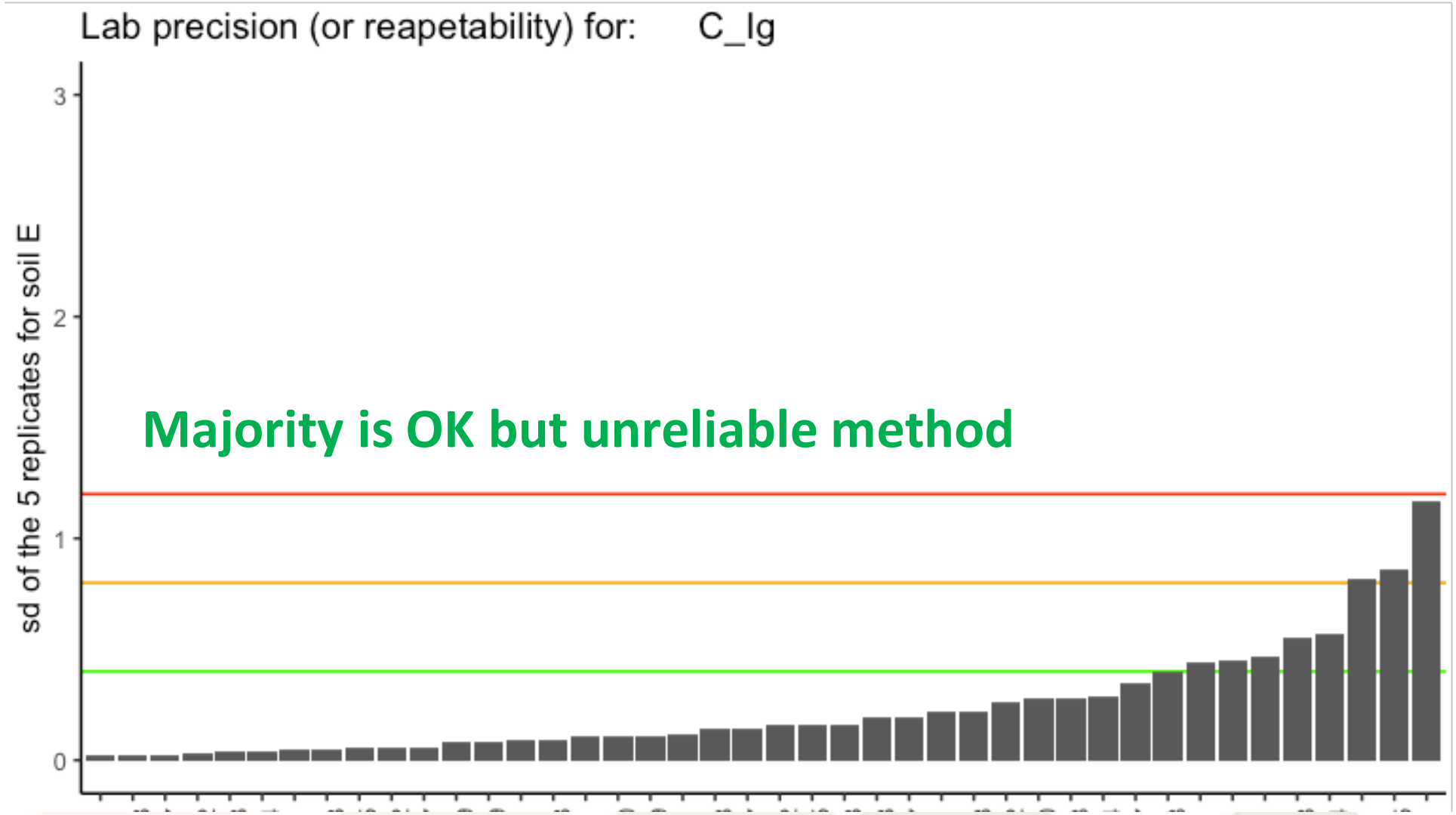

Lab precision (or reapetability) for: C_WB
OK
Half have problems
sd of the 5 replicates for soil E
0
1
2
3


Lab precision (or reapetability) for: C_WB
OK
Half have problems
Some have very serious problems
sd of the 5 replicates for soil E
0
1
2
3

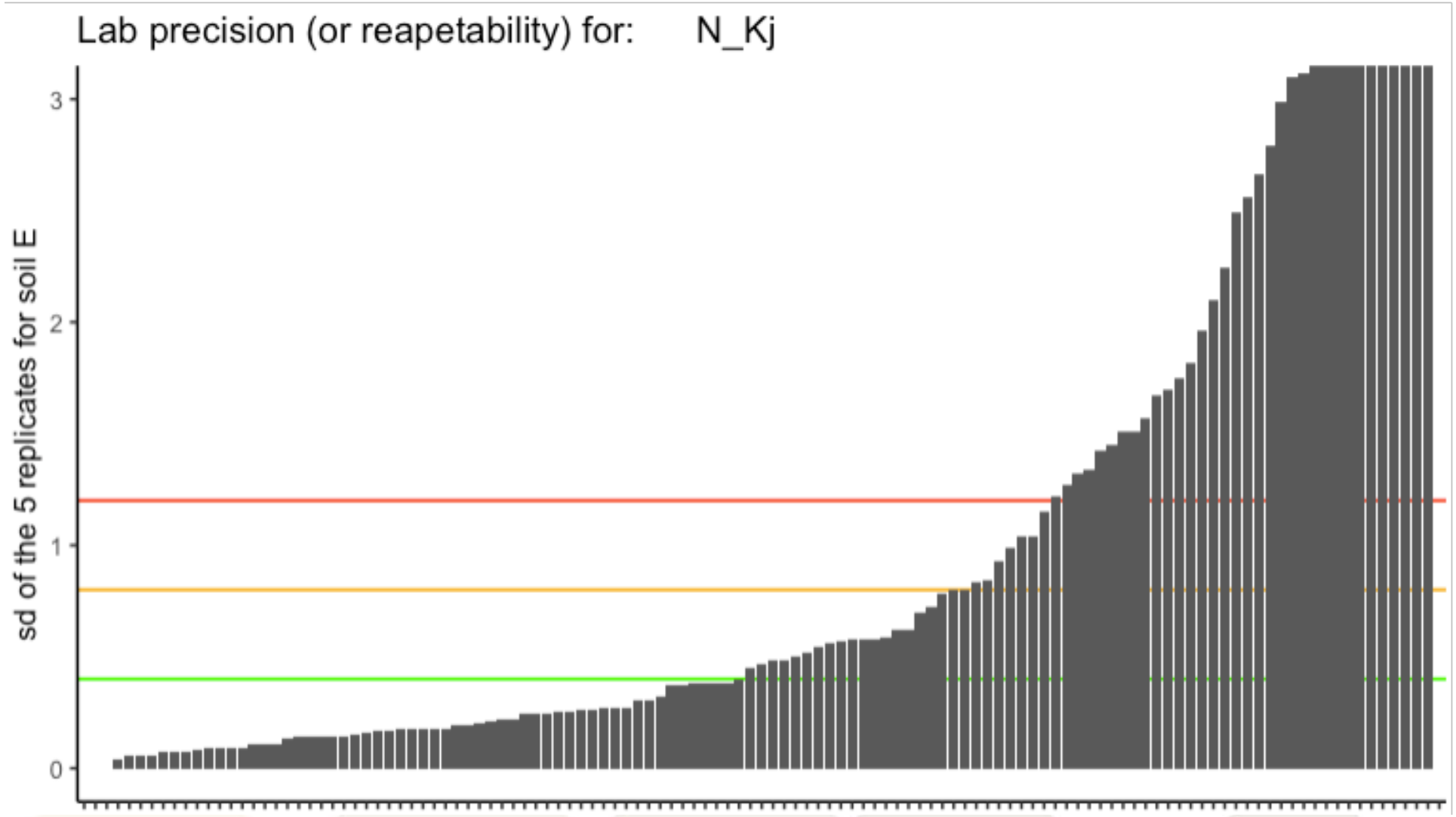

Lab precision (or reapetability) for: C_WB
OK
Half have problems
Analytical problems or transcription problems?
Anyway clients gets low quality and unreliable data
sd of the 5 replicates for soil E
0
1
2
3

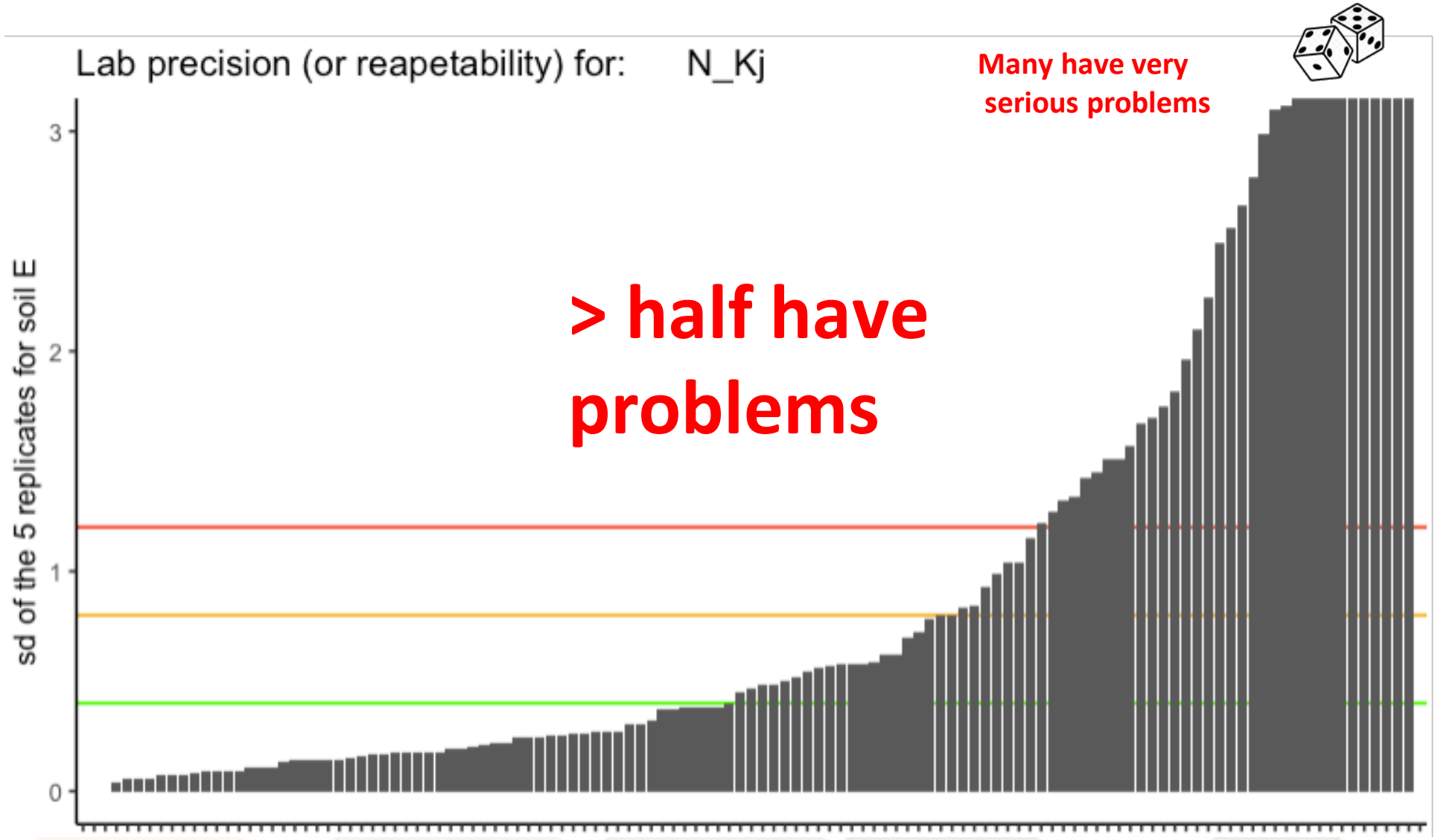

Lab precision (or reapetability) for:
C_Dum
sd of the 5 replicates for soil E
0
1
2
3

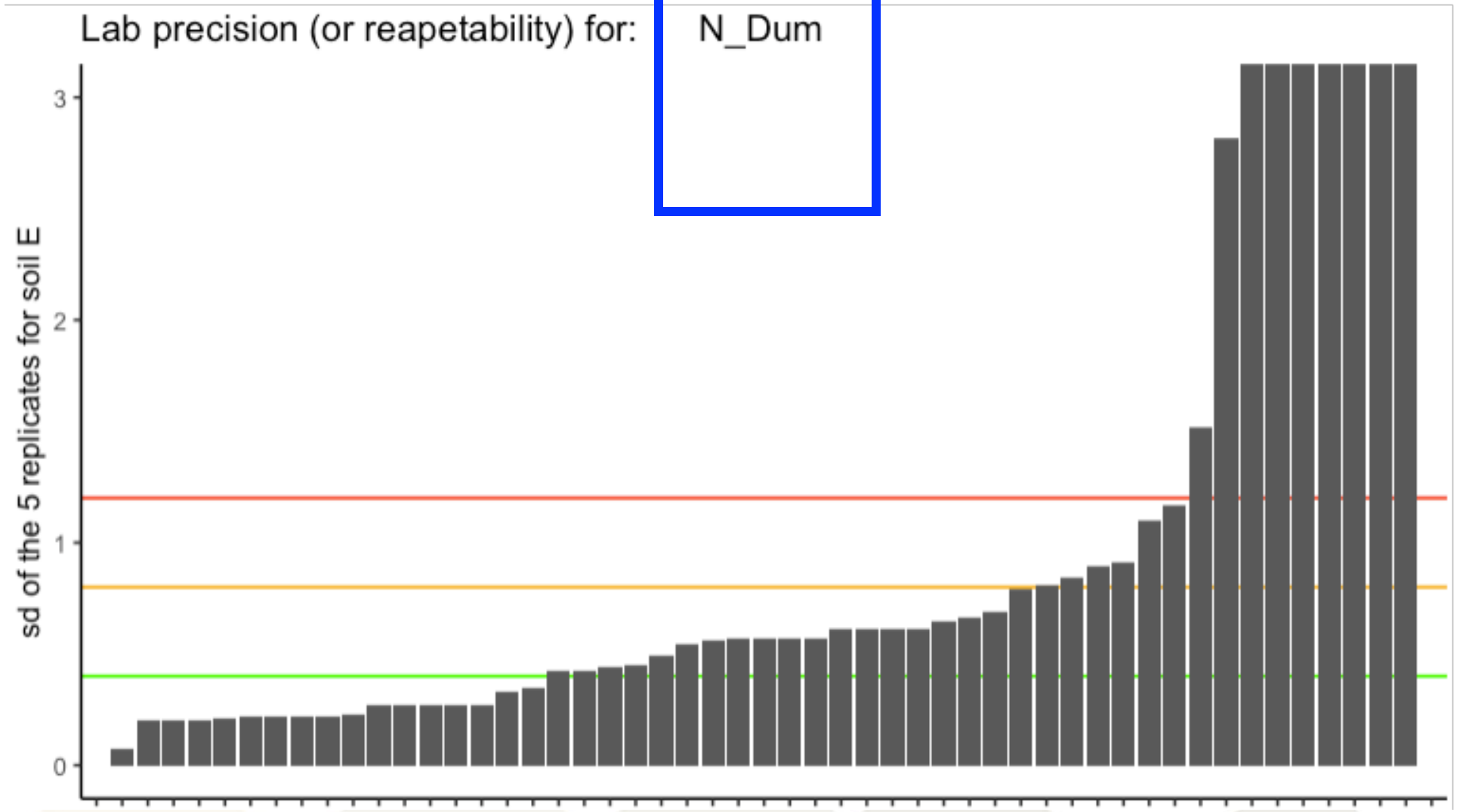
Using high tech. instruments but still problems => human factor?

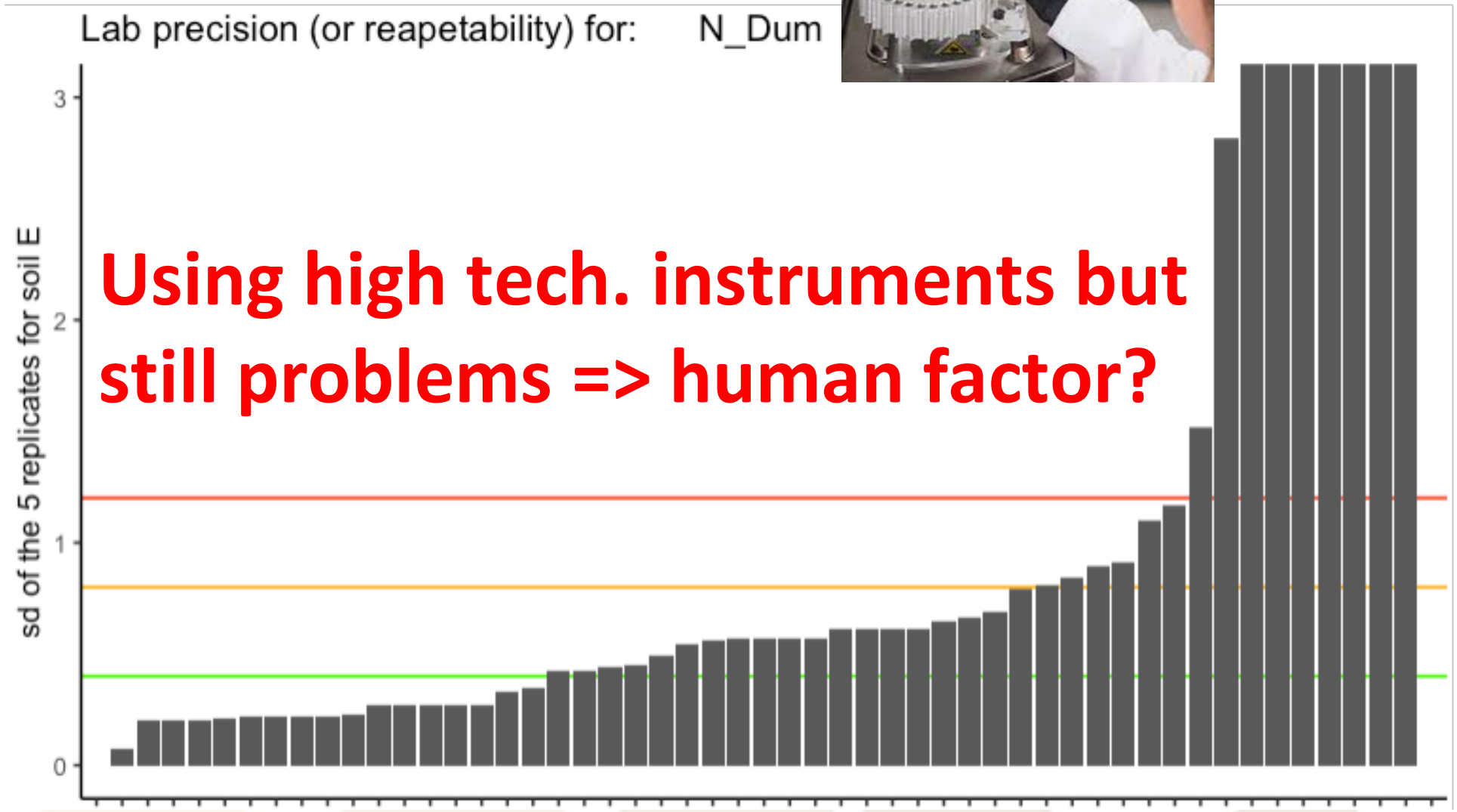

Lab precision (or reapetability) for: C_lg
sd of the 5 replicates for soil E
3
2
1
0
Majority is OK but unreliable method

Nitrogen


Lab precision (or reapetability) for: N_Kj
sd of the 5 replicates for soil E
0
1
2
3

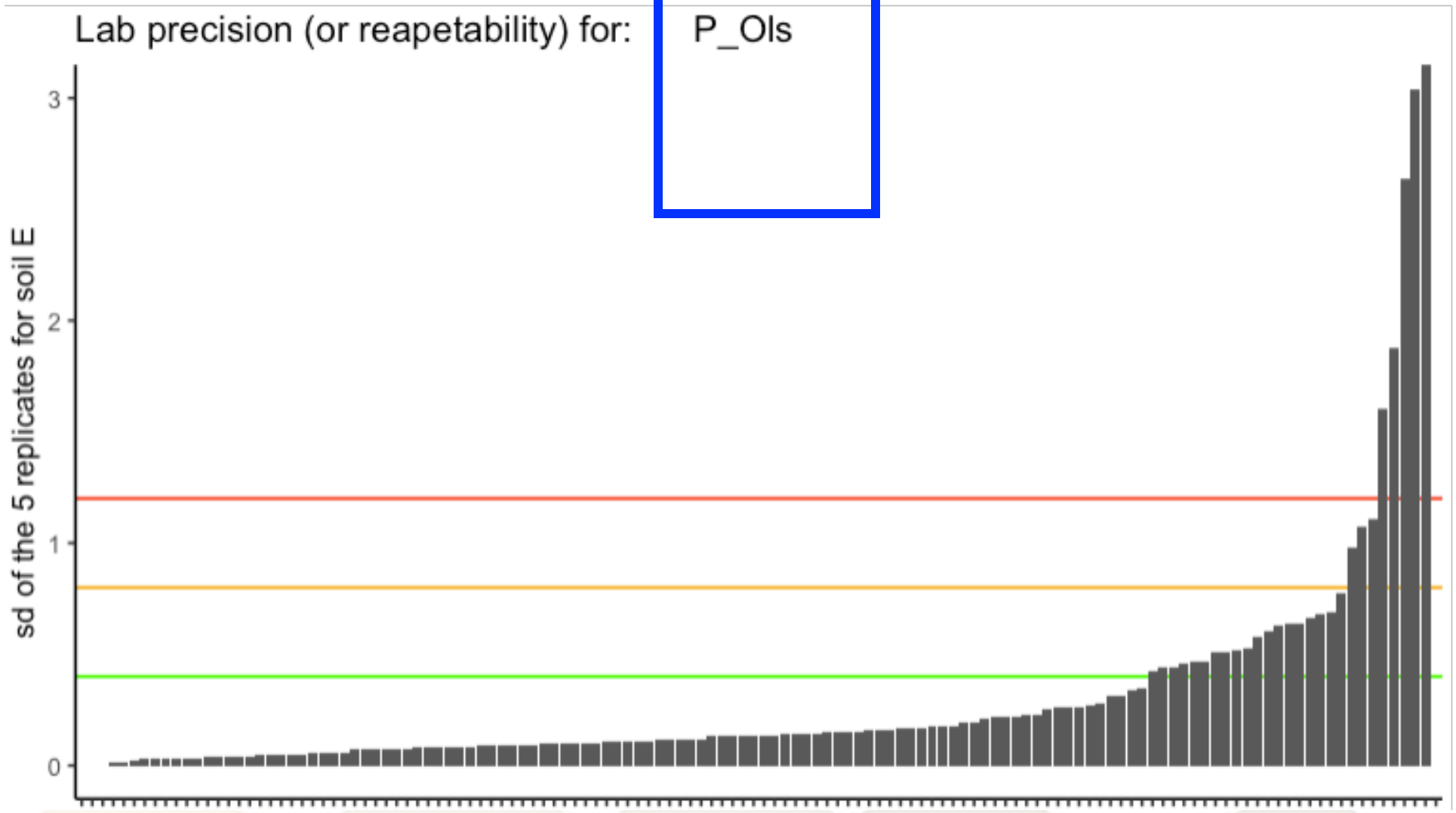

Lab precision (or reapetability) for: N_Kj
Many have very serious problems
> half have problems
sd of the 5 replicates for soil E
0
1
2
3

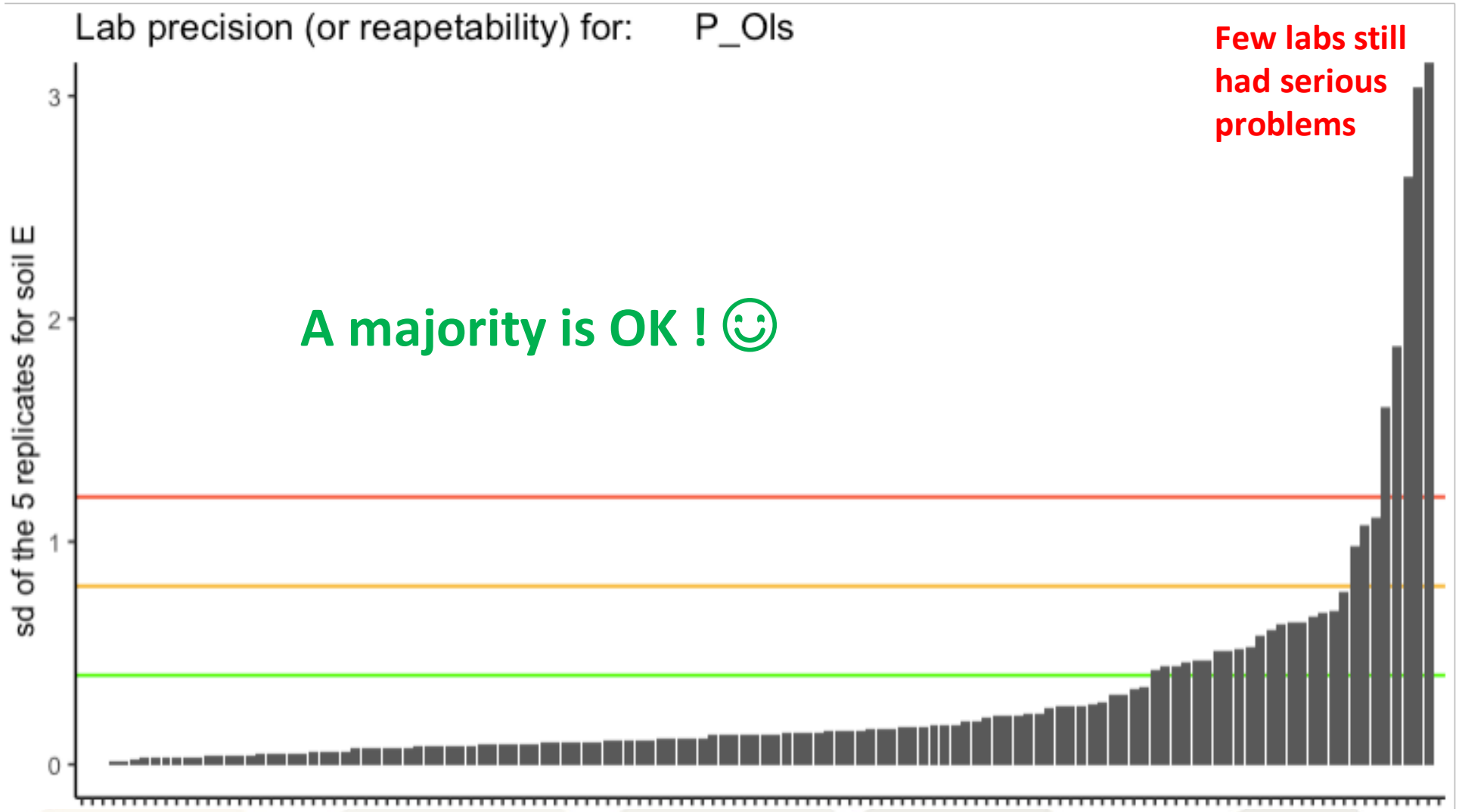

Lab precision (or reapetability) for:
N_Dum
sd of the 5 replicates for soil E
0
1
2
3



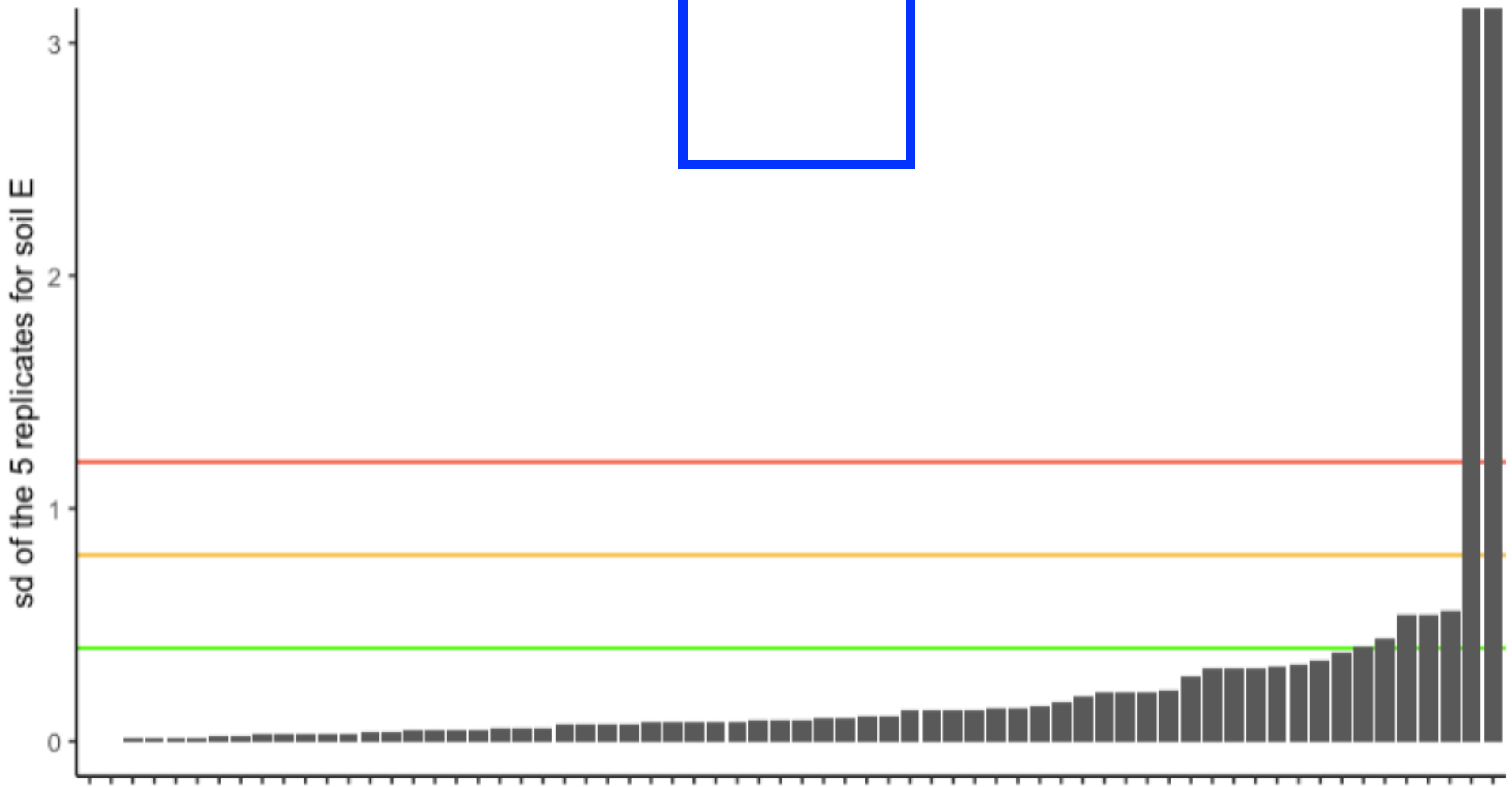
Using high tech. instruments but still problems => human factor?

Phosphorus

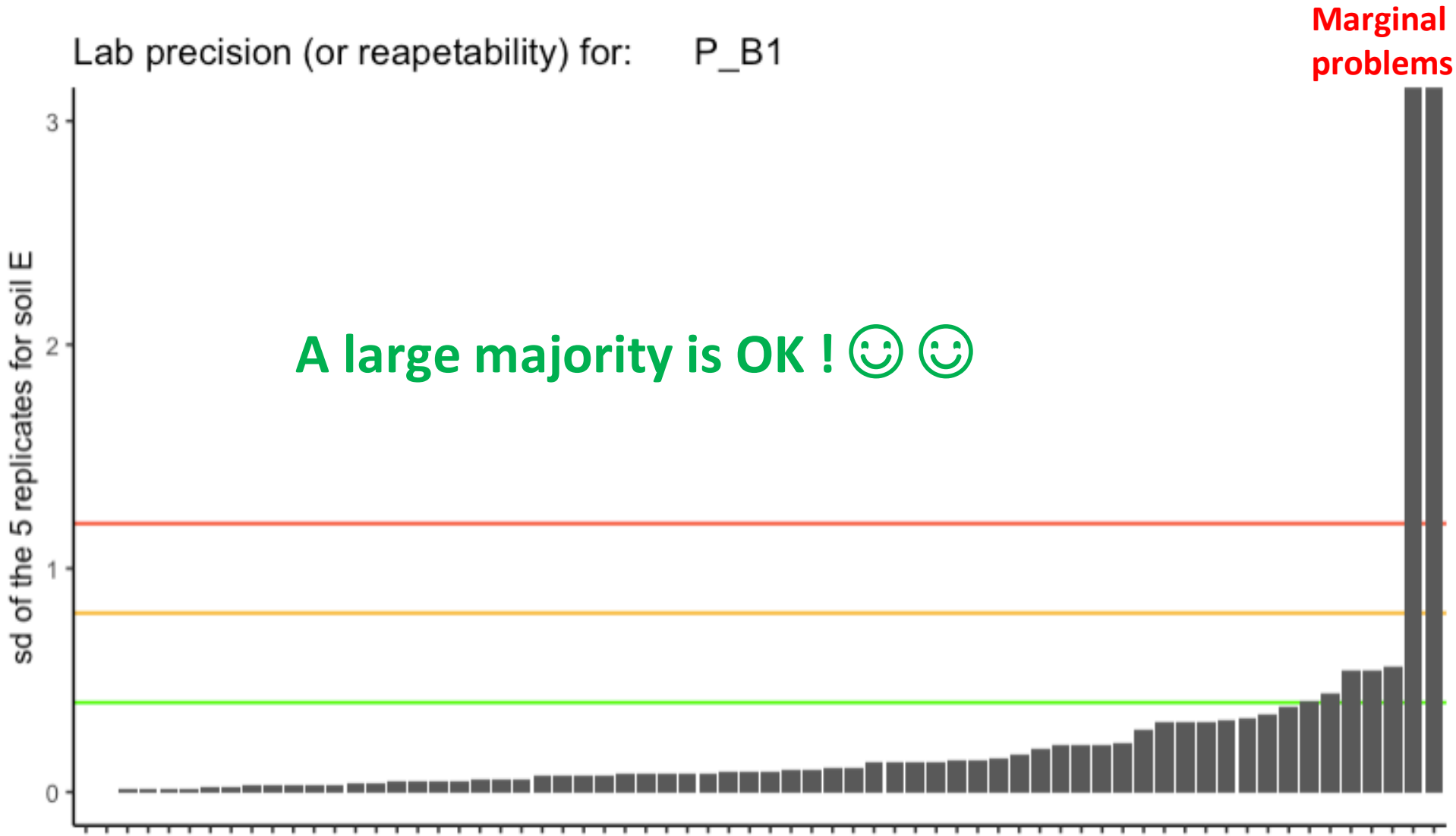

Lab precision (or reapetability) for:
P_Ols
sd of the 5 replicates for soil E
3
2
1
0


Lab precision (or reapetability) for: P_Ols
sd of the 5 replicates for soil E
3
2
1
0
Few labs still had serious problems
A majority is OK ! ☺

Lab precision (or reapetability) for: P_B1

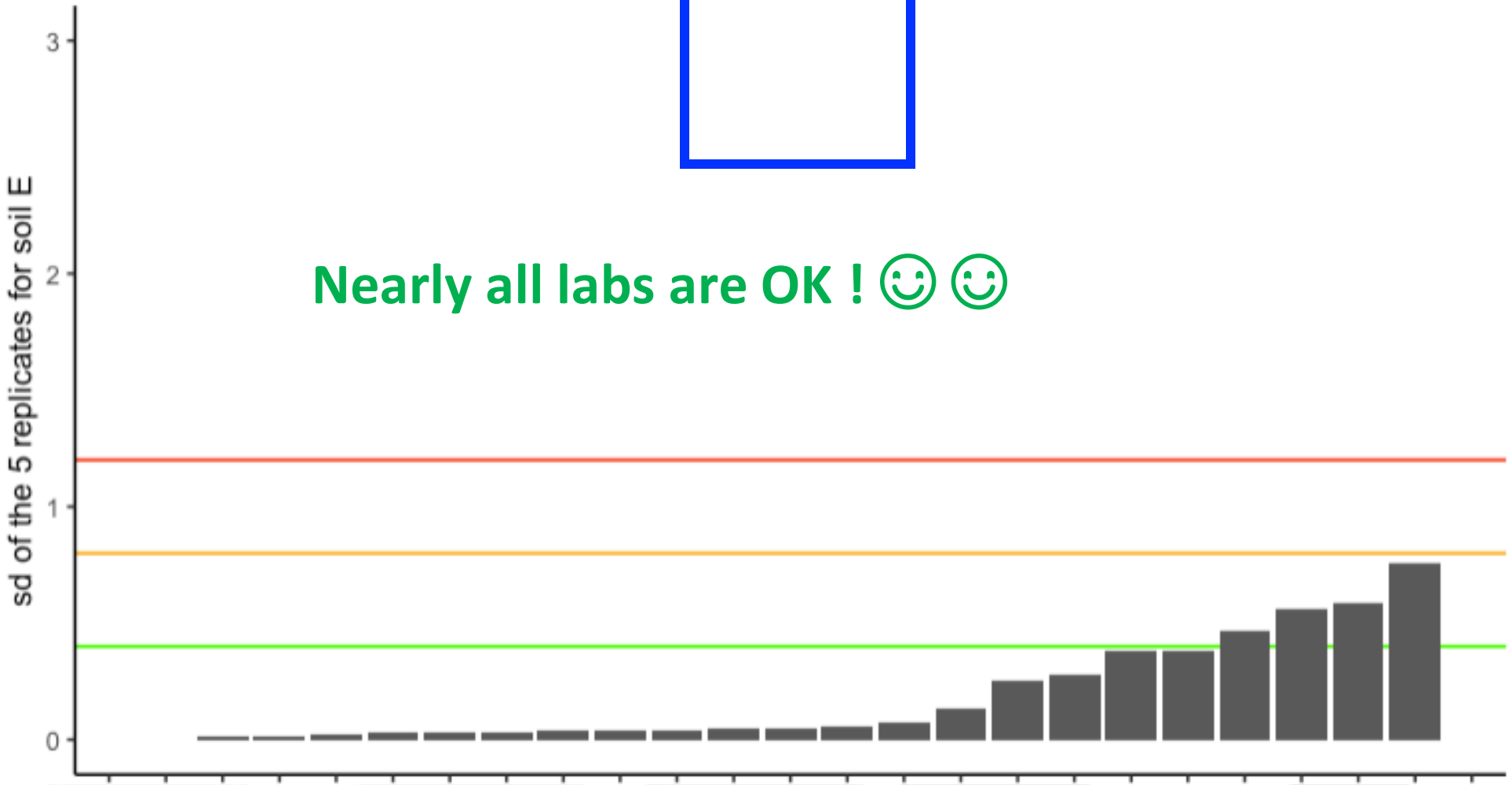


Marginal problems



A large majority is OK ! ☺ ☺

Lab precision (or reapetability) for: P_B2

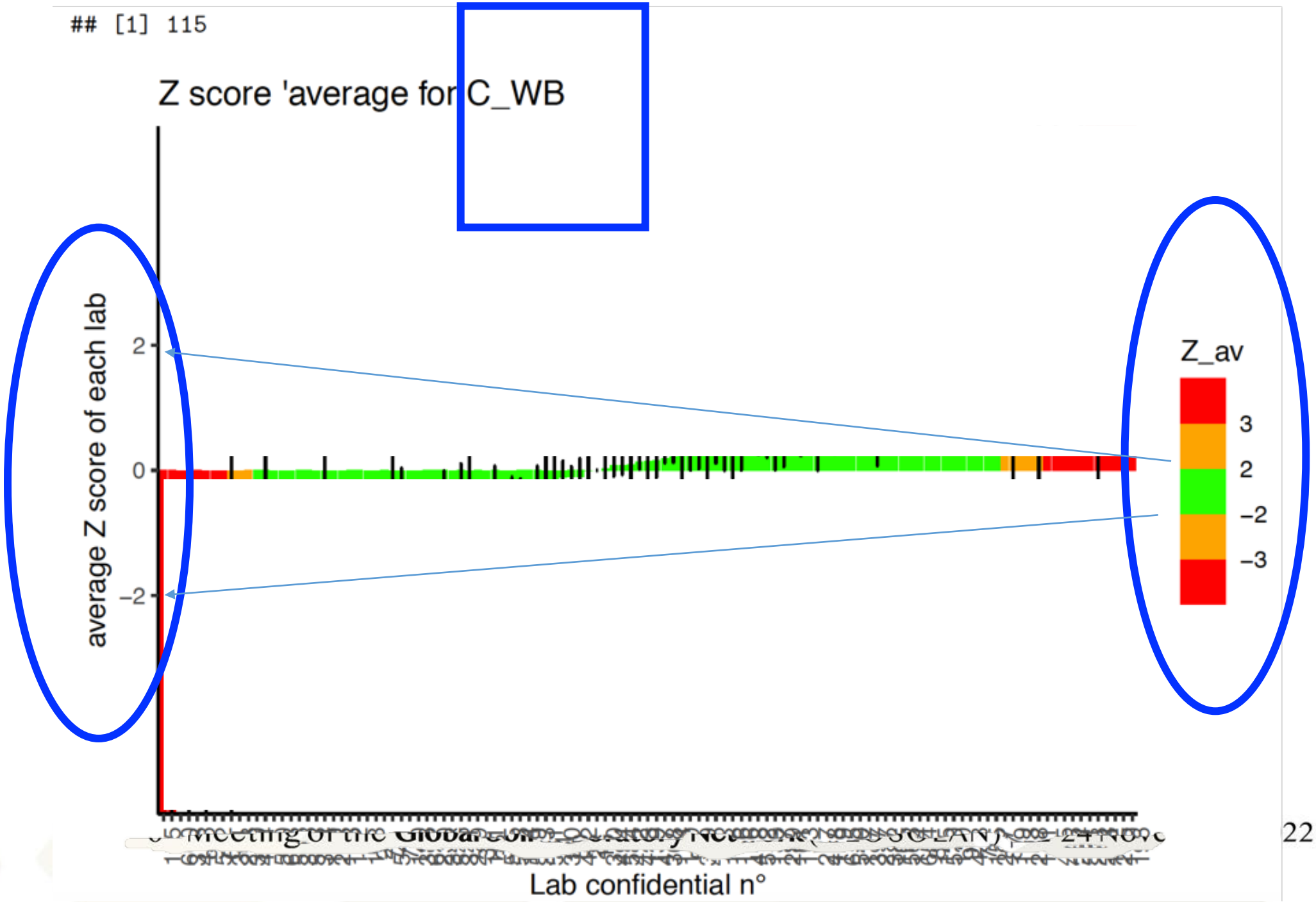


Nearly all labs are OK ! ☺ ☺

Comparability & accuracy

How distant/different are the results from each lab Compared to the consensus value.

Carbon


[1] 115
Z score 'average for C_WB
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3
Lab confidential n°

[1] 115

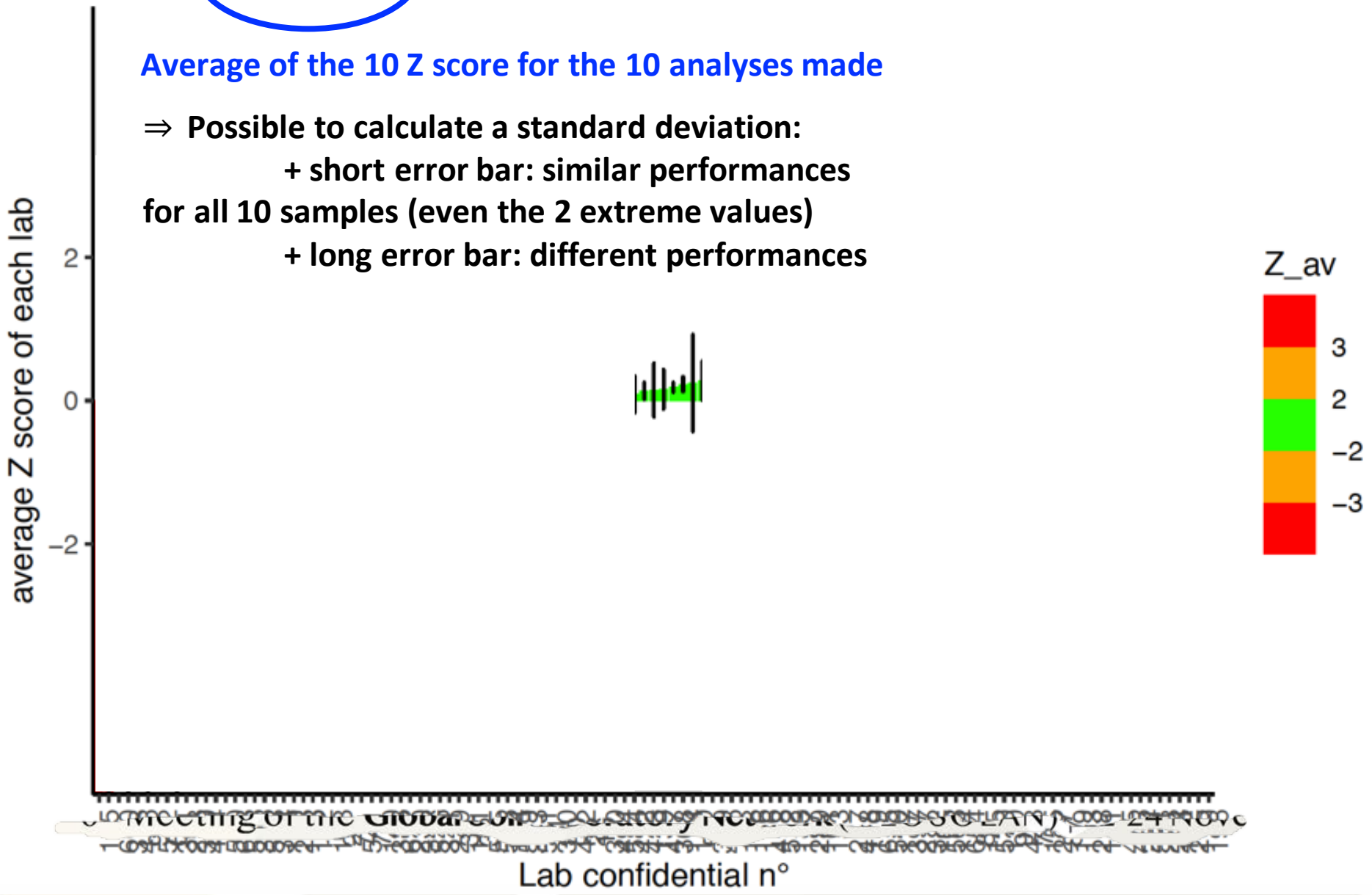
Z score 'average for C_WB

Average of the 10 Z score for the 10 analyses made

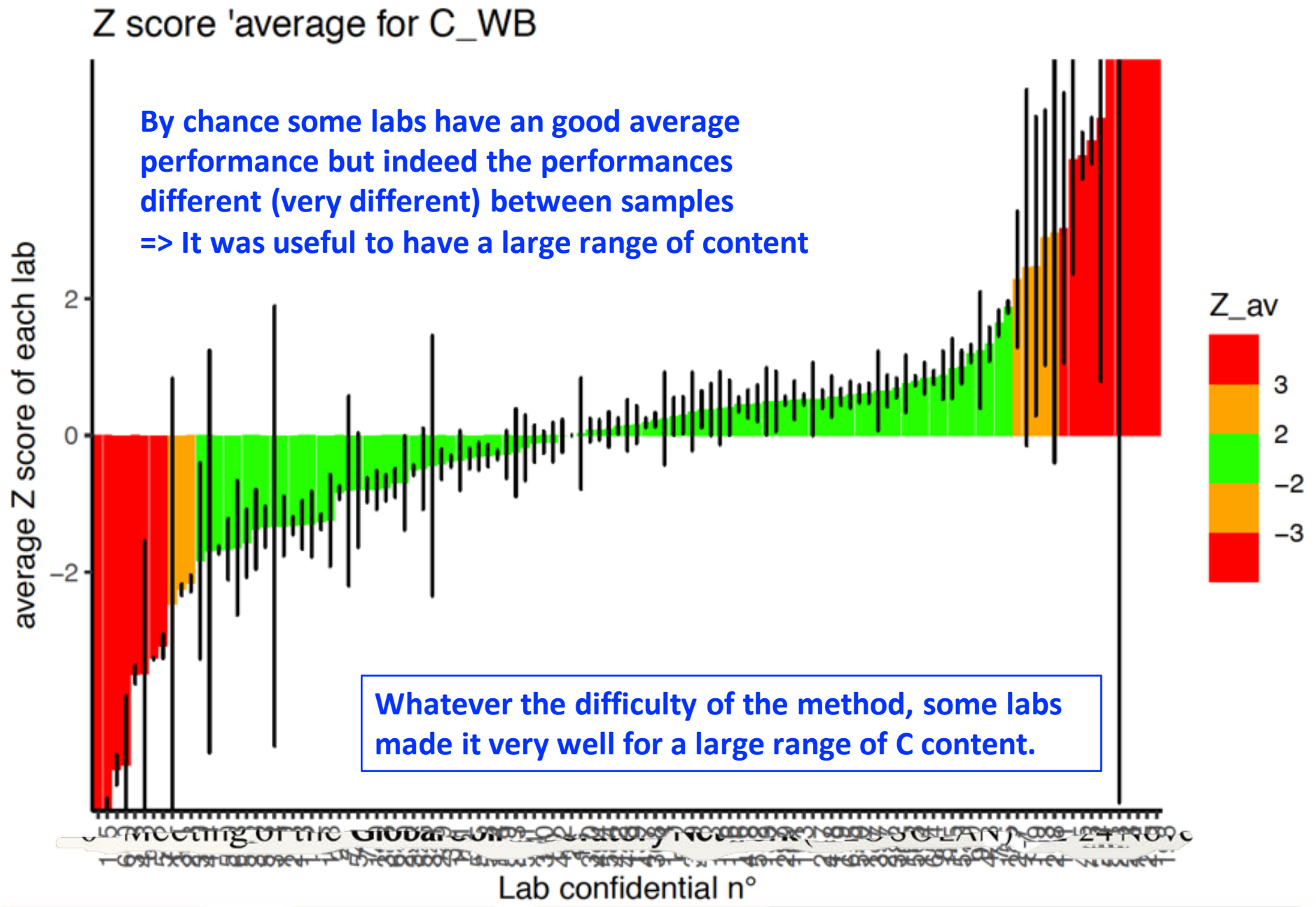
⇒ **Possible to calculate a standard deviation:**

+ short error bar: similar performances for all 10 samples (even the 2 extreme values)

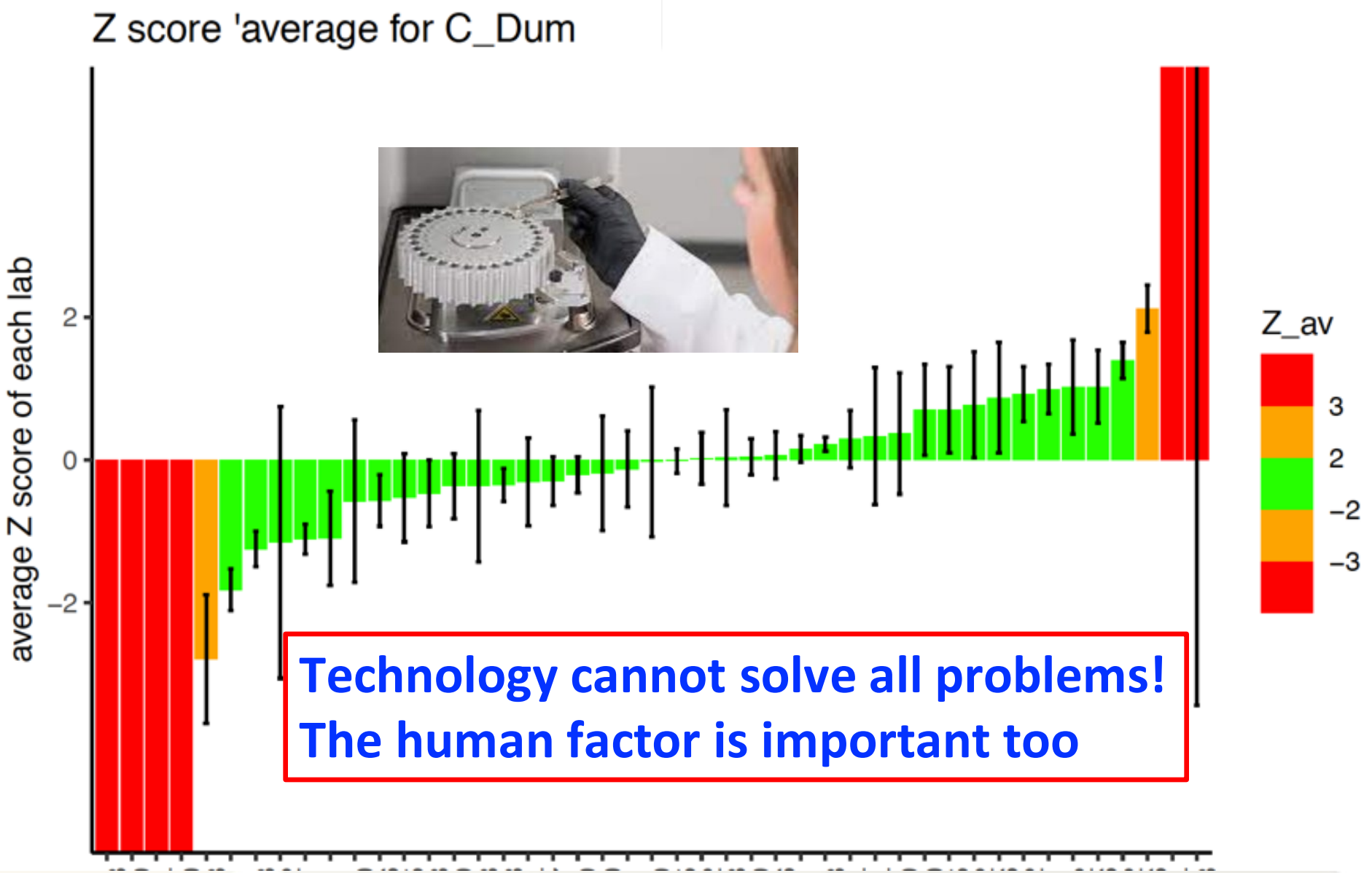
+ long error bar: different performances



```
## [1] 115
```

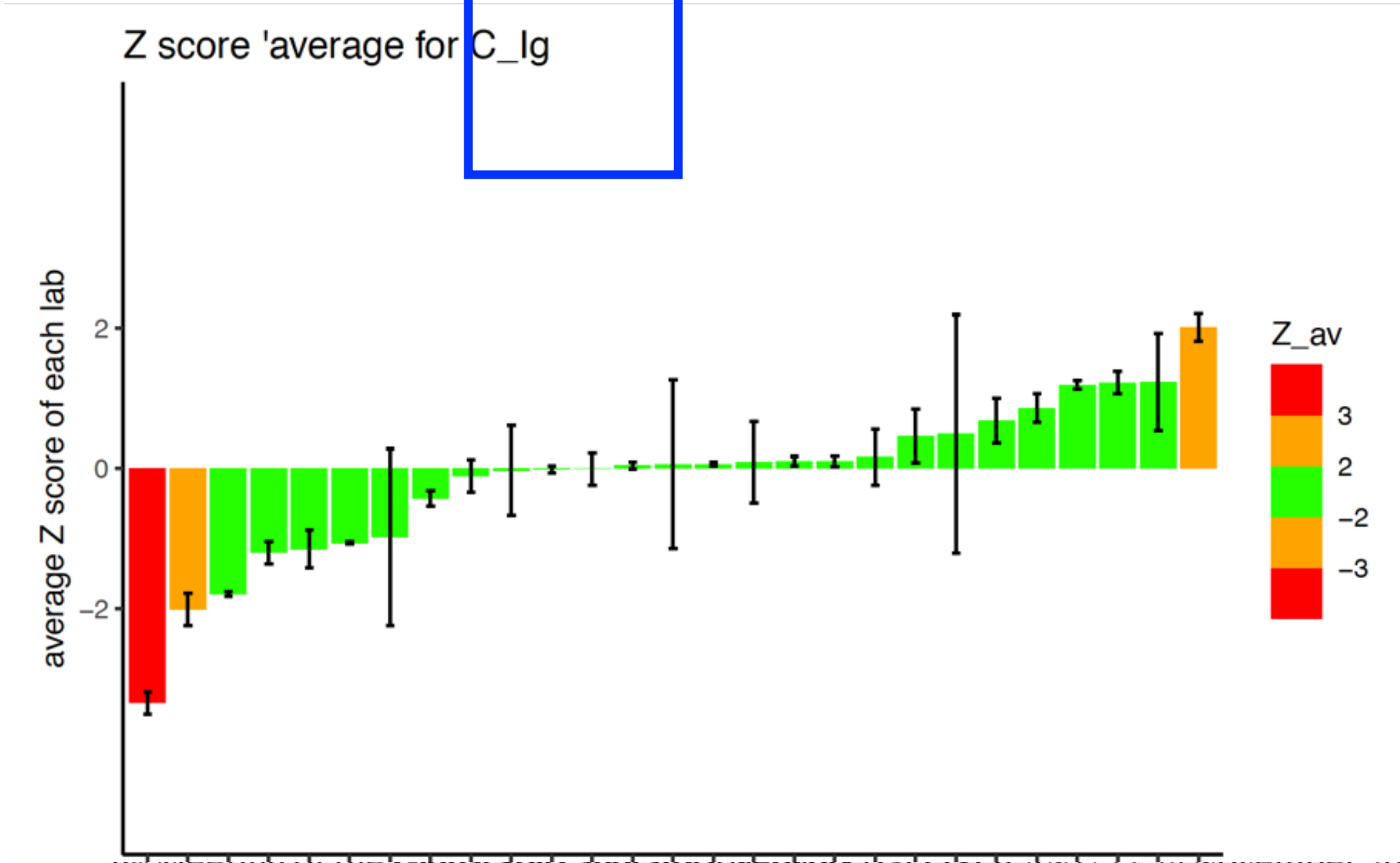

Z score 'average for C_WB
By chance some labs have an good average performance but indeed the performances different (very different) between samples
=> It was useful to have a large range of content
Whatever the difficulty of the method, some labs made it very well for a large range of C content.
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3
Lab confidential n°

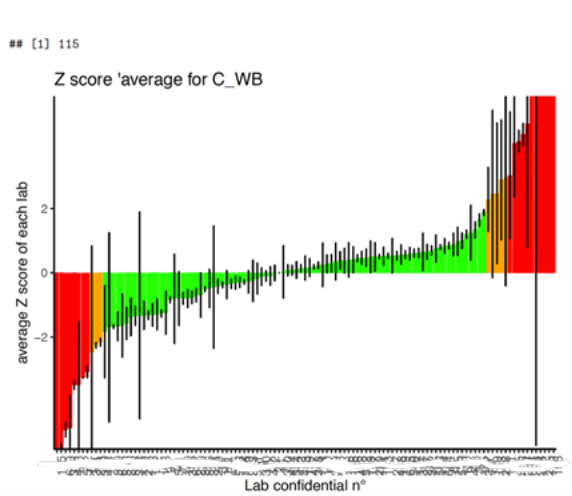
```
## [1] 45
```

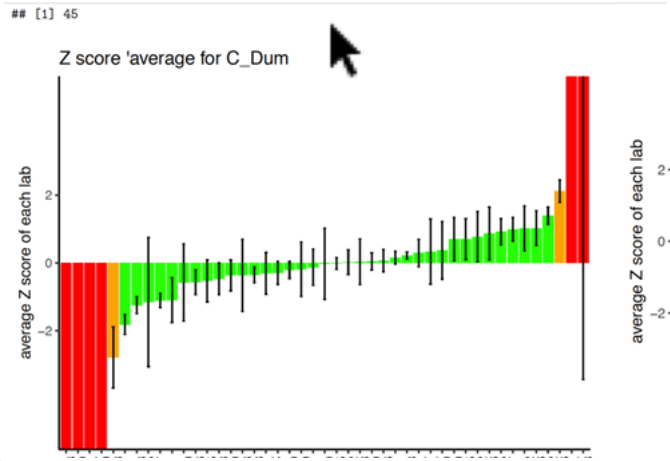


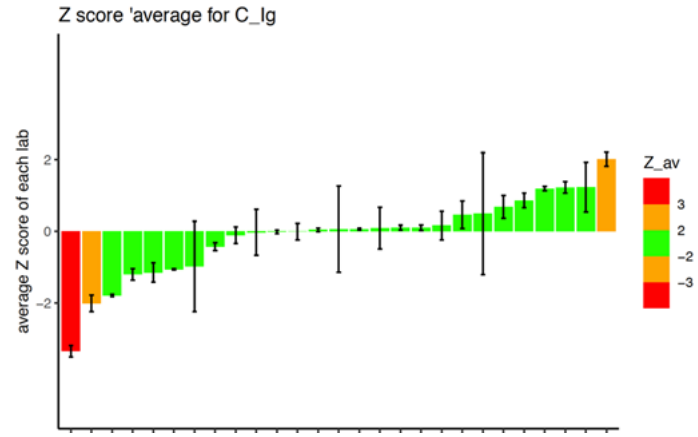
Technology cannot solve all problems!
The human factor is important too

GLOBAL SOIL PARTNERSHIP

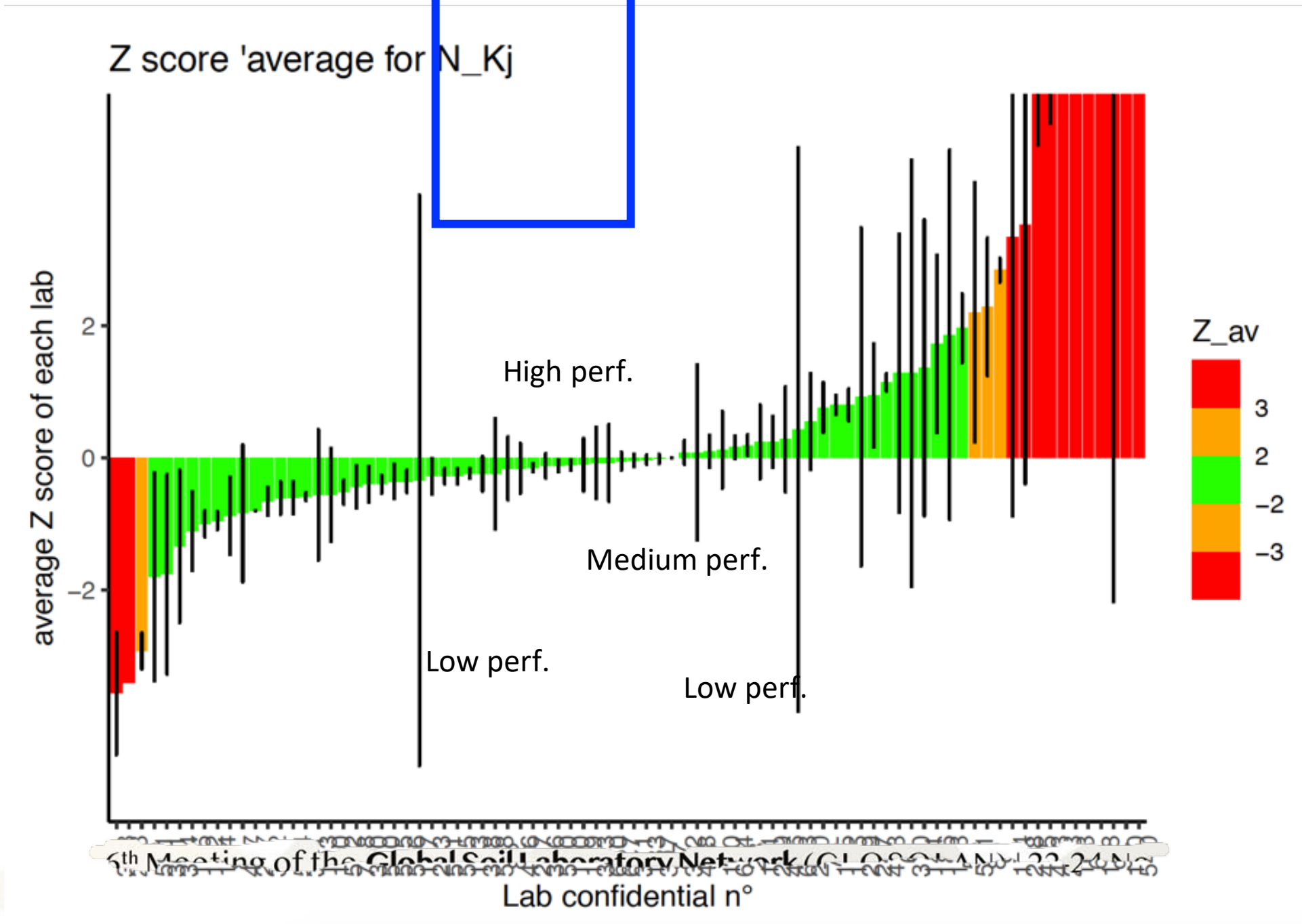

Z score 'average for C_lg
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3


[1] 115
Z score 'average for C_WB
average Z score of each lab
2
0
−2
Lab confidential n°

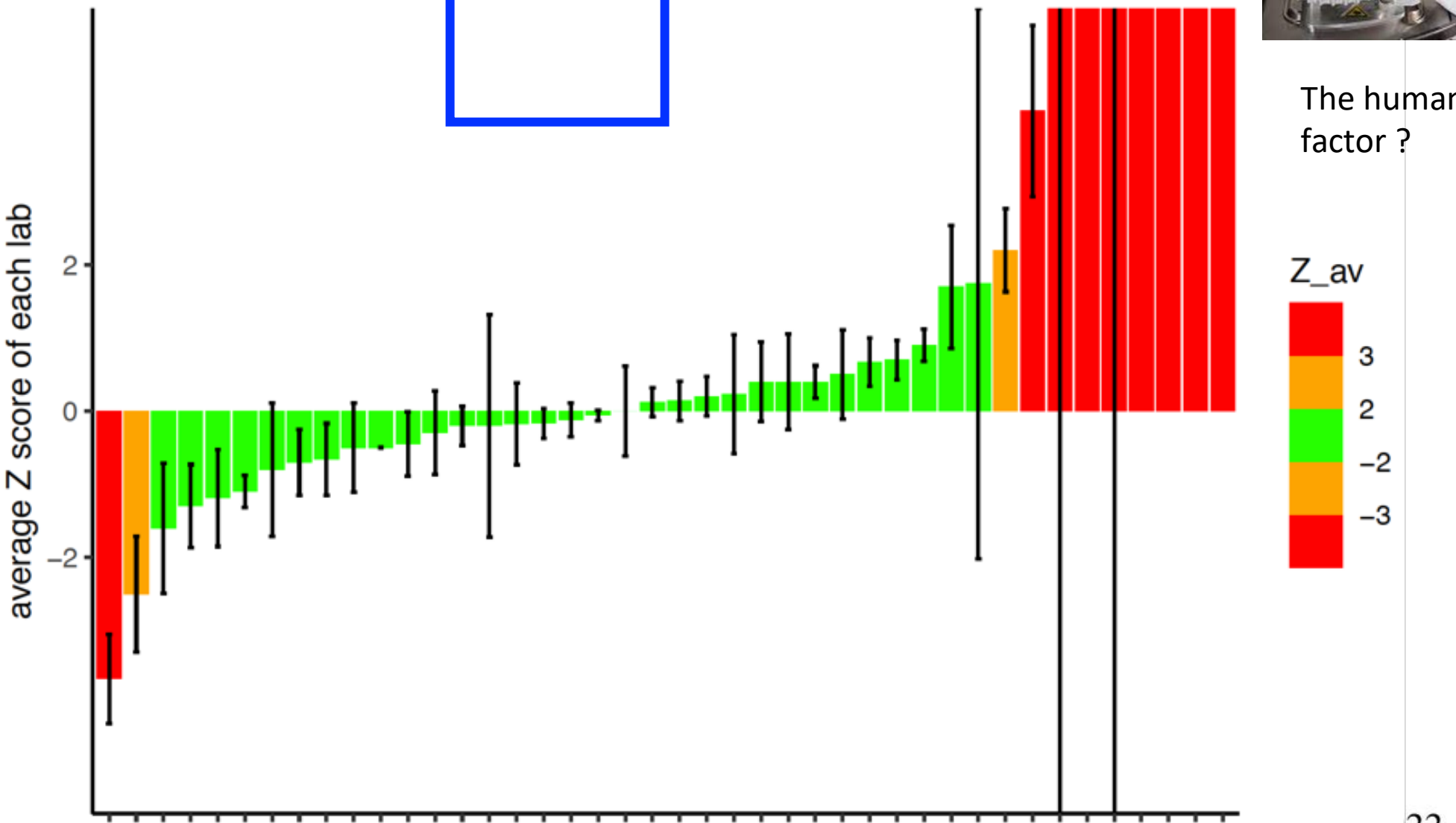

[1] 45
Z score 'average for C_Dum
average Z score of each lab
2
0
−2

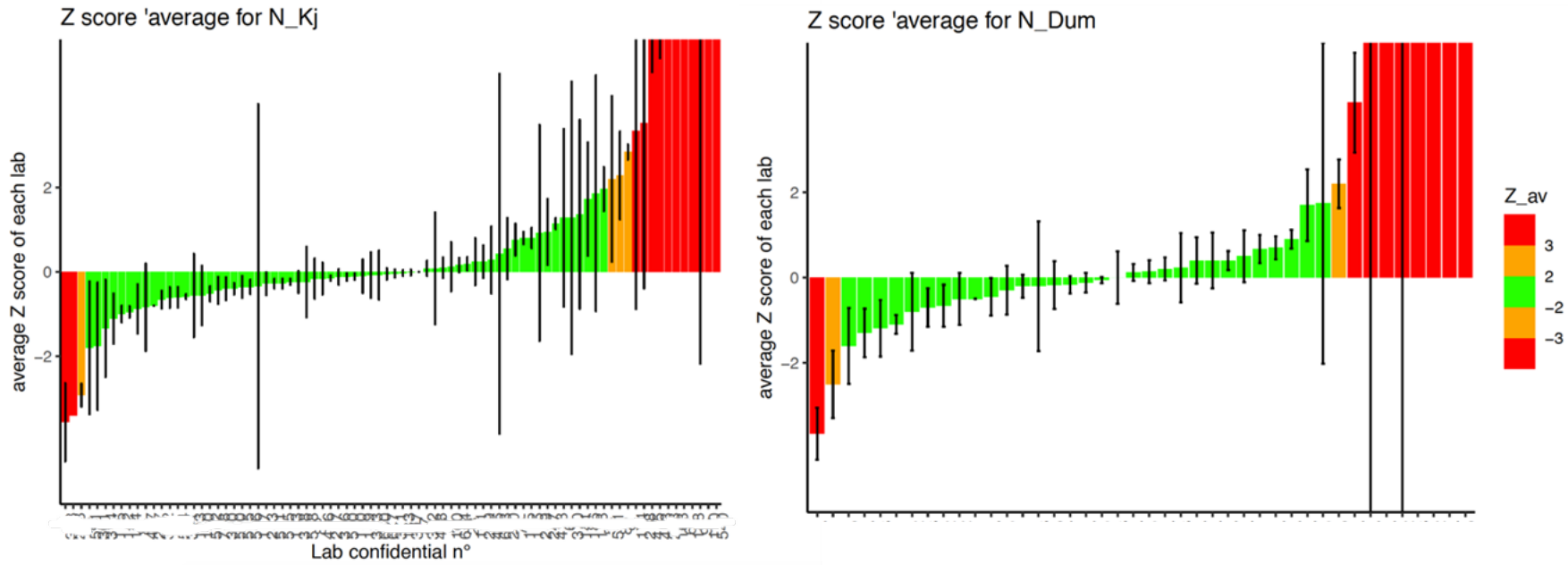

Z score 'average for C_Ig
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3

Nitrogen

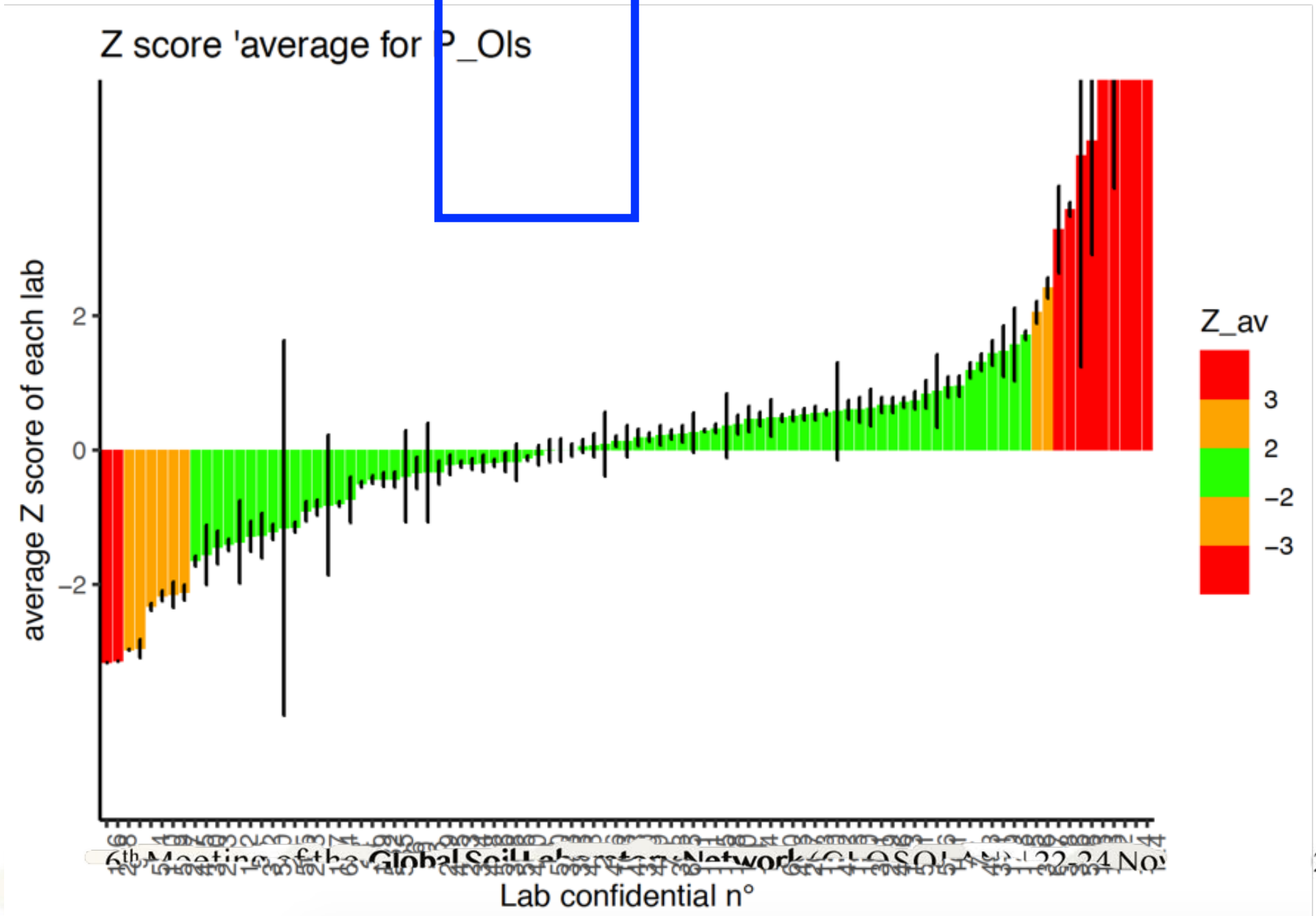

Z score 'average for N_Kj
average Z score of each lab
2
0
−2
High perf.
Medium perf.
Low perf.
Low perf.
Z_av
3
2
−2
−3
Lab confidential n°

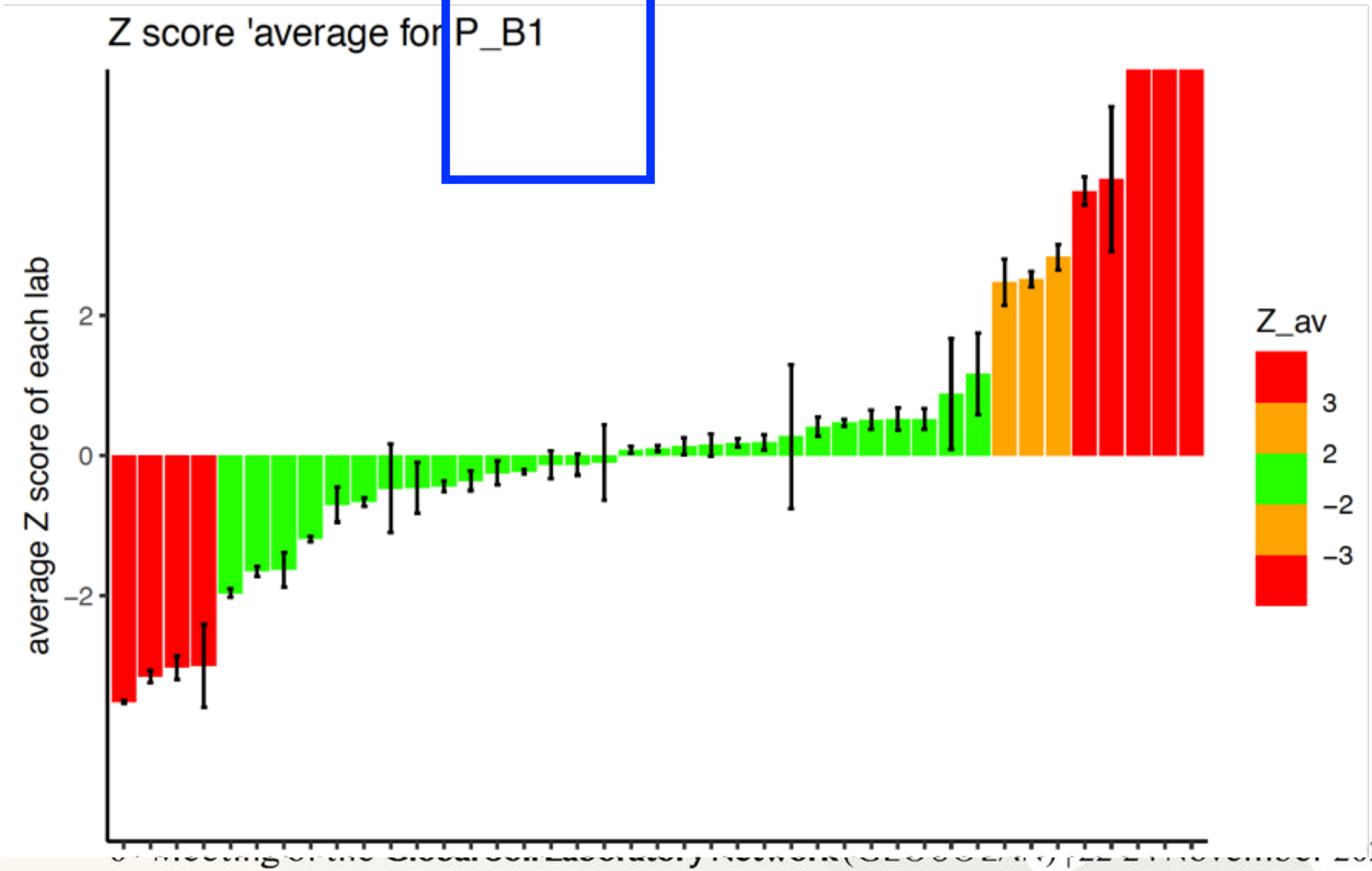
The human factor ?

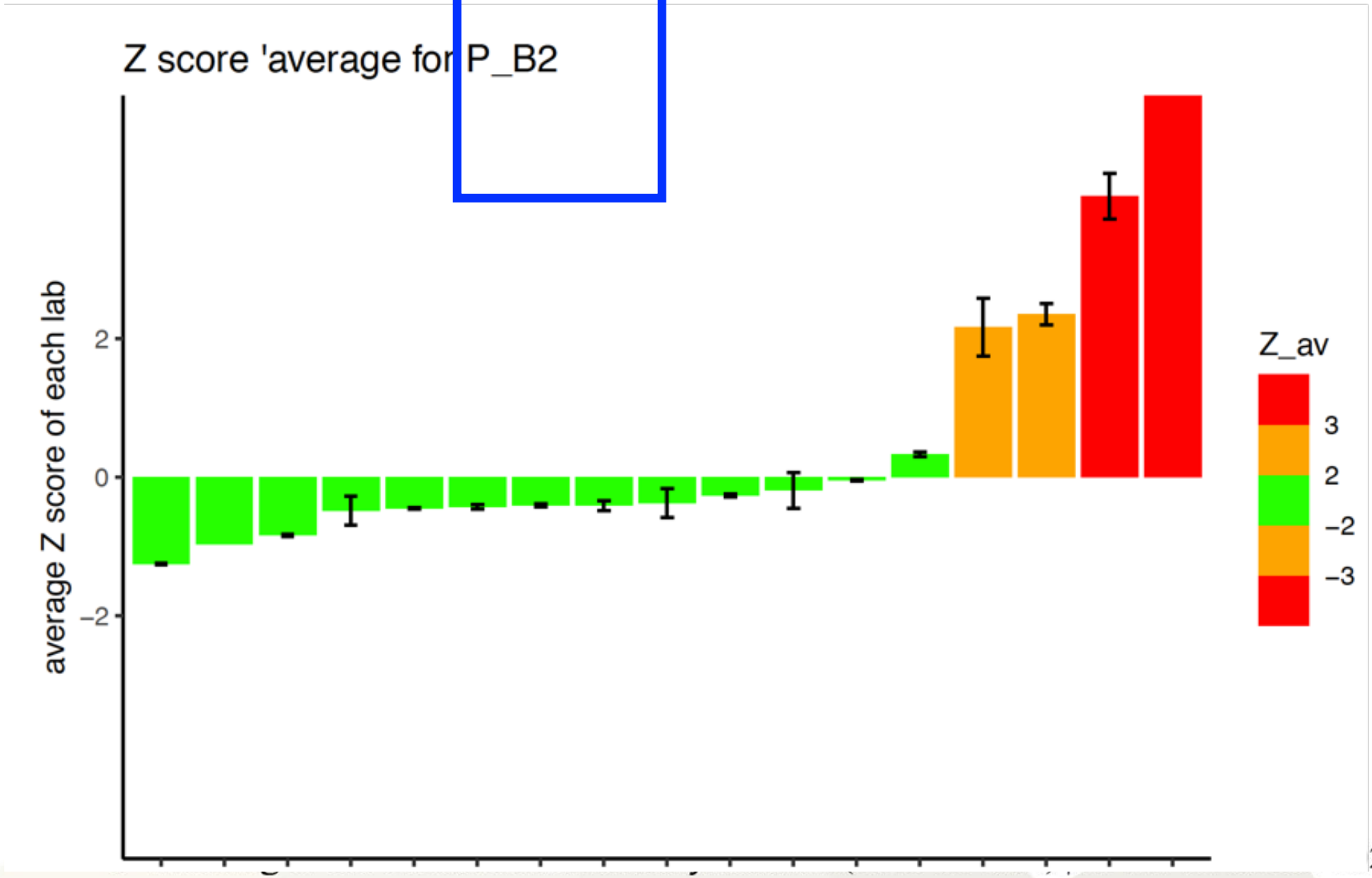


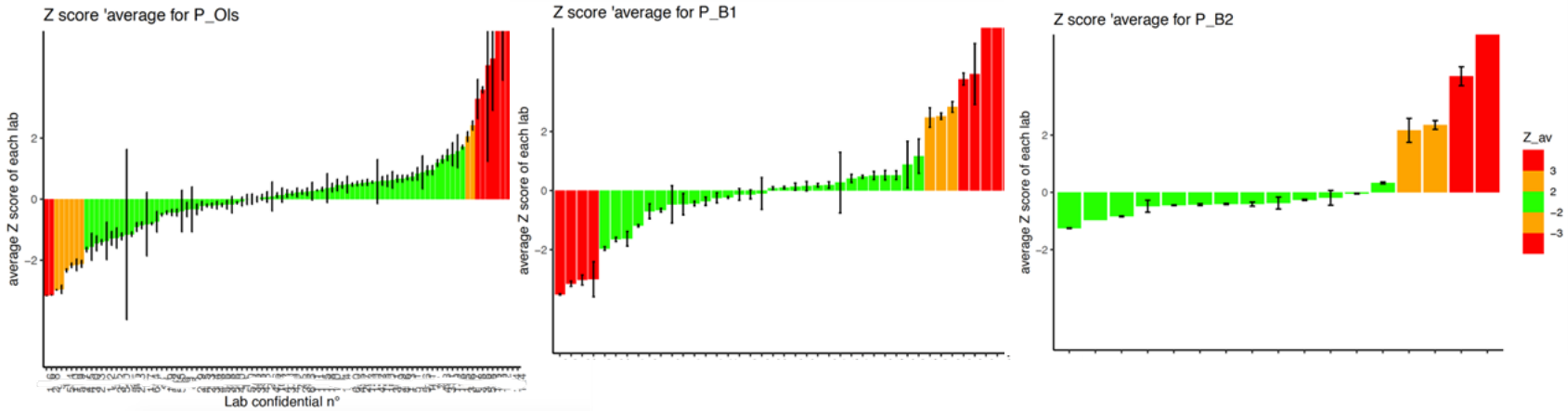

Z score 'average for N_Kj
average Z score of each lab
2
0
−2
Lab confidential n°
Z score 'average for N_Dum
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3

Phosphorus


Z score 'average for P_Ols
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3
Lab confidential n°


Z score 'average for P_B1
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3


Z score 'average for P_B2
average Z score of each lab
2
0
−2
Z_av
3
2
−2
−3


Z score 'average for P_Ols
Z score 'average for P_B1
Z score 'average for P_B2
average Z score of each lab
Lab confidential n°
Z_av
3
2
−2
−3

Part 1 = assessment:

how reliable and comparable are the data produced by soil laboratories?

QUESTIONS: 2 + 1 more

1. **RELIABILITY: for each lab, what is its precision?**

   many labs have insuficient precision: need to develop IQC

QUESTIONS: 2 + 1 more

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2. **COMPARABILITY: among all labs, dispersion of their results?**

   Depends on method but even with high tech

   Analytical problems &/or transcription mistakes ?

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1. **RELIABILITY: for each lab, what is its precision?**

   many labs have insuficient precision: need to develop IQC

2. **COMPARABILITY: among all labs, dispersion of their results?**

   Depends on method but even with high tech

   Analytical problems &/or transcription mistakes ?

3. **REFERENCE VALUE : at global scale,**

   consensus value = reference value : YES !

GLOSOLAN

GLOBAL SOIL LABORATORY NETWORK

Purpose: to improve the quality of soil laboratory data to support decision making at field and policy levels

Done but need to go forward

Objectives :

1. To strengthen the performance of laboratories through use of standardized methods and protocols.
2. To harmonize soil analysis methods so that soil information would be comparable and interpretable across laboratories, countries and regions.
3. To provide a certification for technical competencies in laboratory analysis.

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Record of performances **but not yet certificates**

- Organisation of regional PTs in 2023

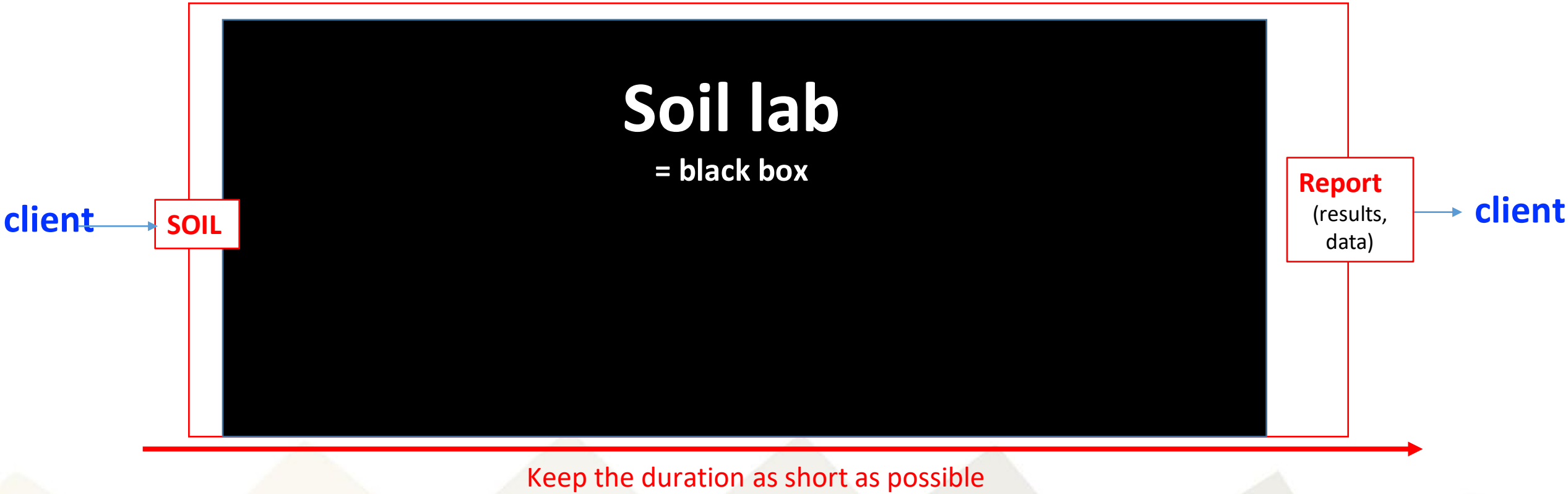
Part 2 = future perspectives:

(suggestions to be discussed)

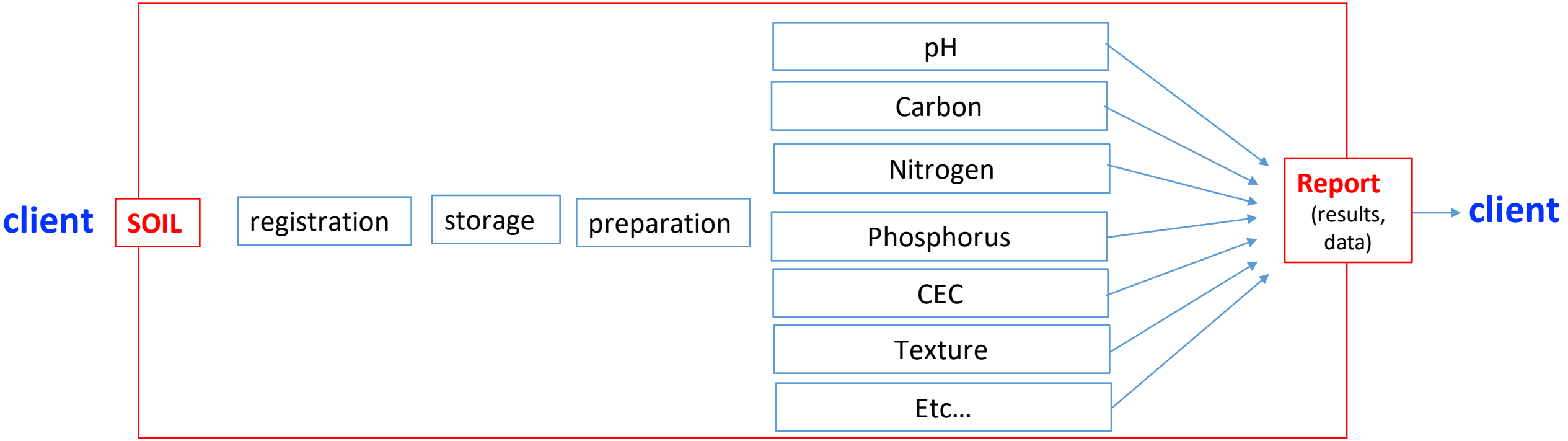
Which actions/activities to improve all labs performances ?

let's consider the laboratories as 'factories producing data'

global situation of labs was a black box
GLOSOLAN has opend the dor and brought some light…



This is how it looks inside the ‘factory’:



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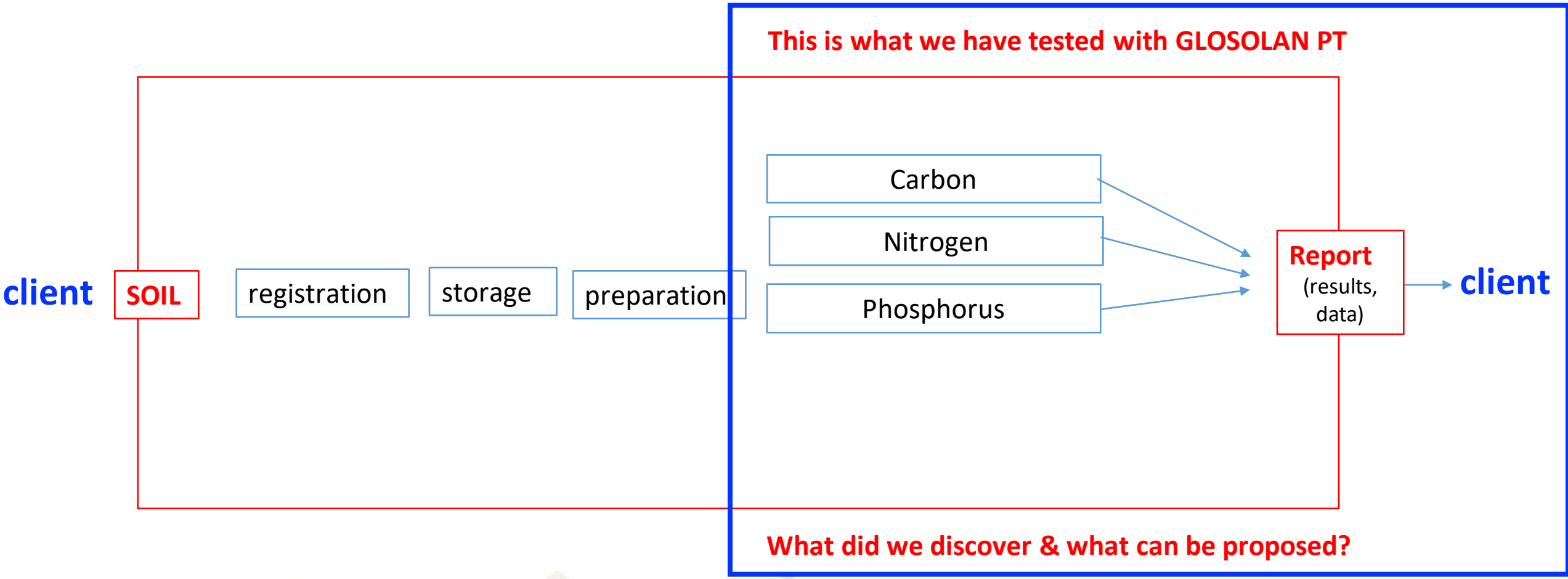

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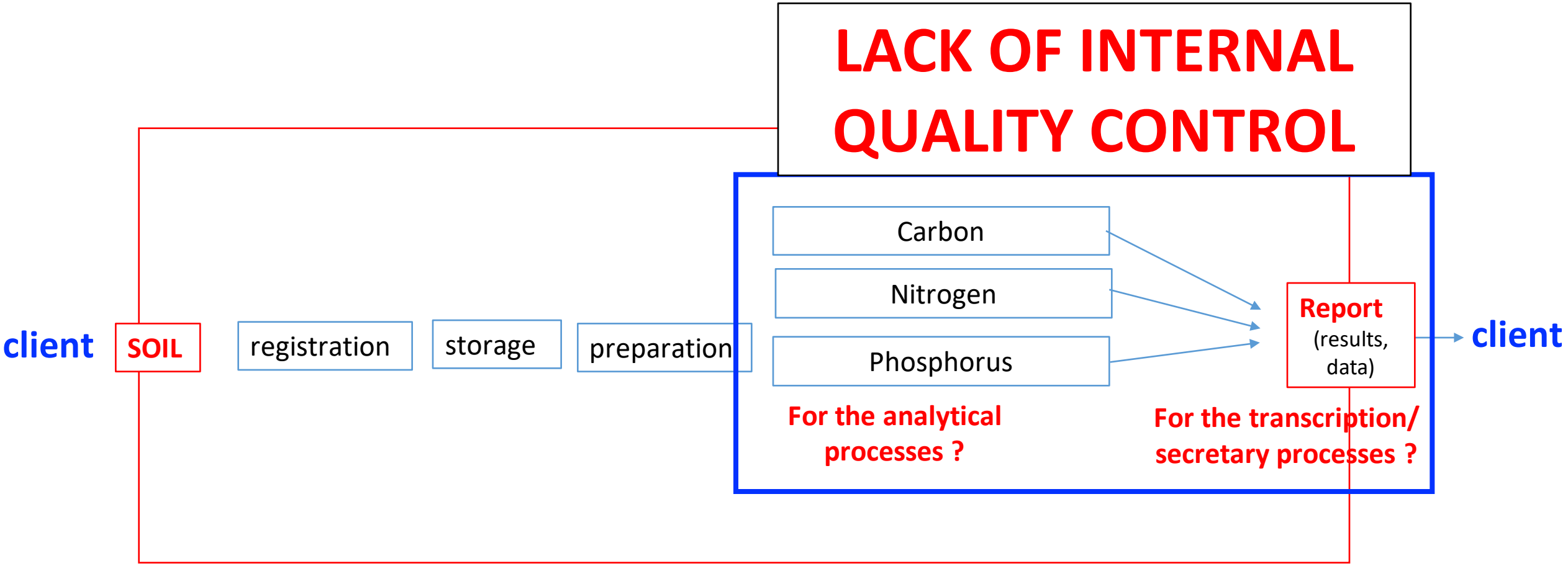
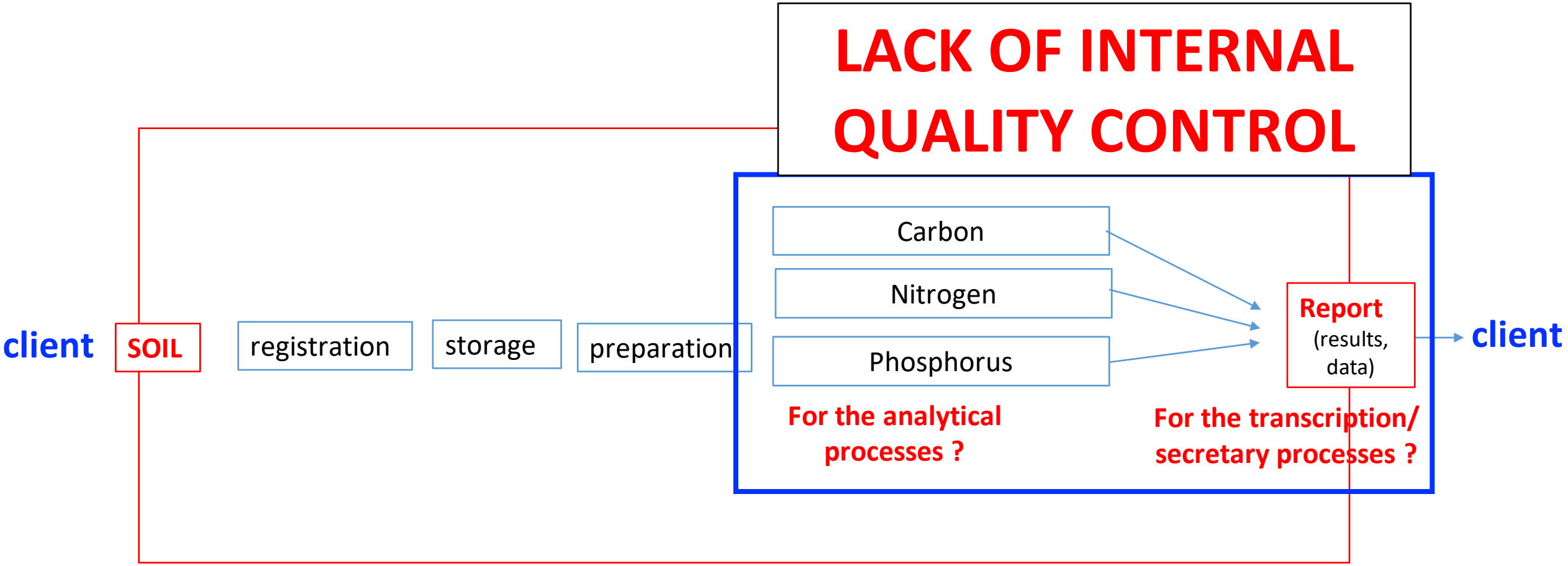


This is how it looks inside the ‘factory’:



Labs with poor ‘precision’ performances need to take action

Request GLOSOLAN members support or GSP/GLOSOLAN secretary

(confidentiality garanteed!)

EXTERNAL QUALITY CONTROL?

ABSOLUTELY NECESSARY BUT…
Cannot be organised by GLOSOLAN for all labs

REGIONAL PTs are necessary

EXTERNAL QUALITY CONTROL?

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ABSOLUTELY NECESSARY BUT…
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EXTERNAL QUALITY CONTROL?

ABSOLUTELY NECESSARY BUT…
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REGIONAL PTs are necessary… how to do?

REGIONAL PTs are necessary… how to do?

- Each region or sub-region must organise PTs

- Glosolan will organise GLOBAL PTs involving only high performing labs to assure accuracy and comparability

Human factor ?

Human factor ?

GLOSOLAN has done many activities to help labs

Now GLOSOLAN needs the help of high performing labs to train the less successful labs,
on a regular basis…

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Human factor ?

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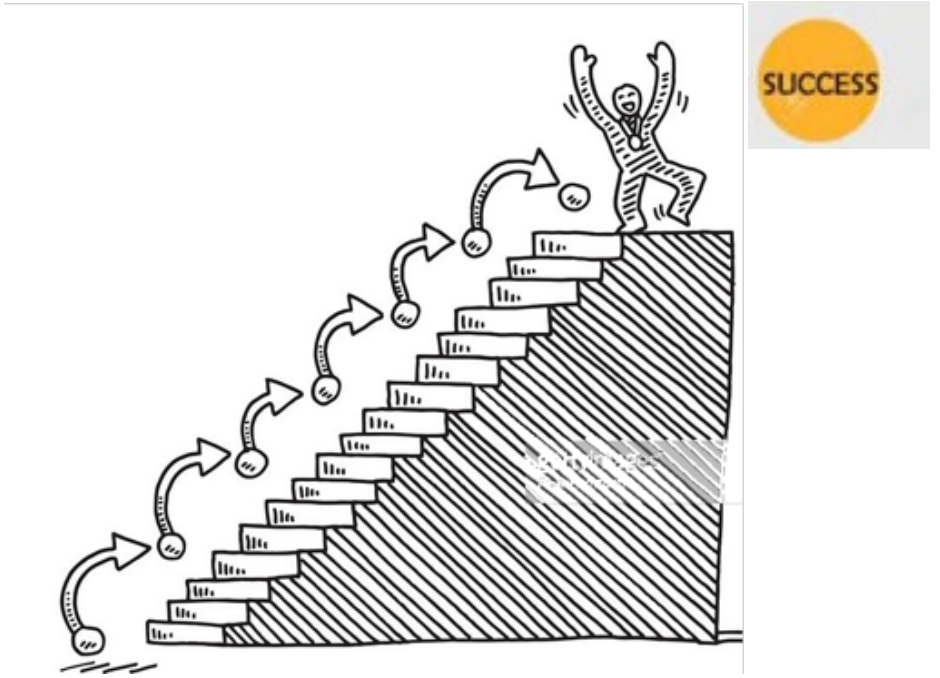
Now GLOSOLAN needs the help of high performing labs to train the less successful labs,
on a regular basis…

It is important to reach the highest step….



It is also important to help each other to reach the highest step!

Human factor ?

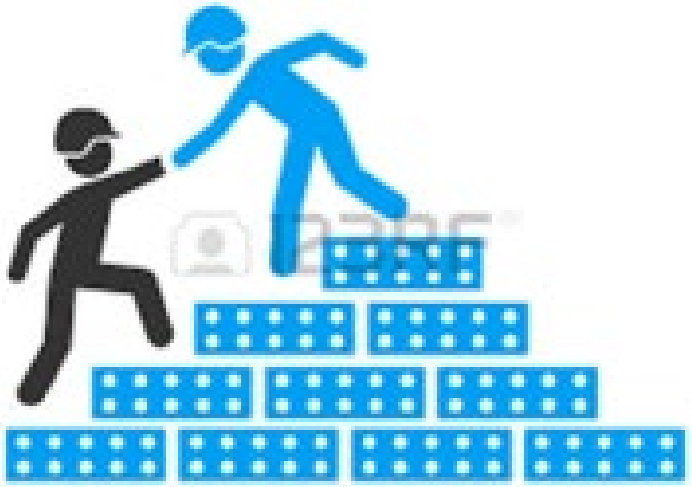
GLOSOLAN has done many activities to help labs

Now GLOSOLAN needs the help of high performing labs to train the less successful labs, on a regular basis…

Performances

All participants know where they are..

FOR THE FUTURE



Data are important

Precision Accuracy

Data are important

Precision

Accuracy

Health & Safety too !

People & environment

On going, should develop…

GLOSOLAN

GLOBAL SOIL LABORATORY NETWORK

Purpose: to improve the quality of soil laboratory data to support decision making at field and policy levels

Objectives :

1. To strengthen the performance of laboratories through use of standardized methods and protocols.
2. To harmonize soil analysis methods so that soil information would be comparable and interpretable across laboratories, countries and regions.
3. To provide a certification for technical competencies in laboratory analysis.

Record of performances but not yet certificates

Food and Agriculture Organization of the United Nations

GLOSOLAN

GLOBAL SOIL LABORATORY NETWORK

Thanks for your attention

Thank you to PT participants

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Without their dedication GLOSOLAN would not have such an unique vision of GLOBAL soil labs!

GLOBAL SOIL PARTNERSHIP