Food and Agriculture Organization of the United Nations

4th Meeting of the
**European and Eurasian Soil Laboratory Network**
(EUROSOLAN)

5 - 6 October 2022

# GLOSOLAN proficiency test (PT) 2021

# Regional outcomes

Dr Christian Hartmann (IRD, France)

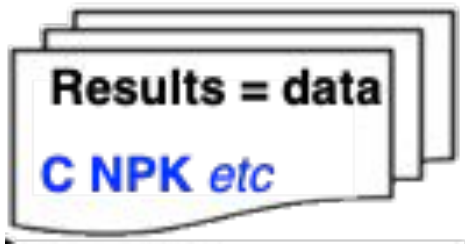
EUROSOLAN
EUROPEAN AND EURASIAN SOIL LABORATORY NETWORK

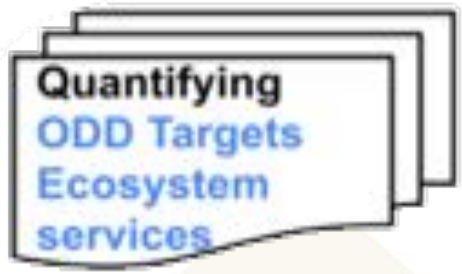
GLOBAL SOIL PARTNERSHIP

# Laboratories:

## *'factories'* producing data


The laboratories are factories able to change soil samples in analytical results



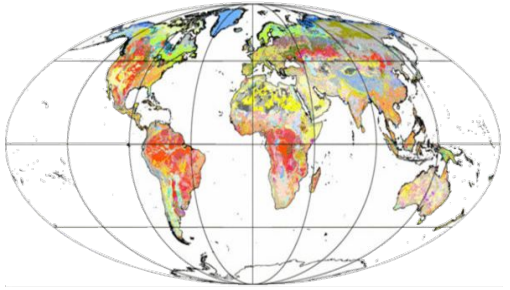




**Data**

**Decisions Actions**

**Traditionally**

- **Fertilisation**
- **Mapping**



**Nowadays**

- **Scientific conclusions**
- **Payment for ecosystem services**

When the same soil sample is given to different laboratories, the analytical results can be the same only if all laboratories:

- use similar machines, i.e. use similar methods,
- run the machines in a similar way, i.e. use similar procedures.

The GLOSOLAN has provided many document and trainings to help lab managers and technician from different laboratories around the world to get them working in the same way.

**is it now possible we get the same analytical results????**

to get the answer to this question...

# GLOSOLAN

# INTER-LABORATORY COMPARISON (or PT)

# 2021

# PROCEDURE

**each lab**
**received 1 set**

**each lab received 1 set**


**1 set = 10 bags**

**each lab received 1 set**


**1 set = 10 bags**


**GLO-01 -02 -03 -04 -05 -06 -07 -08 -09 -10**

each lab
received 1 set


1 set
= 10 bags


GLO-01 -02 -03 -04 -05 -06 -07 -08 -09 -10

1 set
= 6 soils

| A | B | C | D | E | F |
|---|---|---|---|---|---|

each lab
received 1 set


1 set
= 10 bags


GLO-01 -02 -03 -04 -05 -06 -07 -08 -09 -10

1 set
= 6 soils

A B C D E F

E1
E2
E3
E4
E5

1 soil
had 5 replicates

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **randomly distributed** | **GLO-01** | **-02** | **-03** | **-04** | **-05** | **-06** | **-07** | **-08** | **-09** | **-10** |
| **ordered** | | | **A** | **B** | **C** | **D** | **E** | **F** | | |

randomly distributed

GLO-01 -02 -03 -04 -05 -06 -07 -08 -09 -10

carbon content

ordered

A B C D E F

lowest

highest

randomly distributed

GLO-01 -02 -03 -04 -05 -06 -07 -08 -09 -10

carbon content

ordered

A B C D E F

E1
E2
E3
E4
E5

same content

each lab
received 1 set


randomly distributed

| GLO-01 | -02 | -03 | -04 | -05 | -06 | -07 | -08 | -09 | -10 |
|---|---|---|---|---|---|---|---|---|---|

?

ordered

| A | B | C | D | E1 | E2 | E3 | E4 | E5 |
|---|---|---|---|---|---|---|---|---|

F

A F E3 B E4 E2 C D E1 E5

# 3 ANALYTICAL PARAMETERS: C N P

# different methods

## Carbon

"Organic carbon by Walkley and Black" = "**C_WB**",
"Total carbon by dry combustion (Dumas method)" = "**C_Dum**",
"Organic matter by loss of ignition 450 - 550 °C" = "**C_lg**",

## Nitrogen

"Total nitrogen by dry combustion (Dumas method) » = "N_Dum",
"Total nitrogen by Kjeldahl" = "N_kje ")

## Phosphorous

"Available phosphorus by Olsen" = "P_Ols",
"Available phosphorus by Bray I" = "P_B1",
"Available phosphorus by Bray II" = "P_B2",

# today we look only at carbon

## Carbon

"Organic carbon by Walkley and Black" = "**C_WB**",
"Total carbon by dry combustion (Dumas method)" = "**C_Dum**",
"Organic matter by loss of ignition 450 - 550 °C" = "**C_lg**",

## Nitrogen

"Total nitrogen by dry combustion (Dumas method) » = "N_Dum",
"Total nitrogen by Kjeldahl" = "N_kje ")

## Phosphorous

"Available phosphorus by Olsen" = "P_Ols",
"Available phosphorus by Bray I" = "P_B1",
"Available phosphorus by Bray II" = "P_B2",

# PARTICIPANTS

# Number of results per region

| | | Africa | America | | Asia | | | NENA | Pacific |
|---|---|---|---|---|---|---|---|---|---|
| | **GLOBAL** | Af | Al | An | As | EURASIA | EUROPE | Ne | Pa |
| C_WB<br>C_Dum<br>C_Ig | | | | | | | | | |

# Number of results per region

| | GLOBAL | Africa Af | America Al | America An | Asia As | EURASIA | EUROPE | NENA Ne | Pacific Pa |
|---|---|---|---|---|---|---|---|---|---|
| C_WB | 160 | | | | | | | | |
| C_Dum | 54 | | | | | | | | |
| C_Ig | 42 | | | | | | | | |

GLOBAL: Walkley-Black is the more frequent

# Number of results per region

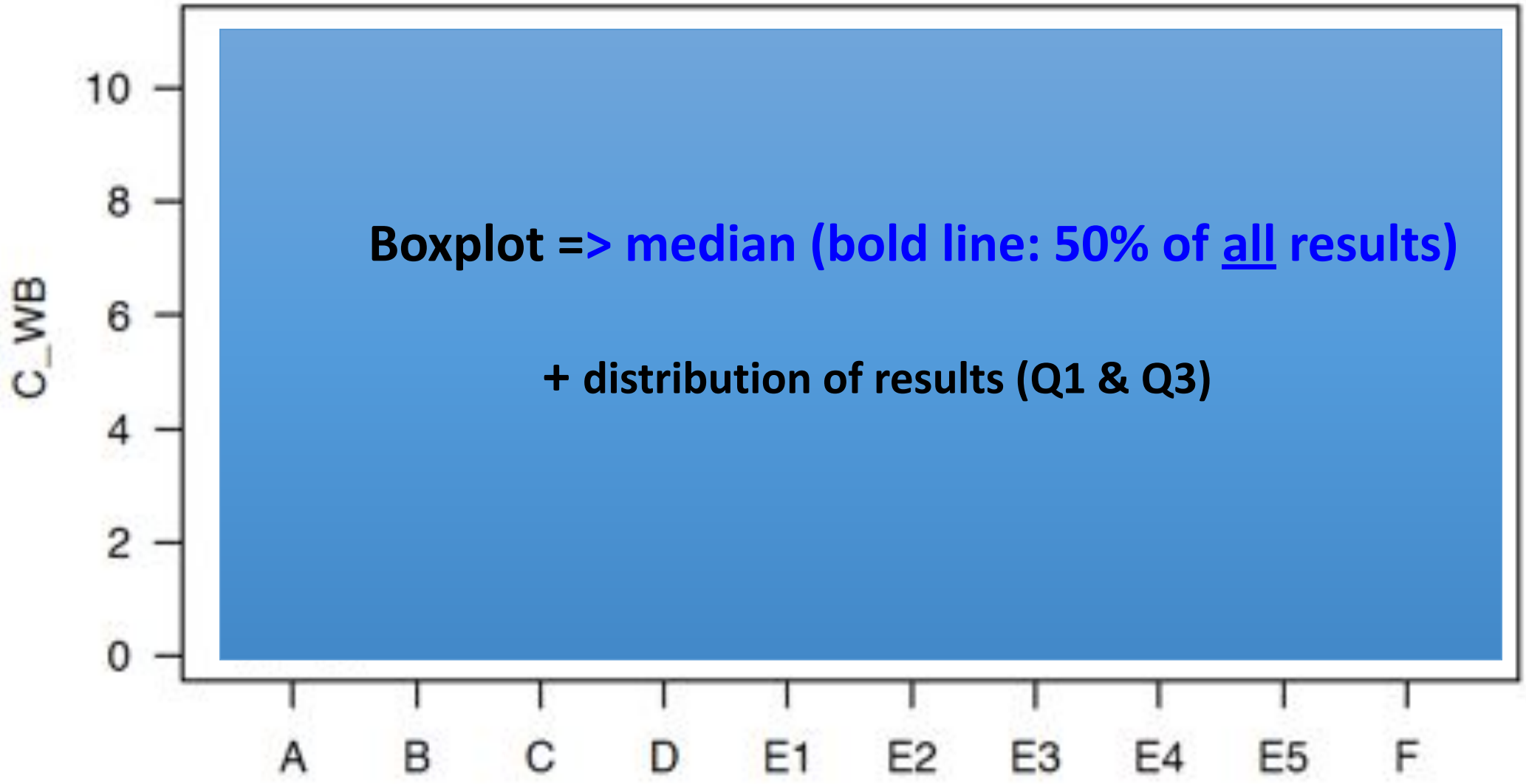
| | | Africa | America | | Asia | | | NENA | Pacific |
|---|---|---|---|---|---|---|---|---|---|
| | **GLOBAL** | Af | Al | An | As | EURASIA | EUROPE | Ne | Pa |
| C_WB | 160 | 41 | 36 | 0 | 38 | 2 | 21 | 20 | 2 |
| C_Dum | 54 | 5 | 14 | 2 | 7 | 0 | 25 | 0 | 1 |
| C_Ig | 42 | 8 | 7 | 2 | 4 | 1 | 12 | 8 | 0 |

Eurasia: few results

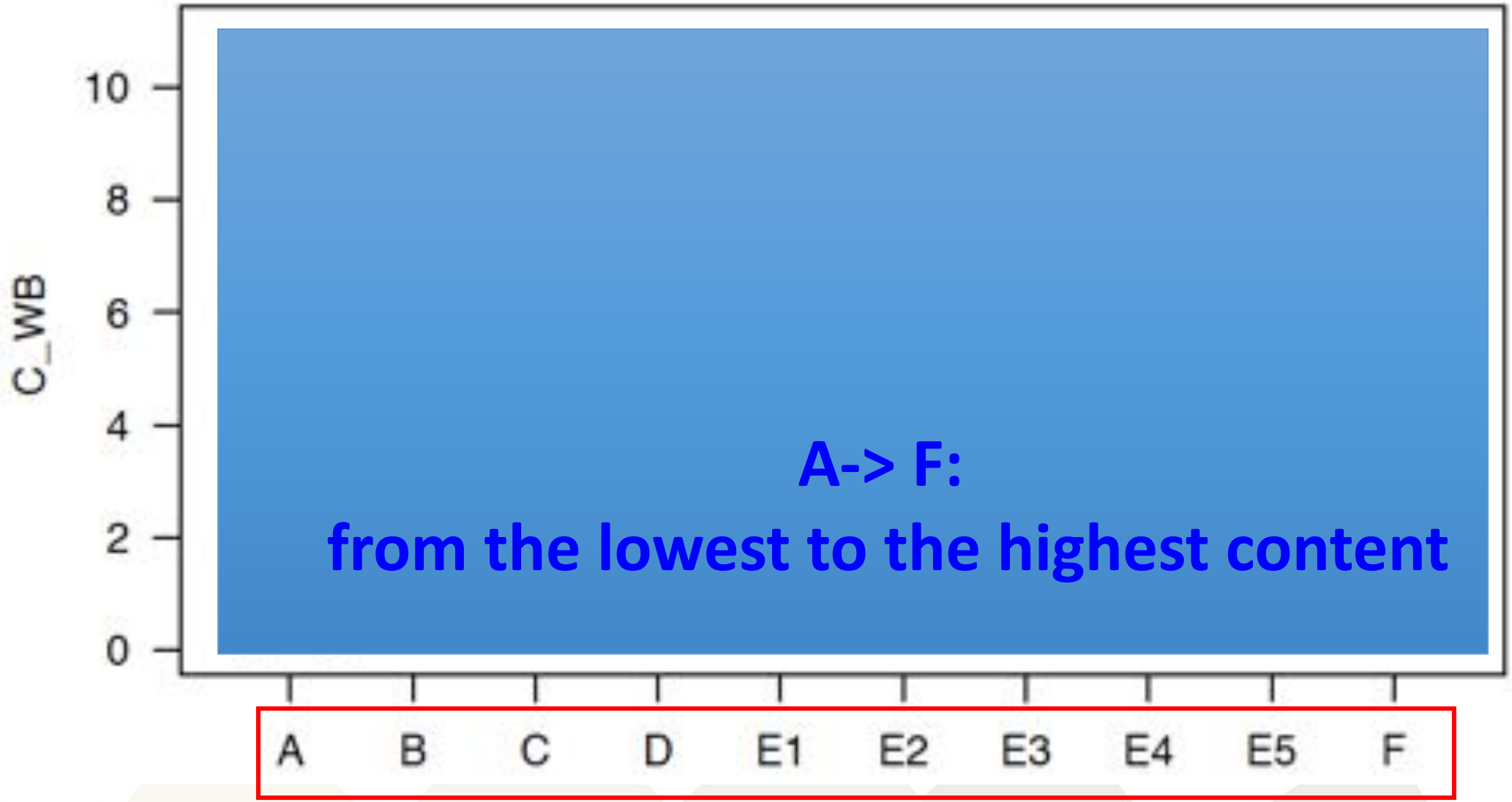
Europe: Dumas is more frequent than Walkley-Black (unlike Global situation)

# STATISTICAL ANALYSIS

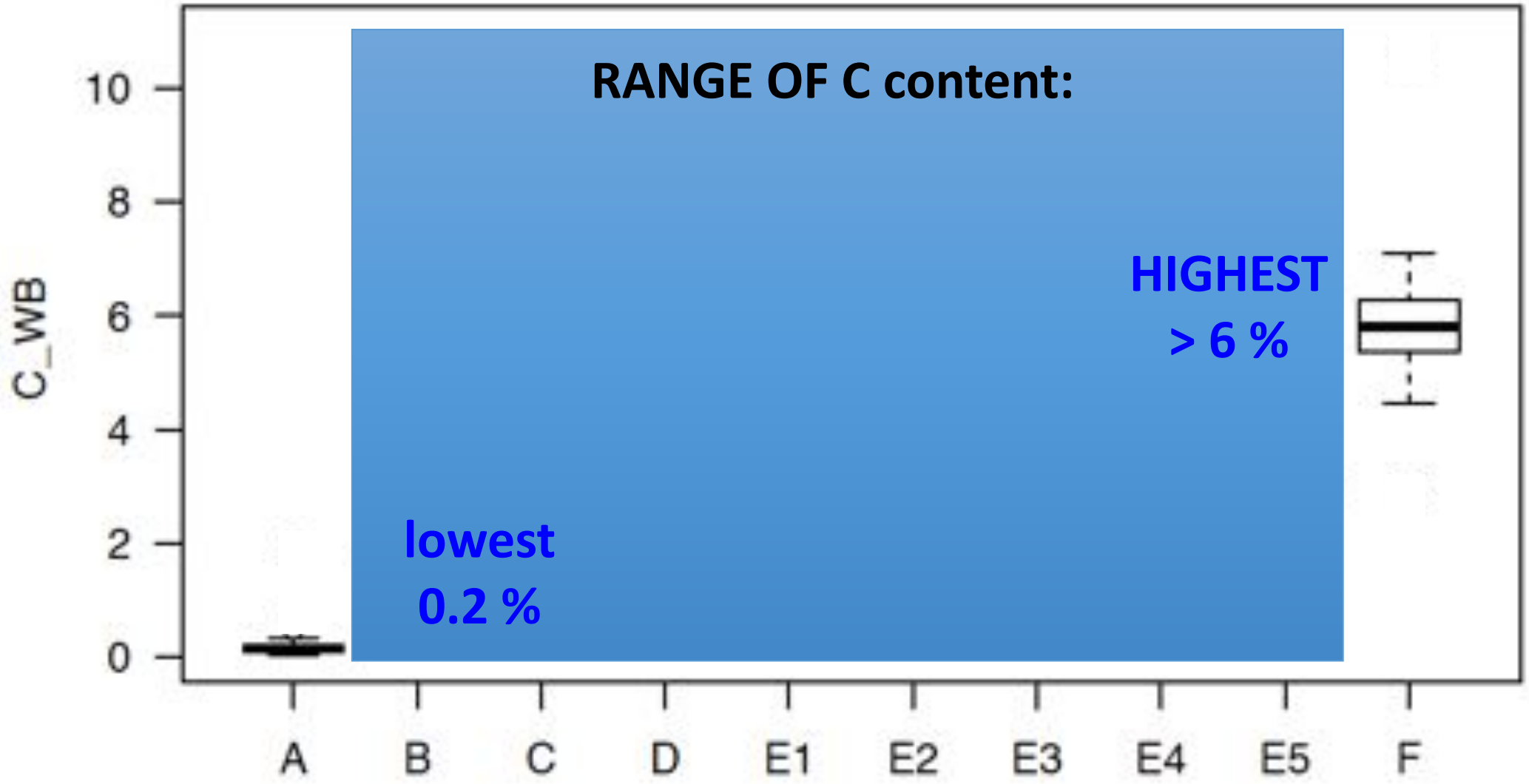
# Carbon W&B (%)


C_WB
10
8
6
4
2
0
A
B
C
D
E1
E2
E3
E4
E5
F
Boxplot => median (bold line: 50% of all results)
+ distribution of results (Q1 & Q3)

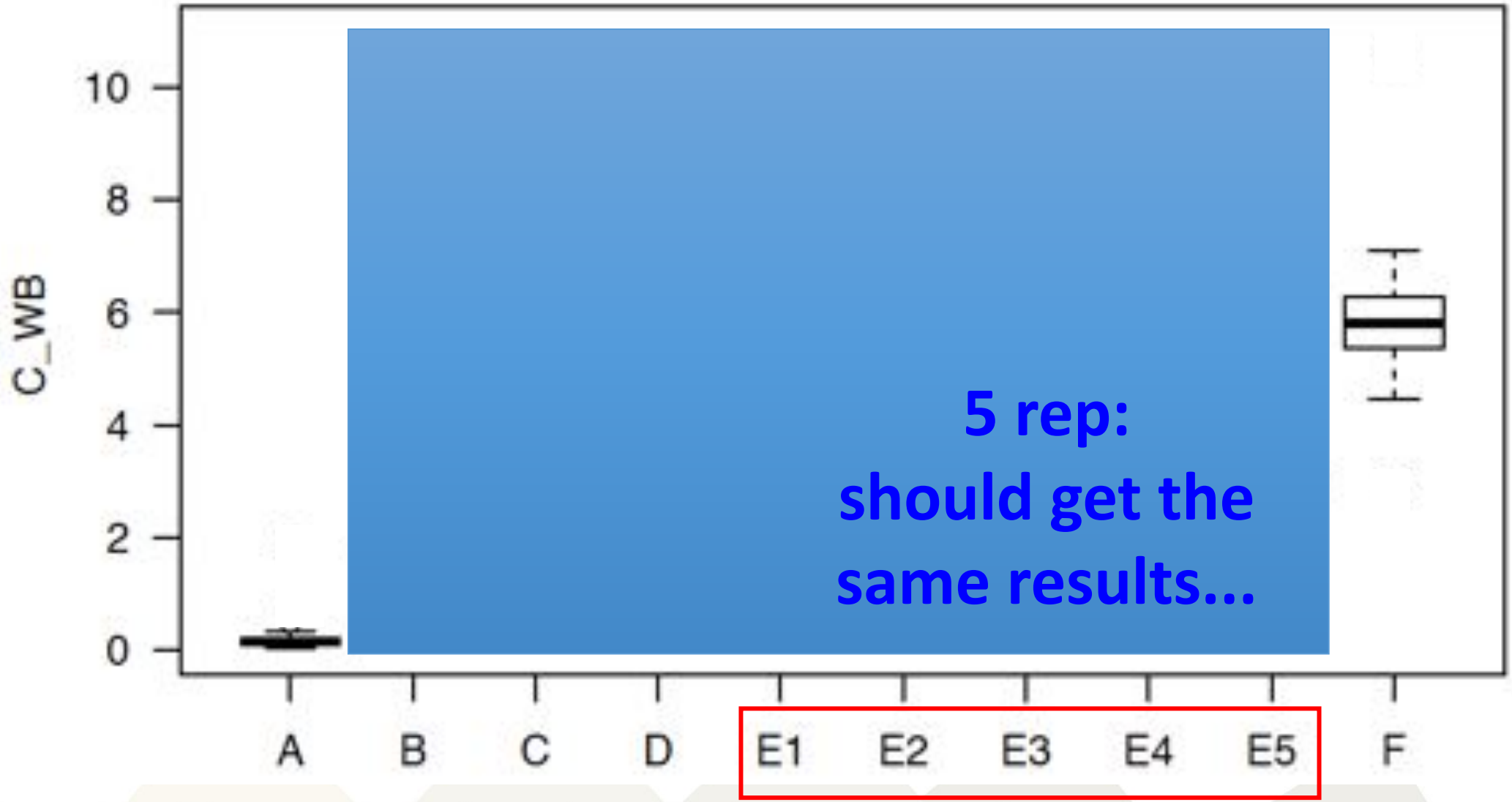
# Carbon W&B (%)


C_WB
10
8
6
4
2
0
A-> F:
from the lowest to the highest content
A
B
C
D
E1
E2
E3
E4
E5
F

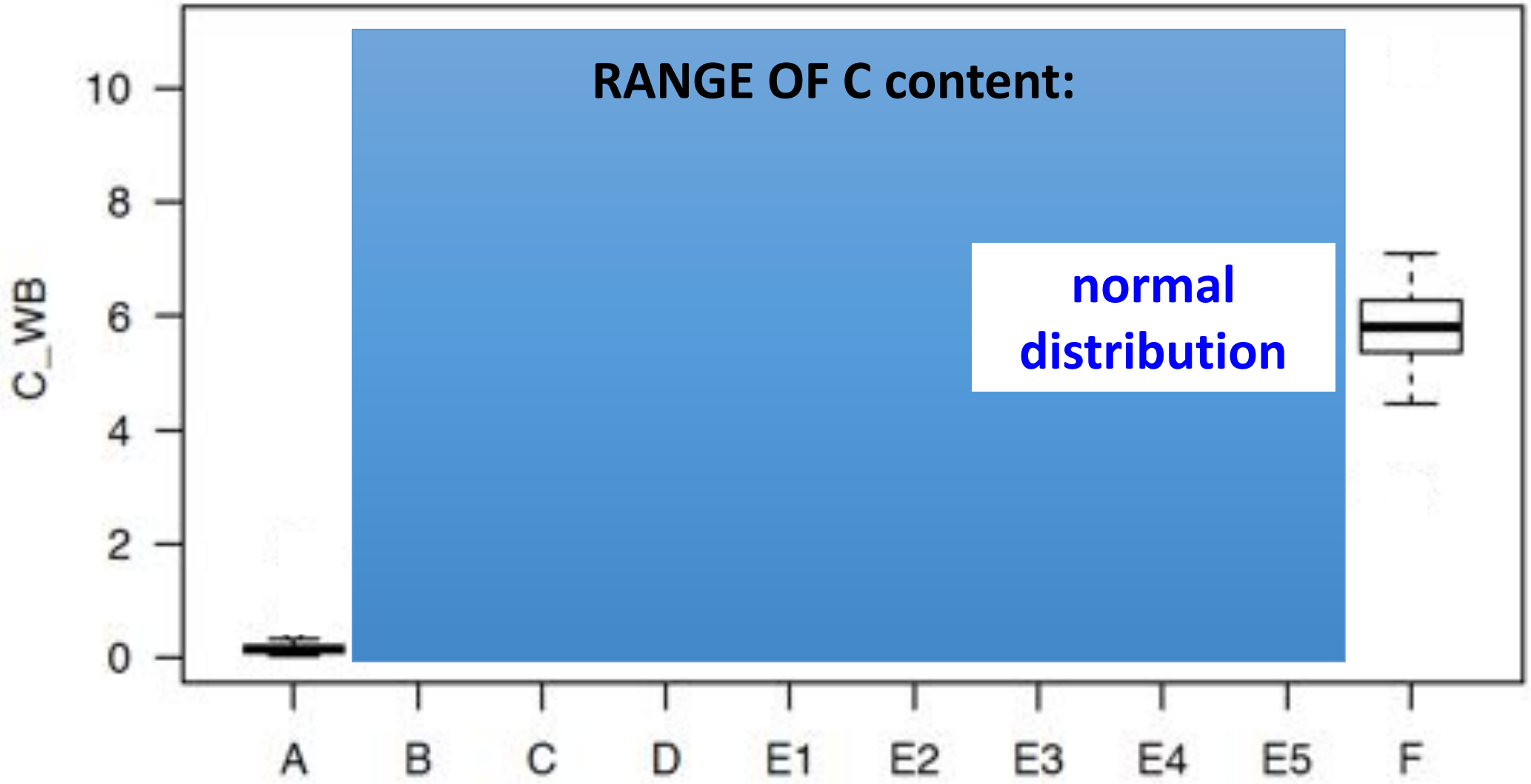
# Carbon W&B (%)


RANGE OF C content:
HIGHEST
> 6 %
lowest
0.2 %
C_WB
10
8
6
4
2
0
A
B
C
D
E1
E2
E3
E4
E5
F

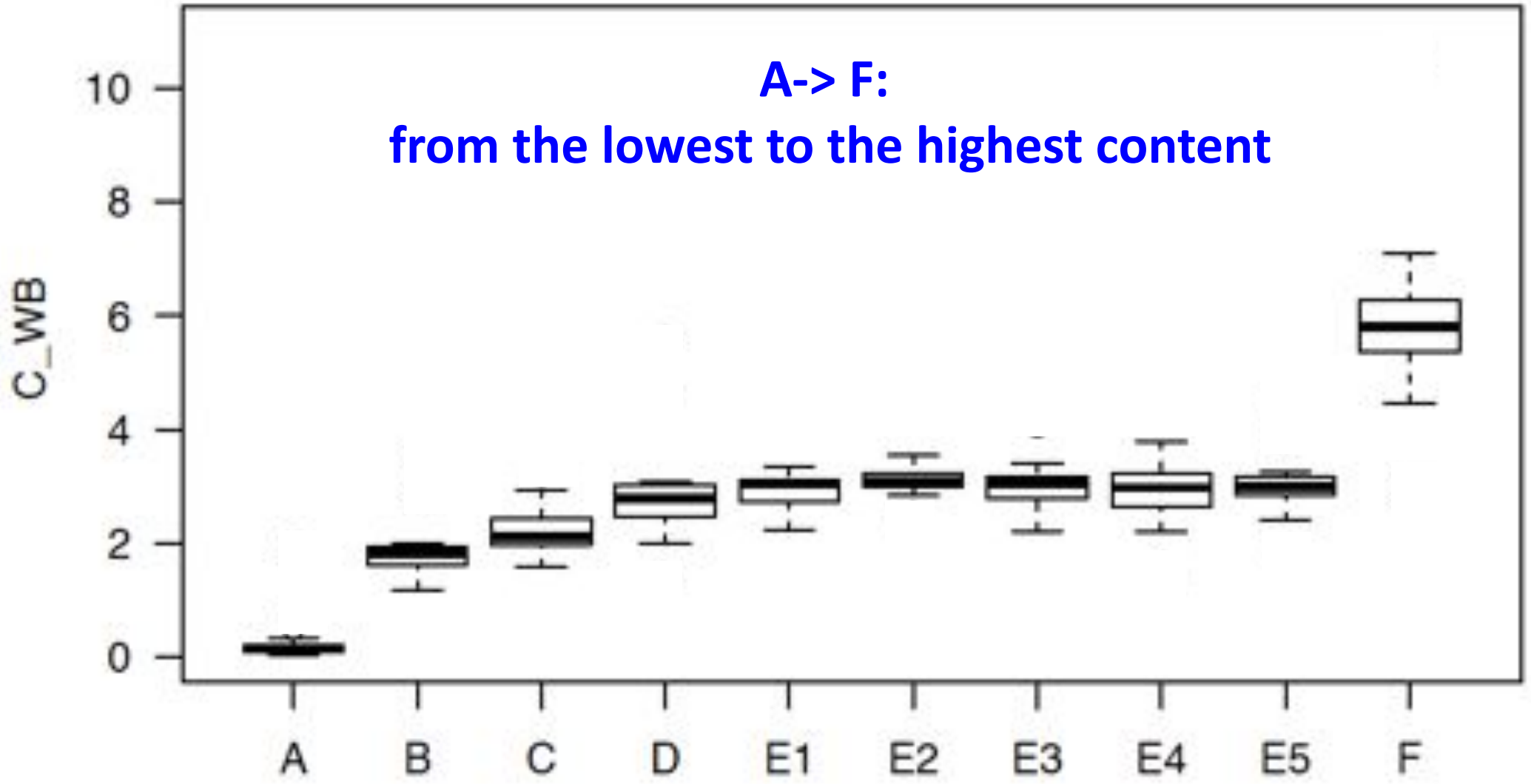
# Carbon W&B (%)


C_WB
10
8
6
4
2
0
A
B
C
D
E1
E2
E3
E4
E5
F
5 rep:
should get the
same results...

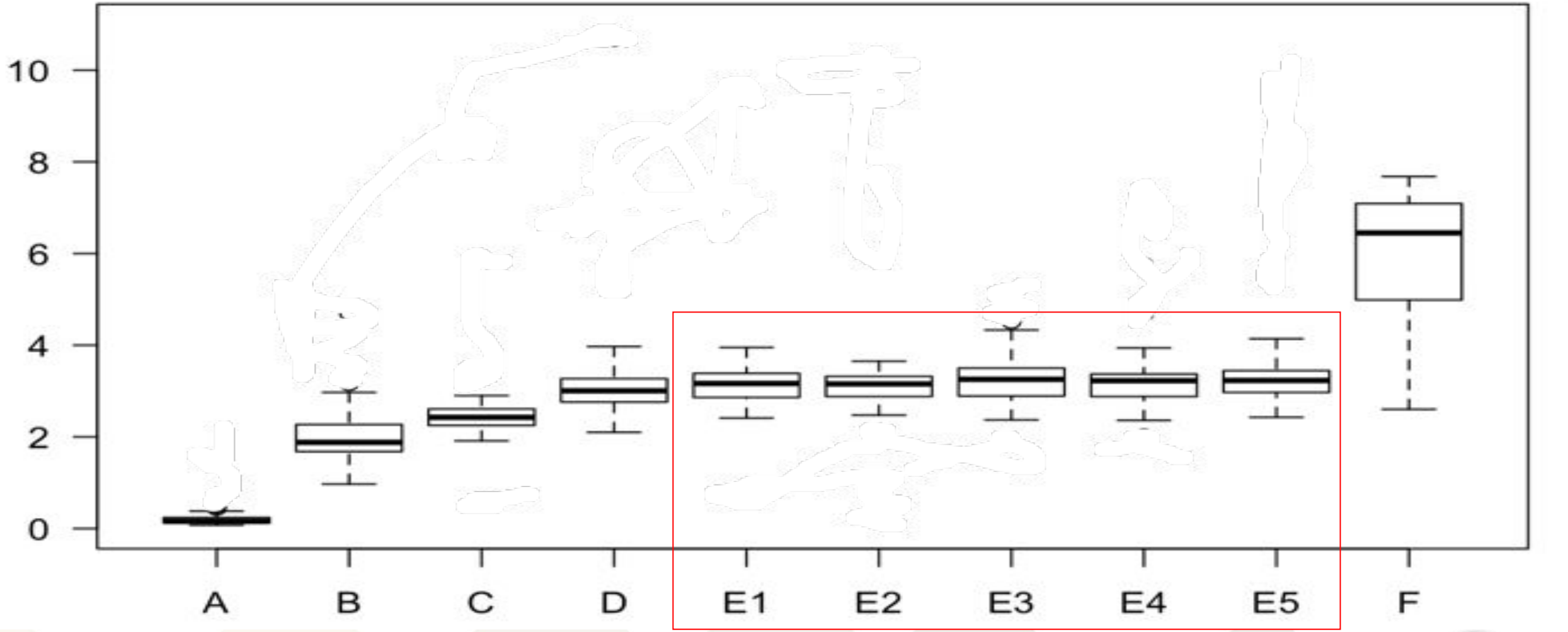
# Carbon W&B (%)


RANGE OF C content:
normal distribution
C_WB
0
2
4
6
8
10
A
B
C
D
E1
E2
E3
E4
E5
F

# Carbon W&B (%)

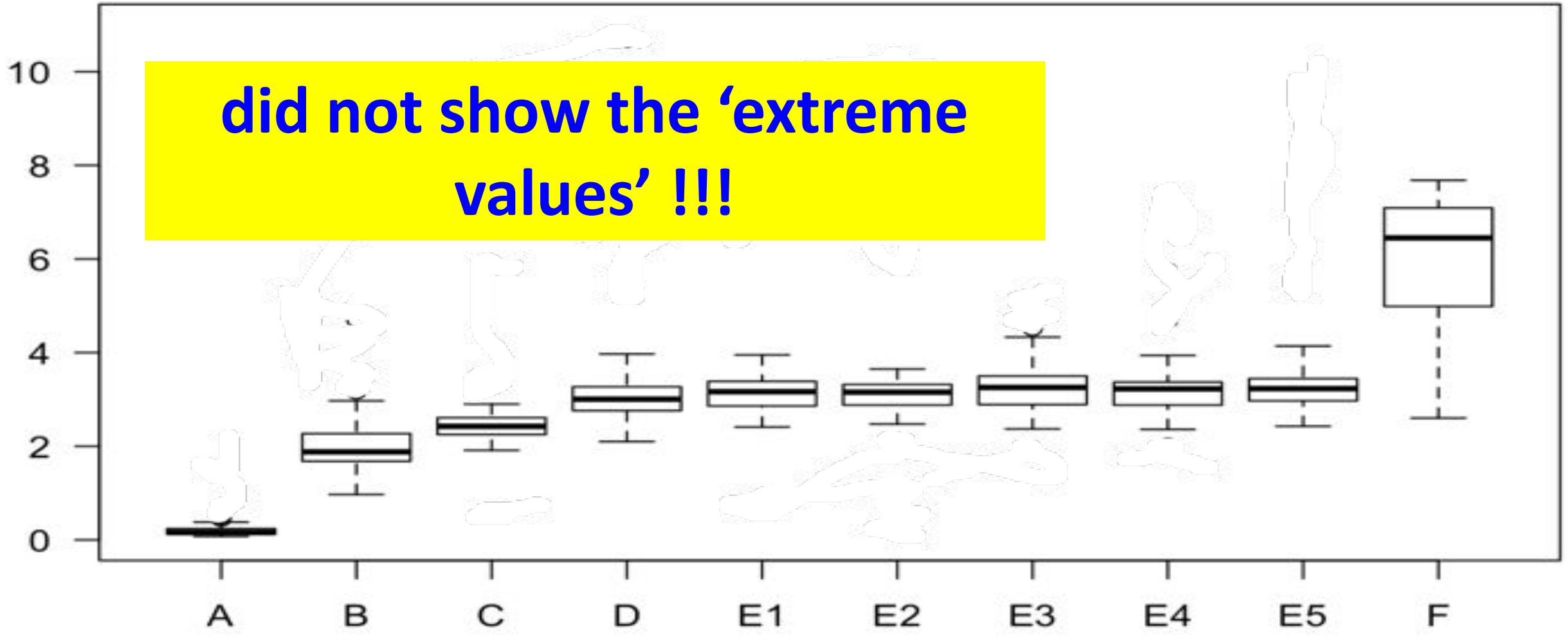

A-> F:
from the lowest to the highest content
C_WB
10
8
6
4
2
0
A
B
C
D
E1
E2
E3
E4
E5
F

# Carbon W&B (%)

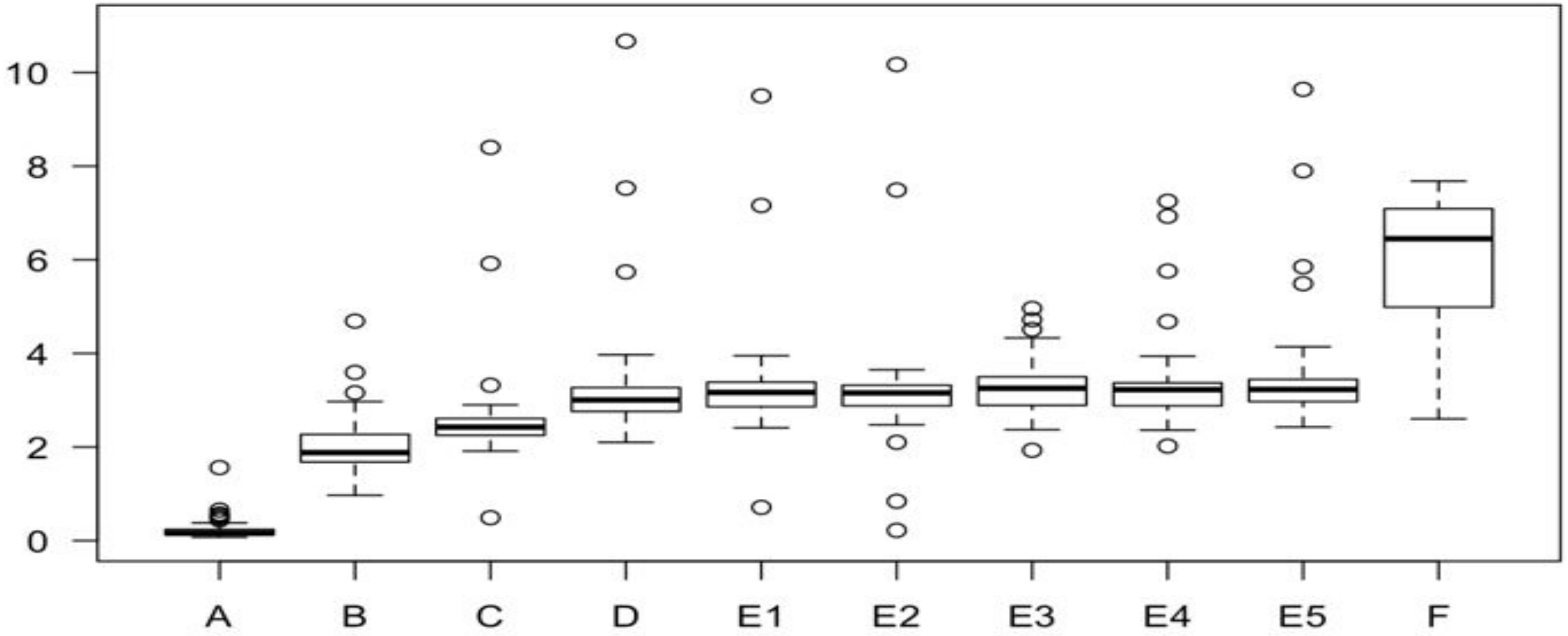



evaluates the precision
'minimal un-certainty'

# Carbon W&B (%)

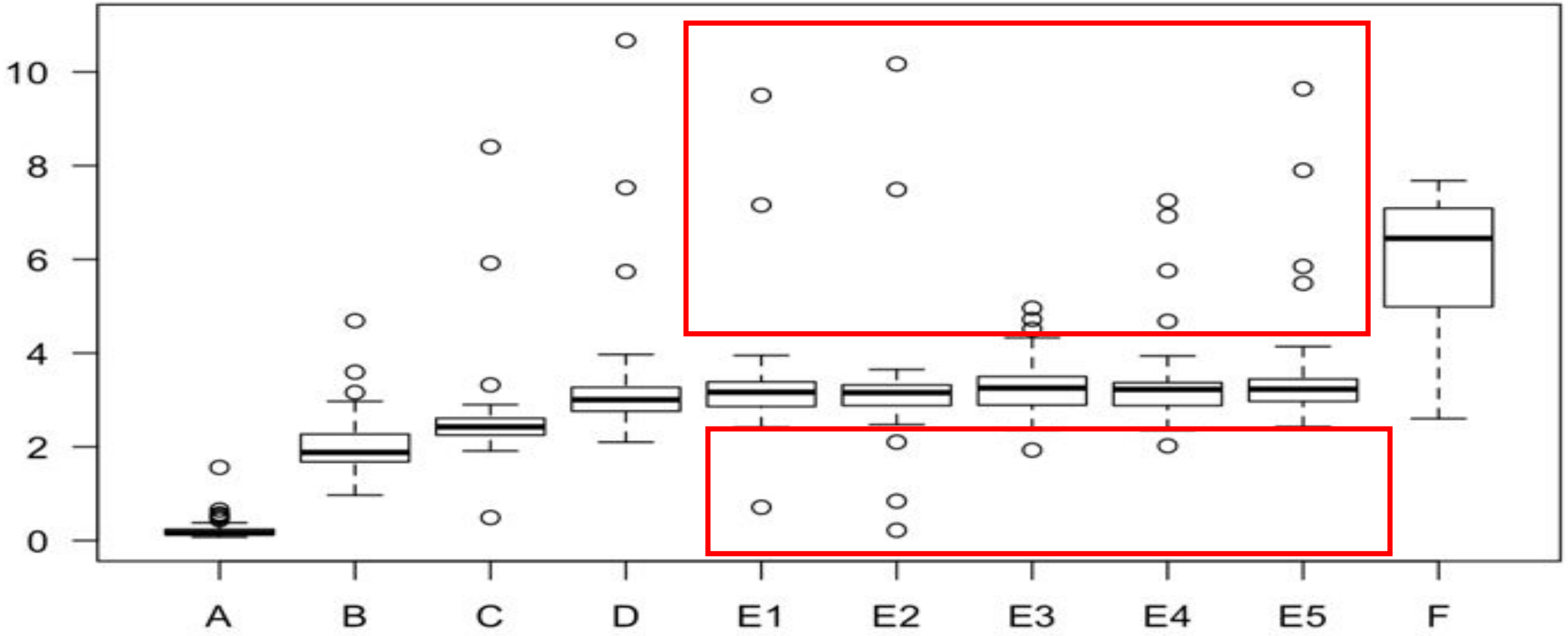


# Carbon W&B (%)



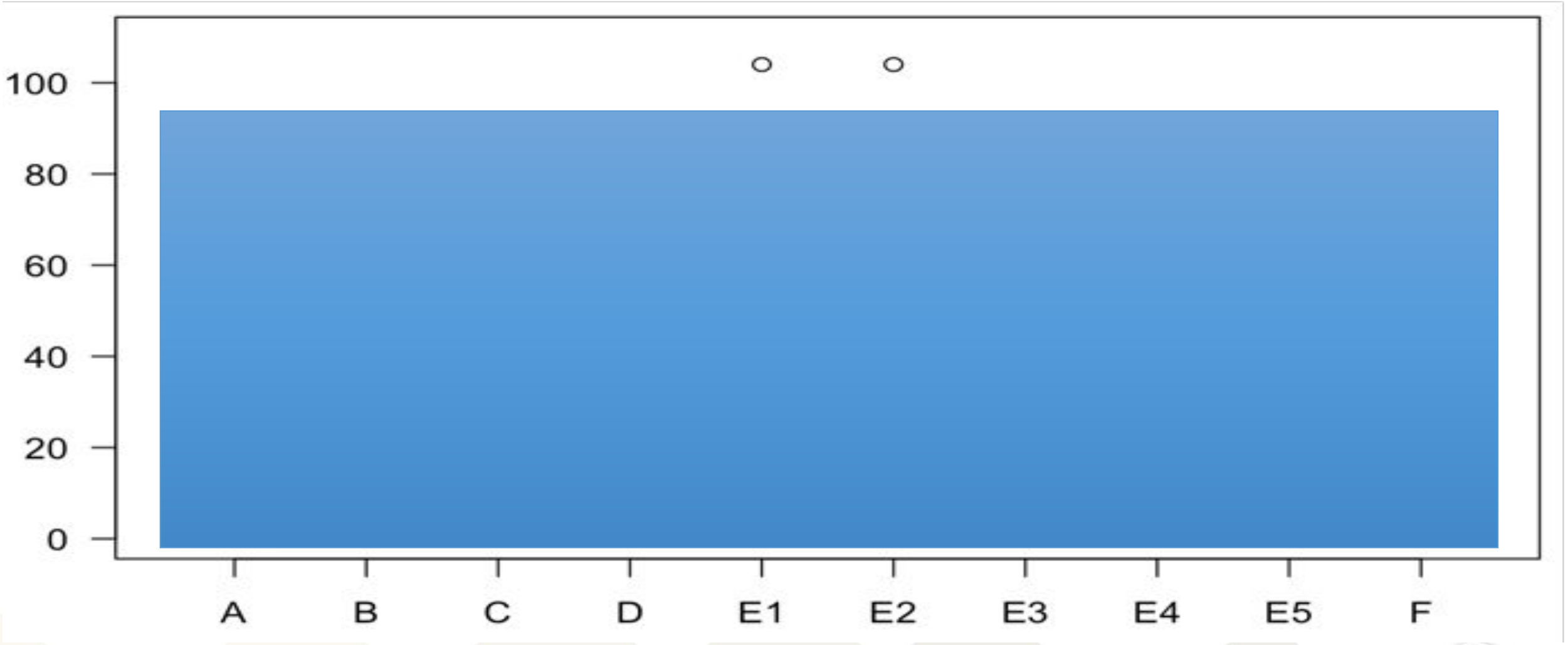

**Too many 'extreme values'**

# Carbon W&B (%)

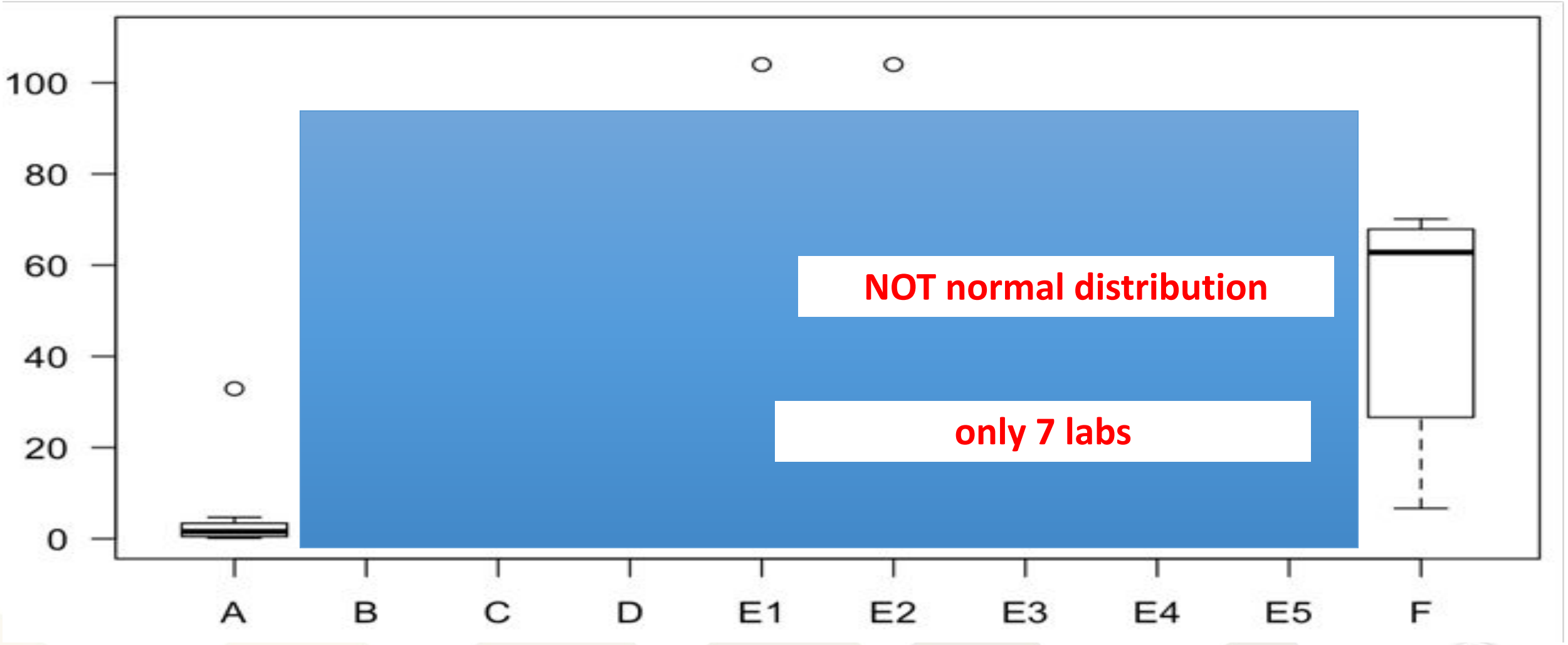



random 'extreme values'

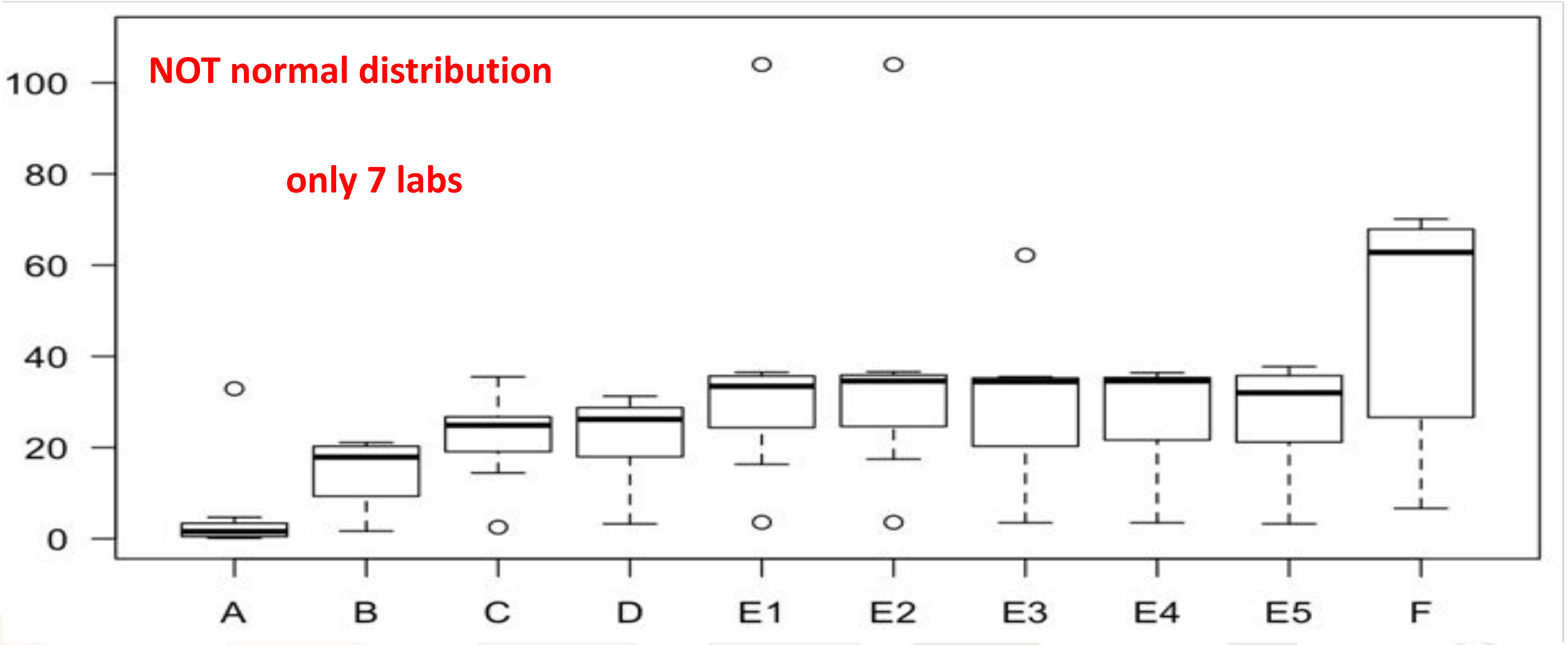
# Carbon Dumas (mg/g)



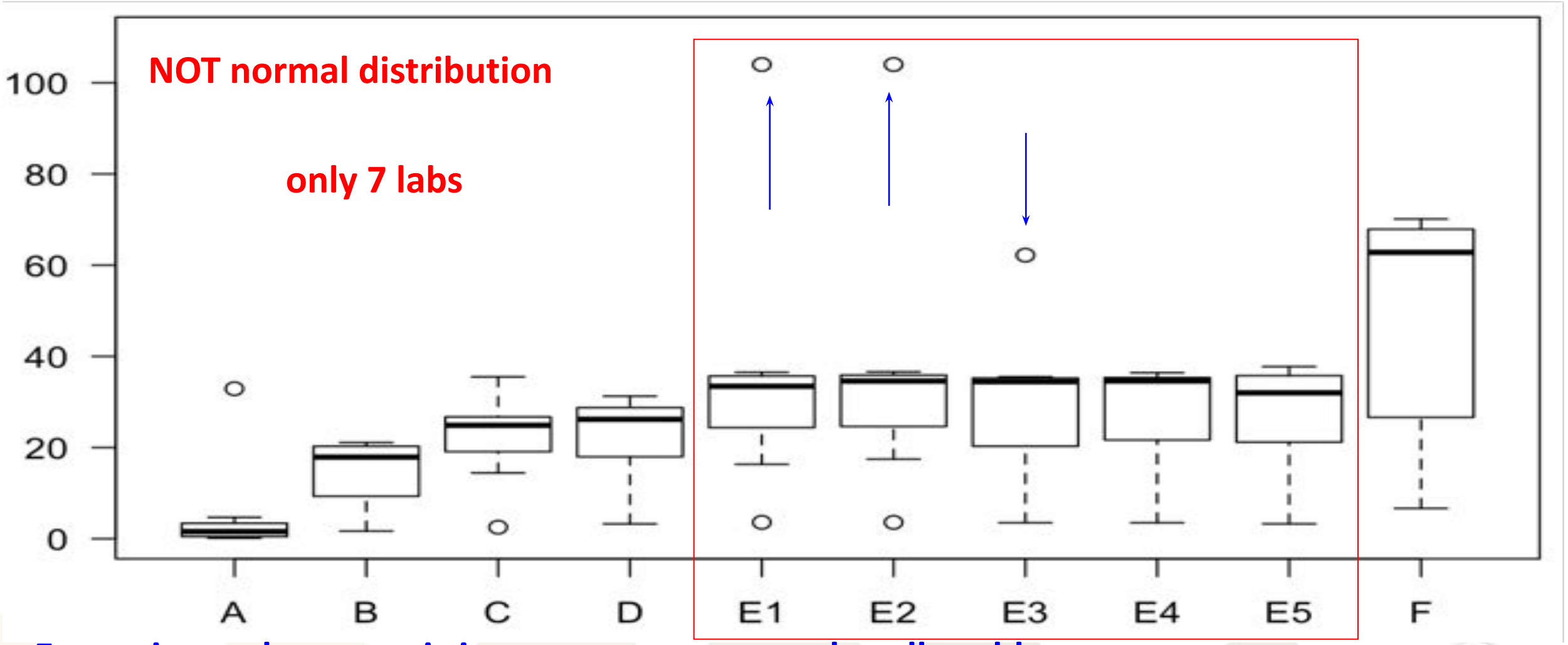
# Carbon Dumas (mg/g)



# Carbon Dumas (mg/g)

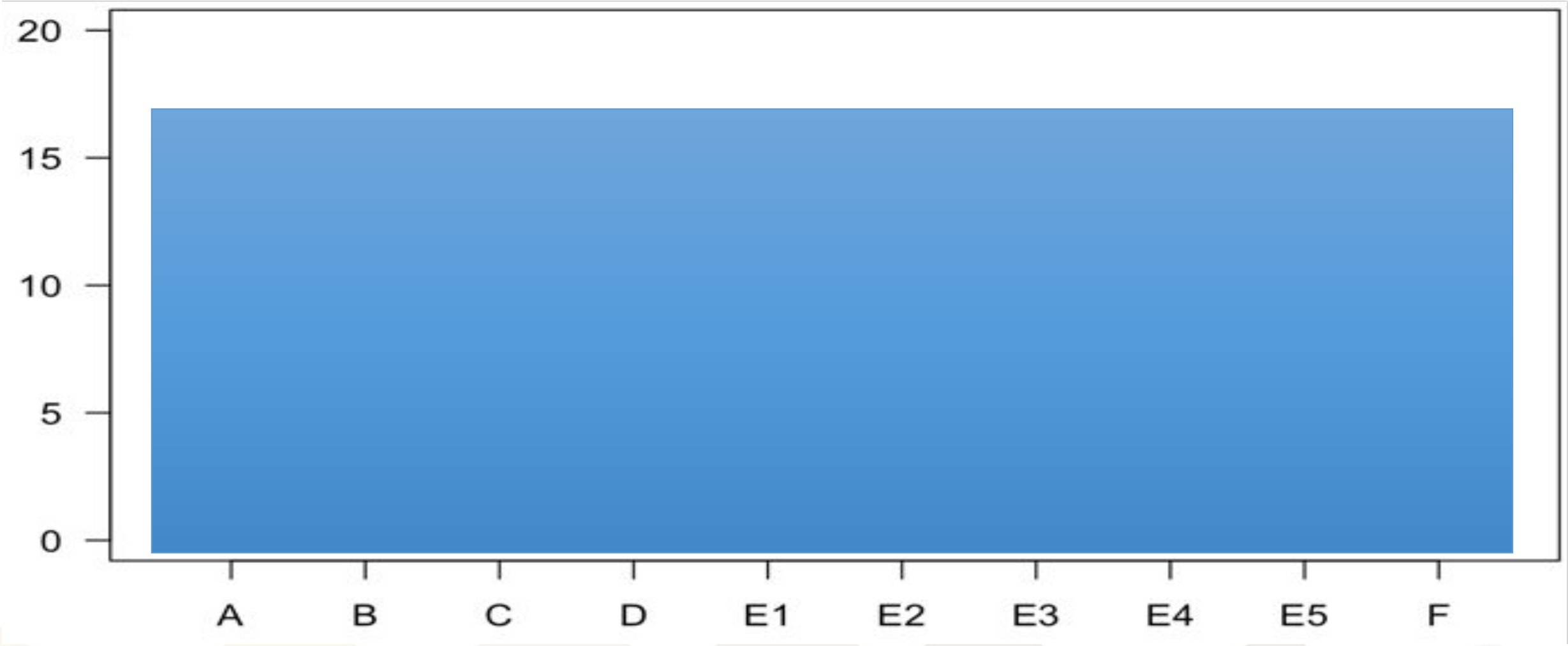


# Carbon Dumas (mg/g)

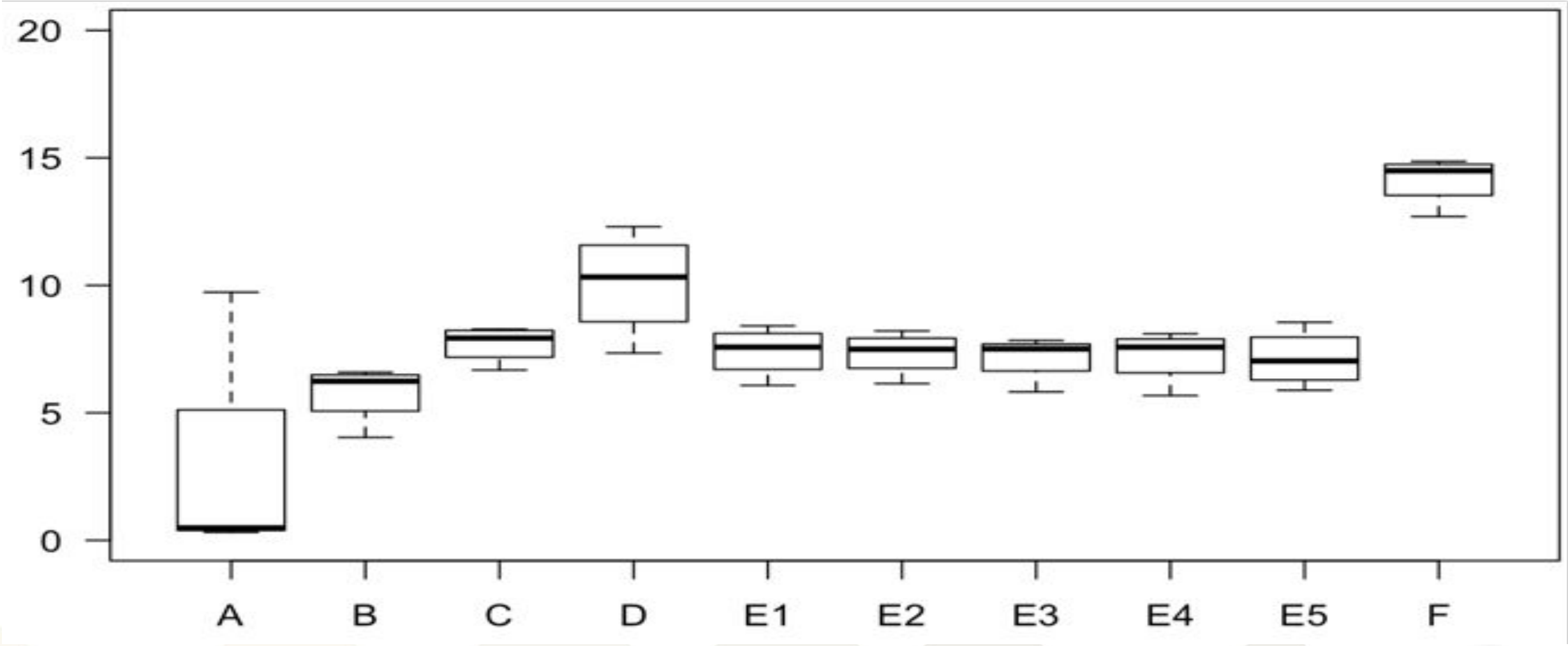


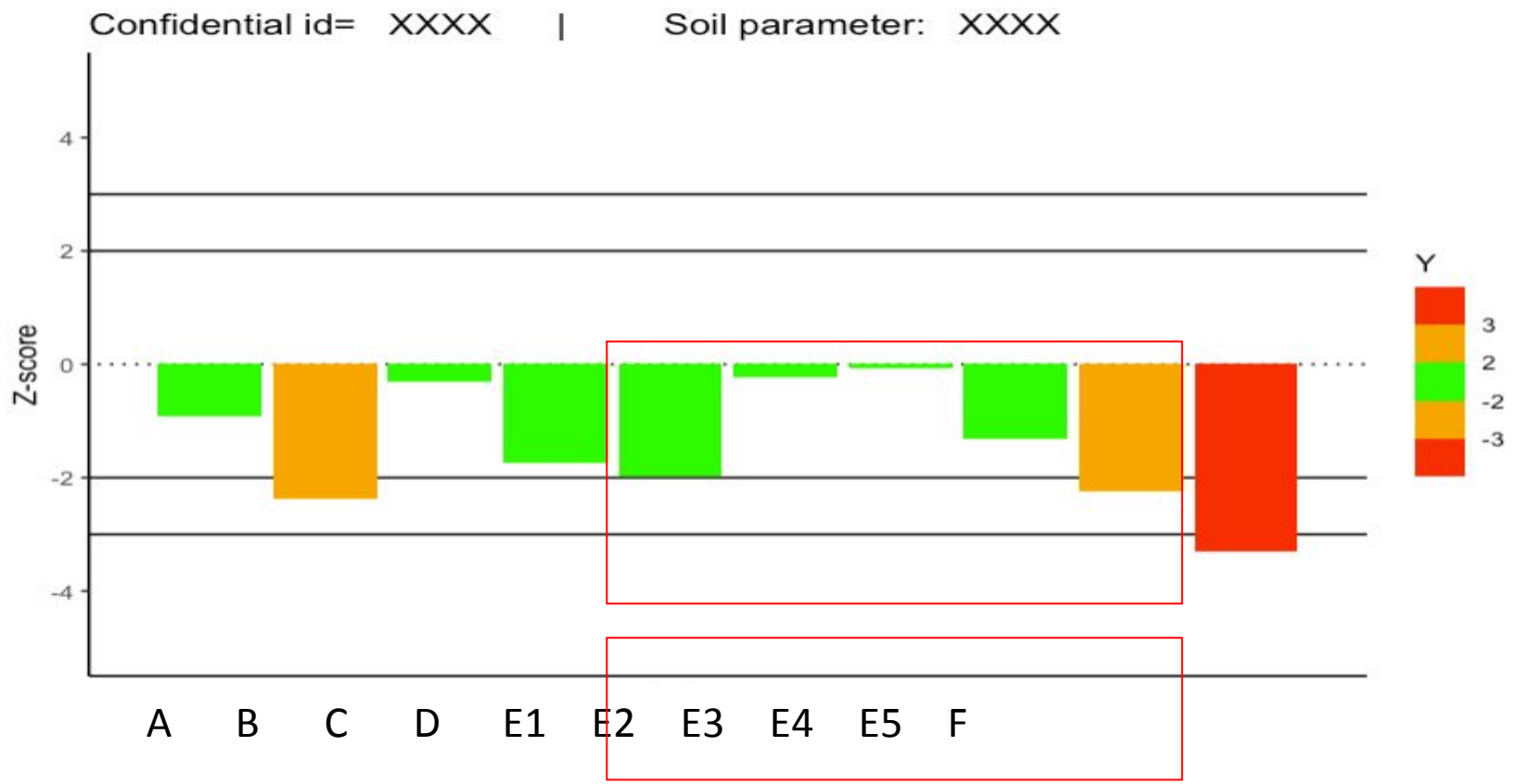

**Expensive and automatic instruments cannot solve all problems...**

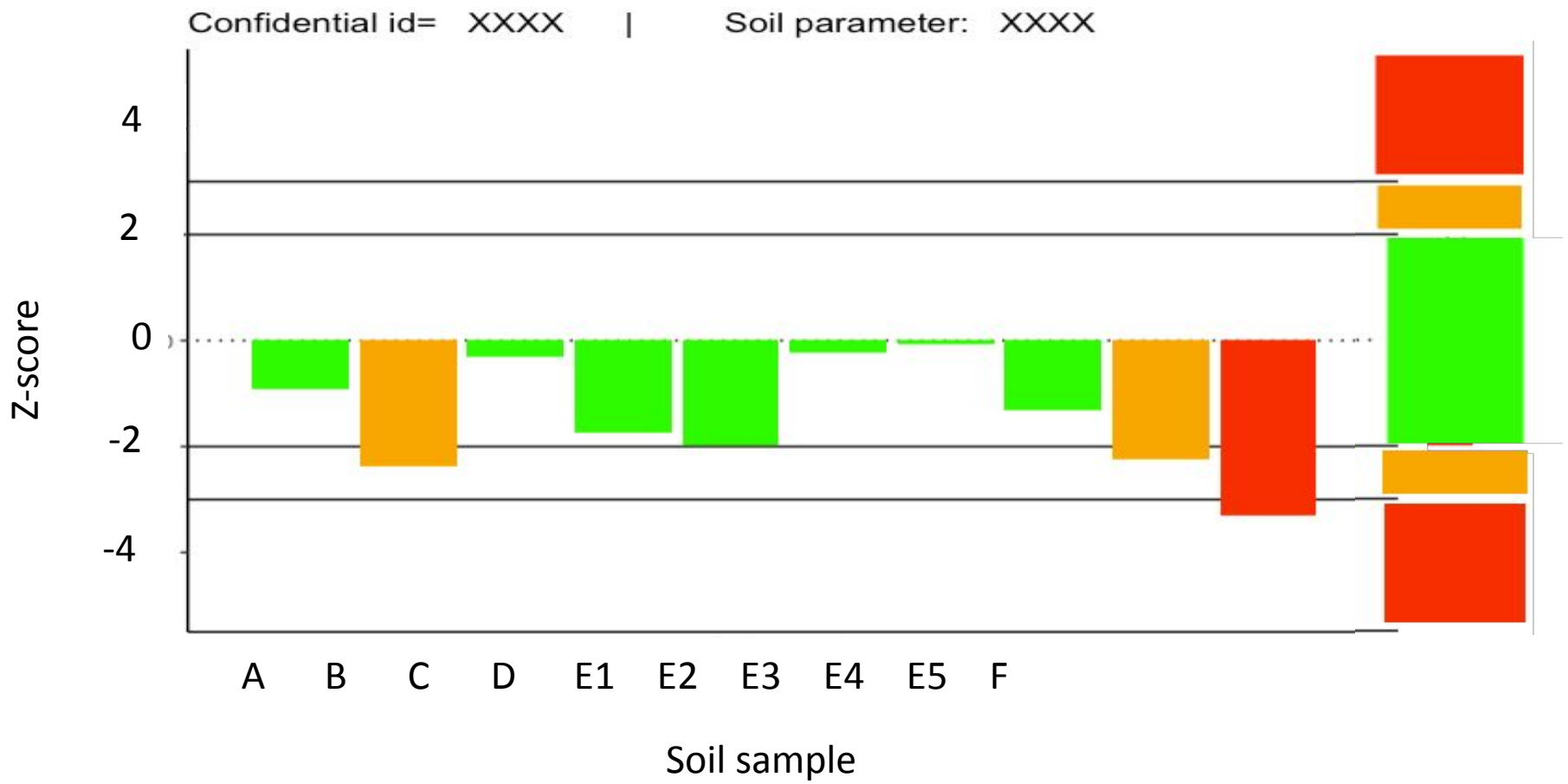
# Carbon Loss of Ignigtion (%)

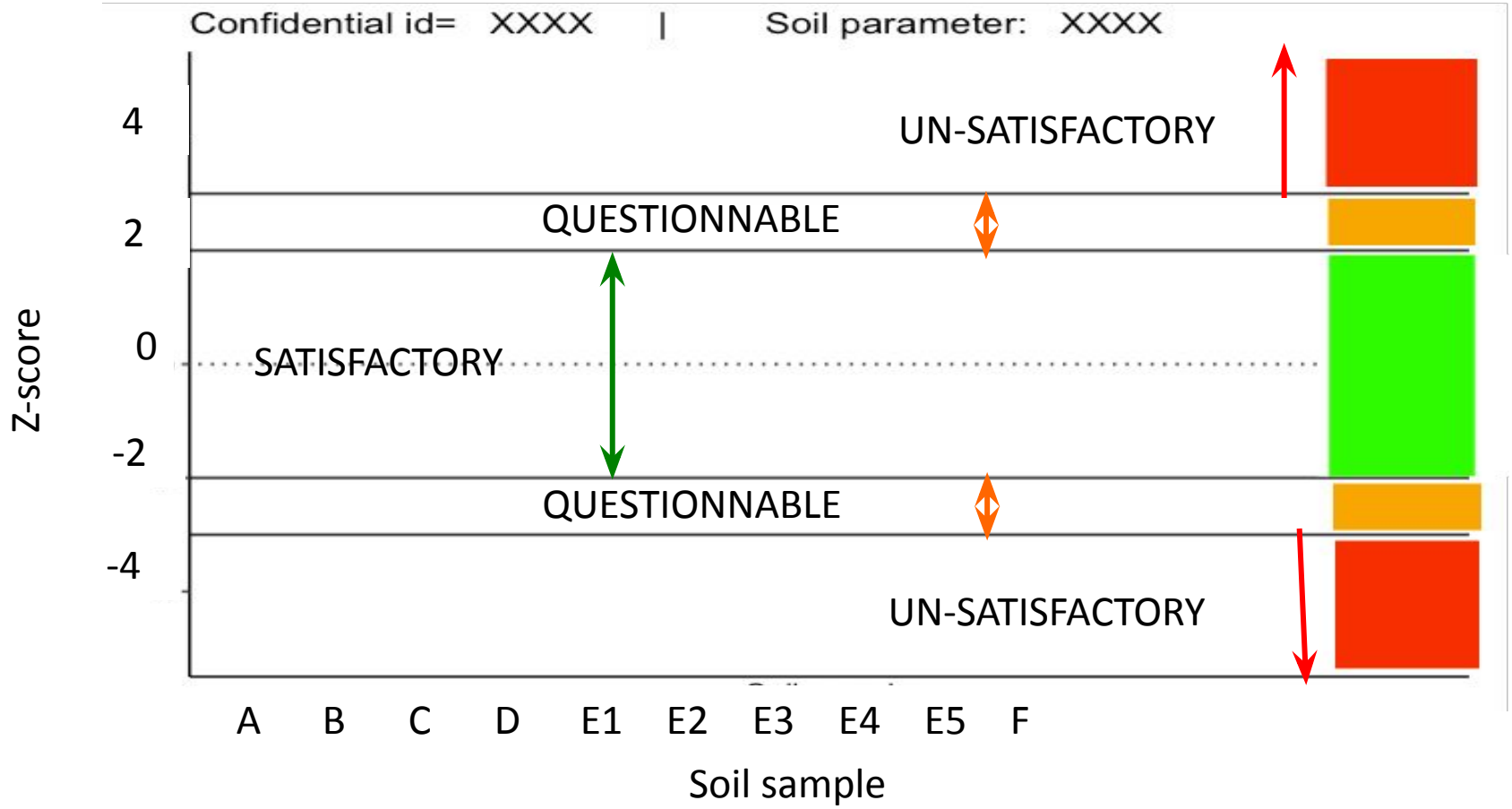


# Carbon Loss of Ignigtion (%)




Confidential id= XXXX | Soil parameter: XXXX
Z-score
4
2
0
-2
-4
A
B
C
D
E1
E2
E3
E4
E5
F
Y
3
2
-2
-3


Confidential id= XXXX | Soil parameter: XXXX
4
2
0
-2
-4
Z-score
A
B
C
D
E1
E2
E3
E4
E5
F
Soil sample


Confidential id= XXXX | Soil parameter: XXXX
4
2
0
-2
-4
Z-score
UN-SATISFACTORY
QUESTIONNABLE
SATISFACTORY
QUESTIONNABLE
UN-SATISFACTORY
A B C D E1 E2 E3 E4 E5 F
Soil sample

Food and Agriculture Organization of the United Nations

EUROSOLAN

EUROPEAN AND EURASIAN SOIL LABORATORY NETWORK

# Thank you for your attention

GLOBAL SOIL PARTNERSHIP