

# Eurasian PT 2023

Elena Shamrikova,  
RUSOLAN Chair

7<sup>th</sup> Meeting of the  
**Global Soil  
Laboratory  
Network**  
(GLOSOLAN)



**GLOSOLAN**  
GLOBAL SOIL LABORATORY NETWORK

# Main authors (in alphabetical order):



*Boris Kondratenok* – Deputy Director in Science, Candidate of Chemistry

*Elena Kyzyurova* – Lead chemical engineer

*Elena Lapteva* – Head of the Department of Soil Science, Candidate of Biology

*Evgenia Tumanova* – Lead chemical engineer

***Evgenia Vanchikova*** – Candidate of Chemistry

*Natalia Bondarenko* – Engineer of the 1 category

*Olga Ostanina* – Lead chemical engineer

*Svetlana Kostrova* – Lead chemical engineer

*Tatyana Zonova* – Lead chemical engineer

*Yulia Bobrova* – Lead chemical engineer

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# Eurasian PT-2023 concept



Coordinator PT – NatRef Lab of the RUSOLAN

Participation in PT is **free and anonymous**.

**The purpose of the PT:** to expand and promote harmonized approaches for measuring SOC among soil laboratories in the region.

**We noticed that the laboratories :**

- afraid to participate in PT (even anonymously),
- and don't see the point in participating - *why?*

*We need to work with this!*

# Eurasian PT-2023 concept

PT participants (26) from 9 countries\*

- Armenia (1)
- Georgia (1)
- Kazakhstan (2)
- Moldova (1)
- Belarus (1)
- Russia (15 RUSOLAN's labs)
- Senegal (1)
- Turkmenistan (1)
- Uzbekistan (3)

\* - *with the support of Maria Konyushkova*



The vast majority of laboratories:

- not accredited (16),
- never participated in PT,
- never used the WB method

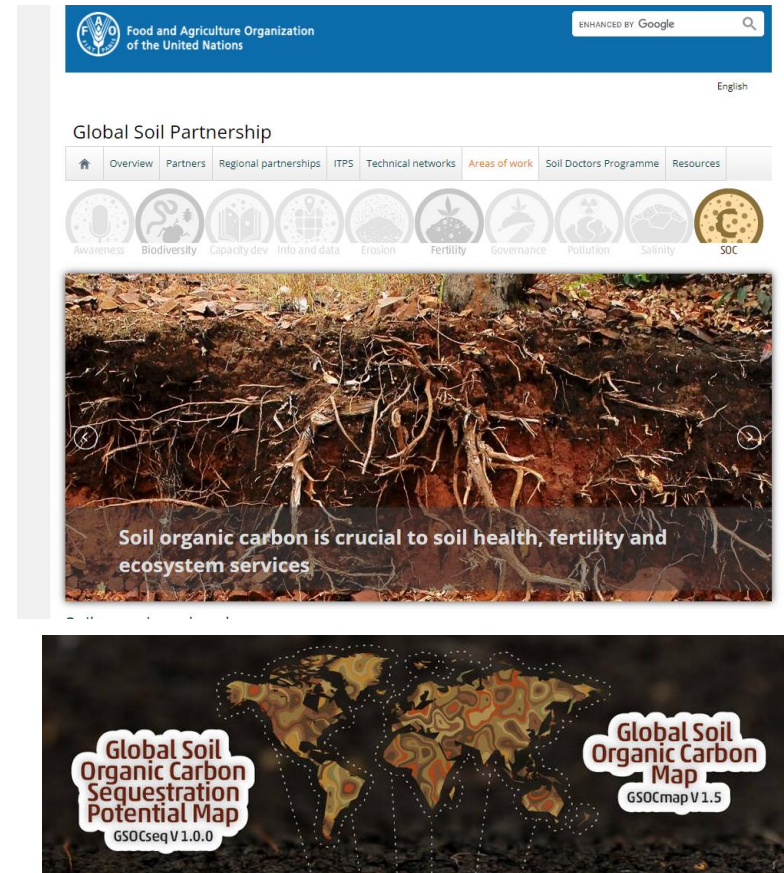
# Why SOC?

SOC is one of the **most important components of soils**.

In the age of global changes in the environment, monitoring SOC is of outmost importance.

Under the GSP initiative of the FAO, the availability of **non-harmonized data** is one of the reasons for the low accuracy of the global SOC map (*Peralta et al., 2022*).

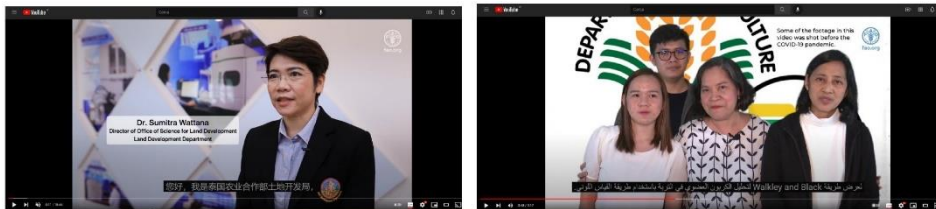
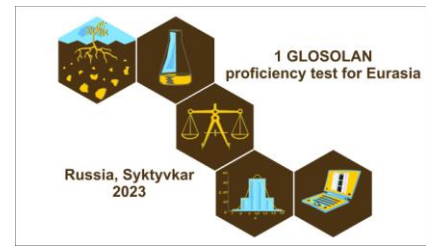
*This is especially true for regions such as Eurasia where data are sparse.*



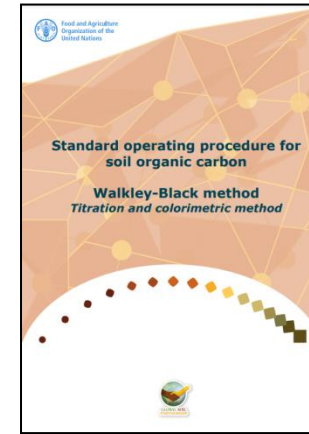
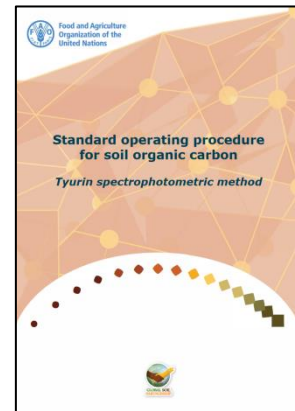
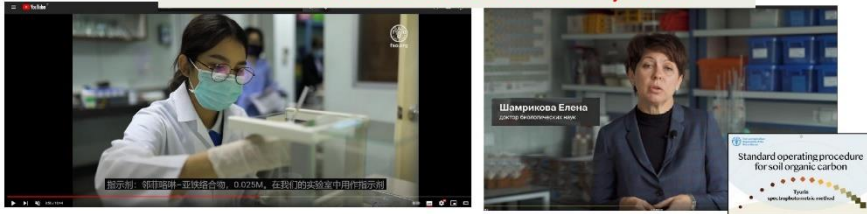
# Tested methods

- Dry combustion on the analyzer (**DC**) ,
- Walkley-Black's method (**WB**),
- Tyurin's method (**T**) ,
- Soil Loss-in-ignition method (**LOI**)

*SOPs of GLOSOLAN*



Almost 9000 views in one year!



[www.fao.org/global-soil-partnership/glosolan/](http://www.fao.org/global-soil-partnership/glosolan/)

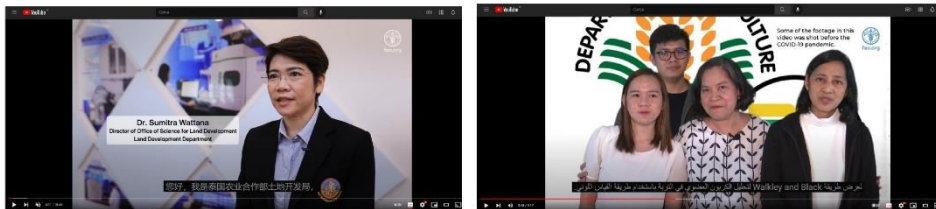
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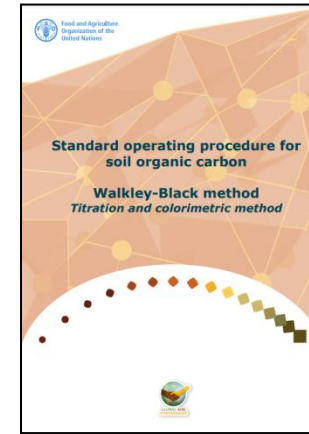
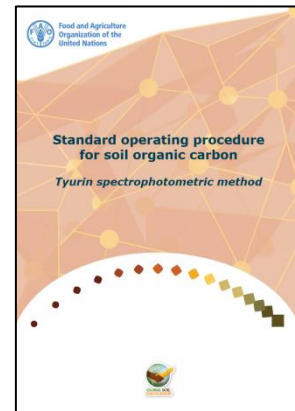
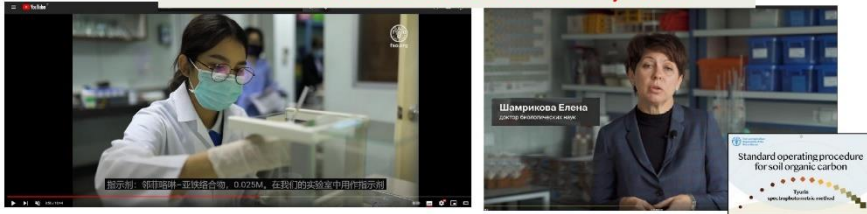
# Tested methods

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*SOPs of GLOSOLAN*



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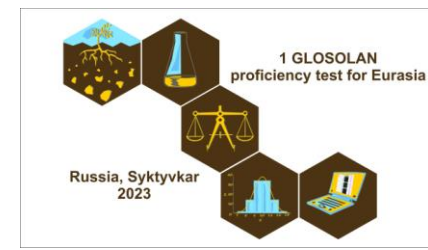


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# LOI: SOP of GLOSOLAN in progress



The bad news - LOI has many modifications!

$$T, t, m_{soil}, d$$

Minimize laboratory errors - the task of the PT coordinator.

**Uniform LOI conditions.**

The conditions were founded **experimentally.**

1.  $T = 550\text{ }^{\circ}\text{C}$ ,
2.  $t = 7\text{ hours}$ ,
3.  $m_{soil} = 2,0\text{-}2,5\text{ g}$ ,
4.  $d < 0,1\text{ mm}$



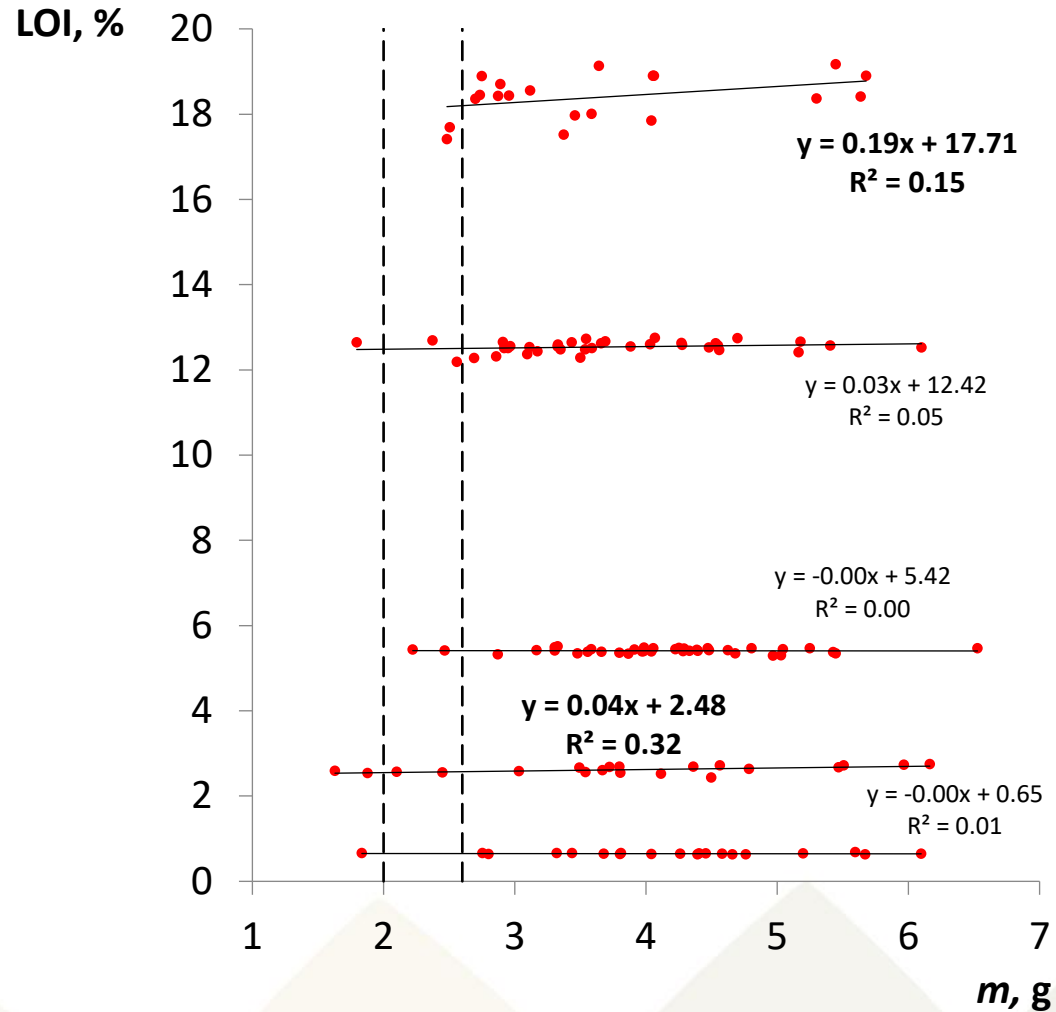
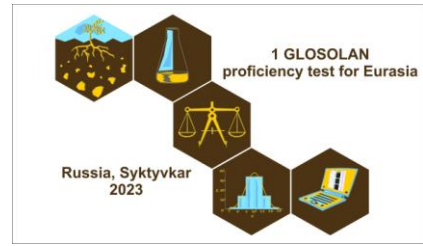


# LOI: Heating time

Soil	Heating time, hour											
	T = 105 °C						T = 550 °C					
	4	5	6	7	8	9	6	7	8	9	10	12
1	14,8309	14,8300	14,8296	14,8297	14,8296	14,8297	14,0339	14,0338	14,0339	14,0338	14,0339	14,0339
2	14,4856	14,4831	14,4822	14,4823	14,4823	14,4823	14,2672	14,2673	14,2672	14,2672	14,2672	14,2673
3	17,4958	17,4921	17,4914	17,4914	17,4913	17,4914	16,6163	16,6164	16,6163	16,1663	16,1663	16,1662
4	16,2597	16,2571	16,2561	16,2562	16,2562	16,2562	12,9443	12,9440	12,9440	12,9440	12,9440	12,9439
5	16,0904	16,0867	16,0807	16,0803	16,0803	16,0802	17,9249	17,9236	17,9237	17,9237	17,9236	17,9231
6	19,5486	19,5407	19,5351	19,5346	19,5346	19,5346	16,3069	16,3054	16,3054	16,3054	16,3054	16,6042
7	18,0275	18,0266	18,0263	18,0261	18,0262	18,0262	17,2339	17,2335	17,2336	17,2335	17,2333	17,2330
8	16,8399	16,8393	16,8391	16,8389	16,8389	16,8389	13,1658	13,1656	13,1656	13,1656	13,1654	13,1650

**T = 550 °C, t = 7 hours**

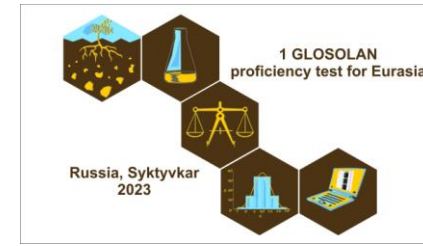
# LOI: The mass of the air-dry soil



1.  $T = 550\text{ }^{\circ}\text{C}$ ,
2.  $t = 7\text{ hours}$ ,
3.  $m_{soil} = 2,0\text{-}2,5\text{ g}$ ,



# LOI: Sample preparation



## 7. Sample preparation DC – SOP of GLOSOLAN

Follow the sample preparation instructions provided by the manufacturer for use of the autoanalyzer. Probably, a representative portion of the soil sample that was previously treated (dried and sieved to 2 mm) must be porfirised (grind fine and homogeneously) until the entire fraction passes through a sieve of inferior size. Typically, a representative subsample is taken from the bulk sample and milled to a sufficiently fine mesh size. Ensure that milling equipment and sieves do not introduce contamination to the samples.

## WB – SOP of GLOSOLAN

### 7. Sample preparation

Air dry soil sample and sieve to  $\leq 2.0$  mm size.

## 7. Sample preparation T – SOP of GLOSOLAN

Soil samples are prepared under conditions that ensure the composition of the sample in accordance with the regulatory and technical documentation for the objects studied. Air-dry samples of soils are obtained by drying at the temperature and humidity of the laboratory room. A portion of the soil sample is taken and scattered on tracing paper, large inclusions (undecomposed roots and plant debris, stones, tumors, etc.) are removed with tweezers.

The soil sample is sieved ( $< 1$  mm or other diameter, according to the procedures of e portion is grinded in a jasper or agate mortar to a size of 0.25 mm in diameter. The prep stored in plastic bags, plastic or glass containers. The mass of the air-dry soil sample to

LOI ???????????

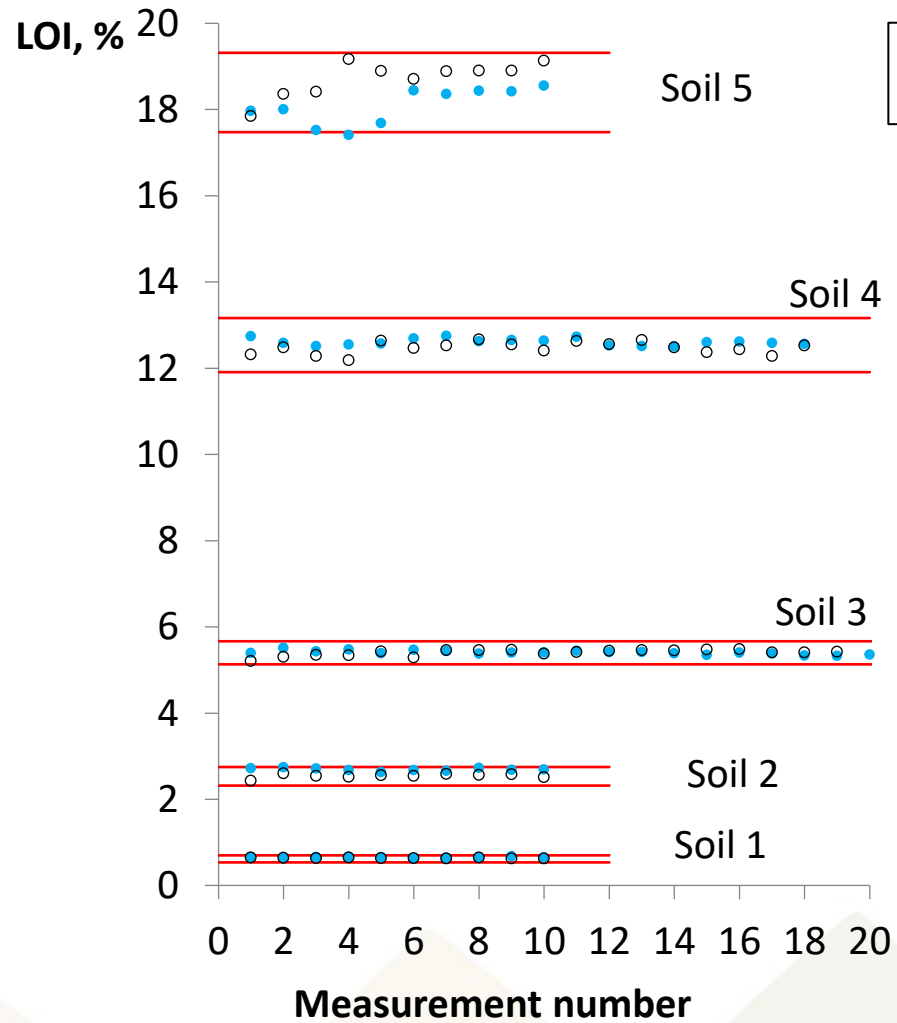
SOP of GLOSOLAN in progress

In Russia,  $d = 1$  mm

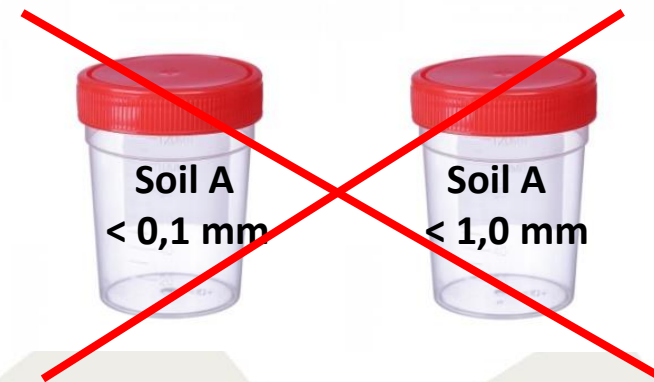
DC, WB, T:  $< 0,1$  mm



# LOI: Sample preparation



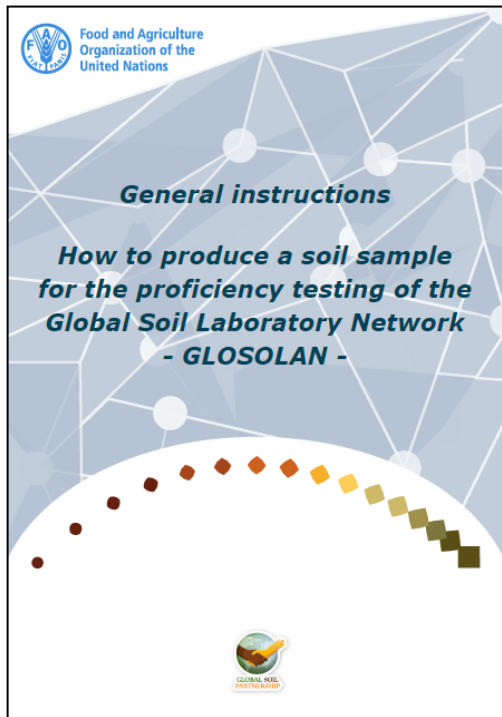
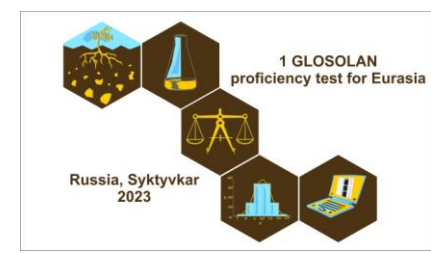
We compared LOI: soils <0,1 mm and <1,0 mm (reproducibility conditions).  
Variation results < 5%, great!  
DC, WB, T, LOI: < 0,1 mm



# Before the start of PT

## Preparation of soil samples for PT

%Corg = 0,17-8,7%, % CaCO3 0%



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# The task of the PT participant



From 1 to 4 methods depending on the capabilities of laboratories

27 September – 1 December 2023

Soil A-Soil I: %SOC = 0.17-8.7%, %CaCO<sub>3</sub> = 0

№	Methods	Units of measure	Soil A			Soil B			Soil C			Soil D			Soil E			Soil F			Soil G			Soil H			Soil I		
			A1 <sub>1</sub>	A1 <sub>2</sub>	A1 <sub>3</sub>	B1 <sub>1</sub>	B1 <sub>2</sub>	B1 <sub>3</sub>	C1 <sub>1</sub>	C1 <sub>2</sub>	C1 <sub>3</sub>	D1 <sub>1</sub>	D1 <sub>2</sub>	D1 <sub>3</sub>	E1 <sub>1</sub>	E1 <sub>2</sub>	E1 <sub>3</sub>	F1 <sub>1</sub>	F1 <sub>2</sub>	F1 <sub>3</sub>	G1 <sub>1</sub>	G1 <sub>2</sub>	G1 <sub>3</sub>	H1 <sub>1</sub>	H1 <sub>2</sub>	H1 <sub>3</sub>	I1 <sub>1</sub>	I1 <sub>2</sub>	I1 <sub>3</sub>
1	DC	%	A1 <sub>1</sub>	A1 <sub>2</sub>	A1 <sub>3</sub>	B1 <sub>1</sub>	B1 <sub>2</sub>	B1 <sub>3</sub>	C1 <sub>1</sub>	C1 <sub>2</sub>	C1 <sub>3</sub>	D1 <sub>1</sub>	D1 <sub>2</sub>	D1 <sub>3</sub>	E1 <sub>1</sub>	E1 <sub>2</sub>	E1 <sub>3</sub>	F1 <sub>1</sub>	F1 <sub>2</sub>	F1 <sub>3</sub>	G1 <sub>1</sub>	G1 <sub>2</sub>	G1 <sub>3</sub>	H1 <sub>1</sub>	H1 <sub>2</sub>	H1 <sub>3</sub>	I1 <sub>1</sub>	I1 <sub>2</sub>	I1 <sub>3</sub>
2	WB	%	A2 <sub>1</sub>	A2 <sub>2</sub>	A2 <sub>3</sub>	B2 <sub>1</sub>	B2 <sub>2</sub>	B2 <sub>3</sub>	C2 <sub>1</sub>	C2 <sub>2</sub>	C2 <sub>3</sub>	D2 <sub>1</sub>	D2 <sub>2</sub>	D2 <sub>3</sub>	E2 <sub>1</sub>	E2 <sub>2</sub>	E2 <sub>3</sub>	F2 <sub>1</sub>	F2 <sub>2</sub>	F2 <sub>3</sub>	G2 <sub>1</sub>	G2 <sub>2</sub>	G2 <sub>3</sub>	H2 <sub>1</sub>	H2 <sub>2</sub>	H2 <sub>3</sub>	I2 <sub>1</sub>	I2 <sub>2</sub>	I2 <sub>3</sub>
3	T	%	A3 <sub>1</sub>	A3 <sub>2</sub>	A3 <sub>3</sub>	B3 <sub>1</sub>	B3 <sub>2</sub>	B3 <sub>3</sub>	C3 <sub>1</sub>	C3 <sub>2</sub>	C3 <sub>3</sub>	D3 <sub>1</sub>	D3 <sub>2</sub>	D3 <sub>3</sub>	E3 <sub>1</sub>	E3 <sub>2</sub>	E3 <sub>3</sub>	F3 <sub>1</sub>	F3 <sub>2</sub>	F3 <sub>3</sub>	G3 <sub>1</sub>	G3 <sub>2</sub>	G3 <sub>3</sub>	H3 <sub>1</sub>	H3 <sub>2</sub>	H3 <sub>3</sub>	I3 <sub>1</sub>	I3 <sub>2</sub>	I3 <sub>3</sub>
4	LOI	%	A4 <sub>1</sub>	A4 <sub>2</sub>	A4 <sub>3</sub>	B4 <sub>1</sub>	B4 <sub>2</sub>	B4 <sub>3</sub>	C4 <sub>1</sub>	C4 <sub>2</sub>	C4 <sub>3</sub>	D4 <sub>1</sub>	D4 <sub>2</sub>	D4 <sub>3</sub>	E4 <sub>1</sub>	E4 <sub>2</sub>	E4 <sub>3</sub>	F4 <sub>1</sub>	F4 <sub>2</sub>	F4 <sub>3</sub>	G4 <sub>1</sub>	G4 <sub>2</sub>	G4 <sub>3</sub>	H4 <sub>1</sub>	H4 <sub>2</sub>	H4 <sub>3</sub>	I4 <sub>1</sub>	I4 <sub>2</sub>	I4 <sub>3</sub>

# The task of the PT participant

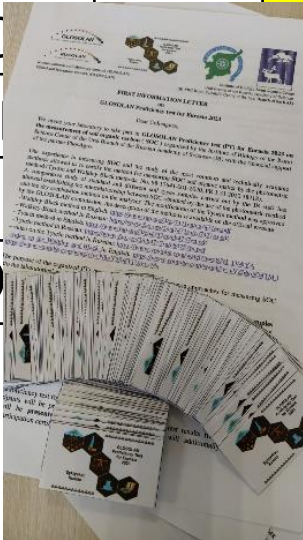


From 1 to 4 methods depending on the capabilities of laboratories

27 September – 1 December 2023

Soil A-Soil I: %SOC = 0.17-8.7%, %CaCO<sub>3</sub> = 0

No	Methods	Units of measure	Soil A	Soil B	Soil C	Soil D	Soil E	Soil F	Soil G	Soil H	Soil I
1	DC		1 A1 <sub>2</sub>		1 C1 <sub>2</sub> C1 <sub>3</sub> D1 <sub>1</sub> D1 <sub>2</sub>						1 I1 <sub>3</sub>
2	W		1 A2 <sub>2</sub>		1 C2 <sub>2</sub> C2 <sub>3</sub> D2 <sub>1</sub> D2 <sub>2</sub>						1 I2 <sub>3</sub>
3	T		1 A3 <sub>2</sub>		1 C3 <sub>2</sub> C3 <sub>3</sub> D3 <sub>1</sub> D3 <sub>2</sub>						1 I3 <sub>3</sub>
4	LO		1 A4 <sub>2</sub>		1 C4 <sub>2</sub> C4 <sub>3</sub> D4 <sub>1</sub> D4 <sub>2</sub>						1 I4 <sub>3</sub>



Each laboratory received :

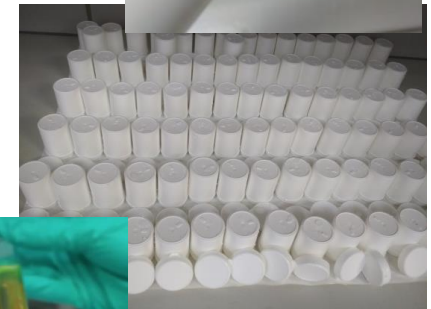
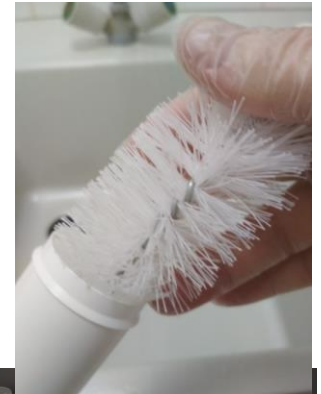
- Information letters (N 1, 2),
- SOPs,
- Instructions,
- Forms for recording results

# Homogeneity - Before the start of PT

10 times 2 parallel repetitions for each sample for each method  
= 20 measurements for each sample for each method

# Stability - During PT

10 times 1-2 parallel replicates for each sample for each method  
= 10-20 measurements for each sample for each method





# Webinar dedicated to holding Eurasian PT-2023 26.09.2023



<b>26 September 2023</b> <b>10.30 – 12.00 (Moscow time)</b> <b>Link to the event:</b> <a href="https://trueconf.ru/c/34d62ba65a7bfc68ceda05d2be8ceae9">https://trueconf.ru/c/34d62ba65a7bfc68ceda05d2be8ceae9</a> <b>Moderator: Elena Shamrikova</b>		
<b>10.30 – 10.35</b>	Greeting: Institute of Biology, Komi Scientific Center, Ural Branch of the RAS	<b>Ph.D. Ivan Chadin,</b> Director
<b>10.35 – 10.50</b>	Experience of the Institute of Biology in Harmonization of Methods for Measuring of Soil Organic Carbon	<b>Dr. Elena Shamrikova,</b> Chairman of RUSOLAN
<b>10.50 – 11.05</b>	Why does a testing laboratory need to participate in Proficiency Tests?	<b>Svetlana Kostrova,</b> Head of the Ecoanalytical Laboratory
<b>11.05 – 11.30</b>	Methodological features of measurements of Soil Organic Carbon in soils in accordance with the Walkley-Black method and a modification of the Tyurin method	<b>Ph.D. Elena Lapteva,</b> Head of the Department of Soil Science, <b>Evgenia Tumanova,</b> Lead Engineer
<b>11.05 – 11.30</b>	Method for measuring Soil Organic Carbon by Loss on Ignition method	<b>N.N. Bondarenko,</b> Engineer of the 1 category, <b>Ph.D. Elena Lapteva,</b> Head of the Department of Soil Science, <b>Elena Kyzuyrova,</b> Lead Engineer
<b>11.30 – 11.55</b>	Round of questions and answers	<b>Dr. Elena Shamrikova,</b> Chairman of RUSOLAN
<b>11.55 – 12.00</b>	Closing the webinar	

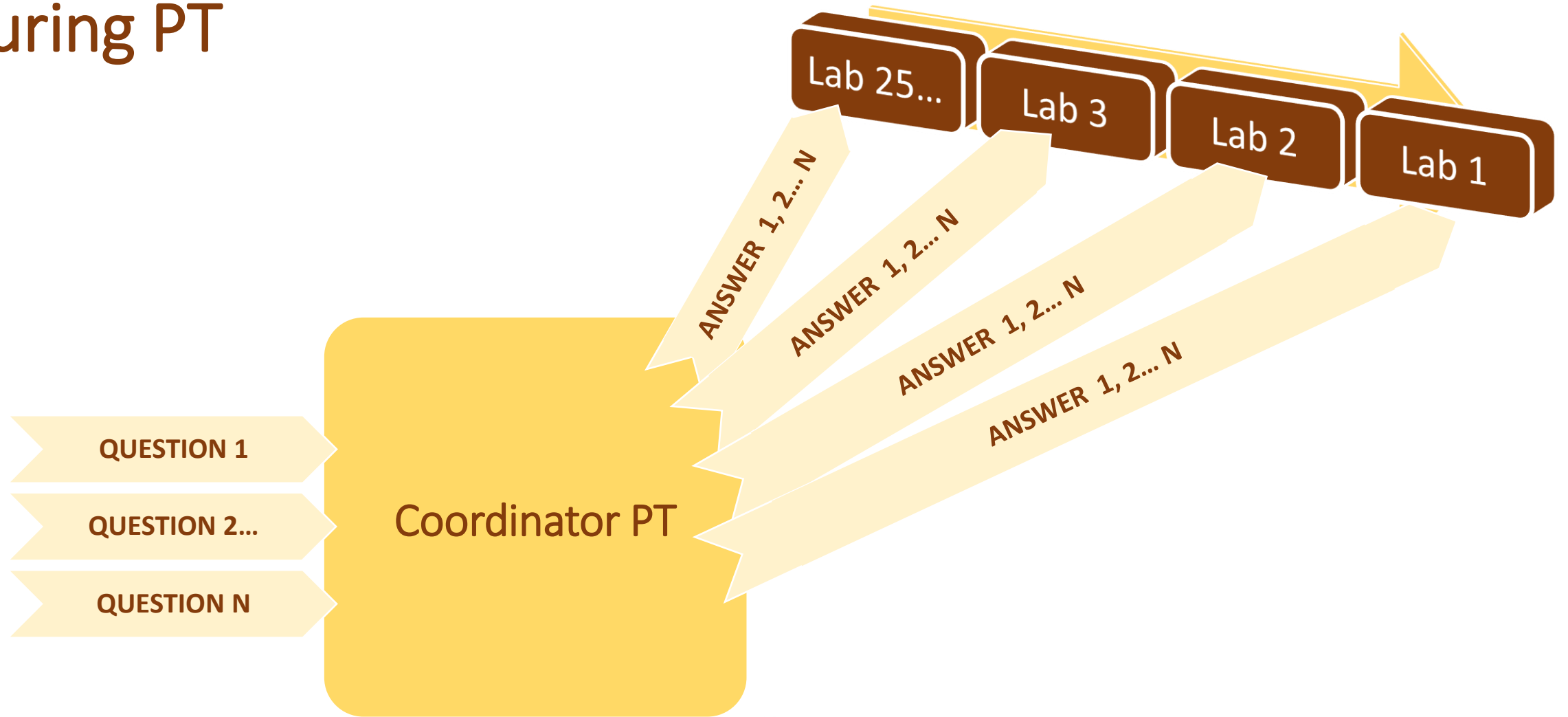


<https://ib.komisc.ru/rusolan/>

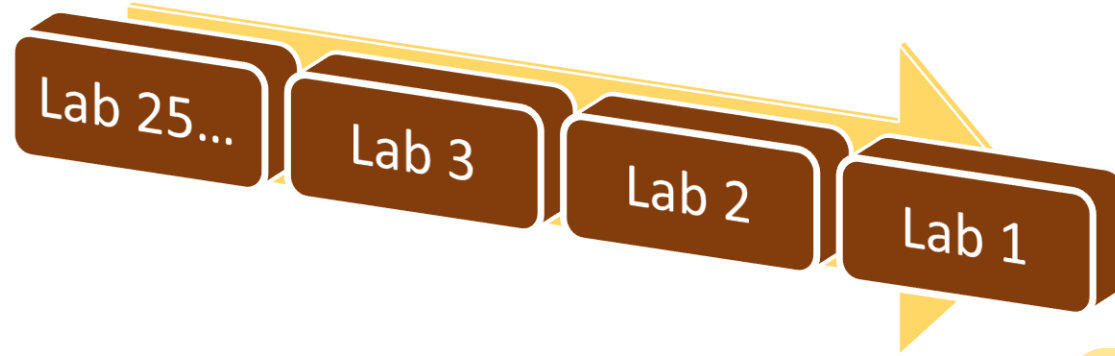
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# During PT



# After PT



Coordinator PT

Statistical  
(Math)  
analysis of  
results

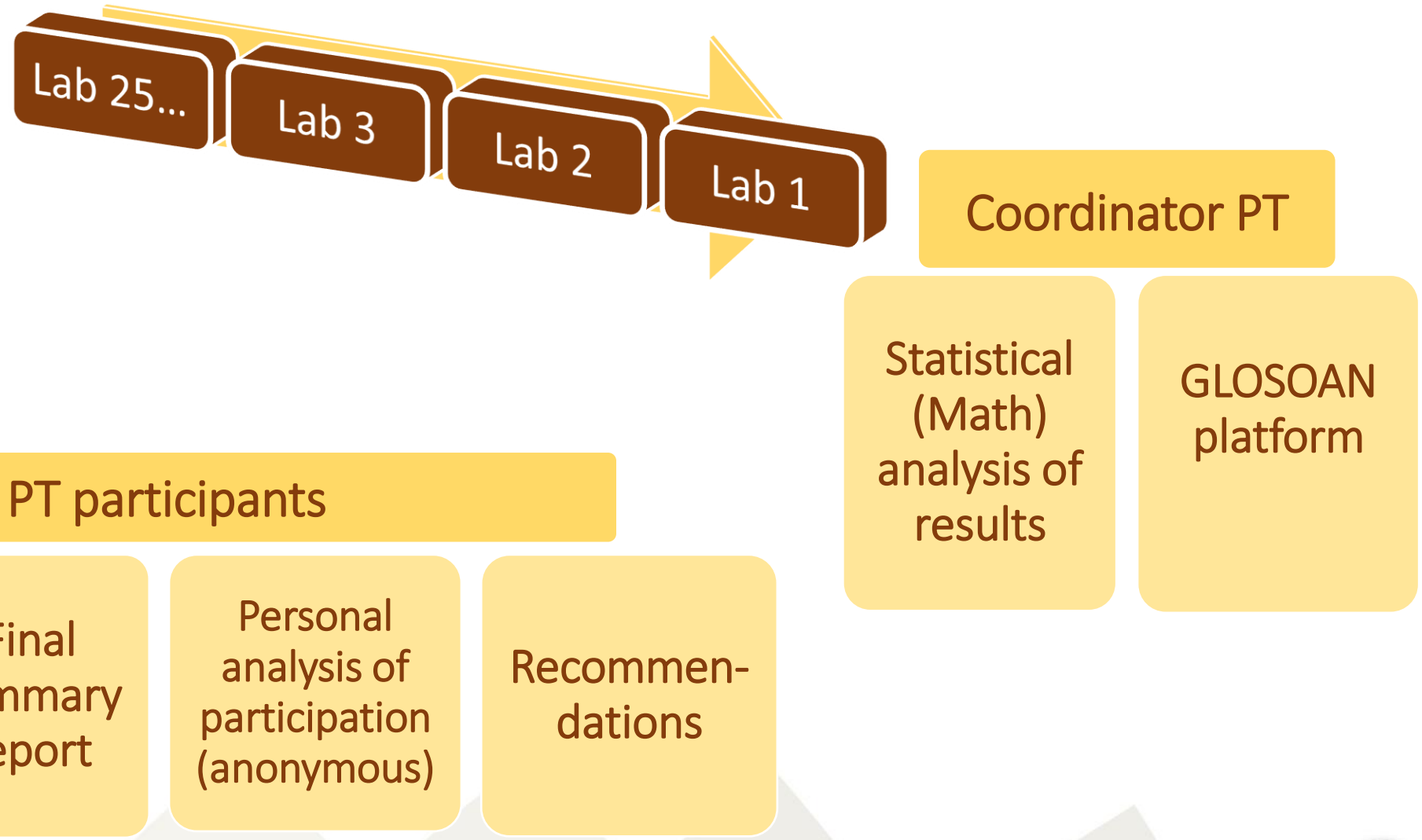
GLOSOAN  
platform



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# After PT



# Conclusion

PT is the driving force behind the quality control of analyses.

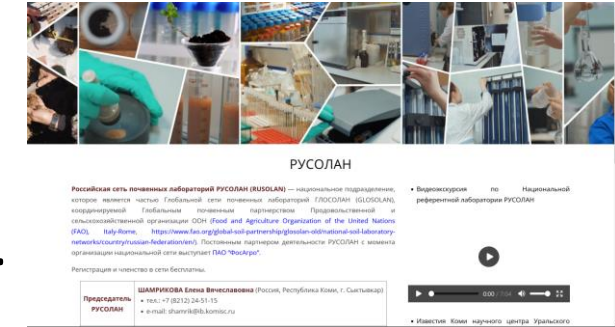
Both coordinators and participants are building capacity:

- quality control,
- development of new methods,
- harmonization of data,
- expansion of connections between laboratories.

At the same time, PT requires significant efforts and resources.

It is necessary to continue educational activities about PT.

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GLOBAL SOIL LABORATORY NETWORK

Thank you for attention!

