



First Indonesian Proficiency Testing Scheme using Reference Values for Cd, Cu and Fe in Drinking Water

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Background

- Proficiency Testing (PT) evaluation based on consensus value is commonly used because considered cheaper and thus easily approachable, and also gives a better confidence to the PT participants.
- The consensus value has a weakness in that it could be significantly different from the true value due largely inexperienced laboratories.
- Starting from 2013, the RCChem-LIPI tried to conduct a PT scheme using reference values for Cd, Cu and Fe in drinking water samples.
- This is the first Indonesia PT that using reference value.

Methods

1. Preparation of PT Sample

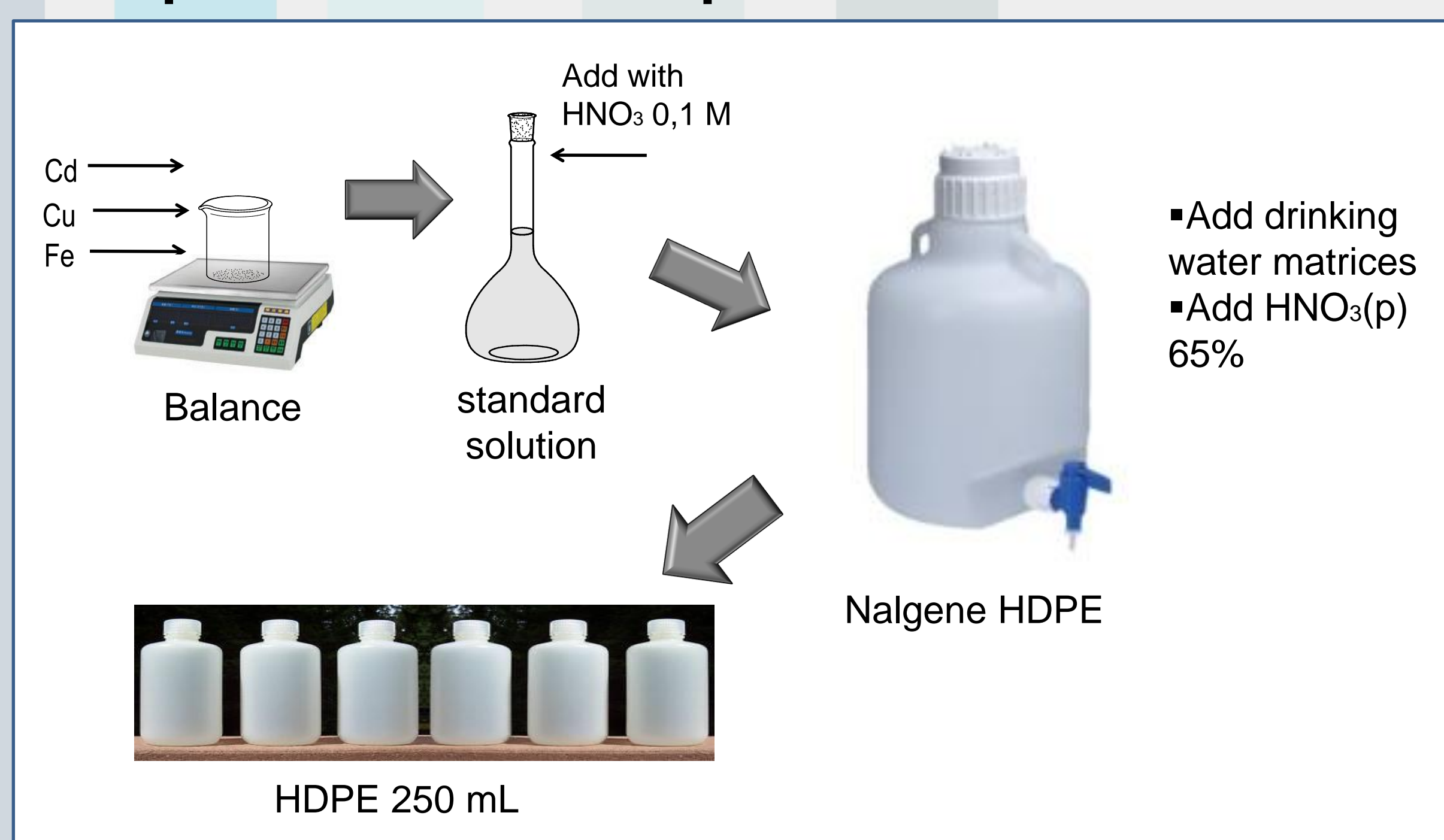


Figure 1. Preparation of PT Sample

2. Determination of Assigned Value

□ Homogeneity Study

- Random stratified 10 bottles
- Data evaluation based on ISO 13528

□ Characterization

Independent methods using GFAAS and ICP-OES

□ Stability Study

- Short term stability at 40°C for 2 month
- Long term stability at room temperature for 1 year

3. Evaluation of Participant Performance

- Data evaluation was calculated using PROLAB Plus, the software analytical quality assurance for interlaboratory studies.
- The method was based on the ISO 13528 with Z-score statistical techniques.

$$z\text{-score } (z) = \frac{X_i - X}{s}$$

- |Z-Score| ≤ 2,0 "satisfactory"
- 2,0 < |Z-Score| < 3,0 "questionable" (\$)
- |Z-Score| ≥ 3,0 "unsatisfactory" (\$\$)

Result & Discussion

1. Preparation of PT Sample

Since matrix of drinking water maybe contain some analyts of interest, the preparation of sample was not accuratly weighing.

2. Determination of Assigned Value

□ Homogeneity Study

Sample was found homogenous for Cd, Cu and Fe.

□ Characterization

The values obtain by GFAAS and ICP-OES were found comparable. The differencies were included in the uncertainty value.

□ Stability Study

- Short term stability was found stable for 2 month in 40°C.
- Long term stability was found stable at room temperature for 1 year, all the instability were included in the uncertainty value.

3. Evaluation of Participant Performance

Sixty two laboratories from the whole Indonesian region participated, and about 94 % and 71 % showed good performance for Cu and Fe, respectively, since have high concentration and the results in accordance between consensus and reference values, as shown in Table 1.

Table 1. Comparison Between Assign Value and Consensus Value

| Parameter | Assign Value | Consensus Value |
|-----------|------------------------|------------------------|
| Cd | 1.97 µgL ⁻¹ | 3.57 µgL ⁻¹ |
| Cu | 293 µgL ⁻¹ | 295 µgL ⁻¹ |
| Fe | 77.9 µgL ⁻¹ | 88.6 µgL ⁻¹ |

- The consensus value of participants for Cd is totally different from reference value. The reference value of Cd was confirmed using 2 independent results of ICPMS, which found to be comparable.
- Most of participants used FAAS (38 %) to measure Cd, while only 31 % and 21 % used GFAAS and ICP-OES, respectively. Only 2 laboratory used ICPMS for the measurement. This is the reason that most of participants can not measure Cd at low concentration and get higher concentration result than it should be. It was found only 50 % laboratories get satisfactory results.

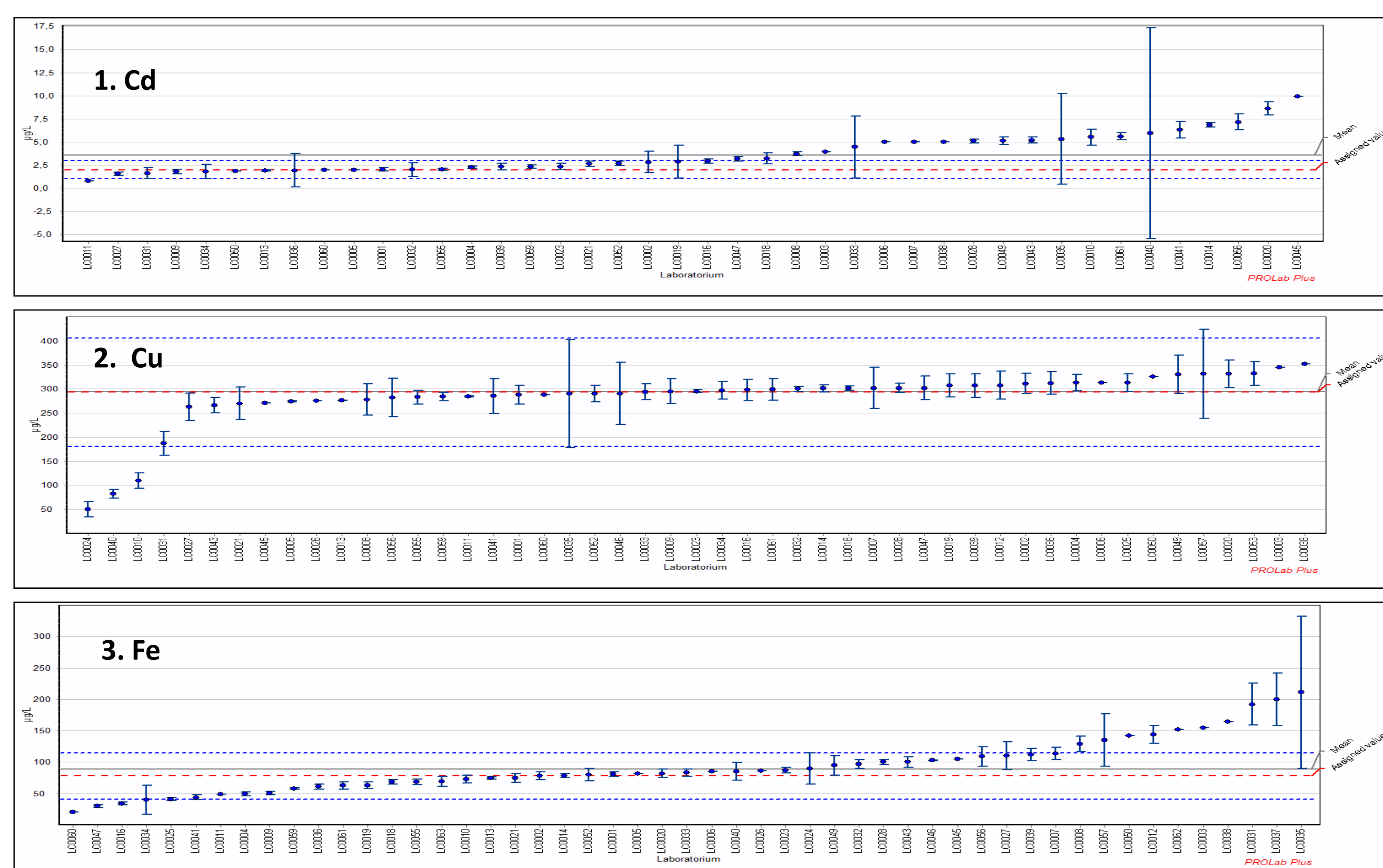


Figure 2. Result of participant in drinking water for Cd (1), Cu (2), and Fe (3)

Conclusion

- Proficiency testing scheme using reference values for Cd, Cu and Fe in drinking water was succesfully provided in 2013
- Sixty two laboratories from the whole Indonesia region participated and 50 %, 94 % and 71 % get satisfactory results for Cd, Cu and Fe respectively.
- The reference values was produced by Metrology in Chemistry Laboratory of RCChem-LIPI using GFAAS and ICPOES

Acknowledgment

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