Analytical quality program of soil fertility laboratories that adopt Embrapa methods in Brazil – 2016/2017 results

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Accuracy and precision of soil fertility results is constantly questioned by customers. To promote its credibility, laboratories generally participated of external performance testing programs. The analytical quality program of soil fertility laboratories that adopt the Embrapa methods (PAQLF) is a voluntary sample-exchange program established since 1992. PAQLF is managed by Embrapa Solos and evaluate P and K extracted by Mehlich1 solution; Al, Ca, and Mg by KCl 1 mol L^{-1} solution; H + Al by Ca Acetate 0.5 mol L^{-1} ; soil pH in water; and organic C by wet combustion. Accuracy is based on a confidence interval: average ± a.SD; where, SD = standard deviation; a = 1, when CV> 50%; a = 1.5, when 20%> CV <50%; and a = 2.0, when CV <20% (CV means coefficient of variation). Precision is determined by the average CV of the analytical results of two samples sent in triplicate. Inaccuracy and imprecision composes an Index of Excellency rank: A for IE> 91; B for 71> IE <91; and C for IE <71. Only A and B laboratories are considered approved by PAQLF. In the 2016/2017 program, 122 laboratories from all Brazilian states had participated. The Midwest region contained the largest number of participants (37%). Southeast, Northeast, North and South regions comprises, respectively, 25%, 17%, 11% and 9% of the laboratories. Only 66% of the 122 laboratories reached the A and B ranks of IE classification. However, Midwest laboratories were by far the ones that presented the best performance, with 87 percent being approved. Northeast laboratories showed the worst results with 38% approval. These findings highlighted the different laboratories profiles of each region. The laboratories of the Midwest are in its most private and possess the greater analytical capacity, some of them exceeding 100,000 yearly analyses. The permanence in the market of soil analysis is clearly dependent on its ability to demonstrate its analytical quality to the customers. And this occurs through its results in quality programs like PAQLF. On the other hand, laboratories in the Northeast region are mostly public and, therefore, dependent on government resources. In this way, due to the weakness of the Brazilian economy in recent years, it's easy to understand why they have the lowest performance. Considering the last seven years, although the number of participants has been growing annually (34%), there is no evidence of lowering of the percentage of approved laboratories.

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