Monitoring Soil Characteristics in Organic Farming: A Comparison of Field vs. Laboratory Methods

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Abstract

Soil quality plays a key role in organic farming. In practice its evaluation is not so simple because there are many indicators that could be used. In our research we used simple field methods (soil quality test kit) and compared the data with traditional evaluation used in the laboratory.

Introduction

Soil quality plays a key role in organic farming; often the term “soil health” is used instead. Soil health is the base presumption for growth and development of healthy plants, animals and man. In practice the evaluation of soil quality is not so simple because there are many indicators that could be used. This is why we attempted to track selected characteristics of the soil (physical, chemical and biological) and the overall state of the soil by using simple field methods, according to Doran, with the use of a soil quality test kit. We then made a comparison of these methods with traditional ones used in laboratories. The results could suggest some recommendations for practical monitoring of the evolution of soil properties during the transfer process to organic farming.

Materials and methods

Soil samples were taken during each spring (March, April, May) and autumn (September, October, November) of 2004-2005 on two farms, located near Dobruška, the Czech Republic; both of which are enrolled in the organic farming system. A large number of properties were tested on parcels with potatoes, spelt, as well as on pastures (one of which was newly planted). These properties included physical (infiltration), chemical (pH, CEC, mineral nitrogen content) and biological (soil respiration) components. These measurements were subsequently supplemented by properties measured in the laboratory, these were: porosity, volume weight, pH, CEC, mineral nitrogen content and soil respiration. The results were evaluated by means of comparative analysis wherever possible (pH, CEC, mineral nitrogen content).

Results and conclusion

Comparisons of the studied values show that the use of a soil quality test kit for approximate monitoring of field state in a selected locality is possible. Results of individual types of analyses differ depending on local conditions. This fact could be demonstrated with two examples: conductivities are similar regardless of the field or

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lab results (Fig. 1), the trends of soil respiration are always the same (Fig. 2), but the resulting respiration is different. This is due to the measurement in the field, which consists of following the actual CO_2 production by both soil and roots with soil organisms – thus the results are greater than with sifted lab samples. Fig. 3 shows correlation between field and laboratory measurements of the CO_2 production. Similar correlation gives conductivity evaluation. If the soil is frequently sampled throughout the year it is possible to compile an image of the soil in a selected locality for an entire season, depending on farming activities, on weather, on pasture, etc. This can be very useful for the organic farmer in planning his activities better. This assessment method could be used in high school or university education as well. This method offers new possibilities for monitoring soil. An assortment of new applications will be tested, and a methodology for organic farming consultants will be prepared.

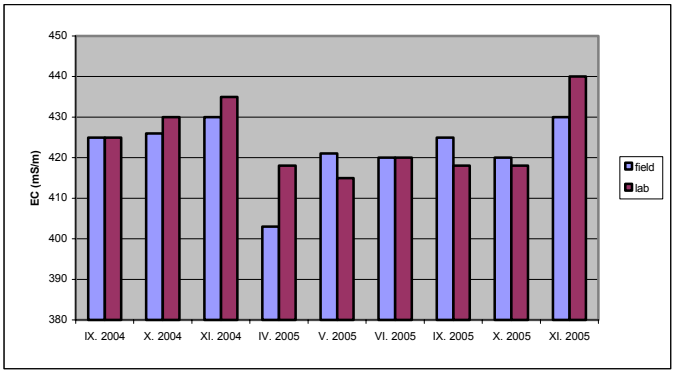

Figure 1: Conductivity (measured in the field and lab conditions)

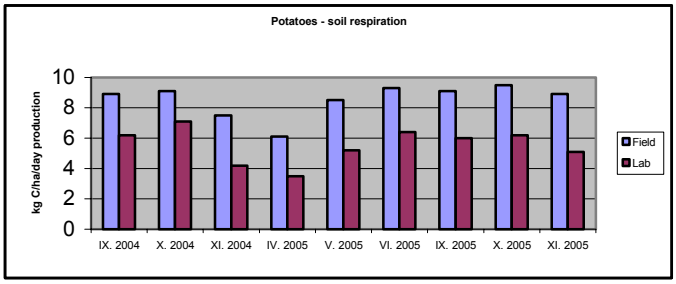

Figure 2: Soil respiration (measured in the field and lab conditions)

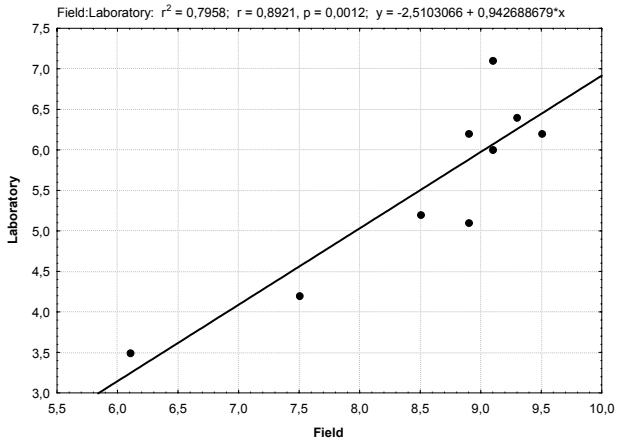

Figure 3: Correlation between field and laboratory measurements of the CO_2 production

Acknowledgments

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