Rapid Soil Analytical Techniques for International Agricultural Research and Development

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Soil analysis is used to assess natural resources and inform management to improve long-term farming profitability. Conventional techniques typically use different methods, equipment, reagents and skills to measure each soil property of interest. The consequence is that a conventional soil laboratory is expensive to set up, maintain and run. These issues result in many countries (and organisations) having to do without a well-functioning conventional soil laboratory. Developments in spectroscopic and potentiometric methods of soil analysis means that these countries need not go without reliable soil analysis. An investment of under Au$ 60 K in a mid-infrared spectrometer (MIR) and ion selective electrodes (ISE) allows many soil attributes that are expensive to measure, such as organic carbon, particle size, CEC, total N, pH, extractable K and N, to be measured rapidly and cost-effectively. A one-off budget is required to analyse a selection of soil samples conventionally to calibrate the MIR. The conventional analysis can be done at an external or overseas commercial laboratory when the facilities are not available in-house. The operating costs of these instruments are minimal. These instruments each occupy the space of an A4 sheet and do not require the infrastructure of a laboratory to run. They require minimal soil preparation and use of often hard to source and hazardous reagents. Working in The Philippines, Myanmar and Cambodia, we found that one week hands-on training followed by one week on the job training are enough to run the MIR and ISE facility well. These facilities were used to map soil types and soil attributes, determine land suitability for different crops and cropping systems, soil constraints for management attention as well as baseline soil fertility levels. Field-deployable pocket ISEs are being tested to inform fertiliser and lime management without the delay often encountered by sending samples to a remote laboratory. A weakness of these rapid methods is inability to measure available soil phosphorus. This weakness is being addressed internationally by active research and development.