NIR-TECHNOLOGY FOR RATIONALE SOIL ANALYSIS WITH IMPLICATIONS FOR PRECISION AGRICULTURE

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The scope of precision agriculture is to reach the put up cultivation goals by adjusting inputs as precise as possible after what is required by the soil and crop potentials, on a high spatial resolution. Consequently, precision agriculture is also often called site specific agriculture. Regulation of field inputs "on the run" has been made possible by the GPS (Geographical Position System)-technology, which gives the farmer his exact real time positioning in the field. The general goal with precision agriculture is to apply inputs where they best fill their purpose. Thus, resources could be saved, and nutrient losses as well as the impact on the environment could be minimised without lowering total yields or putting product quality at risk. As already indicated the technology exists to regulate the input based on beforehand decisions. However, the real challenge is to provide a reliable basis for decision-making. To support high spatial resolution, extensive sampling and analysis is required for many soil and plant characteristics. The potential of the NIR-technology to provide rapid, low cost analyses with a minimum of sample preparation for a multitude of characteristics therefore constitutes a far to irresistible opportunity to be unscrutinised. In our work we have concentrated on soil-analysis. The instrument we have used is a Bran Lubbe InfraAlyzer 500 (1300-2500 nm). Clay- and organic matter-contents are soil constituents with major implications for most properties and processes in the soil system. For these constituents we had a 3000-sample material provided. High performance models for the agricultural areas in Sweden have been constructed for clay-content, but a rather large reference material is required, probably due to the large variability of Swedish soils. By subdividing Sweden into six areas the total performance was improved. Unfortunately organic matter was not as easy to get at. Reliable models for larger areas could not be constructed. However, through keeping the mineral fraction of the soil at minimal variation good performance could be achieved locally. The influence of a highly variable mineral fraction is probably one of the reasons for the contradictory results found in the literature regarding organic matter content. Tentative studies have also been performed to elucidate the potential performance in contexts with direct operational implications: lime requirement and prediction of plant uptake of soil nitrogen. In both cases there is no definite reference method, but there are numerous indirect, or indicator, methods suggested. In our study, field experiments where used as references and NIR was compared with methods normally used in Sweden. The NIR-models performed equally or slightly better as the standard methods in both situations. However, whether this is good enough is open for evaluation.