New Project

CP 93

HDC Studentship: Field Vegetables - On-line measurement of selected soil properties towards the refinement of fertilisation management

Project Number:	CP 93
Project Title:	Field Vegetables: On-line measurement of selected soil properties towards the refinement of fertilisation management - HDC Studentship
Project Leader:	Dr. Abdul M. Mouazen
Student:	Virginia Jimenez-Donaire
Contractor:	Cranfield University
Industry Representative:	Emma Garrod, Produce World Ltd
Start Date:	1st November 2012
End Date:	31st October 2015
Project Cost:	£ 67,650

Project Summary:

Conventional fertiliser recommendations are based on soil sampling and laboratory analysis of soil properties. This procedure is expensive, time consuming and based only on few scattered readings, ignoring within field variability of soil properties. There is a need for fast, cost effective methods of describing within field soil variability. This can be achieved with on-line soil sensors. Visible (vis) and near infrared (NIR) spectroscopy is being increasingly considered as a possible alternative to complement or replace conventional laboratory methods of soil analysis. This project will implement vis-NIR spectroscopy for on-line measurement of selected soil properties in farms producing vegetables, aiming at improving fertiliser recommendations by relaying a much larger number of soil measurements than traditional laboratory methods. Such measurements will then be used to apply fertiliser or management practices on a variable rate basis leading to cost savings and reduced environmental impacts (soil and ground water contamination through nutrient loss and leaching).

Aims & Objectives:

(i) Project aim(s):

The project aims to deploy a previously developed on-line sensor for the measurement of key soil properties in field vegetable crop production, to be used as input data to refine fertilisation recommendations.
(ii) Project objective(s):

1- To develop new calibration models and upgrade previously developed calibration models of vis-NIR spectroscopy that enable measurement of soil organic carbon, total nitrogen, moisture content, pH, Mg, clay content and phosphorous valid for different soil types under vegetable crop production systems.

2- To delineate fertilisation management zones and implement map-based site specific fertilisation based on on-line field measurement of soil properties using the on-line vis-NIR sensor system and advanced geo-statistical tools.

3- To evaluate the economic benefits of adopting the site specific fertilisation based on on-line sensing of soil properties.
4- To communicate project findings regarding site specific fertilisation with field vegetable crop growers through Produce World (representing the complete range of vegetable soil types) and fully utilise HDC communication channels, including the studentship conference and at least one Open Day / Demonstration event.

Benefits to industry

The expected impact of this proposal is a substantial improvement in the analysis of soil properties by sensing, their validation and related data processing, compared to current standard methods, which are time consuming and expensive (up to £8/ha). The studentship will develop and validate these tools for a range of vegetable soils to tailor their application to field vegetable crop production. This will enable improved timing, cost and precision of soil measurement. We expect an increased acquisition rate of the relevant soil properties (~1500 point per ha) and significant progress in data quality that will enable improvements in soil management practices for vegetable crop production in the UK.

It is hoped that the proposed research studentship will lead to increase profitability to growers working in the vegetable crop production sector by facilitating variable rate inputs, reducing input costs and potentially increasing yield. For example a nitrogen responsive crop like maincrop cauliflower can cost £370 per ha in fertiliser; Emma Garrod pers comm). For AHDB this also has the potential to benefit other field crops grown in soil, such as potatoes. Assuming a successful outcome the implementation of this approach will require further development towards commercialisation of the sensor and associated processing, but it is estimated that the cost of on-line soil testing will be lower than current practice due to integration with existing farm machinery passes (tractor mounted). This will also deliver and significant labour and time saving (sample processing). Soil analyses currently take up to 7 days, whereas this system will generate immediate results. The system should also deliver cost savings by potentially reducing the amount of fertiliser applied. Specific figures (cost _ benefit analysis) will be generated during the project.

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