Agricultural Competitiveness White Paper Submission - IP561
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Agricultural Competitiveness

Dr. Chris Waring is a Principal Research Scientist working at the Australian Nuclear Science and Technology Organisation. The provision of new key technologies, capable of producing a step change improvement in agricultural productivity is an important role for ANSTO.

Bringing a major new technology to fruition requires significant support to transfer the technology out of the lab and into a useful product or service. ANSTO is in the technology transfer "valley of death" between R&D or proof-of-concept outcomes and a product ready to commercialise. The Governments intended $100m additional funding to Rural Research and Development Corporations is welcome. However, the maximum GRDC grant is limited to $150k. GRDC Innovation grants are designed for proof-of-concept projects, not step change technologies that will have significant impact with Australian farmers.

How does a FNAA Soil Scanner bridge the soil data gap?

There is a confusing array of Precision Agriculture equipment suppliers and software solutions available to grain farmers with uncertain claims of benefit from individual suppliers. A seamless solution to data collection, information processing and actionable economic farm management decisions remains elusive. One significant data gap limiting Precision Agriculture is the scale mismatch between low spatial resolution soil data and the consequent optimised fertiliser additions needed at high spatial resolution.

Existing remote sensing (eg hyperspectral) and proximal soil sensing (eg EM 38, Radiometric,) technologies can provide some indication of the soil variance but do not provide a quantitative measure of soil type, soil C, soil moisture or bulk density. In effect these techniques are used to guide soil sampling allowing better data extrapolation away from known accurate soil samples.

Currently the cost of filling the soil data gap with existing technologies, at high spatial resolution remains too high. For existing technologies, scope for significant cost reductions is unlikely due to the high proportion of manual intervention and interpretation involved.

What is the new technology?

A new proximal soil sensing technology (Fast Neutron Activation Analysis) for accurate field measurement, to 50cms depth of soil composition Si Al, soil C, soil moisture H, O and bulk density has been proven by operation of a proof-of-concept instrument (eg. Wielopolski 2011). http://www.intechopen.com/books/planet-earth-2011-global-warming-challenges-and-opportunities-for-policy-and-practice

ANSTO has developed an updated Soil Scanner hardware configuration that can measure ~100x faster than the Brookhaven National Laboratory USA instrument. 100x faster translates to approximately 100x lower cost per analysis than standard soil sampling and lab analysis (Waring et al. 2013). Accurately mapping soil compositional variance at high spatial resolution and low cost is feasible to satisfy the Precision Agriculture soil data gap.

Raw soil compositional data is not directly useful to farmers. ANSTO will collaborate with Universities to develop the interpretative concepts and software system requirements necessary to fully implement Precision Agriculture and deliver useful tools for step change increases in farm productivity.

Accurate low cost measurement of soil C is essential if farmers are going to benefit from generation of soil C credits alongside gains in productivity and better environmental outcomes.