

ConstraintID – Updates to enhance useability, accuracy and accessibility in the assessment of sub-soil constraints

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Key words

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Take home messages

- ConstraintID is a web-based tool that enables growers to use remotely sensed data to analyse past crop yields and present maps of subsoil constraints for comparison and amelioration. The data on these driving factors helps the user to interpret the variation shown by the remote-sensing data.
- Integrating this tool into FarmLab allows users to use their existing spatial data in the software to analyse and predict subsoil constraints, create management zones and variable rate application maps
- By integrating directly with soil testing labs, FarmLab allows soil test results to be analysed by the ConstraintID tool, further enhancing useability and helping users to target problem zones across their land.

Introduction

The ConstraintID tool, developed with funding from GRDC (GRDC Code UOQ1803-003RTX), has found a wide range of applications since its release in 2021. It offers growers an assessment of soil constraints across their paddocks using remotely sensed data and on-ground soil samples.

ConstraintID has been integrated with FarmLab to provide a more streamlined user experience and enhanced analysis capabilities for assessing subsoil constraints. This integration offers several benefits:

- Better access to farm and paddock boundaries
- Direct integration with soil testing labs for seamless data ingestion
- Ability to analyze constraints alongside other soil performance drivers, such as fertility, carbon, and water holding capacity

Current format

In its current format, users define their paddock boundaries on Google Maps, triggering background spatial analysis on the server. The software processes a time-series of Enhanced Vegetation Index (EVI) satellite images, filtering out irrelevant data and stitching adjoining images when necessary. The result is a Crop Yield Index (CYI) representing vegetation levels across the paddock for each year.

In subsequent steps, users choose soil constraints for analysis and upload relevant test data. The software guides users in identifying data columns for each constraint. Paddock images displaying CYI for each year are presented, marked by the software to indicate typical cropping years. Users validate these markings, calibrating the analysis. The final step compiles selected cropping years into a paddock map of CYI values. A second image highlights consistently high (blue) and low (red) CYI regions, overlaying soil

test readings for further analysis. This comprehensive process enhances decision-making in agriculture by providing insights into soil health and productivity.

Updates and integration with FarmLab Analytics

FarmLab developers integrated ConstraintID into the FarmLab Analytics platform, allowing users to generate custom reports that include ConstraintID analyses. FarmLab Analytics contains a series of 'widgets' that allow users to automatically generate reports using their remotely sensed data, terrain, soil models and soil test results. This was a logical place to host the tool as it gives users options to explore and compare subsoil constraints to other soil datasets at various depths. This integration has led to significant improvements in functionality and allows it to be used at scale across Australian cropping areas. Specific improvements include:

- Users can import their paddocks in KML or SHP file formats, eliminating the need to manually draw boundaries each time they run an analysis using the tool
- By integrating directly with soil testing labs, soil test results collected in FarmLab are automatically incorporated into the analysis
- The tool can be run efficiently on multiple farms simultaneously, reducing the amount of time an agronomist may need to run several reports or scenarios
- Results can be shared alongside other important production data, such as agronomic soil test results, historic NDVI changes, and other farm environmental data.

Future opportunities

FarmLab is exploring the following opportunities for ConstraintID, based on feedback from Beta testers:

- Stratification for soil carbon projects: recent research suggests a high correlation between subsoil constraints and low soil carbon stocks in cropping systems. ConstraintID could be valuable for identifying areas with high constraints and low carbon stocks, aiding in sample planning and carbon stock estimation for carbon offset projects.
- Loans and financial support for subsoil amelioration: an estimated 90% of Australian cropping land exhibits sub-soil constraints, which hamper yield by up to 20%. Across Australia's wheat industries, that's an unrealised production loss of \$1.9 billion per annum.

Summary

ConstraintID is a valuable tool for assessing soil constraints in agricultural paddocks. Its integration with FarmLab has enhanced its functionality and user experience, making it more efficient and accessible. Future opportunities for ConstraintID include its potential application in soil carbon projects and financial support programs for subsoil amelioration.

References

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