

## Airscan™

This is the trade mark name that Ravensdown uses to describe the development of remotely sensed soil fertility. It is envisaged that once the research phase has proven the technology, a commercial service could be offered to allow New Zealand hill country farmers to remotely sense their farms. Airscan provides the same level of detail as you would get if you conducted 10 000 soil tests per hectare.

## Coefficient of variation (CV%)

Is the ratio of the standard deviation over the mean and is used to indicate the evenness of spread. A CV% of zero would mean perfectly even spreading with the applied fertiliser rate matching the target rate perfectly.

## Hyperspectral and multispectral

Hyperspectral and multispectral sensors collect and process information from across the electromagnetic spectrum. Certain objects leave unique 'fingerprints' or spectral signatures in the electromagnetic spectrum and these 'fingerprints' enable identification of the materials that make up a scanned object. These spectral sensors see light (part of the electromagnetic spectrum) in many more bands beyond the visible light than the human eye sees.

Multispectral imaging deals with imaging these spectral bands at discrete and somewhat narrow bands.

Hyperspectral deals with imaging spectral bands over a continuous range. Hyperspectral sensors have been used for applications in astronomy, agriculture, biomedical imaging, geosciences, physics, and surveillance. Ravensdown's Pioneering to Precision PGP is using a hyperspectral Fenix sensor to determine if it is possible to remote sense soil fertility. This sensor which is flown in a survey fixed

wing aircraft is able to measure a vast amount of the electromagnetic spectrum and is the main distinguishing feature from cameras/sensors that are used in UAV's or drones.

## Intellispread™

The means by which a prescription map is loaded into the aircraft GPS which then communicates with a computer which controls the opening and closing of hopper doors. The doors are automatically operated with the added benefit of not distracting the pilot to apply a variable rate of application so it only gets applied where it is needed and at the rate required.

Intellispread can exclude non-effective areas across a farm thereby improving the efficiency of fertiliser and/or exclude buffer zones which minimises the risk of fertiliser being applied to at risk areas such as waterways. Another important feature of Intellispread is that within a block the hopper doors will automatically adjust depending on the planes ground speed (such as experienced when a top dressing plane climbs) to maintain the application rate as close to the target rate.

## PGP - Primary Growth Partnership

PGPs are a shared investment between the NZ government and industry to make step wise advances in the primary industries. In this case Ravensdown's PGP project is referred to as "Pioneering to Precision" and is aimed at transforming topdressing by focussing on remote sensing soil fertility. The aim being to develop more targeted variable rate fertiliser applications to hill country to reduce waste for farmers and preserve the environment. In a supporting project which is fully funded by Ravensdown new aircraft application technology has been introduced to support the improvement of fertiliser application to hill country.



## Prescription map

This is a map which is loaded into a plane's GPS unit which describes the fertiliser application spatially. It includes boundaries of farms, blocks and paddocks within the farm which may contain different fertiliser rates and highlights ineffective areas or buffer zones which are to be excluded from fertiliser application.

## Placement verification

A visual record of where the fertiliser has been applied on a farm map. The IntelliSpread system in fertiliser application trials has been shown to reduce the coefficient of variation (CV) from 78% without the system to 42%, which is closer aligned with CV values found in ground spreading.

## Placement Verification Technology (PVT)

Currently the maps produced from aerial application show where fertiliser is released from the aircraft. This is a very good starting point for providing on-farm traceability and records. In the future, as the supporting science develops it is envisaged these maps will take into account wind conditions and product ballistics to more accurately map where the fertiliser lands.

## Variable Rate application

This describes the process of applying fertiliser to effective areas of pasture and at different rates to different blocks. The aim is to optimise the pasture production based on potential of the different blocks to grow more, while accounting for farm economics i.e. will fertiliser applications be profitable. Recent analysis of four farm scenarios has shown a compelling value proposition of an average \$43/ha gain in favour of variable rate applications compared to a blanket fertiliser application, with a range of \$21 to \$79/ha.

