Smart-N™ WeedSeeker® technology

Within intensive pasture based dairy systems the application of fertiliser nitrogen (N) onto urine patches can cause economic loss and negative environmental impacts due to excess N being lost into the environment. Smart-N™ WeedSeeker® technology is a sensor based precision agriculture technology that aims to apply liquid based N fertiliser onto pasture without applying N onto urine patches. The system works by detecting differences in normalised difference vegetation index (NDVI) between high N (urine patches) and low N areas and deactivates corresponding spray nozzles to prevent the application of fertiliser N to these N rich areas.

Plate 1: Smart-N™ WeedSeeker® sensor used in this study.

Smart-N™ WeedSeeker® technology is a new technology and consequently there is little available knowledge about its accuracy and precision. A recent Honours thesis, undertaken by Mr. Rob Snare at the School of Agricultural Science (UTAS) and supported by DairyTas, examined the efficacy of this technology at varying sensitivity settings in detecting a urine area. Five artificial urine N concentration treatments equivalent to 0kg N/ha (control), 150kg N/ha, 300kg N/ha, 450kg N/ha and 600kg N/ha were arranged as a randomised complete block design with 12 blocks within a temperate pasture at Cambridge, Tasmania. Plots were non-destructively sampled 2, 3, 5, 7, 9, 12, 15, 19, 24, 30 and 44 days after application (DAA)

of the urine treatments. Measurements of the accuracy and precision of the Smart-N™ WeedSeeker® technology under the sensitivity of 2,6,8,9 and 10 where the 2 represents a lower NDVI threshold and 10 a higher NDVI threshold were undertaken. This thesis concluded that the Smart-N™ is capable of detecting differences in the NDVI between high N and low N areas. According to research up to 23% of a pasture may be affected by urine patches. Therefore, if the Smart-N™ system operated perfectly and avoided the application of N to all urine patches, N use could be reduced by as much as 23%. However, further development of the system is required to reduce the discrepancy between actual reduction in N use and the theoretical maximum of 23% reduction in N use. The major limitation with the Smart-N™ system in this study was the inaccuracy and unevenness of calibration. Improvements in the calibration methodology are needed to ensure all sensors activate in the same manner and that calibration occurs at the appropriate level of NDVI. Accurate calibration will allow for more accurate research and help provide an indication as to the potential reductions in N use that may be achieved by using this technology.