Plain English Summary

Project Title:	Case studies to review methods for defining within-paddock management zones - Kwinana West zone
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Objectives	This project aims to evaluate if there is any difference in deriving management zones from soil or production spatial information and in what situations each of these layers may be useful to help maximise grower investment in PA technologies.
Background	Rising costs and declining terms of trade are driving growers to invest in Precision Agriculture technology for zonal management such as variable rate fertiliser or lime. There is a wide range of spatial information that can be collected from production based information (i.e. yield maps, satellite and farmer knowledge) that measure plant performance as a result of interaction with soil type, season and agronomy; to electromagnetics and gamma radiometric surveys that can be used to map soil type zones and associated soil constraints such as subsoil acidity or salinity. The cost of spatial information layers can vary greatly from $14-25/ha for electromagnetic (EM) and gamma radiometric mapping, to less than a $1/ha for NDVI imagery and yield maps. This wide range of costs causes much uncertainty from growers and consultants about where to being investing in spatial information for zone management.
Research	Three case study farms were selected at Wickepin, Popanyinning and Corrigin. Each grower selected two focus paddocks that had soil types typical of their farm and the area. Data layers collected included yield, NDVI imagery (historical analysis), electromagnetics 0.5m and 1m, gamma radiometrics (Total counts, potassium, thorium, uranium), elevation (from the farm GPS systems), and aerial imagery. The layers were ground-truthed by soil sampling and farmer and agronomist knowledge. Zonal statistics were completed to determine correlations between datasets. Based on data interpretation zone manage applications investigated included variable ripping, lime application, potash and gypsum.
Outcomes	The relationship of the different layers varied across the case studies. The cause of yield variation commonly varied within production zones. EM and gamma can help interpret causes of yield variation. EM strongly correlated with yield in landscapes with highly contrasting soils i.e. sands to clays at Corrigin and Wickepin. Gamma helps delineate different soil types in combination with EM. These layers were used to determine variable ripping zones, potassium and gypsum. No layers were very useful on their own. Topsoil pH did not correlate with any data layer therefore grid sampling is recommended to accurately map pH.
Implications	Yield, NDVI or an aerial photograph is a good starting point to assess variation and identify soil sampling points (more than 5 may be needed). However, the cause of yield variation can vary within production zones so zones may differ depending on management input targeted. Other layers of spatial information such as EM and gamma can help to further refine zones. Ground truthing is essential including grower knowledge.
Publications	Isbister B, Neale T (2016) Implementing zone management in the Kwinana West Zone (to be published).