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Using maps to show how rice yield and yield response to fertilizer varies at provincial-scale

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While agronomy tends to offer advice that is generally true, what farmers need is site-specific advice. Our objective was to represent variations in expected benefits from fertiliser use within an area using maps that integrate data from research trials on farmers' fields with researchers' knowledge and experience about the area to which it is applied. Using farmers and researchers' knowledge helps to capture some of the variation in expected response. The longer term objective was to develop a comprehensive model to enable optimisation of crop and soil management inputs in diverse rainfed rice (*Oryza sativa*) cropping environments of Cambodia. As the soils are very infertile, particular emphasis was given to nutrient and fertiliser management. We compiled a data set for Takeo province, Cambodia, covering an area of 3490 km^2 comprising 2336 trial sites: records were derived from databases of four agencies that conduct on-farm field trials. Regression tree analysis of this data set identified in order of decreasing importance the following factors which explained most of the variation in yield from field experiments: season, location, N fertiliser, soil type. The same data set was used to generate provincial scale maps indicating areas in which response to fertiliser is more or less likely and those areas about which there is little information. Maps of predicted yield were also generated for Takeo province using Expector software to combine using Baysian statistics evidence from the provincial soil map, a flood risk map and a N fertiliser response map based on the field trial data set. The two sets of maps were in broad agreement, suggesting that provincial-scale maps of yield and yield response could be generated using the Expector approach even when there is a low density of field trial data. Discrepancies between the two data sets were only significant where the maximum spread of data points exceeded the above guidelines. However, discrepancies between the two sets of maps also identified areas in eastern Takeo province where increased N fertiliser rates appeared to exacerbate stem borer damage to crops. At the provincial scale, the maps identified areas that can be used to target extension effort to where it is likely to be most effective. This could enhance the strategic planning capability for delivery of extension services and fertiliser inputs. At local level, the map will benefit rainfed rice farmers through their advisers by better definition of the expected performance of fertiliser practices. In return, advisers will have a formalised understanding of the observed localised constraints to the benefits from fertiliser.

Keywords: Bayesian statistics, Cambodia, rice, yield, map, geographic information systems