Monitoring & modelling soil change in a semi-arid landscape with distinctly contrasting landuses

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Australia has a diverse range of landscapes, but the majority (70%) of Australia is comprised of arid or semi-arid regions. While these regions typically receive very low levels of precipitation, some areas have an abundance of groundwater or river water available for irrigated agriculture, which can result in some very contrasting landuses. One such region is the Hillston-district of south-western NSW, which was previously used for extensive rangeland grazing and dryland cropping, but since the 1990's irrigated cotton has become the primary agricultural industry. The intense nature of irrigated cotton production (large fertiliser/water inputs, constant cultivation) poses some challenges in maintaining soil condition in this semi-arid area. In 2002, an extensive baseline soil survey was conducted in Hillston, with a suite of soil properties analysed to assess the preliminary impacts of irrigated cotton production on the soil. The same area was resampled in 2015, with many of the original sites revisited. This study focuses on soil properties at 6 depth increments to 1.5 m, while most monitoring studies solely focus on topsoil. The method used to model the change in soil properties is a bivariate linear mixed model with a range of predictor variables (γ-radiometrics, landuse, terrain attributes). The bivariate linear mixed model takes advantage of co-located sites and optimises the prediction. The past and current status of soil pH, electrical conductivity, and soil carbon under different landuses is shown, along with the direction of changes over the 13-year period. Results show no major changes in soil carbon, significant topsoil and subsoil acidification trends in the region (acidifying from alkaline towards neutral), and desalination trends throughout the soil profile on irrigated farms. Despite the study showing changes in soil attributes over the last decade, it is clear that soil change driven by these irrigated industries is not always necessarily negative.