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8. Other
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OPTIMIZING NUTRIENT USE IN AN INTEGRATED SYSTEM WITH PRECISION AGRICULTURE TOOLS

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Integrated crop-livestock-forest systems (ICLFs) are a sustainable strategy for land use intensification, integrating annual crops, trees, and livestock in the same area and season. Climate, soil, crop, and animal interactions in ICLFs are complex and synergistic or competitive, depending on the arrangements over time and space. Therefore, digital tools like precision agriculture (PA) can be decisive for collecting, processing, and analyzing temporal and spatial data, combining them with other information to support management decisions and considering the estimated variability. Furthermore, it also contributes to improving the management and use efficiency of resources and inputs, with minimum environmental damage risks. Lime and fertilizer are critical factors for agriculture intensification in the Brazilian tropical acid-low-fertility soils. Knowing the spatial variability of soil properties by technologies such as GPS, sensors, GIS, advanced software, and variable rate technology (VRT) equipment is essential for the rational use of inputs, as in integrated nutrient management (INM). This research aimed to evaluate, monitor, and manage the spatiotemporal variability of soil properties, liming, and fertilizer requirements. A field study was conducted in a 30-ha area in São Carlos, SP, Brazil. An INM strategy has been adopted based on soil tests to determine soil nutrient availability, deficiency, and soil fertility management with VRT. From 2014 until now, yearly soil samples were collected at 0-0.2 m depth, and each sample represented a 0.5-ha paddock. Spatial variability soil properties and site-specific liming and fertilizer needs were modeled by inverse distance weighting technique. Liming and fertilization were carried out yearly based on interpretations and prescription maps. Results showed that generating thematic maps was essential to define the rational use of inputs by the spatial analysis of liming and fertilization requirements. Variable rate lime and phosphate fertilizer application technology leads to soil buildup and greater homogeneity of soil chemical attributes. INM practice can be guided by soil nutrient prescription maps and provide a history of land, issue use, and soil conditions.

Keywords: Soil fertility,Variable rate technology,Lime,Fertilizer,Integrated nutrient management