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HEALTHY GARDENS OR HIDDEN HAZARDS: ANALYZING SOIL HEALTH IN SMALL-SCALE AGRICULTURE

GT 09. SOIL HEALTH / GT 16. CONNECTING PEOPLE AND SOILS

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In the face of the triple crises of climate change, pollution, and biodiversity loss, growing vegetables in small gardens offers a promising solution. Previous studies have shown that small areas often face greater anthropogenic impacts compared to large-scale farmland, which this research aimed to investigate. The study was conducted in northern Serbia, Vojvodina Province, within the southeastern Pannonian Basin. Agriculture dominates, with 80% of 1.6 million hectares used for farming, 91.1% being arable land. Soil samples were systematically collected from 4 × 4 km quadrants (0–30 cm depth), totaling 1,364 samples. The distribution of samples: 1,084 from arable land, 93 from forests, 83 from meadows and pastures, 38 from abandoned land, 35 from gardens, and 31 from orchards and vineyards —reflects the actual proportions of land use in Vojvodina. Analyses included pH, carbonate content, organic matter (Tyurin method), readily available P_2O_5 and K_2O (ammonium lactate extraction), pseudo-total (H2O2 + HNO3 digestion), and available (EDTA extraction) copper.

The soils were mostly slightly alkaline with 5–10% carbonates, reflecting the loess and chernozem dominance of the region. Forest soils had slightly lower pH and carbonates. Organic matter, represented by median values, was influenced by human activity, with arable soils at 3.1 ± 3.2%, far below the region's natural humus-rich potential (>5%) due to intensive farming. Gardens showed slightly higher organic matter (3.2 ± 1.2%) than orchards (2.5 ± 1.2%) but lower than forests (3.7 ± 1.6%).

Readily available K_2O was fairly uniform across land uses, with a median value around 20 mg/100g, except in gardens, where excessive fertilization elevated it to 44.5 ± 36.3 mg/100g. Readily available P_2O_5 exhibited significant variation: it was low in abandoned land, meadows, and forests (5–10 mg/100g), optimal in arable soils and orchards (15–20 mg/100g), and toxic in gardens (116 ± 146 mg/100g). Copper concentration was highest in gardens, with median pseudo-total copper at 34.0 ± 39.6 mg/kg and available copper at 13.8 ± 24.8 mg/kg due to copper-based fungicides. Other land uses had median copper levels below 30 mg/kg (pseudo-total) and 10 mg/kg (available), with orchards and vineyards showing the highest values.

These findings highlight the need for better education among small vegetable producers, as overuse of fertilizers and fungicides—often without soil analysis—threatens soil health. Sustainable practices are crucial to ensure the long-term productivity of small-scale gardens.

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