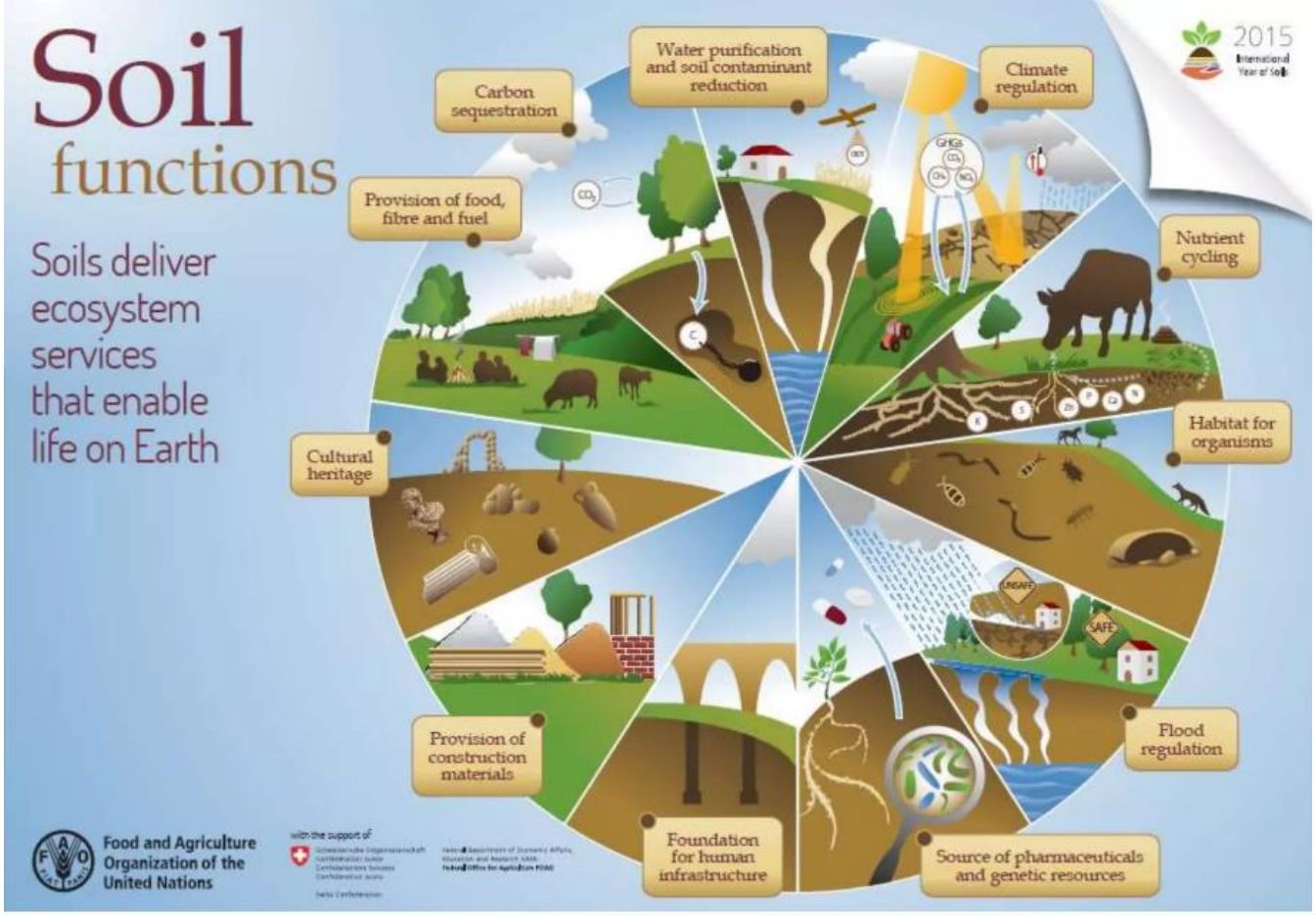
Assessment of management practices to prevent soil degradation threats on Lithuanian acid soils

Mockevičienė Ieva, Feiza Virginijus, Feizienė Dalia, Kadžiulienė Žydrė, Stulpinaitė Urtė, Antanaitis Šarūnas

Lithuanian Research Centre for Agriculture and Forestry


Soil
functions
Soils deliver ecosystem services that enable life on Earth
2015
International Year of Soils
Water purification and soil contaminant reduction
Climate regulation
Carbon sequestration
Provision of food, fibre and fuel
Nutrient cycling
Habitat for organisms
Cultural heritage
Provision of construction materials
Flood regulation
Foundation for human infrastructure
Source of pharmaceuticals and genetic resources
UNSAFE
SAFE
Food and Agriculture Organization of the United Nations
with the support of


Soil is a strategic resource to ensure food security
Where food begins
95%
of our food comes from soils


our Soils under threat
2015 International Year of Soils
fao.org/soils-2015
#IYS2015
Deforestation
Population growth
Urban expansion
Pollution and waste disposal
Climate change
Unsustainable soil management practices
Drivers of soil degradation
Biodiversity loss
Salinization and sodification
Nutrient imbalance
Compaction
Sealing
Pollution
Acidification
Erosion
Loss of organic carbon
Types of soil degradation
Water scarcity
Food and nutrition insecurity
Rapid climate change
Poverty and social insecurity
Migration
Reduction of ecosystem services
Consequences of soil degradation
Solution: sustainable soil management
Inclusive soil governance
Increase investment in sustainable soil management
Advocacy/ awareness raising
Establish soil information systems
Develop capacities and strengthen extension on soils
Stop soil degradation
Restore/ rehabilitate degraded soils
Implement land use planning
Analyse/ assess soil condition
Increase soil organic matter content
Keep soil surface covered
Use nutrients wisely
Minimum tillage
Crop rotation
Reduce erosion
Appropriate waste disposal
Waste water treatment
Food and Agriculture Organization of the United Nations
with the support of

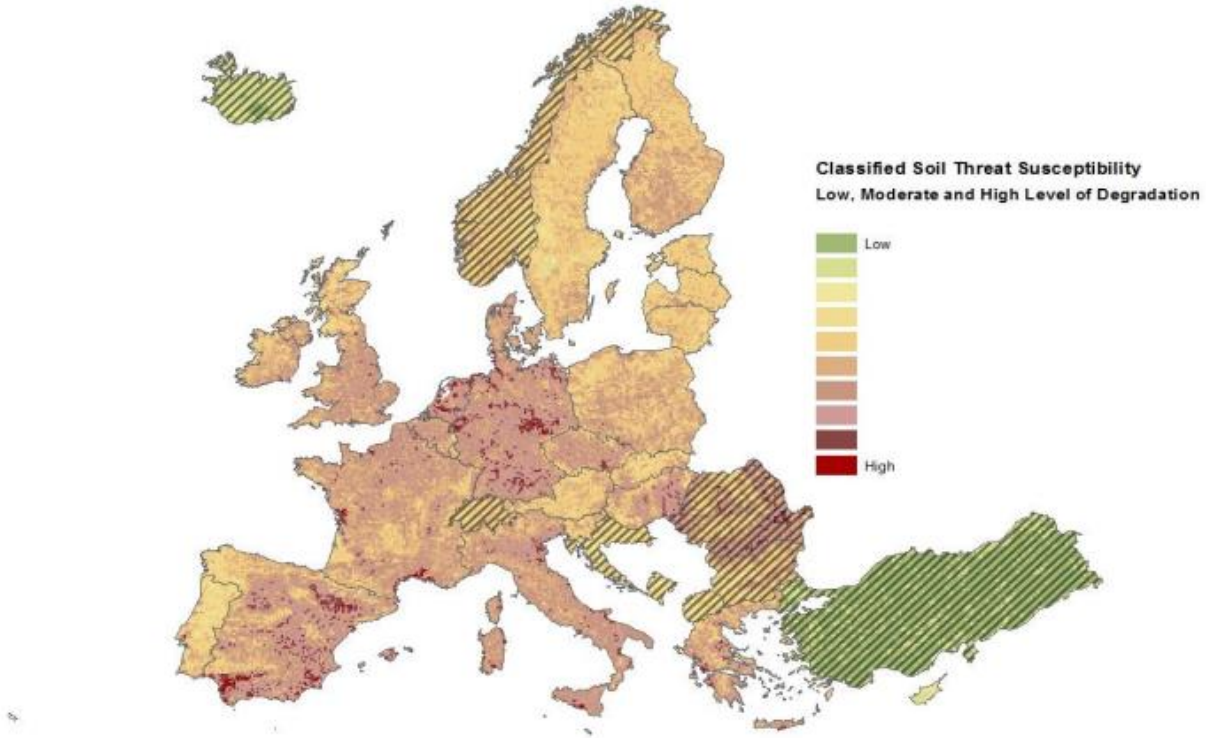
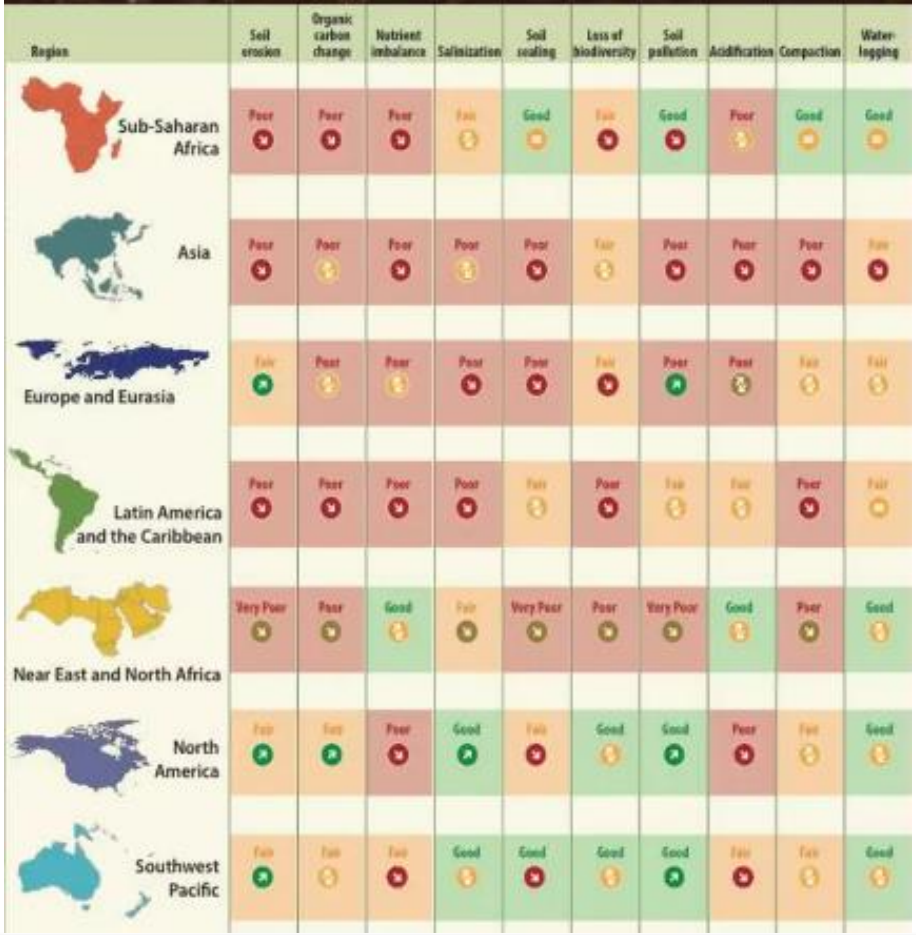


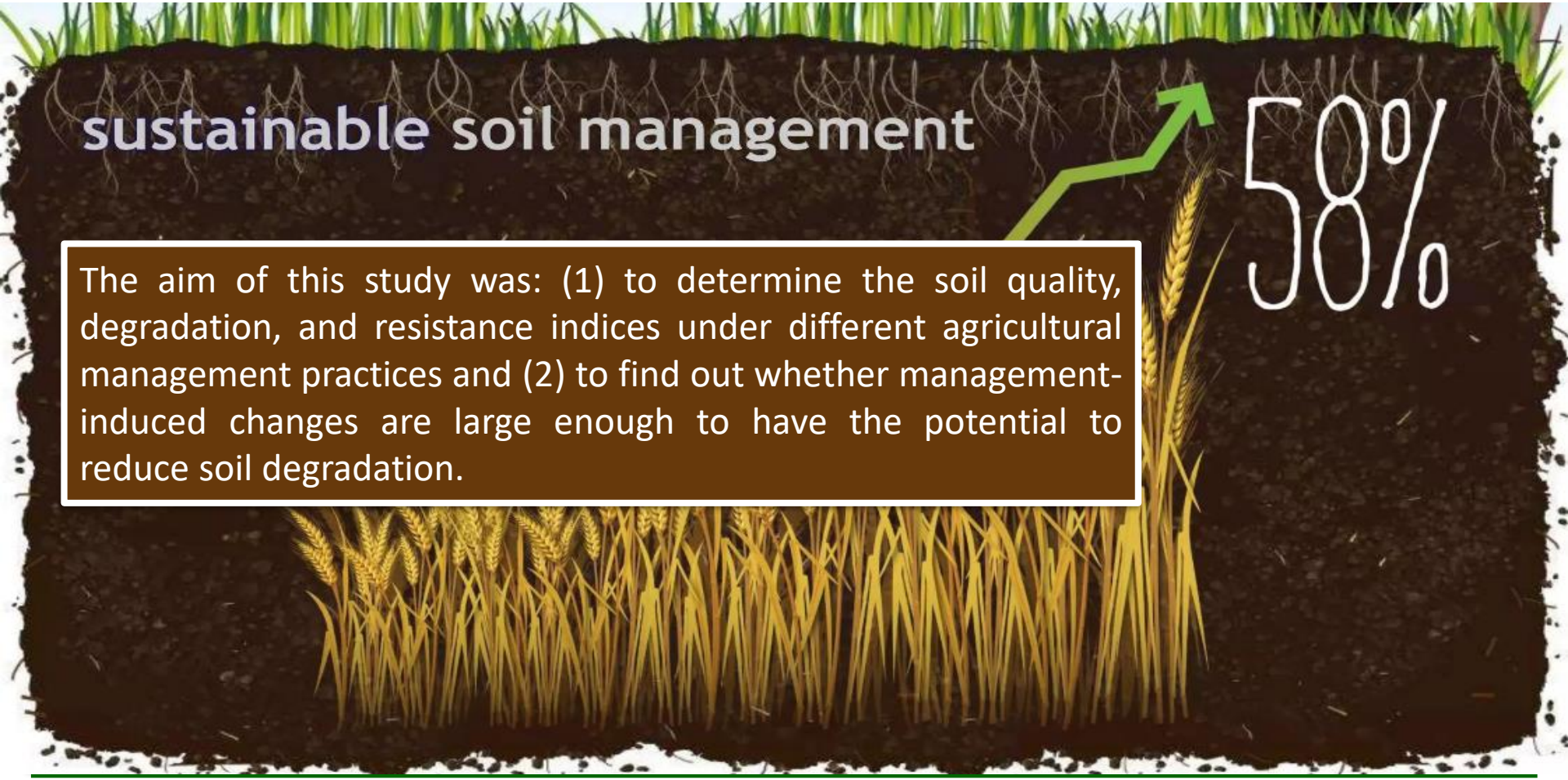
Figure 14.3: Soil threat map of Europe summarized for the low (weighing coefficient 1), moderate (weighing coefficient 2) and high (weighing coefficient 3) category of degradation. For the shaded areas, not all threats are mapped.

***Source**: Jannes Stolte, Mehreteab Tesfai, Lillian Øygarden, Sigrun Kværnø, Jacob Keizer, Frank Verheijen, Panos Panagos, Cristiano Ballabio, Rudi Hessel ; Soil threats in Europe; EUR 27607 EN; doi:10.2788/488054 (print); doi:10.2788/828742 (online)*

- ***The majority of world's soil resources are in only fair, poor and very poor condition.***
- ***The most significant threats to soil function at the global scale are soil erosion, acidification, soil organic carbon loss, nutrient imbalance and soil contamination.***

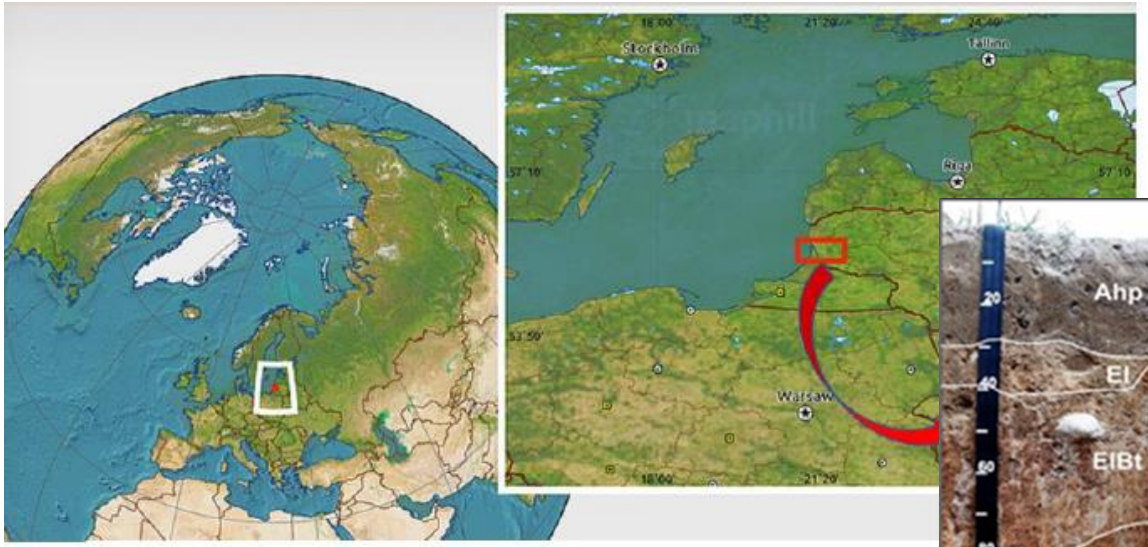


sustainable soil management



The aim of this study was: (1) to determine the soil quality, degradation, and resistance indices under different agricultural management practices and (2) to find out whether management-induced changes are large enough to have the potential to reduce soil degradation.

Methodology



- The study was based on comparing physicochemical indicators data from 3 long-term experiments, conducted in Western part of Lithuania. Changes in soil properties during the last 20 years (1999-2019) were identified.
- The soil of the experimental site is *Bathygleyic Dystric Glossic Retisol* (texture – moraine loam (clay 13–15%)).

Methodology –selected measures

Soil liming

Soil manuring

Residue maitenance

Soil tillage

Methodology –calculations

Soil degradation index (DI)

$$DI = \frac{(A - B)x100)}{B}$$

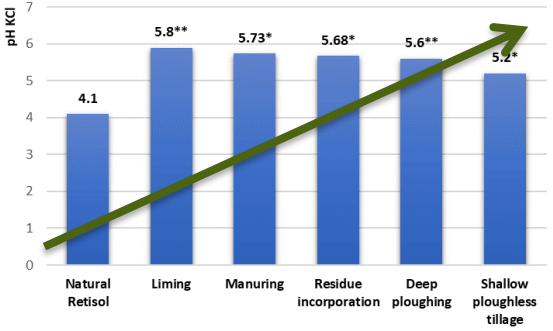
Where DI = degradation Index;
A= the mean value of soil quality parameter for selected measure and B= the mean value of soil quality parameter for control soil

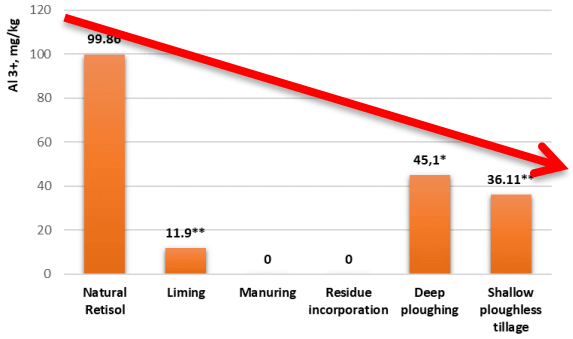
Soil resistance index (SRI)

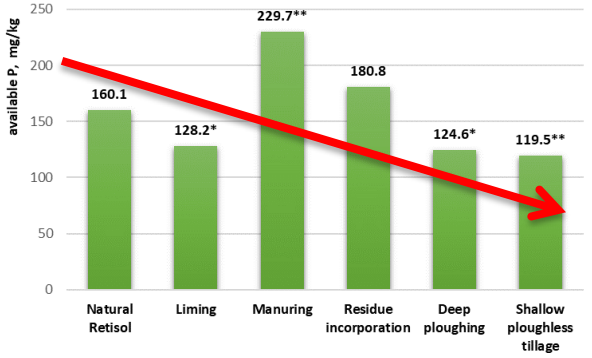
$$SRI = 1 - \frac{2|D_0|}{(X_b + |D_0|)}$$

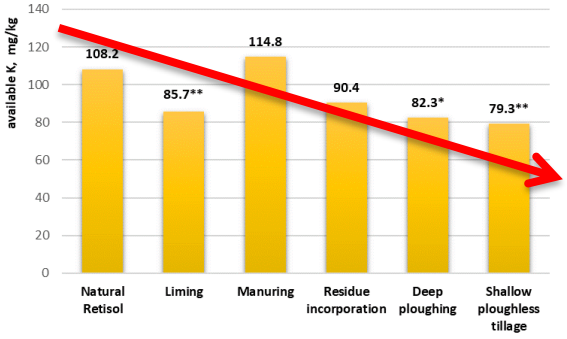
where D_0 is the differences between the disturbed soil (X_a) at the end of the disturbance and the control (X_b). SRI is restricted between -1 and +1. SRI of +1 indicates the maximum resistance without the effect of disturbance, and lower values show less resistance with stronger effect of disturbance

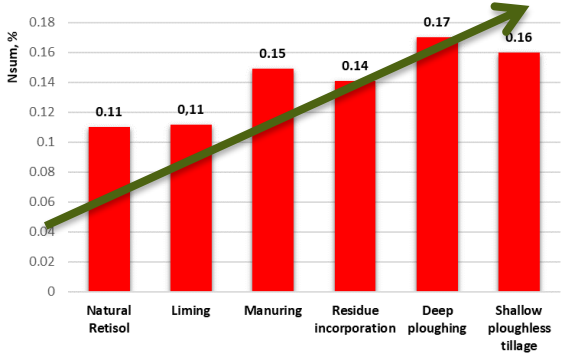
Comparison of main soil properties under different land management

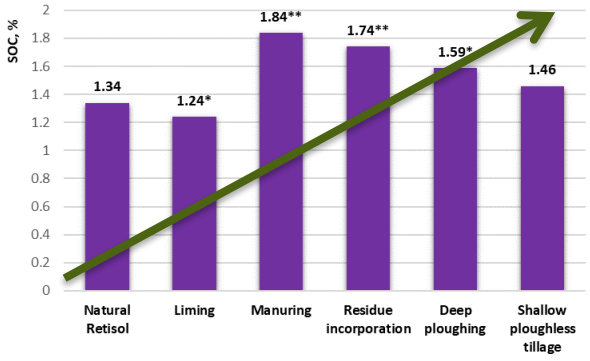




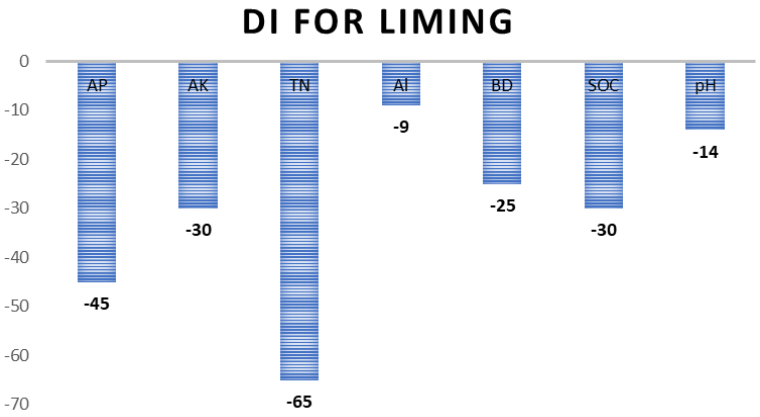


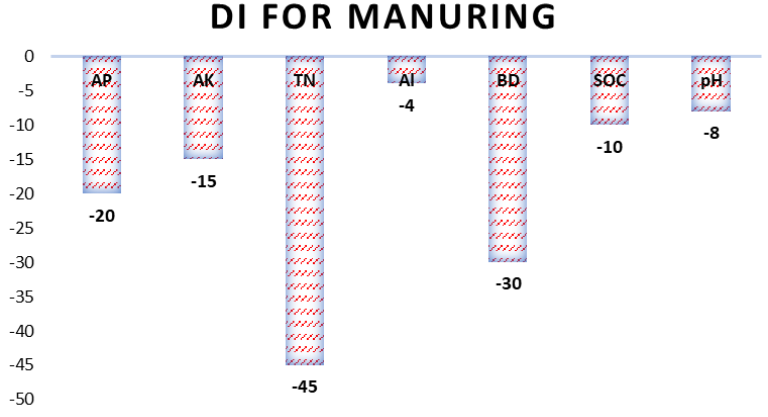


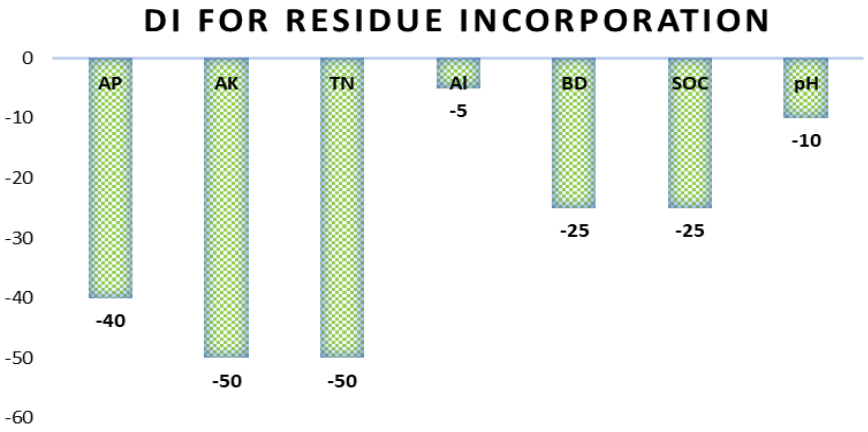


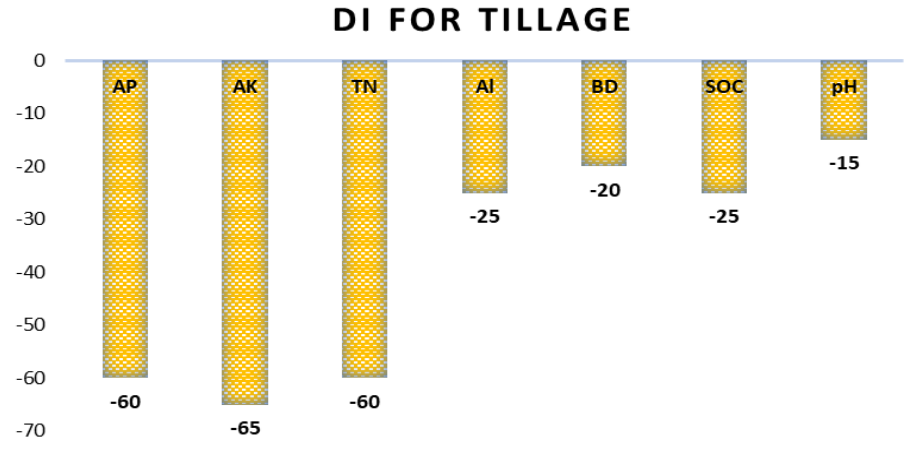


Degradation index of different soil quality parameters

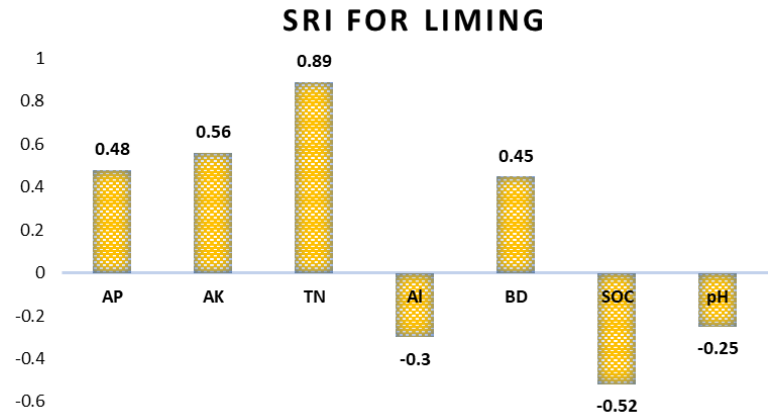


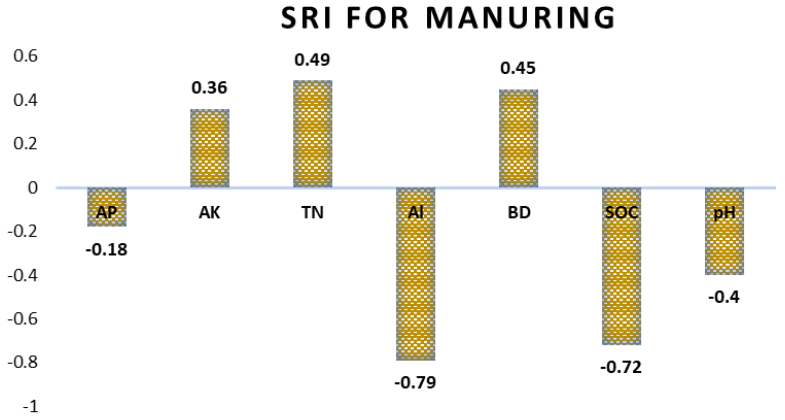


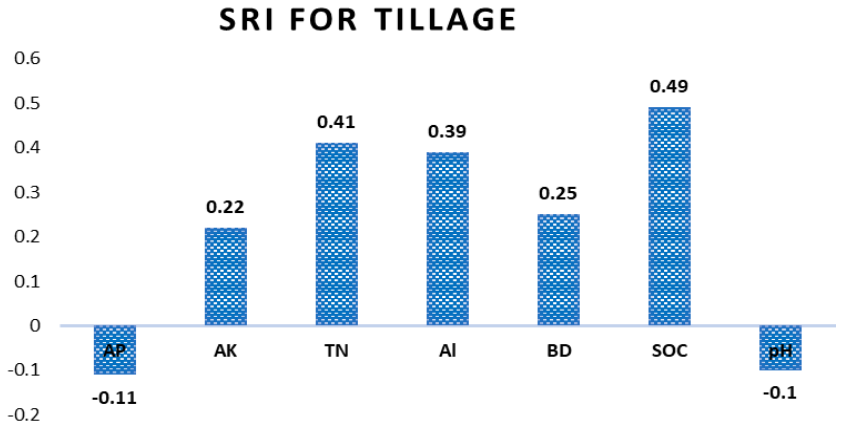




Resistance index of different soil quality parameters







SUMMARIZING:

- Taking into account the soil quality and health determinant indices, applied agricultural practices ranked as follows: **manuring > residue management > reduced tillage > liming.**
- The results obtained showed that soil where **manuring** was applied **had higher value of soil quality parameters** such as: organic matter, total nitrogen and available phosphorus and potassium contents.
- **Soil tillage and liming was determined as a measures which management-induced changes are large enough to have the potential to reduce soil degradation.**

Thank you for your attention...