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Lessons to be learned from the past: Forest biomass utilization and its belowground consequences

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Biomass was the major source of energy until the utilization of fossil energy. Its availability is strongly linked to the rise, prosperity and fall of former civilizations. Biomass from forests became scarce in many countries as the industry developed, leading to increasing transport distances from biomass sources and vast deforested patches of land along streams. There is good evidence from the past that unsustainable biomass extraction and consequent soil degradation had significant impact on soil properties in specific cases. In Central Europe, large quantities of forest biomass were not only used as timber, fuel and raw materials for trade but were also used in agriculture. Litter raking and pollarding were common practices until the mid of the last century. More plant nutrients were extracted from forest ecosystems to sustain the human population by setting up forest pastures and harvesting of edible parts of plants as fodder utilization. Starting from the Bronze Age, mining and proto-industrialization had a significant impact on forest ecosystems mainly because of the rising demand on fuelwood, charcoal and woodash. Such historical practices led to significant base-cation loss in many forest ecosystems and subsequently to soil acidification and reduced growth. Consequences of such practices should be kept in mind when evaluating the impact of harvesting residues management (utilization of slash) which is currently discussed as a measure to lessen dependency on fossil fuels and reduce greenhouse gas emissions.