

Supplementary material 1. Examples of land-use change and land management practices classification for the assessment of soil organic carbon stock change (see supplementary material 2 for the full list used)

Reference	Forests	Annual and perennial croplands	Grasslands	Land-use change
(Smith et al., 2008) IPCC report for GHG mitigation in agriculture		<ul style="list-style-type: none"> - Improved agronomic practices - Nutrient management - No till & residue retention - Water management - Manure application 		
(Paustian et al., 2016) Land management practices for climate-smart soils		<ul style="list-style-type: none"> - Add nutrients; add lime; grow N fixing species - Grow cover crops; reduce or vegetate fallow fields - Reduce to economic-optimal rates - Reduce or halt tilling; implement residue retention - Improve timing and placement; use enhanced efficiency fertilizer - Rotate perennials; use agroforestry; use high-C input species; grow cover crops - Add amendments such as compost and biochar 	<ul style="list-style-type: none"> - Convert to perennial vegetation - Restore to wetland 	
(Griscom et al., 2017) Evaluation of land management practices for GHG mitigation	<ul style="list-style-type: none"> - Natural forest management - Improved plantations - Avoided woodfuel - Fire management 	<ul style="list-style-type: none"> - Biochar - Trees in croplands - Nutrient management - Conservation agriculture - Improved rice 	<ul style="list-style-type: none"> - Grazing-feed - Grazing-animal management - Optimal intensity - Legumes 	<ul style="list-style-type: none"> - Reforestation - Avoided forest conversion - Avoided grassland conversion

<p>(Chotte et al., 2019) Sustainable land management practices for land degradation neutrality</p>		<ul style="list-style-type: none"> - Agroforestry - No/minimum tillage - Crop rotation - Intercropping - Green manuring - Composting/mulching - Manuring - Integrated crop/livestock systems - Conservation agriculture - Fertilizer use 	<p>- Reduce herd densities</p>	<ul style="list-style-type: none"> - Afforestation - Reforestation
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<p>(Smith et al., 2020) Land management practices for food security, climate change mitigation, and against desertification and land degradation</p>	<p>Improved forest management refers to management practices in forests for the purpose of climate change mitigation. It includes a wide variety of practices affecting the growth of trees and the biomass removed, including improved regeneration (natural or artificial) and a better schedule, intensity, and execution of operations (thinning, selective logging, final cut; reduced impact logging, etc.).</p>	<ul style="list-style-type: none"> - Improved cropland management is a collection of practices consisting of (a) management of the crop: including high carbon input practices, for example, improved crop varieties, crop rotation, use of cover crops, perennial cropping systems, integrated production systems, crop diversification, agricultural biotechnology; (b) nutrient management: including optimized fertilizer application rate, fertilizer type (organic manures, compost, and mineral), timing, precision application, nitrification inhibitors; (c) reduced tillage intensity and residue retention; (d) improved water management: including drainage of waterlogged mineral soils and irrigation of crops in arid/ semiarid conditions; (e) improved rice management: including water management such as mid-season drainage and improved fertilization and residue management in paddy rice systems; and (f) biochar application - Practices that increase soil organic matter content include a) land-use change to an ecosystem with higher equilibrium soil carbon levels ; (b) management of the vegetation: including high carbon input practices, for example, improved varieties, rotations and cover crops, perennial cropping systems, biotechnology to increase inputs and recalcitrance of below ground carbon; (c) nutrient management and organic material input to increase carbon returns to the soil: including optimized fertilizer and organic material application rate, type, timing, and precision application; (d) reduced tillage intensity and residue retention; and (e) improved water management: including irrigation in arid/semiarid conditions 	<p>Improved grazing land management is a collection of practices consisting of (a) management of vegetation: including improved grass varieties/sward composition, deep rooting grasses, increased productivity, and nutrient management; (b) animal management: including appropriate stocking densities fit to carrying capacity, fodder banks, and fodder diversification; and (c) fire management: improved use of fire for sustainable grassland management, including fire prevention and improved prescribed burning (see also fire management as a separate practice below)</p>	<ul style="list-style-type: none"> - Reduced grassland conversion to cropland - Reduced deforestation and degradation - Reforestation and forest restoration - Afforestation - Land-use change to an ecosystem with higher equilibrium soil carbon levels (e.g., from cropland to forest)
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(Bai et al., 2019) Effect of climate-smart agriculture practices on soil carbon stocks		<ul style="list-style-type: none"> - Conservation tillage <ul style="list-style-type: none"> - no-till - reduced tillage - Cover crops - Biochar - Other agronomic practices: crop residues, nitrogen fertilization, irrigation, and crop rotation 		
(Chambers et al., 2016) 4P1000 potential in the USA		<ul style="list-style-type: none"> - Conservation cover - Conservation crop rotation - Residue and tillage management, no-till - Strip till - Contour farming - Contour buffer strips - Residue and tillage management, reduced till - Field border - Filter strips - Grassed waterways - Strip-cropping - Vegetative barriers - Herbaceous wind barriers 	<ul style="list-style-type: none"> - Forage and biomass planting - Prescribed grazing - Range planting 	
(Corbeels et al., 2019) 4P1000 potential in sub-Saharan Africa through agroforestry and conservation agriculture		<p>Conservation agriculture:</p> <ul style="list-style-type: none"> - Minimum/no tillage - Minimum/no tillage + residues - Minimum/no tillage + residues + intercropping or rotation <p>Agroforestry: Alley cropping Multistrata systems Fallows Parklands</p>	Parklands	
(Pellerin et al., 2019) 4P1000 potential in mainland France		<ul style="list-style-type: none"> - No-tillage - Cover crops - Increase of temporary grasslands in crop rotations - Increase exogenous organic matter application - Agroforestry - Hedgerows - Cover crops in vineyards 	<ul style="list-style-type: none"> - Moderate intensification of grasslands: fertilization, increase leguminous species, increase grass export - Haying rather than grazing 	

(Conant et al., 2017) Effect of grassland management on soil carbon stocks			<ul style="list-style-type: none"> - Fertilization - Fire - Grazing - Grass ley - Reclamation 	<ul style="list-style-type: none"> - Cultivation to grass - Native to grass
(Batjes, 2019) Effect of grassland management on soil carbon stocks			<ul style="list-style-type: none"> - Controlled grazing - Adjusting stocking rates - Improved pastures with leguminous crops - Fire management 	
(Mayer et al., 2020) Effect of forest management on soil carbon stocks	<ul style="list-style-type: none"> - Nitrogen addition - Selection of species with N-fixing associates - Trees species selection - Management of tree species diversity - Management of stand density and thinning - Removal of forest residues - Herbivory regulation - Fire management 			Afforestation
(Cardinael et al., 2018) IPCC Tier 1 coefficients for agroforestry systems		<ul style="list-style-type: none"> - Alley cropping - Fallows - Hedgerows - Multistrata systems - Shaded perennial-crop systems - Silvo-arable systems - Parklands 	<ul style="list-style-type: none"> - Parklands - Silvopastures - Hedgerows 	