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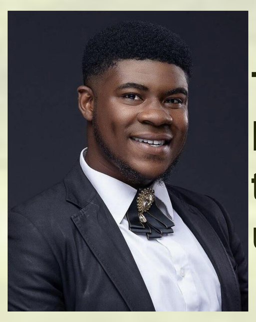
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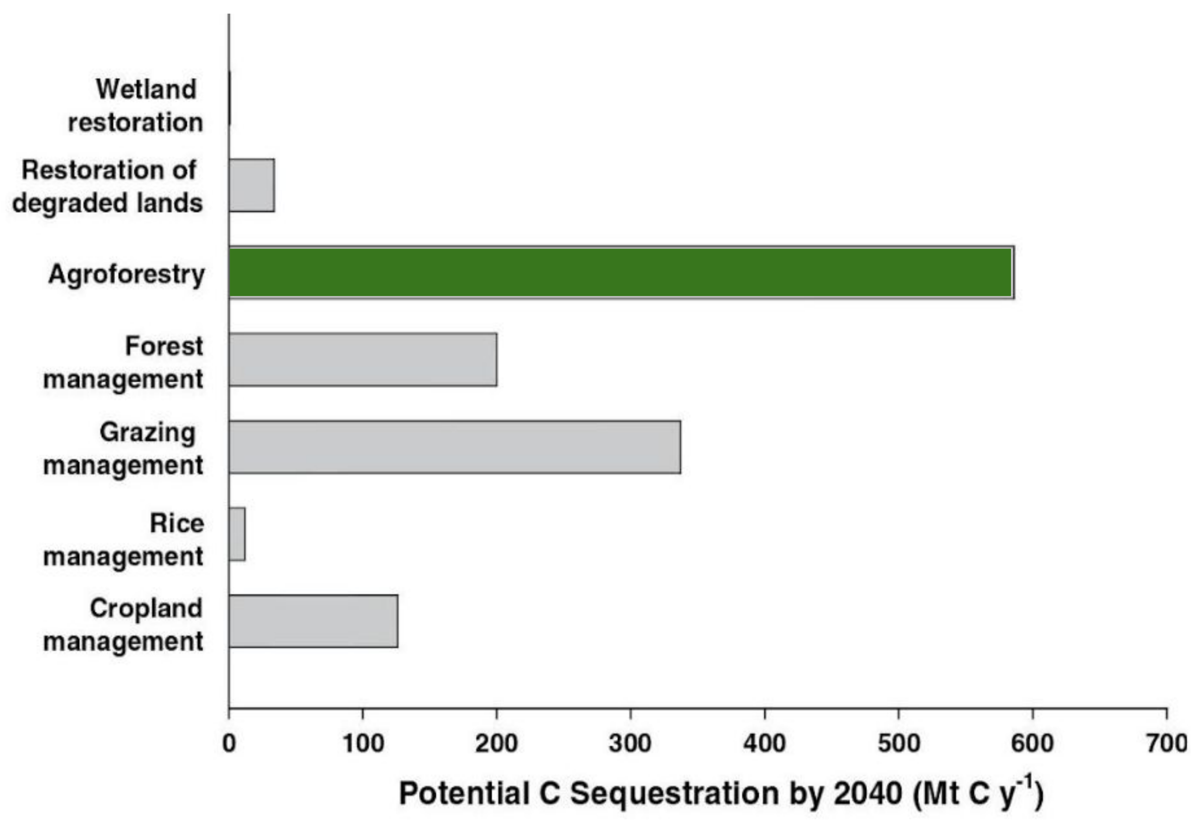
Roles of Agroforestry in Climate Change Mitigation and Adaptation

Situation

Climate Change impacts agricultural production on a global scale by:

- Extreme weather events (droughts, floods, wind erosion)[1][3]
- Loss of biodiversity[1]
- Decreasing growth periods with increasing heat (arid areas)[9]
- Desertification[1]
- Change in pest and disease distribution [1][8]
- Less nutritional value of crops (rice, rye, and soy) by CO_2 fertilization.[4]
- Loss of 1-2% crop yield per decade[10]
- Future food security threats arise especially in developing countries.[1][9]

Agroforestry is a system of agricultural production with potential towards climate change mitigation and adaptation[3][6][7][8]



Carbon sequestration potential of different land use and management options (adapted from IPCC 2000)

DEFINING AGROFORESTRY

Agroforestry is the purposeful integration of trees and shrubs with crops and/or livestock.[6]

Agroforestry has potential to be practiced in most of the temperate zone, the subtropics and tropic zones.[5]

Globally ca. 1,6 billion ha under agroforestry (78% in Tropics and Subtropics, 22% in the Temperate zone)[5]

Agroforestry Systems

Silvopasture- Combination of trees with forage and livestock. Practiced in Europe, Canada and USA.[3][8][9]

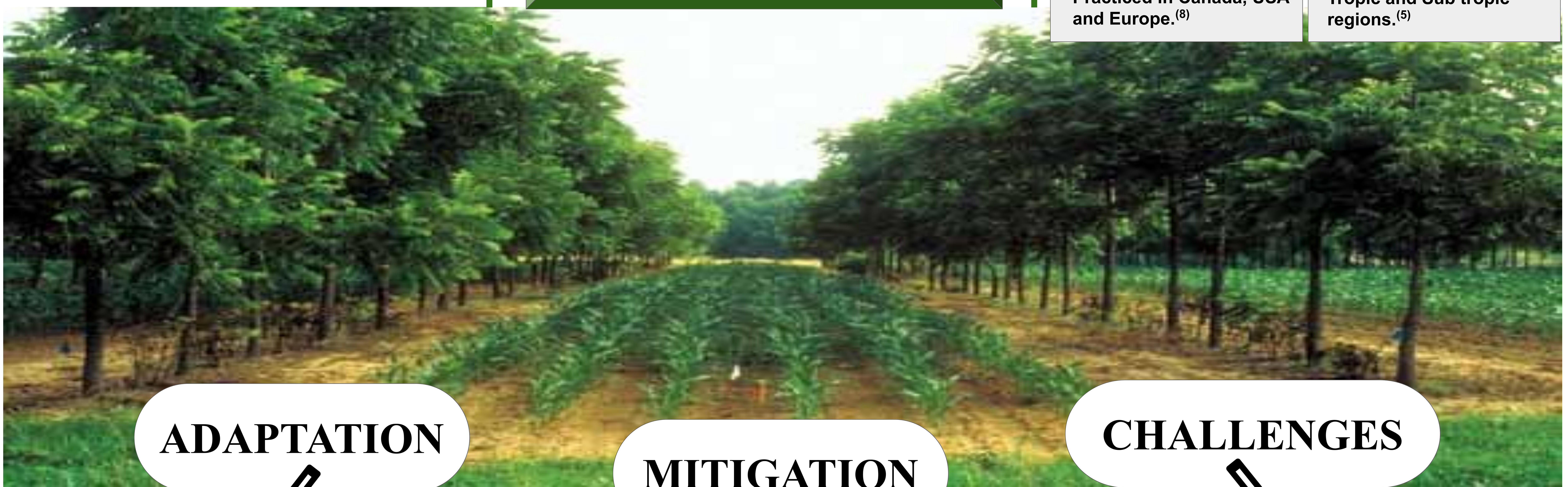
Silvoarable- Combination of widely spaced trees with crops. Practiced in Europe, USA and Canada.[3][8][9]

Forest farming- Cultivation of high value non-timber crops under a forest canopy. Practiced in Africa, Central and South America.[8][9]

Wind breaks- Shielding plants and livestock from wind with trees or shrubs. Practiced in Europe, USA and Canada.[8][9]

Riparian forest buffers- Planting trees or shrubs next to rivers to reduce nutrient pollution. Practiced in Canada, USA and Europe.[8]

Home gardens- Trees and herbaceous species intercopped on < 0.5 hectares. Practiced in Tropic and Sub tropic regions.[5]



ADAPTATION

- Prevention of soil erosion[3]
- Increases soil porosity – prevents runoff[8]
- Access to water and nutrients by deep rooting trees[3][8][7]
- Aerate soils during excessive soil moisture events[3][8]
- Increases soil cover→ water infiltration and retention in soil [3][8]
- Economic returns even though crops might be destroyed[8]
- Increases soil cover→ water infiltration and retention in soil [3][8]
- Formation of microclimates[7][8]
- Reduce crop transpiration by shading[7]
- Soil fertility and soil faunal activities[3][7]
- At the same time sustaining high levels of crop production [3]

MITIGATION

CO2 Sequestration
ca 2,6 to 8,5 t of C ha per year [1]
(depending on agroforestry systems and global regions)[3][8]

TAKE HOME MESSAGE:

The application of agroforestry is a promising tool to mitigate climate change while at the same time improving the resilience of agricultural systems and farmers to climate change impacts and enhancing global food security.

CHALLENGES

- Proactive implementation (planting prior to an event)[8]
- Reduced light availability might reduce photosynthetic action of crops[7]
- Competition for water at drought events might occur[7]
- Agroforestry systems themself suffer from climate change[7][8]
- C sequestration strongly varies, depending on tree age, species and density [3]
- N2O and CH4 source or sink of agriculture are strongly dependent on local conditions and management [9]

SOURCES:

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