Land-based Food Security Interventions Can Deliver Both Climate Change Mitigation and Adaptation Benefits in Sub-Saharan Africa: Lessons from Ethiopia's Productive Safety Net Program

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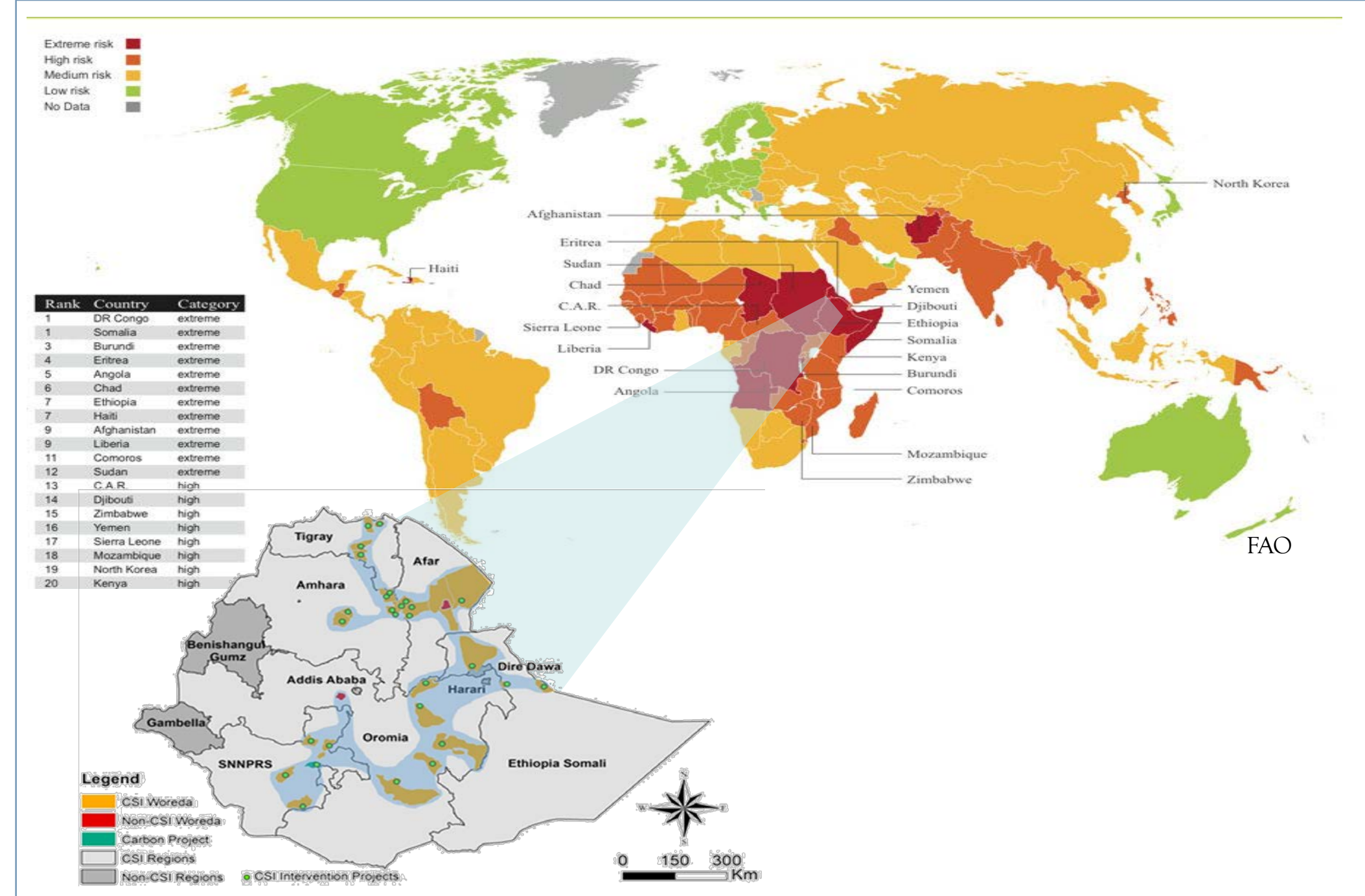**Berhanu Belay, Gebermedihin Ambaw, Kefelgn Getahun, and Milkyas Ahmed** - *Jimma University*
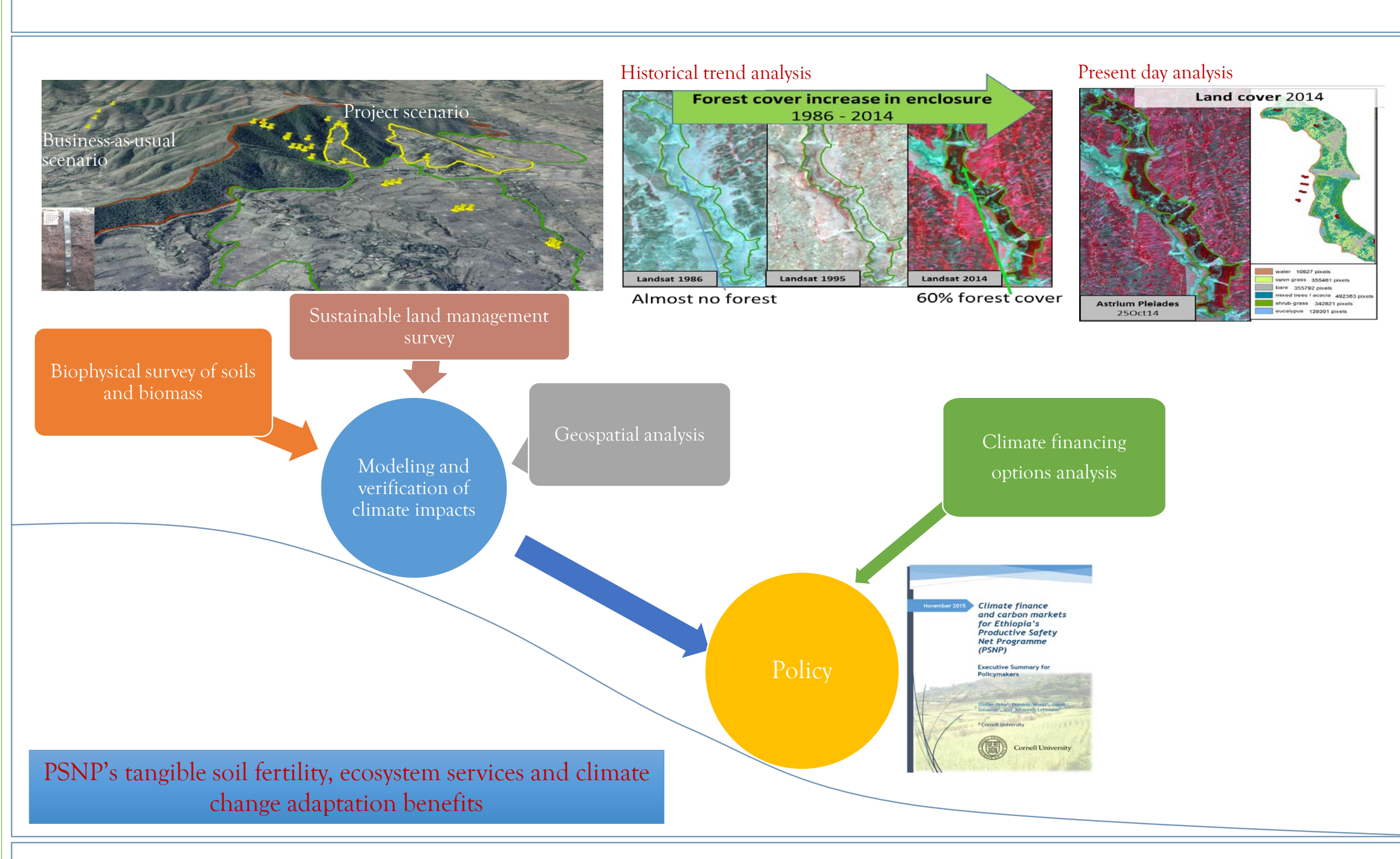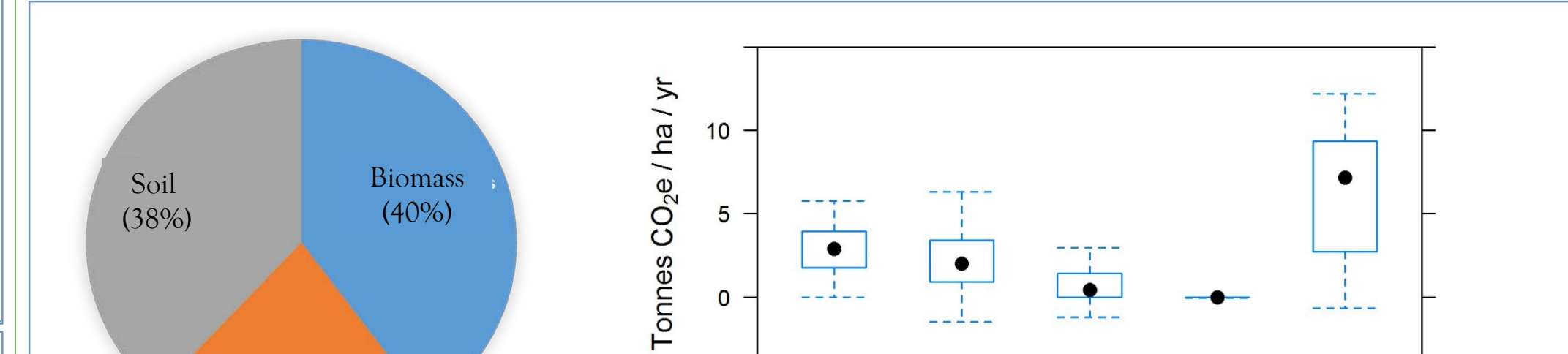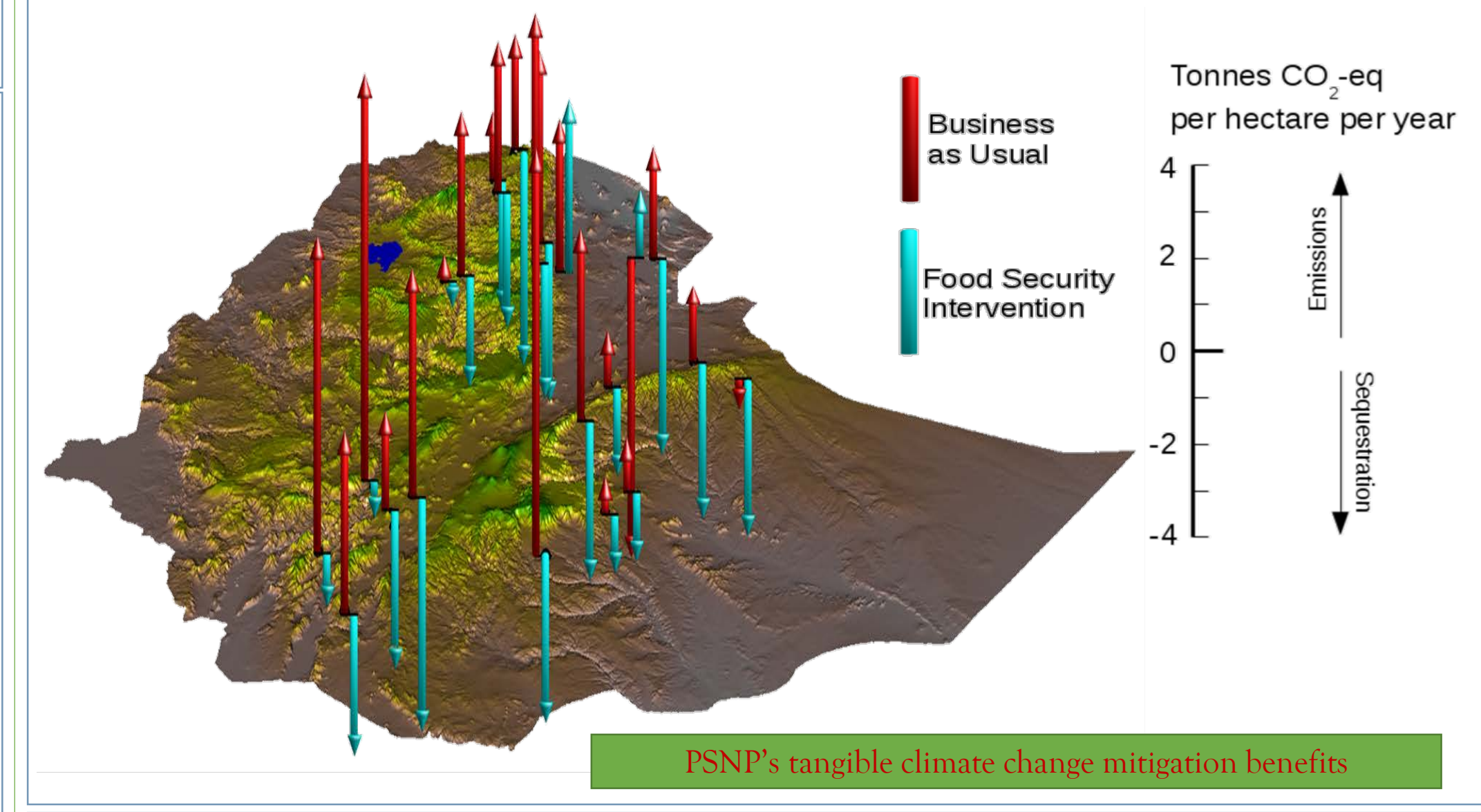
- Ethiopia has been deemed a climate "hotspot" – a place where a changing climate could pose grave threats to food security and human well-being
- To tackle the threats of climate change, Ethiopia has made an ambitious commitment, in its Intended Nationally Determined Contribution submitted to UNFCCC, to curb its GHG emissions from 150 in 2010 to 145 Mt CO_2e by 2030
- This represents a major shift, since conventional economic growth would more than double Ethiopia's GHG emissions by 2030

- Land degradation in Ethiopia is also closely linked with chronic food insecurity

- To overcome this Ethiopia also implement a food-security initiative - the Productive Safety Net Program (PSNP) - that provides food and financial support to resource-poor beneficiaries, in exchange for public works that reduce vulnerability and food insecurity, while also improving livelihoods
- To enhance resilience to economic and climatic shocks, PSNP includes >600,000 ha land-based climate-smart participatory integrated watershed management and degraded ecosystem rehabilitation programs at both the landscape and smallholder farm levels to restore and build the productive capacity and ecosystem services of the land

- Cornell by applying both standard and cost-effective analytical methods, and geospatial modeling approaches generated downscaled baseline data and completed a country-wide assessment of the soil carbon, fertility and climate change mitigation co-benefits of Ethiopia's land-based climate-smart initiative for unlocking future climate finance opportunities for landscape- and regional-scale projects

PSNP's tangible soil fertility, ecosystem services and climate change adaptation benefits

- Soil carbon stocks increased by a factor of up to three times
- Soil nitrogen, phosphorus and potassium - three critical micronutrients - more that doubled with soil carbon
- Soil plant nutrient retention and exchange capacity significantly enhanced.
- Other co-benefits include increased water holding and infiltration to mitigate droughts and floods

- Ethiopia's land-based social protection program in addition to providing improved food security, livelihoods and restoration of almost uninhabitable ecosystems across the landscapes offers co-benefits in terms of carbon sequestration and improved soil fertility
- The assessment clearly demonstrates the unique and significant biophysical potential of this land-based food security intervention to provide climate change mitigation at the national scale, whilst also reducing land degradation, enhancing the fertility and productivity of the soil and rehabilitating the extremely degraded ecosystems
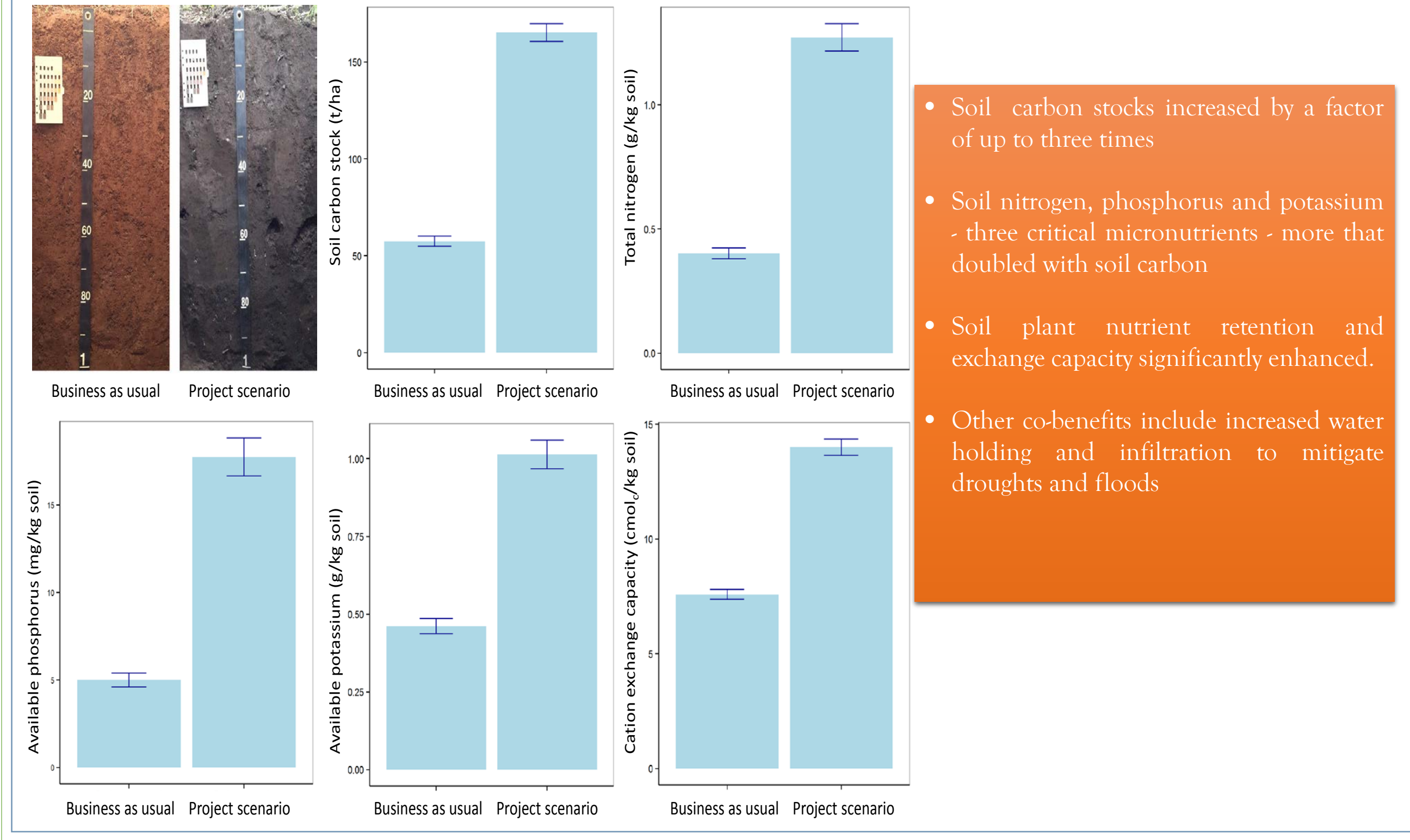
- Higher emissions were observed under business-as-usual scenario
- Negative emissions (sequestration) was observed under the project scenario of land based climate smart food security interventions

PSNP's tangible climate change mitigation benefits

- Soil carbon and biomass are equally the largest sinks of GHG gases in Ethiopia's where land-based climate smart food security interventions were implemented

- Integration of participatory watershed management into social protection programs such as PSNP can promote:
  o restoration of degraded (agro-)ecosystems
  o building soil carbon and biomass GHG sinks
  o synergies between mitigation, adaptation, and resilience
  o enhanced ecosystem services and co-benefits, such as increased soil fertility, combating desertification and conserving biodiversity
- There is an opportunity to capitalize on land-based food security programs as a vehicle for climate change mitigation and adaptation in Sub-Sharan Africa (SSA)

- Scaling up and sustainability of land-based food security interventions, however, are limited by available finance for food security interventions
- Climate change mitigation co-benefits of these land-based food security interventions can help to support their scalability and sustainability through access to future climate finance opportunities
- The international community can help to achieve this:
  o by providing support, which can enhance Ethiopia's and other SSA countries capacity and preparedness to benefit from future climate finance initiatives
  o by developing policy measures that take both above and below-ground carbon (both soil and biomass) into account in marketable carbon mitigation
  o by streamlining and standardizing GHG accounting methodologies, designed to support the land-use sector
  o by institutionalizing jurisdictional or regional baseline and additionality accounting methodologies and approaches into future climate finance policies
  o by developing and standardizing cost-effective monitoring of carbon stocks using advanced geospatial and spectral reflectance methods