THE SOCIO-ECONOMIC BENEFITS OF CLIMATE CHANGE MITIGATION MEASURES: A COMPARISON BETWEEN TRADITIONAL AND FUTURE LAND MANAGEMENT PRACTICES AND THEIR PRODUCTIVITY IN THE LONG TERM

Introduction

Climate change is not only an environmental challenge but also a significant socio-economic issue (Field, 2014; Stern, 2007). Traditional land management practices, which have historically emphasized maximizing short-term productivity, are increasingly seen as unsustainable in the face of escalating climate change impacts (Mirzabaev, 2019; Tilman, 2002). The shift towards future-oriented land management practices, designed to mitigate climate change, is gaining momentum as it offers potential long-term socio-economic benefits (Altieri, 2017; Nkonya, 2016). This article examines the socio-economic advantages of climate change mitigation (CCM) measures, particularly when comparing traditional and future land management practices, and explores their productivity over the long term.

The Unsustainability of Traditional Land Management Practices

Traditional land management practices, particularly in agriculture and forestry, have focused primarily on short-term economic gains. These practices often involve intensive farming/forestry, monocropping, and deforestation, leading to significant degradation of soil quality, loss of biodiversity, and increased greenhouse gas (GHG) emissions (Foley, 2005; Altieri, 1999; Gibbs, 2010). For instance, the drainage of organic soils for agricultural purposes has been a common practice in many regions, especially in Northern, Eastern, and Central Europe. However, this has contributed to the release of significant amounts of stored carbon into the atmosphere, exacerbating climate change (Joosten, 2010).

The unsustainability of these practices is becoming more apparent as the negative environmental impacts are increasingly linked to long-term economic risks. Soil degradation reduces agricultural productivity, increases vulnerability to climate change, and leads to higher costs for soil restoration and agricultural inputs (Lal, 2004). The loss of biodiversity and ecosystem services, such as pollination and water purification, further undermines the resilience of agricultural systems and the broader economy (Díaz, 2006; Costanza, 1997).

Future Economic Threats from Climate Change

The economic threats posed by climate change are profound and multifaceted. They include increased frequency and severity of extreme weather events, such as droughts, floods, and storms, which directly impact agricultural productivity, food security and damage forest stands (Field, 2012; Porter, 2014; Allen, 2010).

Additionally, the long-term impacts of climate change, such as rising sea levels and shifting climatic zones, threaten the viability of traditional farming practices, further straining economic resources (Lobell, 2008).

Economic studies have shown that the costs of inaction on climate change far outweigh the costs of implementing mitigation measures (Nordhaus, 2007). The Stern Review, a comprehensive study on the economics of climate change, estimated that if no action is taken, the overall costs of climate change could be equivalent to losing at least 5% of global GDP each year, now and forever. In contrast, the cost of action to reduce GHG emissions could be limited to around 1% of global GDP each year (Stern, 2007).

Future-Oriented Land Management Practices Tested in the LIFE OrgBalt Project and Their Benefits

In response to the limitations of traditional land management, future-oriented practices have been developed, focusing on sustainability and climate resilience. These practices include agroforestry, reforestation, and controlled drainage, among others. These practices not only aim to reduce GHG emissions but also enhance soil carbon sequestration, improve biodiversity, and increase the resilience of agricultural systems to climate change (Jose, 2009; Drury, 2014; Locatelli, 2015).

For example, the implementation of controlled drainage systems in grasslands has been shown to maintain agricultural productivity. Similarly, agroforestry, which integrates trees into agricultural landscapes, enhances carbon sequestration, improves soil health, and provides additional income streams through the production of timber, fruits, and other tree-based products (Mbow, 2014).

The socio-economic benefits of these practices are increasingly being recognized. A key advantage is the long-term productivity gains associated with soil health and reduced reliance on chemical inputs. Healthier soils are more resilient to extreme weather conditions, reducing the risk of crop failure and associated economic losses. Moreover, these practices often provide additional ecosystem services, such as water regulation and habitat provision, which have significant socio-economic value.

A major challenge in transitioning to future-oriented land management practices is the upfront cost and the longer payback period. However, when viewed over the long term, the economic returns from these practices can be substantial. For instance, a study within the LIFE OrgBalt project, which focused on the climate change mitigation potential of nutrient-rich organic soils in the Baltic States and Finland, demonstrated that while some CCM measures might have a longer return on investment, they offer significant economic net present value (ENPV) and most of them also significant GHG emissions reductions over extended periods.

For example, afforestation measures implemented over a 100-year period showed substantial reductions in GHG emissions. Although the financial net present value (FNPV) was initially negative for some measures, indicating a need for public funding support, the economic net present value (ENPV) was positive, demonstrating the socio-economic benefits when ecosystem services are taken into account.

Furthermore, the analysis of different CCM measures in agricultural lands revealed that certain practices, such as the conversion of cropland to grassland or the introduction of legumes into crop rotations, usually have short payback periods while also contributing to soil improvement. These measures not only provide immediate financial returns but also contribute to the long-term sustainability and resilience of the agricultural sector. Though GHG emissions reductions were positive for conversion of cropland to grassland.

The Economics of Climate Change Mitigation in the Long Term

The economic case for climate change mitigation measures is strengthened when considering the long-term benefits. While traditional land management practices may offer short-term financial gains, they often lead to long-term economic losses due to environmental degradation and increased vulnerability to climate change. In contrast, future-oriented practices, though requiring higher initial investments, can yield substantial long-term economic benefits.

These benefits include not only improved agricultural productivity and resilience but also the preservation and enhancement of ecosystem services, which are crucial for sustaining economic activities and human well-being. Moreover, by reducing GHG emissions, these practices contribute to global efforts to mitigate climate change, thereby avoiding the potentially catastrophic economic impacts associated with unmitigated climate change.

Conclusion

The transition from traditional to future-oriented land management practices is essential for achieving long-term socio-economic benefits and sustainability. While traditional practices are increasingly unsustainable and pose significant future economic threats, future-oriented practices offer a pathway to mitigating climate change while enhancing long-term productivity and economic resilience.

Investing in climate change mitigation measures in land management not only addresses the environmental challenges but also provides substantial socio-economic returns. The adoption of these practices is crucial for ensuring the sustainability of agricultural and forestry systems, protecting ecosystem services, and safeguarding the economic well-being of current and future generations.

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Project "Demonstration of climate change mitigation potential of nutrient rich organic soils in Baltic States and Finland" (LIFE OrgBalt, LIFE18 CCM/LV/001158) is implemented with financial supportfrom the LIFE Programme of the EuropeanUnion and State Regional Development Agency of the Republic of Latvia. www.orgbalt.eu

The information reflects only the LIFE OrgBalt project beneficiaries view and the European Climate, Infrastructure and Environment Executive Agency is not responsible for any use that may be made of the information contained therein.

Additional information: www.orgbalt.eu

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