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TRANSFORMING LIVES AND LANDSCAPES

04

Policybrief

# The Case for Investing in Africa's Biocarbon Potential


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Reducing greenhouse gas emissions from Agriculture, Forestry and Other Land Uses (AFOLU) offers a great opportunity for Africa to contribute to climate change mitigation and help millions of smallholder farmers adapt to climate change impacts. The Common Market for East and Southern Africa (COMESA), supported by the World Agroforestry Centre, is promoting a biocarbon approach for carbon management in African landscapes

## Justification for Action

1. **Africa's biocarbon offers significant potential for climate change mitigation through reducing emissions and increasing carbon storage**
2. **Reducing Emissions from Deforestation and forest Degradation (REDD) is unlikely to succeed without considering agriculture**
3. **Reducing emissions from Africa's agricultural landscapes has both local and global benefits**
4. **A biocarbon approach to reducing emissions can enable Africa to get maximum benefits for both mitigation and adaptation**

## What needs to be done?

- African ministers should develop a common position and collectively endorse reduced net emissions from AFOLU as a major element of their climate change strategies.
- Climate change negotiators should agree on a work plan for reducing emissions from Agriculture, Forestry and Other Land Uses (AFOLU) under a post-2012 climate change agreement
- International greenhouse gas offset markets should accept biocarbon credits from emission reductions and carbon stock increases from AFOLU from developing countries
- Developed countries should invest in research and institutional capacity to support biocarbon activities
- African governments should adopt multi-sectoral approaches for reduced emissions from AFOLU

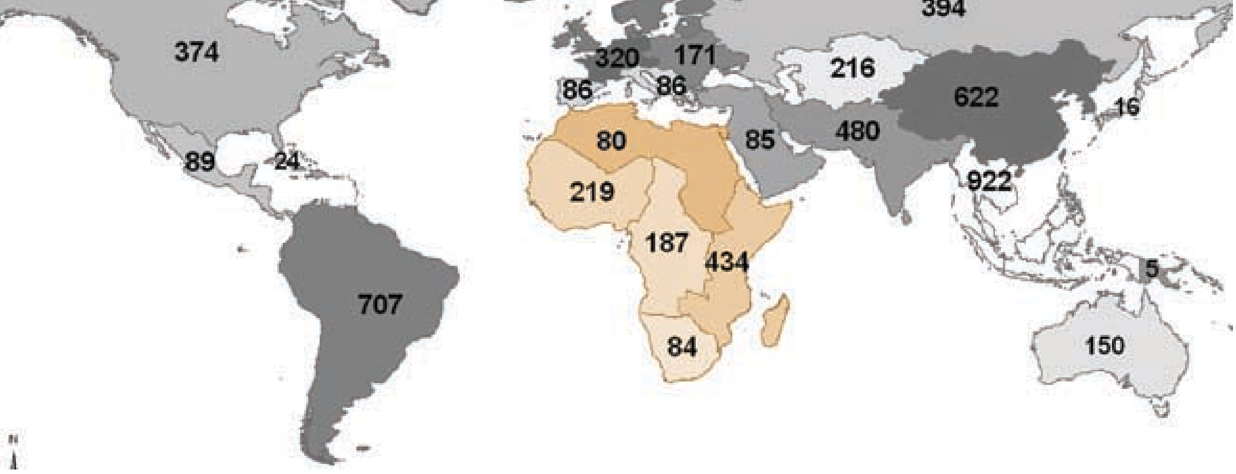


*Figure 1 - There is huge potential in Africa for reducing emissions from agriculture compared to other parts of the world (expressed in $MtCO_2$-eq/year). Source: Smith et. al 2007.*

## 1. Africa's biocarbon offers significant potential for reducing emissions and increasing carbon storage

### • Africa is a major reservoir of biocarbon

Africa is one of the world's most important reservoirs of terrestrial carbon, which includes soil, forests and agricultural carbon stocks, accounting for at least 20 per cent of the world's forest carbon. For example, Central African forests alone are estimated to store between 25-30 billion tonnes of carbon. Evidence also shows that mature humid forests in Africa also can provide a critical buffer against global and regional climate change.[13]

Realizing the full potential for mitigation in Africa will require considerable new investment in measures to prevent deforestation and to adopt land use practises that sequester high carbon.

### • Agricultural lands are expanding and emissions increasing

In Africa, agricultural lands are expanding rapidly, due to growing demand for food, a macro-economic framework that emphasizes agriculture-led development,[15] a dietary shift towards more meat consumption, and increased global demand for non-food agricultural products, including liquid biofuels. Farmers have limited access to tools, knowledge and resources for intensification, which enhances the rate of expansion of agricultural area into forests and woodlands.[5] Despite their importance, Africa's forests continue to decline at a rapid rate: between 1990 to 2005 more than nine percent of Africa's forests were lost at an average annual rate of about four million hectares.[7] If this expansion continues over the 2000-2030 period, researchers estimate that GHG emissions from African agriculture will increase by more than 60%.[21] Unlike the developed world, $CO_2$ emissions from land-use change in Africa are more important than emissions of non-$CO_2$ greenhouse gases from agriculture.

It is expected that nitrous oxide ($N_2O$) and methane ($CH_4$) emissions will continue to increase in Africa due to unavoidable agricultural growth to meet demand for food. Improved farm management of and trees can potentially reverse this trend through significant increases in carbon sequestration on existing agricultural lands. Furthermore, reducing $CO_2$ emissions from land conversion presents another appropriate target for political and technical interventions. By taking a landscape-level view of $CO_2$ emissions, and making the link between agriculture and deforestation, national and international-level policy makers can design appropriate incentives and interventions to reduce emissions and improve livelihoods.

### • African farmers can and must be part of the solution

Climate change will have disproportionate impacts on Africa, relative to the small human-induced emissions from the continent and relative to Africa's economic strength. Moreover, between 70-80% of the rural population in Africa are dependent on agriculture, livestock and forests for their livelihoods. About 70% of the economic (i.e. cost effective) potential for reducing emissions from agriculture in developing countries.[17] Global carbon markets could harness this potential. However, current rules of the clean development mechanism (CDM) and other regulated markets have essentially locked out African farmers.[9] African agriculture remains unabated and untapped as a global mitigation option.

### • Reducing GHG emissions from agriculture can be relatively inexpensive

Often the additional income that farmers get from converting marginal lands into crop agriculture are low relative to the value of the carbon contained in these lands and the damage caused to ecosystems and the climate when they are converted. Research across the tropical forest margins found that 80% of land users earned less than USD $5 of net revenue per tonne of carbon dioxide equivalent that was lost as a result of land use change.[15] Studies on global mitigation cost and potential have estimated that deforestation could technically be halted in Africa at a cost of less than USD 10 per tCO2e.[12] Carbon emissions from land use changes could be reduced if farmers considered carbon values in their economic decision making. Farmers also need alternatives to expansion of croplands; intensification and agroforestry must be promoted as cost-effective investments that can mitigate climate change, while ensuring more productive systems for sustaining smallholder livelihoods.

## 2. REDD is unlikely to succeed without considering agriculture

The first proposals for a mechanism for Reduced Emissions from Deforestation and forest Degradation (REDD) did not consider emissions from terrestrial carbon stores outside of core or standing forests, nor did they address the drivers of deforestation adequately. Land tenure in agricultural areas is often more clear than in forested areas making it easier to design policy interventions which respect land user rights. More recent proposals for REDD address the range of forest types more fully, taking into account forest conservation, sustainable forest management and enhancement of forest carbon stocks in addition to avoided deforestation.[6] These proposals are being referred to as REDD-plus.

- **Agriculture is a major driver of deforestation in Africa**

Most African farmers live and work in agriculture-forest mosaics and forest frontier areas, and depend on expansion into forests and woodlands to increase agricultural output or replace exhausted agricultural lands.[5, 8] In Africa, 66% of increased output in food production is derived from expansion of harvested area, while globally, only 22% is due to expansion of harvested areas.

For a REDD mechanism to be successful it must take into account the daily decisions made by tens of millions of people whose actions shape land use change and thus emissions from deforestation and forest degradation. Including agricultural landscapes under an enhanced REDD-type mechanism would facilitate a whole landscape approach to carbon monitoring and mitigation, and therefore take into account the forces that drive carbon-emitting land use changes, as much as the changes themselves.

- **Leakage issues can be reduced if whole landscapes, including agricultural lands, are taken into account**

Under a REDD mechanism, there is serious risk that successful efforts to reduce emissions in one location can simply displace the deforestation or forest degradation to a neighbouring area. This spillover effect is referred to as *leakage*, and is a major challenge for project, program and policy design. One way to address leakage is to ensure that all the people who derive employment and benefits from the areas to be protected have alternative means of employment and income. Expanding the units of carbon accounting to include land uses outside of forest core areas, such as agroforests and cropping systems, can also serve to internalize leakage effects.

## 3. Reducing emissions from agricultural landscapes has global benefits

A biocarbon approach to reducing GHG emissions and increasing sequestration will have both short and long term benefits for people and ecosystems. Lands rich in biocarbon provide a mix of social, environmental and economic co-benefits including maintaining soil fertility from organic matter deposition, healthy water and soil moisture, biodiversity, weather regulation, economic development and climate change adaptation.[16]

Emissions from deforestation account for about 18-20% of global GHGs in our atmosphere, while emissions from agriculture count for about 14%. Together this represents more emissions than the global transport sector (13.1%) or emissions from industry (19.1%).[11]

Although the exact potential for mitigating emissions from agriculture is still uncertain, the IPCC has argued that agriculture remains a major contributor to global GHG emissions and that mitigation will not happen without decisive action.

## 4. A biocarbon approach to reducing emissions can enable Africa to get maximum benefits for both mitigation and adaptation

GHG mitigation in agriculture can have local benefits. For example, practices that improve soil carbon can also improve agricultural productivity – which can enhance local food security. Other carbon-sequestering interventions can prevent erosion and land degradation. Agroforestry, in particular, offers a number of options that can have immediate livelihood benefits and raise farmers' resilience to climate change impacts. For example, diversified production systems that combine trees with crops can provide an economic buffer in times of water stress and variable temperatures. Trees improve the way soils absorb rainwater, and provide additional nutrients, tree products and fuel. Recent research conducted on agroforestry systems in Zambia shows that improved fallows can help to buffer the production effects of variations in rainfall,[19] while research in Burkina Faso shows that agroforestry systems can make water more available to crops.[4]

## Tree-based agricultural systems for enhancing bio-carbon stocks in Africa

Tree-based agricultural systems, including agroforestry in which farmers deliberately manage trees in agricultural landscapes, offer important options for carbon sequestration and reducing carbon emissions, while helping African smallholder farmers adapt to climate change. Tree-based systems mitigate atmospheric emissions of greenhouse gases by: (1) storing carbon in biomass and soil, (2) providing alternative sources of forest products such as timber and firewood, which are often major drivers of deforestation and degradation, (3) avoiding $CO_2$ emissions by substituting fossil fuels with biofuels produced in more sustainable ways in closed carbon cycles.[1] Studies of the mitigation potential of agriculture have drawn different conclusions regarding the mitigation potential of agroforestry,[14, 21, 18,] partly because of the wide range of systems that the term agroforestry covers. To quantify the direct impact of an agroforestry system, it is important to consider the specific attributes of the agroforestry system and the land use that the agroforestry system replaces.

### Above ground carbon stocks in tree-based systems

A number of agroforestry practises from Cameroon are illustrated in the figure above in terms of time-averaged carbon stock and financial profitability (net present value) over a standardized 25-year production cycle. The multistrata cocoa production systems have the ability to store an average of 180 t $ha^{-1}$ of above-ground carbon, while generating net present value of up to $1500 per hectare.

It is interesting to note the overall trend, with profitable crop fallow systems storing less carbon, while less profitable systems such as high forests and secondary forests storing more carbon. Between these extremes lie tree crop systems that are both profitable and can store high amounts of carbon, such as extensive and intensive cocoa agroforests with fruit sales. The least profitable and least carbon storing system is a continuous monocrop, such as cassava (Figure 2).

Other types of agroforestry systems show lower potential of agroforestry to store carbon. For example, improved fallows in semi-arid areas of Zambia which showed high profitability from increased maize yield relative to conventional tillage without fertilizer, but relatively low values of time-averaged carbon stocks (between 1.6 to 2.4 t $ha^{-1}$) over a five year period.[2] Further surveys indicated that improved fallows in Zambia are a significant source of firewood for households [2] potentially contributing to avoided deforestation.

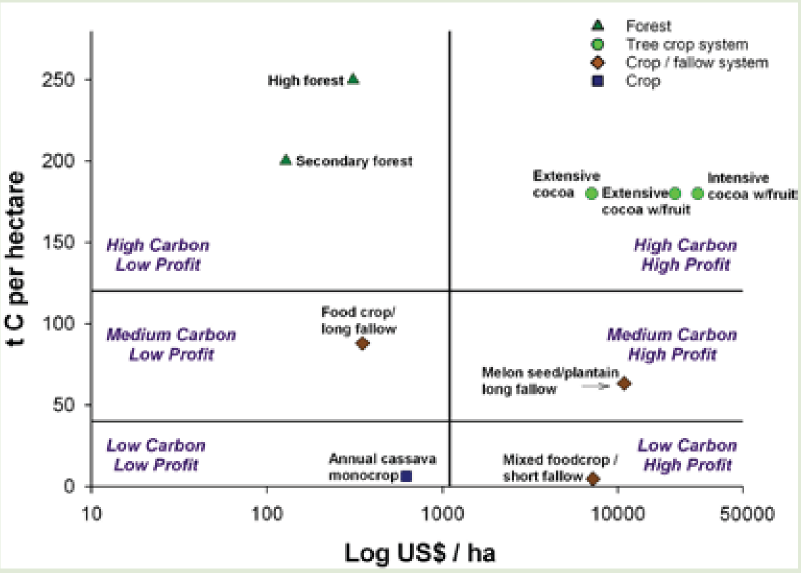


*Figure 2. Time averaged carbon stocks and private profitability (circa, 2000) for different land uses in Cameroon (15)*

## Soil organic carbon

The technical GHG mitigation potential of agriculture has been calculated at 5.5 to 6 gigatonnes of CO2e per year by the year 2030.[14] About 90% of this potential could be achieved through soil carbon (C) sequestration. Estimates of soil organic carbon (SOC) in Sub-Saharan Africa remain unclear for several reasons: 1) different methods for estimating soil carbon have been used, 2) reports from different studies consider different depths e.g. 0-10 cm, 0-20 cm and even 0-200 cm, 3) differences in sampling techniques and soil analytical procedures, and 4) different time of sampling.

Tree-based systems in particular have potential to play a major role in increasing SOC through the establishment of natural or improved fallow systems, which give attainable rates of C sequestration in the range of 0.1 to 5.3MgC$ha^{-1}$ $yr^{-1}$.[18] Conservation agriculture systems – based around the management principles of permanent soil cover, reduced tillage, and crop rotations – also have potential to enhance soil carbon and restore degraded lands.

## What needs to be done?

### • African Ministers should endorse reducing emissions from AFOLU

The African Ministers Council for the Environment (AMCEN) should endorse AFOLU as part of a common position for Africa. Moreover, AMCEN, Agriculture Ministers and the African Union should adopt AFOLU as part of a broad climate change mitigation and adaptation strategy, in order to achieve climate change mitigation and adaptation benefits as well as biodiversity and poverty reduction.

### • Climate change negotiators should agree on a work plan for reducing emissions from Agriculture, Forestry and Other Land Uses under a post-2012 climate change agreement

The global community will agree to a post-2012 climate change agreement at the UN climate change meeting in Copenhagen in December 2009. For reduced emissions from AFOLU to move forward, the meeting needs to produce an agreement on REDD and parties must agree to a work program to develop AFOLU options.

### • International greenhouse gas offset markets should accept AFOLU emissions reductions from developing countries

Acceptance of AFOLU emission reduction units by these international offset mechanisms is likely to significantly improve the return to farmers from better management of carbon and catalyze further investments for biocarbon emissions reductions in Africa.

### • Developed countries should invest in research and institutional capacity to support biocarbon activities from AFOLU

Setting up an AFOLU system will require research and institutional capacity building. Lack of institutional capacity and research gaps are partly responsible for Africa's poor participation in current UNFCCC mechanisms such as the Clean Development Mechanism. Getting prepared for AFOLU will require developed countries to invest in research, training and financing and can follow the example of REDD-Readiness investments. For smallholders to benefit from carbon finance, it needs to be shown that smallholder projects are feasible, and so support should be given for pilot carbon projects to test for measurement, technical, and institutional feasibility. Research must also be conducted on the tradeoffs and cross-sector interactions of reducing emissions and building carbon stocks in agricultural landscapes.

### • African governments should develop multi-sectoral approaches to deal with AFOLU, where agriculture, forestry, environment and energy ministries work together towards a national action plan

In many countries REDD has caused tension between Environment and Forestry ministries. In Africa, where agriculture and demand for timber and fuelwood are main drivers of deforestation, ministries responsible for agriculture and energy will also have a stake in policies to reduce emissions. As a result, *all* of relevant ministries must be involved in a successful REDD and AFOLU plan for Africa. Similarly, REDD/AFOLU ought to be mainstreamed in the national development planning and budgeting processes.

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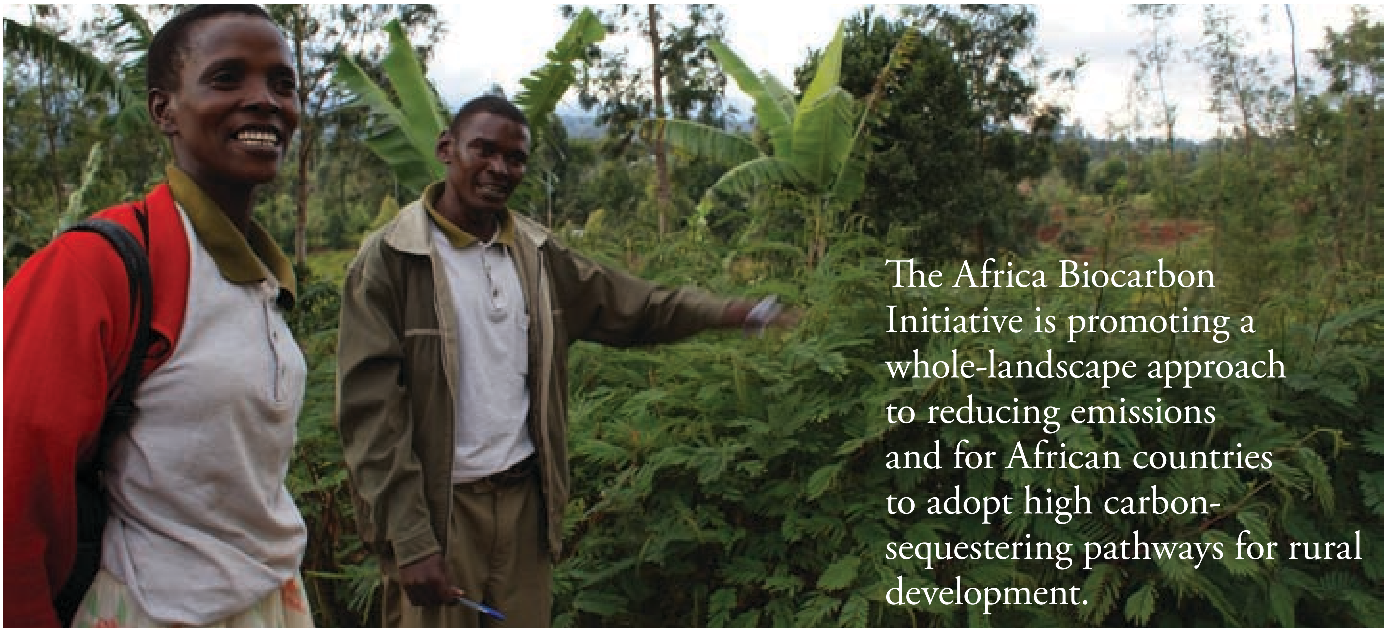
*Cameroon, Yaounde, drying cocoa on Christophe Nisse's farm.*

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*Trees planted for fodder for livestock on a farm near Mt. Kenya, have benefits for both climate change mitigation and adaptation.*

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The Africa Biocarbon Initiative was endorsed by the heads of state of the countries of East and Southern Africa in 2008, and launched at the UNFCCC meeting in Poznán, Poland. The Africa Biocarbon Initiative is being promoted by the Common Market for East and Southern Africa (COMESA), the East African Community (EAC) and the Southern African Development Community (SADC). The Government of Norway and the Rockefeller Foundation are providing financial support. The World Agroforestry Centre and partners are providing technical support.
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