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Carbon Market Watch

Using nature to pardon environmental pollution

Risks of agriculture sequestration carbon offsets

December 2015

Executive Summary

Agriculture supports the livelihoods of around a half of the world's population, but is at the same time a notable source of greenhouse gas emissions (GHGs) driving climate change. As of one the options to tackle emissions in the sector, governments have been discussing to include additional agricultural activities into the Clean Development Mechanism (CDM) under the United Nations Climate Change Convention (UNFCCC) since 2011. Whether agricultural activities should be eligible for carbon offsetting programmes is not only topical within discussions in the UNFCCC but also within certain regional cap-and-trade schemes and discussions to establish a market based mechanism for international aviation emissions, expected to be adopted in October 2016 under the auspices of the International Civil Aviation Organization (ICAO).

Progress on the subject has been continuously delayed as setting up an appropriate system of financially incentivising practices that sequester carbon in soils is subject to profuse challenges. Differences between the nature of land use emissions and fossil fuel emissions are at the source of the debate. Problems stemming from this difference include accounting difficulties, leakage risks, ensuring additionality of actions, problems with addressing the non-permanence of sequestration activities and disregard for co-benefits that provoke questions about the effectiveness of offsets for mitigation in the agricultural sector.

While it is of vital importance to address emissions from agriculture, it is important to note that agricultural activities are closely related to numerous elements, such as biodiversity, food production, local livelihoods, land rights and adaptation to climate change. The narrow focus of carbon offsetting programmes on the mitigation potential of agricultural activities, as well as the different characteristics of fossil and land use emissions, makes carbon offsetting an inappropriate tool to address emissions from agriculture.

Key recommendations to address emissions from the agricultural sector:

- **Address carbon sequestration projects outside of carbon markets** to effectively respond to the multiple objectives of the agricultural sector (i.e. food security, tenure rights, ensuring local livelihoods, emissions reductions).To achieve this, agriculture should largely be addressed under adaptation policies, such as National Adaptation Plans (NAPs). They are better tailored to tackle the complex challenges that climate change poses to farmlands. Where mitigation options are suitable, finance-based climate policy instruments, such as Nationally Appropriate Mitigation Actions (NAMAs) that focus on sustainable development benefits, should be used.

- Recognize the difference between land and energy sectors, specifically the **fundamental difference between biological carbon and fossil carbon** that leads to technical comparability issues in market systems including: determining additionality, MRV difficulties and most importantly accounting for non-permanence. CO_2 absorbed from trees and soils is rapidly reversed by natural processes (e.g. ageing forests) and human activities (e.g. ploughing land). Thus, sustainable land use activities must accompany, not replace, reductions in other sectors to ensure permanent emission reductions.

- **Promote co-benefits beyond emissions reductions for finance-based mitigation activities.** Solutions must go beyond cost effective GHG reduction by taking into account the well-being of the people (small-scale farmers, indigenous communities, etc.) and land behind the carbon permits. Specifically this means addressing:
    - **Social and economic co-benefits** through projects that support food security, food sovereignty and sustainable rural livelihoods
    - **Environmental co-benefits** to ensure the long term sustainability of farmland

- Recognize that addressing emissions from agriculture cannot be a one-dimensional discussion. Certain agricultural activities dealing with **non-CO_2 gases**, like methane and nitrous oxide, do not face the same challenges as soil carbon sequestration activities and can be tackled with holistic mitigation activities. Additionally, emissions must also be addressed through **demand side management** by reducing food waste and lowering meat consumption, the production of which is energetically inefficient and which can be a significant cause of CH_4 emissions as well as a driver for deforestation and other adverse land use changes.

Content

Introduction

Discussions whether carbon market initiatives – such as carbon offsetting programmes – are an appropriate tool to address emissions from agriculture has been under discussion by civil society, policy makers and other stakeholders over the past years. A large variety of arguments is being used to defend both sides, e.g. to include agriculture in carbon markets as well as to argue why agriculture emissions shall be ineligible for carbon offsetting programmes.

This paper provides an overview of challenges and risks of including agricultural emissions in carbon markets and aims to inform the ongoing discussion in particular with arguments relevant to activities related to CO_2 removals (carbon sequestration) from agricultural land, such as: conservation tillage, increased crop productivity (i.e., carbon inputs), control of soil water, and erosion reduction.

Generally, carbon sequestration activities give capacity back to soils and plants to remove CO_2 from the atmosphere and for it to be stored. These removals are easily reversed by tilling the land or cutting down trees and thus must be distinguished from permanently limiting emissions through cutting fossil fuel use. In other words, fossil fuels remaining stored in the ground have a negligible risk of contributing to global warming while soil and plant carbon is easily and rapidly re-emitted into the atmosphere. Experiences can be drawn from CO_2 removal projects in the forestry sector subject to similar problems that highlight why these types of land use projects should not be integrated into markets. While some agriculture activities have qualities that could allow for inclusion in markets (e.g. manure management, improvement of feed quality), **the scope of this paper is limited to the challenges of soil carbon sequestration activities used as offsetting projects in carbon markets.**

Background on policy frameworks for agriculture in carbon markets

Greenhouse gas (GHG) emissions in the agricultural sector are dominated by non-CO_2 gases, such as methane (CH_4) and nitrous oxide (N_2O) from crop and livestock production. Carbon dioxide (CO_2) emissions are mainly related to cultivation of organic soils, food production (e.g. energy, transport) and deforestation and land use changes driven by agriculture.

The role of agriculture in carbon markets has so far been fairly limited. Since 2009 parties have articulated strong support to move the agricultural sector higher on the agenda of the UNFCCC climate negotiations, though tensions over whether to address agriculture emissions via adaptation or via mitigation measures has been prevailing. While Negotiating Text of Ad Hoc Working Group on Long-Term Cooperative Action in 2009 acknowledged the importance of agriculture in many initiatives (Nationally Appropriate Mitigation Actions (NAMAs), Reducing Emissions from Deforestation and Forest Degradation (REDD+), Country's mitigation actions, cooperative sectoral approaches and sector specific actions, etc.),[1]the outcome of the Ad Hoc Working Group only addresses agriculture and food security related to action on adaptation.[2]

Since the sector holds much potential to reduce emissions through carbon sequestration[3], substantial political debate has revolved around its inclusion into carbon markets. Accounting for emissions from agriculture already exists in carbon markets on a voluntary basis. With a few exceptions, land use, land-use change and forestry (LULUCF) activities, which include CO_2 agricultural activities, are not accepted as eligible project activities under compliance markets.

Irrespective of these difficulties, the option to include additional LULUCF activities to the CDM has been discussed under the UNFCCC since 2011, backed by governments and businesses heavily invested in the voluntary offset market. Other viable initiatives, such as agroecology practices and Nationally Appropriate Mitigation Actions, have received less attention.

Outside the UNFCCC, agricultural emissions and offsets from LULUCF activities remain suspended from most emissions trading schemes (e.g. European Union and New Zealand's emissions trading schemes), but have long played a role in the voluntary carbon markets and are addressed through numerous initiatives targeting emission reductions within the agriculture sector.[4]

Agriculture in regulated carbon markets

Emissions from agriculture remain for the most part unregulated under the UNFCCC and the Kyoto Protocol. Annex I countries[5] need to account only for non-CO_2 emissions from agriculture. Activities or mechanisms which removeCO_2 from the atmosphere through 'sinks', are regulated under the so-called LULUCF policy framework. LULUCF is defined by UNFCCC as a "greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities."[6]The sector compels annual reporting on mitigation activities, however, Annex I Parties are only required to account for GHG emissions from the forestry sector.

Thus so far the only agriculture-related practices eligible for credits under the CDM are energy-related projects such as the production of alternative fuel sources (e.g. biogas) from agricultural residues and projects that capture methane from composting and manure.[7] On the other hand, soil carbon sequestration has so far been excluded from compliance markets under the UNFCCC framework.

The only eligible LULUCF activities under the CDM are afforestation and reforestation activities[8]. The reason why other activities are still ineligible is mostly due to major uncertainties in agriculture lands on how to measure and verify the amounts of sequestered carbon converted into carbon credits. Concerns also exist over risks of carbon leakage and non-permanence. Accordingly, there

is no coherent vision or set of rules in relation to agriculture and carbon markets under the UNFCCC.[9]

The option to add additional LULUCF activities to the CDM was proposed in 2011 at the 7th session of Conference of the Parties[10] and was still under discussion. In June 2014 at the SBSTA 40, discussions continued and narrowed down the consideration of the following possible additional activities in the CDM: revegetation, cropland management and grazing land management[11], wetland rewetting. While LDCs, Sahelian and West African countries expressed their views that additional activities would create opportunities for new mitigation projects in the relevant land-use categories, the European Union along with NGOs raised concerns over the danger of reversals.[12]A draft decision by the CDM Executive Board, originally intended for the Lima Conference of Parties in December 2014, on the feasibility of adding new land use projects into the CDM, will be presented at the SBSTA session in June 2016.

The European Union's Emissions Trading System (EU ETS) excludes both emissions from the agricultural sectors as well as offset credits from LULUCF activities. Countries that allow forestry offsets in their ETSs, like New Zealand and China in certain pilot programmes, are deemed unfit to be linked with the European system and criticized for weak rules (ex. both systems have no absolute caps)[13].

Nevertheless, proposals by a number of multilateral organisations, such as the World Bank and FAO, consultancies and private initiatives (PriceWaterhouse Coopers, Unique Forestry Consultants, Terra Global Capital, Climate Focus and EcoAgriculture Partners),[14] call for the expansion of the market mechanisms to include most land-use, including soil carbon sequestration mitigation activities, despite other policy tools being better suited to addressing emissions from this sector and despite already weak demand for credits. The enthusiasm of the private sector can be seen through activities undertaken in the voluntary carbon market to test new technologies and invest in new opportunities in the global south.

Agriculture in voluntary carbon markets

Despite the multiple methodologies for dealing with a number of essential issues, including MRV (Measurement, Reporting and Verification), permanence and leakage, the voluntary market has generated numerous mitigation projects and provides the main platform for trading credits from agriculture. In fact, forestry and land use, which includes agriculture, represent about 32% of transacted credits in voluntary market.[15]

Companies, NGOs and individuals participate in the voluntary markets for two overarching reasons according to the Global Climate Change Alliance[16]: early investments in climate actions with hopes of gaining a return in the future compliance market, and competitive advantage through corporate social responsibility branding.

There are many voluntary land-use and soil carbon initiatives in place or under development, which address carbon sequestration in farms and soils. They include The Global Research Alliance, The Global Alliance for Climate Smart Agriculture (GACSA), the Global Methane Initiative (GMI), The Climate and Clean Air Coalition and Joint Programming Initiative on Agriculture, Food Security and Climate Change. Many of these initiatives are backed by agribusiness corporations looking to improve their reputations by offsetting their emissions with mitigation projects elsewhere.

Voluntary agricultural projects have been lumped together under the name "Climate Smart Agriculture", which as defined by the FAO, "sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation) while enhancing the achievement of national food security and development goals." However, the term is so large it encompasses virtually any agricultural practice even potentially unsustainable ones which can compromise the future resilience of communities. Bread for the World and other NGOs recently supported an open letter[17]warming against climate smart agriculture, highlighting the lack environmental criteria and social safeguards as well as favouritism of the agendas of corporations and wealthy governments.

Voluntary markets are attractive as, unlike compliance markets, there are no uniform rules and regulations. While this allows for experimentation and fewer transaction costs, the lack of quality control has led to ineffective projects[18]. Carbon project accounting standards, country and region specific programs (e.g. the Verified Carbon

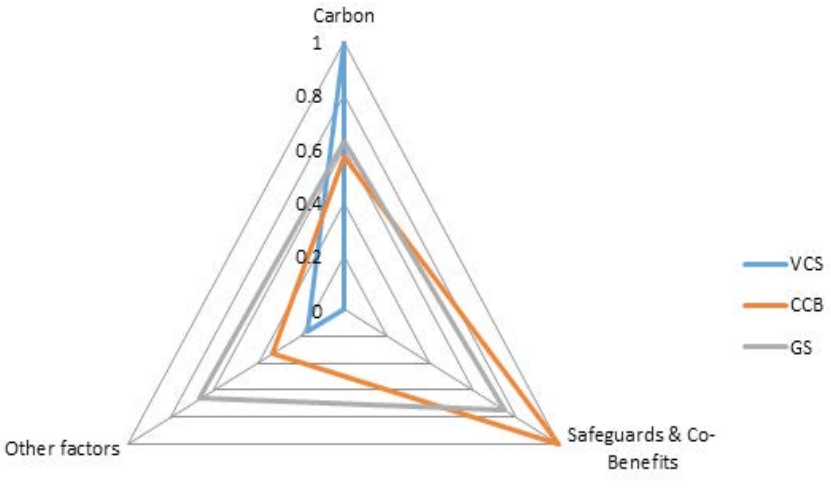

Figure 1: Voluntary market standards

Standard (VCS), Gold Standard (GS), and Climate, Community and Biodiversity Standards (CCB), etc.) provide differing levels of project verification that may lack environmental and social integrity.

For example, the Verified Carbon Standard does not evaluate social safeguards, local participation or co-benefits of projects[19], while Climate, Community and Biodiversity Standards leaves out evaluation of baseline approaches, leakage calculations and permanence guarantees[20]. The plethora of patchwork verification criteria leaves plenty of holes that can lead to reduced cost, and quality of their projects.

Challenges of carbon markets addressing agricultural emissions

The inclusion of agricultural activities in carbon markets has been controversial for over two decades. The principle nature of carbon markets primarily focuses on CO_2 benefits, while in agriculture carbon payment is relatively small in relation to other non-carbon benefits, particularly for small farmers. While technical problems make agricultural offsets difficult to implement, there are also environmental and social concerns that make it particularly challenging to address emissions from agriculture through an offsetting mechanism. Some of the central challenges are noted below.

Technical and Accounting Difficulties

Accounting and MRV cost and complexity

Measuring carbon captured in soils presents a major challenge. The amount of carbon sequestered varies greatly according to many factors such as soil type, location, climate, crop or vegetation, tillage practices and farm management. Thus, measuring and verifying the amounts converted into carbon credits is a highly uncertain process and developing systems for MRV of soil carbon is very costly. Effectiveness of emission trading programs is largely dependent on a robust MRV system. Measurement of agricultural carbon requires on-site measurement, indirect measurement from off-site tools and estimation using models or inferences, which can be challenging.[21] The uncertainties emerging with measurement of soil carbon also have significant implications for consumer confidence and the market. Providing the level of accuracy needed for legitimate carbon trading in agriculture is technically and financially unviable.[22]

Unlike carbon pricing in the forestry sector, enforcing market based mechanisms in agriculture is even more complex due to more numerous land practices, emissions from CO_2, CH_4 and N_2O, larger variability in cropping patterns in time and between actors, and consequently more uncertainty in measurement and monitoring.[23]Considering that measuring carbon stored in forests leaves space for error between ±50%[24]and ±1000%,[25] measuring carbon in agriculture leaves even higher risks of uncertainty, particularly in larger schemes of thousands of farmers. Due to the noted difficulties, the international climate regime does not yet include a coherent set of accounting rules for the sector and has instead encouraged the creation of a number of accounting frameworks (for example under programmes like Nationally Appropriate Mitigation Actions (NAMAs) or Reducing Emissions from Deforestation and Forest Degradation (REDD+)), which creates significant overlaps, tracking difficulties and thus risks of double counting.[26]

Non-permanence

Mitigation practices in agriculture distinguish between emissions reductions and soil sequestration. While the first is considered permanent, mitigation from soil sequestration is considered to only have a temporary climate mitigation benefit. Sequestration of carbon is non-permanent because there is always a high risk that the carbon stored in terrestrial vegetation can be released back into atmosphere as a result of certain human activities (e.g. ploughing, additional fertilizer application) or natural events.[27]Climate change is likely to bring upon even higher frequency of extreme weather events in the future, which can affect soil carbon storage.

Leakage

Concerns also emerge in relation to carbon leakage, which occurs where a certain activity causes intended effects beyond its boundaries. This can negatively lead to increased emissions outside the project boundaries. It can be manifested in such things as the forms of market impacts, people moving from place to place, ecological feedbacks.[28]For example, reducing the intensity of grazing on a parcel of land may result in the displacement of animals and farmers. Then, the displaced farmers may engage in those activities on land outside of the project area and the resulting carbon emissions are referred to as leakage.

Determining additionality

One of the main challenges of carbon offsetting is establishing additionally, and this is particularly complex for the land use sector. This requires the certainty that an implemented mitigation project would not have happened without the incentives of the financial support triggered by the offsetting project. However, for agricultural activities that are relying on a large variety of elements, such as food security, income generation etc. many agricultural activities that may receive carbon credits would have occurred anyway under a pre-existing program or practice, and may not go beyond 'business as usual" (BAU). Furthermore, there

is a potential risk that reductions may be double-counted or attributable to other environmental goals or programs.[29]Testing additionality of agricultural activity is complicated with studies suggesting that 20-70% of all CDM projects are non-additional.[30]

Social and Environmental Impacts

Lack of demand and feeble returns for farmers

Carbon projects take several years before they generate carbon credits, which makes it highly challenging to find investors to provide pre-finance to the management of the projects. The returns for farmers from carbon offsetting are thus very poor; For example, in a World Bank and SIDA-supported pilot project in Kenya, farmers earn between $5 and $1 per year.[31] With the amount of resources needed for scientists, field surveyors and consultants to inspect the carbon sink, this leaves little reimbursement for the smallholders.[32]

Aside from challenges for smallholders and local organizations to yield from carbon offsetting, the prices of carbon credits in agriculture are likely to be unsuited. The uncertainty related to the international offsetting scheme has dropped demand, meaning returns of offset projects will be insufficient to justify further investments. Continuing public investments in such offsetting projects disincentives investing in credible climate solutions like agroecology.

Risk of land grabbing

Including agriculture in carbon markets is likely to have particularly harmful effects for small and marginal farmers, whose lands are not big enough to sequester an amount of carbon that would be meaningful to sell and/or do not have formal tenure rights. Soil carbon projects require a larger 'carbon pool', which requires a great number of farmers to aggregate into a single scheme. This is also due to the capacity needed to cover upfront costs of a project by project developer. Such a move is likely to bring upon social conflicts, violation of land tenures and a possible shift in food production by giving up traditional crops in order to accumulate carbon sinks.[33]

An example of this is the use of so called "marginal lands", deemed unfit by authorities for industrial food production, by corporations for genetically modified (GM) monoculture projects[34]. Often these lands are vital for the livelihoods of marginalized communities, and companies looking to acquire land for new activities are displacing these populations. Particularly in countries, where property rights are uncertain and land titles uncommon, high transaction costs to organize projects are likely to create benefits only for those with formal land entitlements and exclude the farmers and communities with non-registered tenure rights.[35]With the absence of safeguards, projects like these are likely to affect lives and rights of local people and threaten the land entitlements of indigenous communities.

Disregard for co-benefits

The use of market mechanisms for land use is more problematic than for other sectors, because unlike factories, land has more environmental utility than just reducing or absorbing CO_2 emissions. Overconcentration on the issue of carbon can simplify the climate change discussion for agriculture and side line important issues like adaptation needs of small scale farmers, long term sustainability of farming practices and food sovereignty.

Additionally, environmental co-benefits like improved water quality and soil fertility can be neglected due to focusing on GHGs emission reductions. Industry and government promotion of market based solutions has forced other promising solutions like the use of agroecology techniques and NAMAs onto the backburner to be substituted for projects promoting chemical fertilizers and GM seeds as climate solutions with little regard for their environmental impacts.

Greenwashing and potential perverse incentives for agribusiness

With the high transaction costs needed to monitor carbon uptake, only large landowners or corporations can provide the financing necessary to organize offsetting projects and still benefit from economies of scale. With weak returns on credits and uncertainty of real emission abatement the question can be asked: who benefits?

Agro-industrial giants like Syngenta and Yara have shown interest in offsetting projects to promote their GM seeds and herbicides as climate solutions through increasing yields and soil quality. Yara has been publicizing the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) as a climate friendly project due to "Sustainable intensification"[36], meaning increasing the use of fertilizer (which leads to increased N_2O emissions) and pesticides to increase maize yields, which they assume avoids deforestation and the resulting GHG emissions. Proving the additionality between the project and avoided deforestation is not required or mentioned in SAGCOT reports.

The Kenya Agricultural Carbon Project, funded by Syngenta, relies on the use of the company's herbicides Sencor 480sc and

Velpa to decrease tilling of the land (an activity which releases carbon in the soil) and thus prevents GHG emissions. Success of these techniques is highly uncertain with sceptics questioning if carbon sequestered in soil is any greater than CO_2 released in the production of the agrochemicals used[37].Furthermore, the World Bank Environmental and Social Assessment (ESA) identifies increased pest and diseases as a result of the proposed practices[38]

While these companies stand to make a profit, farmers are driven towards monoculture agriculture and dependency on the seeds and herbicides of the company running the project, which can greatly weaken a farmer's adaptation capacity to climate related crop failures[39].

These projects are being paraded as "Climate Smart Agriculture", through voluntary initiatives, like the Global Alliance on Climate-Smart Agriculture (GACSA), supported by Agribusiness corporations. Created in 2014, GACSA has 87 members representing of which 20 countries as of April 2015. Within GACSA, the private sector is the second largest membership group after national governments, with over 70% coming from the fertilizer industry and agribusiness representing themselves several times through subsidiary companies[40]. There are no criteria for stakeholder engagement, the term "climate smart agriculture" is left undefined, and the alliance proposes no environmental criteria or social safeguards. The omission of these criteria is detrimental to producing sustainable projects and undermines the viability of agricultural offsets as a legitimate climate tool.

Principles for addressing agriculture emissions

Carbon mitigation projects in agriculture could in theory bring genuine benefits, as long as they would deliver long lasting environmental gains and related co-benefits. In order for GHG mitigation measures to have win-win outcomes for environment and communities, certain principles need to be respected.

Recognizing the difference between land and energy sectors

One of the difficulties of putting land use into a carbon market lies in the fundamental difference between biological carbon released from and absorbed in trees and soil, and fossil fuel carbon emitted in other sectors. Biological carbon and fossil fuel carbon are not comparable.Land use emissions operate on biological timescales and allow for rapid emissions and absorptions over years. Fossil carbon has been securely stored in geological formations for hundreds of millions of years and it takes thousands to millions of years for CO_2 in the atmosphere to be weathered back into rocks. Putting these emissions together is like comparing apples and pears, and burdensprojects with additional challenges, mentioned previously, like accounting problems, measurement difficulties and inter-annual variations of carbon.

Ensuring permanent emission reductions

As addressed in the UN framework, principle countries using markets for mitigation actions "must meet standards that deliver real, permanent, additional and verified mitigation outcomes".[41] However, there is a difference between increasing the capacity of the land to absorb emissions (sequestration) and reducing the amount of greenhouse gases emitted into the atmosphere. In other words, the sequestration process is used to reduce the level of greenhouse gases in the atmosphere, and works merely as a removal, not real emission reduction. On the other hand, non-CO_2 emissions, which present the majority of GHG emissions in this sector, have a potential of real and permanent emission reductions.[42]While emissions avoided are permanent, increasing soil capacity to sequester carbon can easily be reversed through ploughing, use of chemical fertilizers or extreme natural events.

Currently, rules on non-permanence in the CDM do not provide a full solution to this elemental issue.Thus, reversible soil carbon sequestration projects should be treated separatelyfrom activities that permanently reduce the amount of emission emitted. This way sequestration and emission reduction can work hand in hand to combat climate change instead of arguing over technical work around to make them compatible in a carbon market.

Keep land use separate from the other sectors

Because of the aforementioned problems of comparability - biological vs. fossil carbon, sequestration vs. real emission reduction and permanent vs. non-permanent activities - agriculture should contribute to tackling climate change but it should not displace efforts in the other sectors (e.g. energy, industry and transport), especially efforts to cut fossil fuel emissions. Agriculture, along with all other activities in the land use sector, should thus be distinguished from other sectors in the fight against climate change. This should be considered when fitting this sector's mitigation activities in climate policy. Compiled with technical issues, such as high MRV costs, data uncertainty and inter-annual variability an offsetting mechanism does not provide the easiest nor the most comprehensive option to properly address the needs of the sector.

Redefine objectives beyond carbon – protecting the people and land behind the permits

When reducing carbon is the name of the game (the game being carbon markets) other criteria fly out the window in the race for cost-effectiveness and profitability. This poses less of a problem when the playing field is power plants and industrial sites,

but when the pawns become local communities and their lands the game can have disastrous effects. Corporations cannot be allowed to dictate the futures of local farmers and their lands behind the guise of "fighting climate change".

Ensuring social and economic co-benefits

Considering that non-carbon benefits in agriculture are likely to be greater than the profit of carbon payments in the near future, project managers should shift focus from solely mitigation aspirations to social welfare of project activities, meaning measures outside of carbon markets such as sustainable agriculture programmes through National Adaptation Plans (NAPs) or finance-based solutions.[43] As noted, mitigation activities have a potential to bring upon adverse effects on local population and compromise their tenure rights. Given that offset projects are carried in developing countries where people principally prioritize food security, this should be taken in account when implementing activities. Mitigation measures should thus consider broader criteria, such as food production, sustainable development and human rights in order to provide sustainable rural livelihoods.

Ensuring environmental co-benefits

The use of mitigation measures should seek to incentivise broader environmental benefits (e.g. improved biodiversity, water quality, animal habitat and soil fertility) and not neglect them due to focusing on GHG emission reductions. In agriculture, it is also important to understand the relation of co-benefits to carbon markets. If agriculture offset markets become more developed, and projects are expanded and developed to reduce a maximum of CO_2 at minimal cost to gain profits, then achieving extra co-benefits (which equate to co-costs) will be avoided. As co-benefits like water quality and long-term soil health are important and sometimes outweigh carbon benefits, it makes far more sense to consider other policy instruments to sustainably deal with the sector.

Solutions outside of carbon markets

The UNFCCC was in part motivated by the threat of climate change to agriculture and food security, with developing countries being particularly vulnerable to extreme weather events affecting yields. Supporting the adaptation of agriculture production systems while reducing emissions must go hand in hand. Agro-ecological approaches fulfill this double aim by improving soil quality, insuring diversity of native seed varieties to deal with changing weather conditions and improving yields[44]. Additionally, these practices implement a rights-based approach, develop food democracy and strengthen small-scale farming through systems that sustain yields and optimize the use of local resources while minimizing the negative environmental and socio-economic impacts of modern technologies[45]. This holistic approach, useful for both developed and developing countries, is being overshadowed by the profit-driven interests of private sector. Governments and NGOs should promote these adaptation practices for the long term sustainability of farming systems.

It should be noted that certain agricultural activities, like limiting fertilizer use and improved feed quality, may be properly addressed under crediting mechanisms as they are not subject to the same difficulties, such as non-permanence, as the actions addressed in this paper.Generally speaking, as agriculture must meet many objectives beyond emissions reduction such as providing food security and maintaining local livelihoods, adaptation policies should be considered first and foremost to ensure the prosperity of communities, deep transformation of local infrastructure and sustainable management of farmlands. National Adaptation Plans work toward this aim and remain a viable option for addressing agricultural emissions.

Alternatively, mitigation actions that do not leave the risk for sequestration activities to replace fossil fuel reduction can be found in finance-based solutions. Nationally Appropriate Mitigation Actions, or NAMAs, are a potential option. They are based on voluntary mitigation activities, implemented by developing countries, that are not tied to credits. Such an activity represents a great potential for mitigation action as they move away from the traditional offsetting and focus only on developing countries' own contribution to CO_2 reduction.

To round off the discussion on effectively tackling emissions from agriculture, solutions should be widened to tackle demand side problems. Supply chains need to be made efficient in avoiding food waste, including through not throwing away substandard goods, through not oversupplying markets, and through consumers being better managers of their food. The necessary behavioural changes to improve consumption patterns could be achieved through programmes on how to menu plan and use leftovers.

Conclusion

The issue of the inclusion of agricultural activities in carbon markets is an ongoing discussion in international climate policy negotiations. Understanding the negative consequences of creating credits from these activities, highlighted by several corporate-run projects with questionable outcomes, should encourage the move away from offsetting towards more sustainable solutions. The scientifically incompatible characteristics of fossil and biological carbon, which have carbon cycles operating on different timescales are the core of the problem. Technical obstacles such as problems accounting for non-permanence, implementing effective MRV systems, preventing leakage and proving additionality make that carbon sequestration projects are not appropriate for use as an offset. However, it should be noted that non-CO_2 agricultural activities, such as manure management, may be considered as they are not subject to the same challenges as soil sequestration (along with the exception of peatland rewetting).

Actions to reduce emission from agriculture must ensure verifiable emissions reductions, consider environmental and social impacts and take into account the specificities of the sector. For actions that consider the long-term economic and environmental prosperity of local agricultural communities, adaptation option are generally better suited for agriculture. Options are already available. NAPs work to turn local communities struggling against the effects of climate change into resilient and sustainable communities capable of realizing resource management as well as ensuring food security.

Additionally, mitigation options exist that avoid the compatibility problem of combining fossil and terrestrial carbon in the form of finance-based solutions. NAMAs represent a great potential as they contribute to domestic sustainable development on voluntary basis in form of programs, standards, policies, regulation, financial incentives or project-level actions. As NAMA projects emerge from local needs, numerous developing countries show interest in implementing NAMAs in agriculture. They offer an encouraging opportunity to create a new framework and develop best practice guidelines for developing country participation in global climate change mitigation.

Finally, it must not be forgotten that reductions from agriculture cannot be solved through policy mechanisms alone and must also be addressed from the demand side to effectively combat climate change.

Discussions on the incorporation of agriculture in carbon markets on UNFCCC level, specifically concerning the possible addition of agricultural activities in the CDM, have been stalled back by lack of demand for CDM credits and the real fear that adding land use activities in market based approaches will allow continued fossil fuel emissions to be offset by non-permanent sequestration activities. Such a decision would prevent real emission reductions and in turn compromise the effort to limit global warming under 1.5° Celsius. Updates on this SBSTA item have repeatedly been pushed back with the next report, delayed from Lima, to be presented in Paris at COP21 in December.In light of these continual setbacks, other viable solutions must be considered that provide real emission reductions, ensure environmental integrity, food security and overall enrich the livelihoods of rural populations.

Key recommendations to address emissions from the agricultural sector:

- **Address carbon sequestration projects outside of carbon markets** to effectively respond to the multiple objectives of the agricultural sector (i.e. food security, tenure rights, ensuring local livelihoods, emissions reductions).To achieve this, agriculture should largely be addressed under adaptation policies, such as National Adaptation Plans (NAPs). They are better tailored to tackle the complex challenges that climate change poses to farmlands. Where mitigation options are suitable, finance-based climate policy instruments, such as Nationally Appropriate Mitigation Actions (NAMAs) that focus on sustainable development benefits, should be used.

- Recognize the difference between land and energy sectors, specifically the **fundamental difference between biological carbon and fossil carbon** that leads to technical comparability issues in market systems including: determining additionality, MRV difficulties and most importantly accounting for non-permanence. CO_2 absorbed from trees and soils is rapidly reversed by natural processes (e.g. ageing forests) and human activities (e.g. ploughing land). Thus, sustainable land use activities must accompany, not replace, reductions in other sectors to ensure permanent emission reductions.

- **Promote co-benefits beyond emissions reductions for finance-based mitigation activities.** Solutions must go beyond cost effective GHG reduction by taking into account the well-being of the people (small-scale farmers, indigenous communities, etc.) and land behind the carbon permits. Specifically this means addressing:

    - **Social and economic co-benefits** through projects that support food security, food sovereignty and sustainable rural livelihoods
    - **Environmental co-benefits** to ensure the long term sustainability of farmland

- Recognize that addressing emissions from agriculture cannot be a one-dimensional discussion. Certain agricultural activities dealing with **non-CO_2 gases**, like methane and nitrous oxide, do not face the same challenges as soil carbon sequestration activities and can be tackled with holistic mitigation activities. Additionally, emissions must also be addressed also through **demand side management** by reducing food waste and lowering meat consumption, the production of which is energetically inefficient and which can be a significant cause of CH_4 emissions as well as a driver for deforestation and other adverse land use changes.

1. http://unfccc.int/resource/docs/2009/awglca6/eng/08.pdf
2. http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf
3. According to the IPPC AR4, total mitigation potentials for the AFOLU sector are estimated to be ~3 to ~7.2 GtCO2eq/yr up to 2030. Of the total technical mitigation potentials, about 89% is from soil carbon sequestration.
4. Agricultural carbon markets: Opportunities and challenges for Sub-Saharan Africa
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