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# Agricultural Offsets in GHG Trading: What, How and Why

Sara Hessenflow Harper, The Clark Group, LLC

## Introduction

This paper provides an overview of the agriculture sector's ability to provide offset tonnes for greenhouse gas (GHG) reductions and/or soil carbon sequestration from the United States and internationally.

My first encounter with the international controversy surrounding the issue of agricultural and forestry offsets came when I was a US Senate staffer observing the Sixth Conference of the Parties in The Hague. As we entered the meeting, members of Greenpeace unfurled a huge banner proclaiming, "Don't Sink the Treaty". It was clear at that point that sinks were to become the most criticised form of offsets.

The criticisms of sinks at that time were much the same as they are today. First, there is the fear that such reductions or sequestrations would not be real, verifiable and additional, and thus could be used to exceed the cap. Second, many environmental advocacy groups believe that only a high carbon price will encourage the rapid deployment of low or zero carbon emitting technology sufficient to stabilise the concentration of GHGs in the atmosphere. Notwithstanding the impact that such a price may have on economies, they believe that offsets such as sinks forestall a move to those technologies. Finally, there is an undercurrent of desire by many environmental nongovernmental organisations to force industry to be accountable for their emissions and to use the climate issue to end the use of coal and oil. Sinks would play a part in allowing a future for such fuels because emitters could offset the emissions from the use of fossil fuels by purchasing reductions or sequestration from the agriculture sector (and other uncapped sectors, domestically or internationally).

Some of these criticisms are worthy of concern and are able to be addressed. However, many of environmental advocacy groups have failed to see the immense promise of agricultural offsets, and instead of tackling the potential concerns with good policy options, they have used these concerns to build a barrier against them.

The bottom line is that the world has an immense challenge in front of it and needs to use all the tools available. Getting GHG reductions and sequestration from a sector that otherwise would remain uncapped through a market approach is a tool that the we cannot afford to ignore.

This article will provide an overview of the agricultural offsets issue by first looking at many different ways in which the agriculture sector can reduce GHG emissions or sequester them in soils and forests. Second, it will examine how quality controls can ensure that agricultural offsets represent real reductions. Finally, it will examine the potential role for agricultural offsets in an international trading platform.

## Creating Quality Offsets –Environmental Integrity as a Value-Added Component of the Carbon Crop

According to the US Environmental Protection Agency's 2005 report, Greenhouse Gas Mitigation Potential in US Forestry and Agriculture, the United States' farms and forests currently offset approximately 12% of GHG emissions from all sources in the US, representing 830 terragrams (Tg) of $CO_2$ equivalent. That same report notes that the potential for even greater amounts of avoided emissions and soil sequestration of $CO_2$ is significant:

*"Total national mitigation annually is estimated to average almost 630 Tg $CO_2$/yr (170 Tg C) in the first decade and 655 Tg $CO_2$/yr (180 Tg C) by 2025, under one of the moderate GHG prices considered (\$15 t/$CO_2$e, or \$55/t C, remaining constant over time). Mitigation then declines to about 85 Tg $CO_2$/yr (23 Tg C) by 2055."*[1]

## Types of Offsets

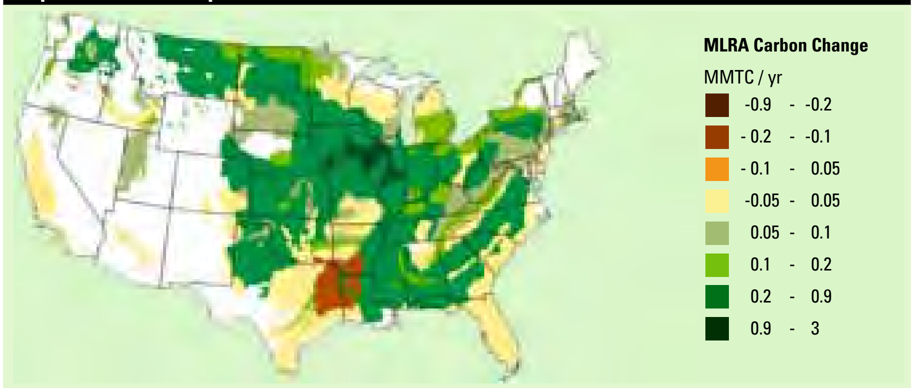
There are numerous ways in which agriculture can provide GHG reductions. These activities fall into one of two basic categories: soil carbon sequestration, or "sinks", and reduced/avoided GHG emissions.

### Soil Carbon Sequestration

Soil carbon sequestration is something that every plant does naturally just by living. Plants take in $CO_2$ and release oxygen. As the plant grows, the $CO_2$ is converted into carbon and stored in the plant matter and, most importantly for our purposes, in the root systems. When a plant dies, the upper part may decay and the carbon returns to the atmosphere. However, the roots left behind trap the carbon, adding crit-

[1] US Environmental Protection Agency. November 2005. Greenhouse Gas Mitigation Potential in US Forestry and Agriculture.

**Map 1: Soil Carbon Sequestration Potential**




ically important Soil Organic Compound (SOC) which increases soil fertility. In conventional agriculture, the carbon gets re-released during tillage, which is used to prepare the field for the next crop. If farmers apply conservation tillage or no-till practises, they simply drill down through the previous year's growth and plant the seed directly in the soil without full tillage; thus, the carbon stored from the previous year's plants remains in the soil and the soil accumulates more carbon with the growth of the new plants.

Soil carbon sequestration also occurs with the planting of perennial grasses such as switchgrass. Since these grasses can have an underground root system of six feet or more, the amount of carbon they can sequester is enormous. Current measurement of switchgrass carbon gains has found an increase of two to three tonnes of carbon per acre per year.

Other methods of soil sequestration include the practise of growing cover crops and decisions made on crop type and crop rotation (some crop varieties grow longer root systems and, therefore, are better than others at storing carbon).

## Reduced/Avoided GHG Emissions

The second major way for the agriculture sector to create emissions offsets is through reducing or avoiding emissions that would otherwise occur because agriculture is not a capped sector (and not anticipated to become one in either the US or most international systems). Some of the most promising emission reductions can come from capturing methane emissions from livestock manure. Since methane is 21-23 times more potent than $CO_2$, each tonne of methane avoided can yield significant return to the atmosphere and the livestock producer. This process is usually achieved by putting the manure through an anaerobic digester. The resulting biogas can either be burned off by flaring or it can be used to generate electrical power as a natural gas substitute. Another method is adding special additives to livestock feed which help the animals to digest their food more efficiently and thereby reduce enteric methane emissions. Yet another method entails reducing the amount of nitrogen applied to fields through precision agriculture techniques, thereby reducing $N_2O$ emissions, which are over 300 times more potent than $CO_2$ in global warming potential.

It's important to note the significant potential for GHG reductions that carbon offsets from agriculture could provide. It has been estimated that 20-40% of current US emissions could be offset by agricultural soil sequestration alone. Map 1 illustrates the potential for soil carbon sequestration on cropland in the US "(up to a total of 21.2 Mt $CO_2$e/yr)", with the green and dark green areas indicating the highest carbon potential.[2] The US Department of Agriculture forecasts the amount of carbon sequestered by US agriculture will nearly double from current levels in the next five years, which "would add 11 Mt $CO_2$e."[3] This additional uptake is expected through improved soil management (~60%), improved manure and nutrient management (~30%), and additional land-retirement (~10%). Such gains are due to a potential alignment of the multiple benefits that good conservation practises can inspire. If there were a carbon price, such gains would be expected to grow far past this projection.

## Quality Assurance

As we have seen, the potential for reductions from the agricultural and forestry sectors is significant. But that potential can only be realised if a system can be devised to: accurately measure, monitor and verify offset projects that are additional; account for leakage; and deal with concerns about potential impermanence. The outline for such a system has been put forward by Duke University's Nicholas Institute for Environmental Solutions in their work "Harnessing Farms and Forests in the Low Carbon Economy". This manual, commonly referred to as the "Duke Standard", outlines and provides answers to some of the most difficult agriculture and forest sequestration measurement questions. It is worth noting that the authors and advisory committee members of this effort include top soil scientists and agriculture economists from across the US.

The scientific consensus that has emerged with this work, demonstrates that even though the issues surrounding agriculture and forestry offsets are complex, they are also man-

[2] Parton et al. 1994. National Estimate of Carbon Sequestration using the CENTURY Model.

[3] Congressional Research Service. 6 Mar 2007. Climate Change: The Role of the US Agriculture Sector.

ageable. Through sound project development, formulas to be applied for fully accounting for additionality and leakage, and suggestions for how to manage the permanence issue, the Duke Standard lays out a very strong path for answering the concerns that have long plagued the agricultural offsets issue.

For example, the Duke Standard lays out the concept of proportional additionality whereby an entire type of emission reduction activity is evaluated for how extensively it is currently being practised in a given region. So, for example, if no-till conservation were being continuously practised in a given region, a discount rate would be applied to all agricultural offset projects coming from that region which would reflect an increase above business-as-usual in that type of emission reduction in that specific region. In this way, a system can move beyond project- specific additionality determination and instead apply a more top-down approach to crediting across an entire emission reduction project type.

Similarly, on the leakage issue, an analysis would be done by project type, and a discount factor applied to all projects of that type in a given region to account for leakage.

With regard to permanence, Duke and others have suggested the concept of a "buffer pool" of GHG reductions, or carbon tonnes sequestered, that would be created by requiring that projects contribute some fraction of their issued credits into the pool. The pool would be used to replace tonnes from projects where the emission reductions were not permanent. Also, there has been discussion of providing an insurance product that is specific to offsets generated by sinks. An insurance product would assess the impermanence risk of each offset type and provide the means to compensate a buyer if emission reductions were not permanent.

Many of the principles laid out in this work were adopted as legislative language in the climate bill put forward by Senators Lieberman and Warner in the US. Although this bill did not pass, the original draft provides a good first draft for the US and possibly the world, as a way to go about putting a quality agriculture and forestry offset system in place that still retains the flexibility to attract offset project developers.

## Conclusion

As we have seen, there is strong potential for agriculture and forestry offsets in the carbon market. For the first time, farmers and foresters can view environmental services as a positive gain for their business rather than just another cost added to them. Done properly, this tool can provide a lower cost means of reducing GHG emissions, an incentive for rural constituents to see value in a climate cap-and-trade system, and a new market revenue stream for the world's farmers and foresters.

**The Clark Group**
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