

## Opportunities for Agriculture to Offset Climate Change

### Key Points:

- Agriculture can provide readily available and low-cost solutions for beneficial near-term greenhouse gas reductions.
- Agriculture can help to solve the challenge of climate change while producing revenue for its services under a cap-and-trade carbon market.



Direct Seed/No-Till



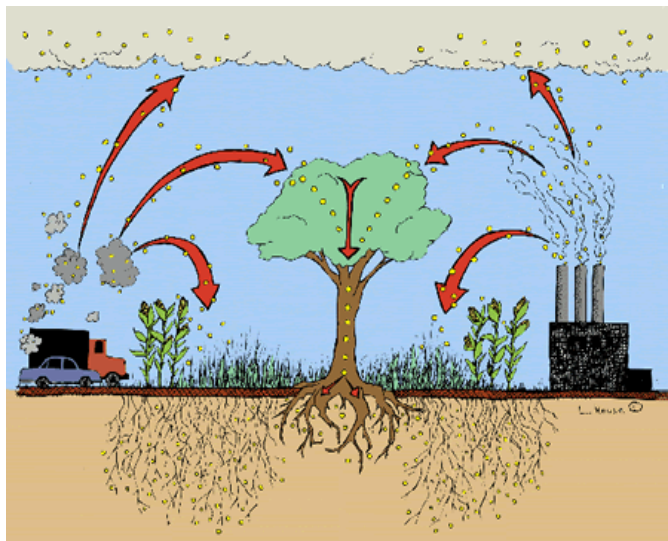
Switchgrass



Manure Methane Capture

### Agricultural practices can reduce or offset greenhouse gases.

**OFFSETTING CARBON EMISSIONS.** The process by which carbon “sinks” remove or “offset” emissions of carbon dioxide (a primary greenhouse gas or GHG) from the atmosphere is known as carbon sequestration. Plants take up carbon dioxide and give off oxygen. In this process, they store carbon in plant matter and in the soil through their roots.



However, much of the carbon stored in the soil is released when farmers plow up the field to plant a crop. If farmers were to use direct seeding or no-till practices, they would store that carbon in the soil through “soil carbon sequestration”. Increasing vegetation, through the use of buffer areas and reforestation, also increases the amount of carbon captured in the soil.

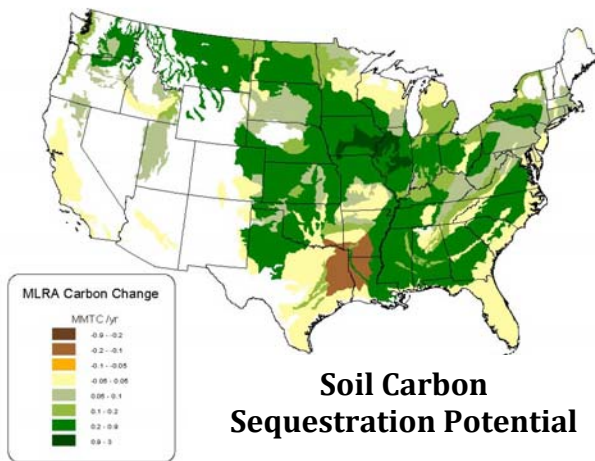
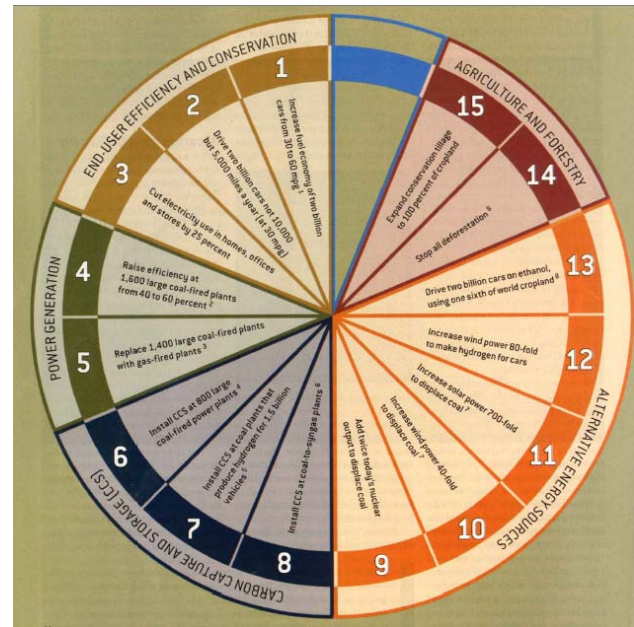
Practices like this – which have the ability to literally take CO<sub>2</sub> out of the atmosphere and sink it into soils and

vegetation – also create better soil fertility, water quality, water retention and greater wildlife habitat.

**REDUCING CARBON EMISSIONS.** In addition to soil carbon sequestration, opportunities exist for agriculture to reduce emissions even though *as an uncapped sector, agriculture will not be required to make these reductions*. For example, livestock operations that capture the methane from manure could generate significant offset credits to sell on the climate market. Methane is 21-23 times more potent in terms of climate change than CO<sub>2</sub>, so when livestock producers either flare it or convert the manure into biogas (a potential substitute for natural gas) for electricity generation or as a form of low-carbon energy, they are converting methane into CO<sub>2</sub>. While this is still a GHG emission, it is much less potent than methane, and therefore is treated as a reduction. These practices are just some of the many ways that the agriculture and livestock industries could qualify as GHG emissions reduction or sequestration providers.

**Agriculture has a key role in reducing atmospheric carbon.**

Agriculture and forestry have a critical role in stabilizing carbon emissions. The graph at the right illustrates the range of approaches and technologies that could be used to limit the amount of carbon in the atmosphere.<sup>1</sup> Each “*de-carbonizing wedge*” represents 25 billion tons of carbon avoided or reduced over 50 years and 7 wedges are needed to stabilize carbon emissions.<sup>2</sup> Under this scenario, agriculture and forestry could account for up to 30% of the total reductions needed to stabilize atmospheric carbon. Agriculture presents a low-cost, readily available source of beneficial near-term GHG reduction.



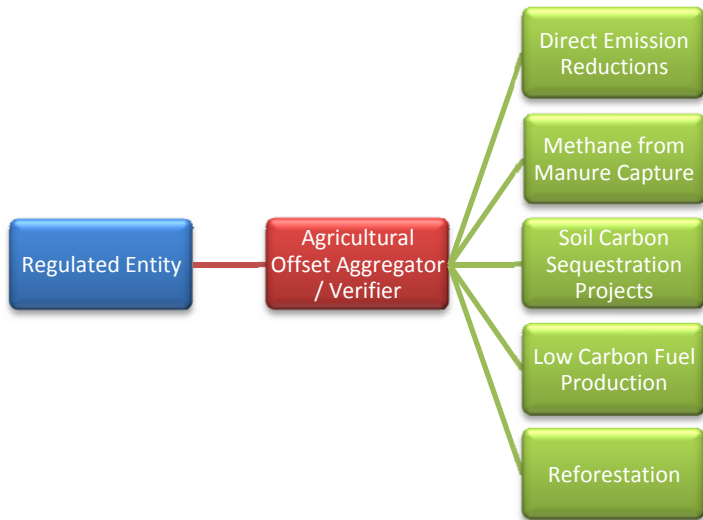
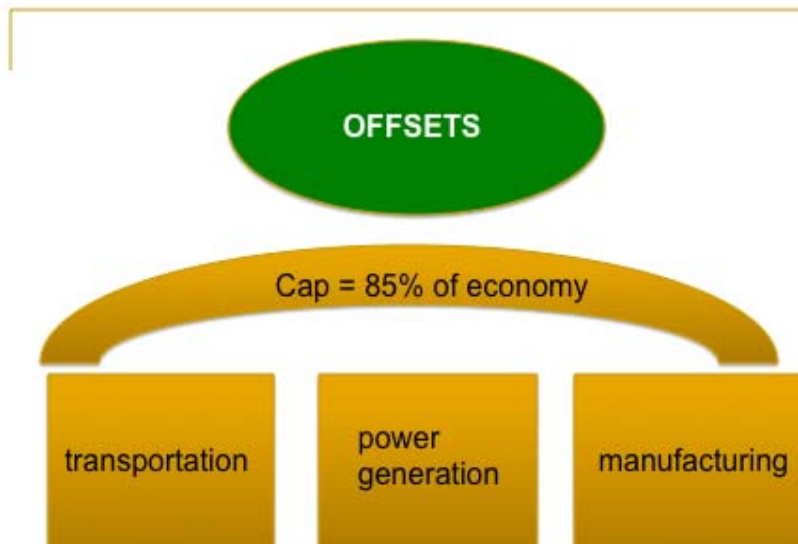
It has been estimated that 20% to 40% of targeted GHG emissions reductions in the United States could be met by agricultural soil sequestration alone. The map at the left illustrates the potential for soil carbon sequestration on cropland in the United States (up to a total of 21.2 MMTCE/yr), with green indicating areas with the highest carbon potential.<sup>3</sup>

USDA forecasts the amount of carbon sequestered by US agriculture will nearly double from current levels in the next five

years (adding 11 MMTCE).<sup>4</sup> This additional uptake is expected through improved soil management (~60%), improved manure and nutrient management (~30%), and additional land-retirement (~10%).<sup>5</sup>

**Agriculture could sell carbon credits under a cap and trade market.**

Congress is considering adopting policies that would cap greenhouse gas emissions and allow agricultural offsets to be purchased (cap and trade). Under a cap and trade market, agriculture could sell “credits” and generate additional revenue from emissions offsets which would be purchased by industry required to reduce their emission levels. One carbon credit would equal one metric ton of carbon dioxide, and the cost of such a credit would be determined by the market. These credits would be created by sequestering and reducing carbon or other GHG emissions. Other policies such as a carbon tax would not generate any markets for agriculture.



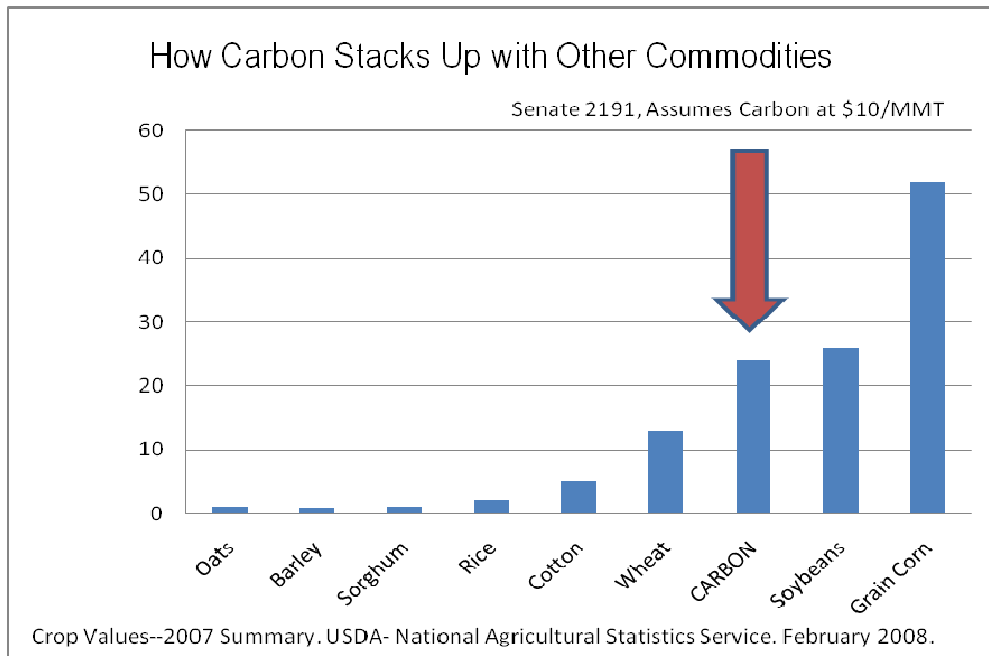
As discussed, there are many different ways in which agricultural practices can offset or avoid GHG emissions. Companies, under a cap and trade policy, will likely want to buy a bulk amount of GHG tons and will not want to make several hundred contracts with individual farmers. This means there will be a new market for carbon “aggregators”. These entities – such as local farm associations or cooperatives – would be responsible for bundling the carbon and verifying that the reductions are actually occurring.



**Agriculture could generate revenue in a carbon economy.**

When a mandatory cap and trade policy is adopted, the producer’s ability to benefit from the GHG reductions they create will depend primarily on the how much market share is allowed by the law, the market price of carbon, measurement costs and the efficiency of farm-based sequestration and emissions reductions aggregators. Estimates put the value of agricultural offsets at potentially \$24 billion annually.<sup>6</sup>

To put the agricultural offset market’s value in context, the chart below shows how carbon would rank economically as a crop. Keep in mind that carbon can be stored and other GHG emissions can be reduced on working lands – so it is not a matter of deciding to grow carbon OR corn – both “crops” can be grown at once on the same land.



With a Democratic Congress in place and President Obama’s stated policy to address climate change, the coming months are expected to see an uptick in legislative activity on the climate issue. The Senate is likely to include agricultural offsets in any new cap-and-trade legislation similar to the Climate Security Act introduced by Senators Lieberman (D-CN) and Warner (former R-VA) during the last Congress. The Lieberman-Warner bill (S.2191) included offset provisions (15% domestic / 15% international) that would have created market incentives for farmers and foresters to offset carbon emissions. Department of Energy economic modeling estimated the cumulative value through 2030 of the provisions in the legislation at **over \$330 billion for all categories of offsets**, with an **additional \$110 billion allowance** set-aside for USDA to create a carbon conservation program.<sup>6</sup>

However, these agricultural offset provisions are not assured. The House of Representatives is likely to take a more aggressive stance on climate change under the leadership of liberal Democrats such as Henry Waxman (D-CA), the new Chair of the House

Energy and Commerce Committee. Some legislators and environmental groups fear that offsets will merely become a means to “bust the cap” or allow GHG emissions over the level permitted by law; without environmental integrity in the offsets market, this could happen. However, there are multiple ways of ensuring that a reduction or sequestration made outside of the capped sector is a real and additional reduction or sequestration.

Between offsets from the market and emission allowance income funding the government conservation program for carbon friendly practices, the agriculture industry could earn billions of dollars annually for conservation and waste management practices. Agriculture’s involvement in the carbon market may not only generate income and revenue for national and state programs, but also for local farmers and communities.



Laura Sands  
Sara Hessenflow Harper  
Sara Brodnax

The Clark Group, LLC  
(202) 544-8200  
[www.clarkgroupllc.com](http://www.clarkgroupllc.com)

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<sup>1</sup> R. Socolow and S. Pacala. 13 Aug 2004. “Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies.” *Science*, Vol. 305. Graphic from “A Plan to Keep Carbon in Check” by same authors in *Scientific American*, Sep 2006, Vol. 295, Issue 3.

<sup>2</sup> Ibid.

<sup>3</sup> Parton et al. 1994. *National Estimate of Carbon Sequestration using the CENTURY Model*.

<sup>4</sup> Congressional Research Service. 6 Mar 2007. *Climate Change: The Role of the U.S. Agriculture Sector*.

<sup>5</sup> Ibid.

<sup>6</sup> Energy Information Administration. *S.2191: America’s Climate Security Act*. National Energy Modeling System (NEMS).