Unearthered: Agricultural Emissions in the Corporate Supply Chain

Findings from the CDP 2011 U.S. Agriculture Supply Chain Pilot
Foreword

My history with Agriculture goes back more than twenty years to when I led some of the most complex environmental negotiations in California as they continue to address decades of water wars in the West. With their hands in the dirt everyday, many of the farmers would be considered the original conservationists and environmentalists. They knew how and when to till, harvest, let land lay fallow and most understood how weather conditions affect their every activity.

The American farmer’s resolve will be tested further in coming years as the global agricultural landscape expands and contracts. Market pressures are demanding increases in productivity; at the same time farming inputs such as water, energy and stable growing seasons are becoming more scarce, expensive and volatile. At The Sustainability Consortium, we consider a changing climate an important consideration in developing a measurement and reporting system that enables sustaining viable agricultural systems for future generations.

No economic players will feel the effects of dynamic climate shifts earlier or more severely than farmers. Sustaining environmental and social resources in a changing global climate requires leadership from across multiple sectors and it requires flexible systems that can adapt over time. In order to mitigate the effects of climate change, biodiversity shifts and water scarcity on our food supply and avoid the most dire scenarios, U.S. agriculture has an important role to play. Critical to this role is the measurement, understanding and reduction of our own greenhouse gas emissions (GHGs).

The upsides for the industry in heeding this call to action are many. The most immediate is financial. As a measurement primarily of fuel, fertilizer and electricity use, emissions represent direct costs to the farmer. Farming practices that lower the emissions per unit of yield improve profitability. Identifying, developing and sharing these innovations requires measurement and reporting structures to be in place. The predictable capacity to measure and harmonization of the metrics system can only benefit growers and processors in answering the increasing number of calls from buyers, consumers and regulators for data related to their environmental impacts.

It should not be expected that farmers alone shoulder the burden of measuring and improving their sustainability performance. Agricultural suppliers, food brands, processors, retailers, and end-of-life management organizations have much to gain from the agricultural community taking a leadership role in the stewardship of the environment. All elements of the value chain must contribute in providing technical support and a substantive set of incentives to farmers that encourage and improve the reporting and management of GHGs, water quality and quantity and other environmental impacts.

This report examines the findings of a pilot facilitated by the Carbon Disclosure Project to test the capacity of the agricultural supply chain to report GHG information. The pilot is an important step in identifying the barriers and the opportunities for wider adoption of measurement and reporting across the agricultural sector. I think the findings of the project are invaluable to the agricultural industry – there are some very good practices already in place, but there is much work left to do. As you review the recommendations, I encourage you to keep in mind that as the imperative for action has increased, so too has the capacity of industry to respond. With increased transparency, better measurement tools and sophisticated information technology platforms to access data, we are embarking on exciting times to collaborate and find innovative solutions. It is time to elevate our level of dialogue, access and action to support responsible food production in our country and this report is a solid beginning.

Bonnie Nixon
Executive Director

Carbon Disclosure Project 2011
Agriculture will be among the sectors first and most significantly impacted by climate change. The earth’s climate is changing, as increasing concentrations of greenhouse gasses (GHGs) trap more of the sun’s heat in the atmosphere. The changes that unfold during the coming decades will vary by region, but average temperatures and frequency of heat waves will likely increase, as will extreme weather events such as storms, floods and droughts.

In the longer term, changing temperatures and rainfall patterns are forecast to reduce global yields. Rising commodity prices will spike further as yields in some regions are depressed by climate change, causing detrimental impacts along the entire food value chain, from farmers through to consumers. Producers will likely see their profit margins further threatened in the long term by higher costs of inputs, such as fertilizers and fuel, and increased volatility in growing conditions.

But agriculture is not only affected by the negative impacts of climate change; it is also a major contributor. Globally, agriculture contributes to approximately 14% of GHG emissions. Roughly 8% of GHG emissions in the United States are produced by agricultural activities; this is comparable to the total national emissions of Spain, France or Italy.

How can the agricultural sector put itself in a leadership position in mitigating the risks associated with climate change? The first step is to measure its emissions to understand the specific sources and begin to formulate a plan for reduction.

GHG emissions are only one indicator of sustainability performance, but they can also serve as a proxy for efficiency in use of fertilizer, energy, agro-chemicals and other materials use. Although varying by region and commodity, the vast majority of emissions from agricultural products – up to 80% or more based on some studies – occur before products leave the farm gate.

Beginning in late 2010, the Carbon Disclosure Project (CDP) conducted a pilot with leading agricultural CDP Supply Chain members, aiming to engage their U.S. suppliers of tomatoes and potatoes, to gauge their capacity to report on GHGs and to identify areas of successful emissions management. The wide variety of responses to the CDP pilot questionnaire is eye-opening; some growers have been systematically reducing emissions using sustainable farming practices for over a decade, while others doubt both the causes and the urgency of climate change.

CDP’s work demonstrates that while corporate customers have ambitious, publicly-stated sustainable agriculture goals, in order to fulfill the emissions reduction and risk mitigation ambitions of the sector, much more needs to be done to overcome barriers to emissions reporting at the farm level.

As the first major sector of the economy that will be seriously affected by climate change, the U.S. food and agriculture industry needs to take a leadership role in addressing it. In order to move to a world of lower-emissions agriculture, a variety of stakeholders must be engaged. Demands for information from consumers and investors, short-term incentives for growers to take the first and hardest steps, and transparency up and down the value chain will aid in delivery of ambitious emissions reduction goals. Agriculture needs to lead the way and deliver on these goals alongside other sectors of the U.S. economy and the world. CDP can help provide the platform for reporting of emissions and a forum for the sharing of best practices. But it is up to the growers, processors and food distributors to make the big changes that can significantly lower emissions and help protect the agricultural supply chain upon which all of humanity depends.
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Farmers know weather, and they know that the weather patterns that they depend on for productive yields are becoming more volatile. As the atmosphere fills with more heat-trapping greenhouse gasses (GHGs) such as carbon dioxide (CO$_2$), methane (CH$_4$) and nitrous oxide (N$_2$O), the effect will make weather less predictable, increasing both the financial risk to the farmers and the reliability in supply of food and fiber.

The impact of these changes will vary across different regions, but will include longer and more severe heat waves, stronger and more frequent hurricanes, desertification in some areas, and flooding in others (see Figure 1). No sector of the world economy will be affected earlier and more dramatically by climate change than agriculture.

In the short term, especially in colder areas in the northern latitudes, warmer temperatures and increased carbon dioxide availability may actually increase yields. However if current trends continue, by the middle of this century, crop yields will fall significantly – by 20-30% or more in many parts of the world, including most of the world’s current top producing regions – according to a recent World Bank analysis (Figure 2).

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Trend</th>
<th>Expected Impacts to Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtually certain</td>
<td>• Warmer, with fewer cold days and nights, and more hot days and nights</td>
<td>Increased yields in colder environments; decreased yields in warmer environments; increased insect outbreaks</td>
</tr>
<tr>
<td>Very likely</td>
<td>• More frequent warm spells/heat waves</td>
<td>Reduced yields in warmer regions due to heat stress; increased danger of wildfire</td>
</tr>
<tr>
<td></td>
<td>• More frequent heavy precipitation events</td>
<td>Damage to crops; soil erosion, inability to cultivate land due to waterlogging of soils</td>
</tr>
<tr>
<td>Likely</td>
<td>• Area affected by drought increases</td>
<td>Land degradation; lower yields/crop damage and failure; increased livestock deaths; increased risk of wildfire</td>
</tr>
<tr>
<td></td>
<td>• Intense tropical cyclone activity increases</td>
<td>Damage to crops; uprooting of trees</td>
</tr>
<tr>
<td></td>
<td>• Increased incidence of extreme high sea level</td>
<td>Salinization of irrigation water</td>
</tr>
</tbody>
</table>

Source: IPCC, Fourth Assessment Report, 2007

1 Fourth Assessment Report on Climate Change, IPCC, 2007
As yields fall, commodity prices will increase – slowly at first, and then at an increasing rate (Figure 3). But even before these trends gain momentum at 3-4 degrees Celsius above baseline temperatures, the volatility and uncertainty around the severity of climate impacts will increase the price of commodity hedges used by many food processors. More frequent crop failures and soil erosion can be expected due to extreme weather events. This is already happening; record-breaking drought and heat wave in Texas in 2011 depressed peanut yields, tripled prices for processors, and led to consumer price increases for peanut butter of 30-40%.\(^4\)

As in this case, food processors will experience rising costs and decreased availability of inputs in the aftermath of extreme weather events, and will be forced to raise prices for their products and cut back production. In Sara Lee’s response to CDP’s 2011 information request, the food processor highlights that “extreme weather conditions may threaten the growing conditions relied upon by crop and livestock producers, ultimately interrupting the supply of raw material inputs to Sara Lee production processes.” In addition, rising fertilizer and fuel prices will likely cut into growers’ profit margins, as increased demand for these inputs from a growing population interacts with a finite supply of fossil fuels and mined phosphorus and potash, key inputs for fertilizer.\(^5\)

This is not an attractive future, but it is increasingly likely if major steps to address climate change are not taken across the countries and economic sectors that most heavily contribute to it. Agriculture is not the largest contributor to climate change – but it is significant.

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5 Jeremy Grantham, GMO Quarterly Letter July 2011 – Resource Limitations 2
Agriculture’s contribution to climate change

Globally, agriculture accounts for as much as 14 percent of global emissions. In the United States, agricultural related activities contribute about 8 percent of total U.S. emissions. At ~490 million metric tons of CO₂ equivalent annually, U.S. agricultural emissions are comparable to the total national emissions of Spain, France, or Italy (U.S. EPA, 2009) (see Figure 4). This is equal to the annual emissions from 87 million cars (about one third of the passenger cars in the U.S.), or 160 average size (500 MW) coal-fired power plants (about one third of the coal-fired plants in the U.S.).

It must be noted that climate change is not the only challenge facing agriculture as the world population soars toward 9 billion by the middle of this century – water shortages, erosion, nitrogen run-off, labor relations and other issues must also be addressed. But GHG emissions, in addition to contributing to climate change, are a useful proxy for efficiency in operations as they represent, largely, fertilizer, agro-chemical and energy use. It is a single metric that communicates a great deal of information. Although varying by region and by crop or type of livestock, the vast majority of emissions from agricultural products – up to 80% or more based on some studies – occur before products leave the farm gate.

The Innovation Center for U.S. Dairy, which was established by dairy producers and addresses sustainability across the dairy value chain, chose to focus first on GHG emissions as a primary metric for the dairy industry’s environmental impact, a decision that is increasingly being made by other agricultural commodity boards and stakeholders.

In the broader economy, GHG emissions are usually attributed to the burning of fossil fuels for electricity or transportation (see Figure 5). Part of the U.S. agricultural sector’s footprint includes emissions attributable to both of these sources. Specific to agriculture, however, are methane emissions related to livestock digestion and manure, and nitrous oxide from fertilizer application and soil management.

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Figure 4: U.S. GHG Emissions by Sector in World Context - Millions of Metric Tons CO₂e (US 2009, others 2008)

Sources and Notes:
U.S. Data is CO₂ equivalent emissions, 2009 (U.S. EPA)
Rest of World Data is CO₂ equivalent emissions excluding LULUCF, 2008 (UNFCC)

“Many different policies have played an active role in bringing down greenhouse gas emissions. Alongside renewable energy or energy efficiency, efforts to reduce water pollution from agriculture also led to emission reductions. This experience shows we can reduce emissions further if we consider the climate impacts of various policies more systematically.”

Jacqueline McGlade, European Environment Agency Executive Director, in Business Green’s “Official: EU climate policy is working”
Three sources typically have the highest emissions on farms:

1. Fertilizers and agro-chemicals manufactured using natural gas release carbon dioxide during manufacture, and fertilizers emit nitrous oxide when applied to crops.

2. Livestock produce methane through digestion and manure.

3. Fuel combustion and electricity use produce carbon dioxide emissions.

Although methane and nitrous oxide are produced in smaller quantities than carbon dioxide, their high potency (expressed as Global Warming Potential (GWP)) makes their impact on the climate much stronger than that of the same volume of carbon (methane is about 23 times stronger, nitrous oxide 296 times).

But the complete story is not told only looking at agricultural emissions. There is also a potential for farmlands to act as a carbon sink by capturing and sequestering carbon in the ground through practices such as the planting of cover crops or conversion of land from, for instance, cropland to grassland or grassland to woodland (see Figure 6). Agriculture is also uniquely positioned to provide clean energy products (biofuels, potential siting locations for wind turbines) that can help to mitigate risks while expanding markets for farmers.

Sources:
CDP Agriculture Supply Chain Pilot

The CDP Supply Chain program is a unique collaboration of 50 global corporations who recognize the significance of the supply chain in carbon management. While many food and beverage companies (including Campbell Soup Company, Coca-Cola Company, The J.M. Smucker Company, Del Monte and Pictsweet), already disclose through CDP on an annual basis at the request of their largest investors and corporate customers. Few of these companies report on their supply chain’s agricultural emissions, as CDP had not specifically asked for such data in its core questionnaires. For example, H.J. Heinz cites extreme weather events affecting agricultural supply chain reliability and Kellogg Company’s discloses risk from water scarcity for important crops, but none included emissions estimates aggregated from farm level detail.

In 2010-2011 CDP launched an initiative focused on reducing GHG emissions of U.S. agriculture through expanded implementation of the CDP Supply Chain program. The program focused on two crops – tomatoes and potatoes – purchased by two member companies of the CDP Supply Chain program. By requesting primary GHG emissions data from farmers on behalf of their largest corporate customers, CDP strove to field-test existing and developing tools. Additional questions asked growers to examine their perceived risks and opportunities from climate change and to demonstrate how changes in their land use practices result in quantifiable reductions of GHG emissions and cost savings.

The CDP Agriculture Supply Chain pilot targeted 11 growers that were selected to receive the pilot questionnaire by ConAgra Foods and H.J. Heinz; 7 tomato growers and 4 potato growers. ConAgra Foods selected growers based on “good working relationships, solid accounting practices and record-keeping. They tended to be larger operations with a progressive bent.” H.J. Heinz selected a representative sample, including those both “likely and unlikely to respond” in order to determine if and what differences exist in reporting capabilities. In addition to the growers, ConAgra Foods, H.J. Heinz, and three other CDP Supply Chain members (Kraft, PepsiCo, and Walmart) shared their input through interviews on their current initiatives and best practices for engaging with their agricultural supply chains.

Of the eleven growers who received the request for information from CDP, seven completed a questionnaire and one provided relevant materials. There was a wide variety of responses; some growers have been systematically reducing emissions by enacting sustainable farming practices for over a decade, while others expressed doubt that the cause of climate change is anthropogenic. Others are implementing comprehensive sustainable agriculture initiatives but did not report emissions data to quantify emissions reductions. Still others can report quantitative data but are unable to show improvements over time because they did not establish a baseline. Finally, others provided complete, comprehensive descriptions and calculations and even highlighted awards and recognitions they had received for their efforts (see Figure 7). Some growers for whom climate change is not a significant concern are nevertheless undertaking initiatives that will reduce emissions, usually as a secondary benefit to optimizing yield and reducing costs.

**Figure 7: CDP Agriculture Supply Chain Questionnaire Responses**

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is climate change incorporated into your business plan?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have an emissions reduction target?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have any emissions reduction initiatives?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you identified climate change risks or opportunities?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHG emissions estimate reported?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Based on 7 responders plus 8th grower who submitted information regarding emissions reduction initiatives*
Farmers can reduce emissions

There are two key reasons for optimism that the agriculture sector will be able to significantly reduce GHG emissions and increase carbon sequestration:

1. **Sustainable agriculture makes business sense**

   "Reducing carbon is a great way to promote efficiency in your operations and reduce costs."

   **Scott Krall, Global Sustainability Leader, H.J. Heinz Company**

As industrial developments in farming are maximized and the growth in yields levels off, increasingly the best way to boost profits will be to identify alternate farming practices which can enable a reduction in inputs. This has the added benefit of reducing both emissions and costs. For example, many tomato growers have installed drip irrigation in recent years, reducing the amount of farm equipment fuel, fertilizer and water required as fewer passes need to be made by tractors and fertilizer can be delivered more precisely. Costs for, and emissions from, fuel and fertilizer are simultaneously reduced.

2. **Low cost and no cost practices can be employed**

   McKinsey & Company's Global Greenhouse Gas Abatement Cost Curve for agriculture shows that there are many options for reducing emissions and sequestering carbon (i.e., negative emissions) that are low or no cost to the grower (Figure 8). For example, adopting low or no-till farming and planting cover crops can significantly reduce emissions and increase the amount of sequestered carbon. In addition to reducing emissions, these actions generally align with age-old traditional farming practices that can increase soil health and productivity.

   "What we need to address is not only near term weather volatility, but also the directional climate changes that may not be as noticeable, but are impacting our ability to maintain and improve our level of food production globally."

   **Ian Hope-Johnstone, Director - PepsiCo Agriculture Sustainability**

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**Figure 8: Global GHG abatement cost curve for the Agriculture sector**

<table>
<thead>
<tr>
<th>Abatement cost € per tCO₂e</th>
</tr>
</thead>
<tbody>
<tr>
<td>MtCO₂e per year</td>
</tr>
</tbody>
</table>

Livestock – Anti Methogen Vaccine  
Rice management shallow flooding  
Rice and nutrient management  
Grassland nutrient management  
Tillage and residue management  
Cropland nutrient management  
Organic soil restoration  
Degraded land restoration  
Agronomy practices  
Livestock feed supplements

9 Source: McKinsey & Company, Pathways to a Low-Carbon Economy: Global GHG Abatement Cost Curve v2.0 Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO₂e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
A number of the responding farmers in the pilot reported that they are adopting sustainable farming techniques, which reduce their environmental impact, emissions and costs. Many of the examples in Figure 9 above were cited by more than one farmer.

The nutrient management and land management actions above fall into the first two bars of the McKinsey GHG abatement cost curve for agriculture (Figure 8) – Cropland nutrient management and Tillage and residue management – indicating that they are some of the lowest cost options for reducing emissions.

For some farmers, sustainable agriculture has been the preferred method of production for decades. Others rely on conventional techniques but have started to adopt some new practices that minimize their environmental impact; for many, establishing the business case for adoption of more sustainable agriculture practices has yet to be understood. Further down the supply chain, food processors and retailers are beginning to see a shift in consumer demand and the need for risk mitigation. For example, in 2009 PepsiCo determined that consumers of PepsiCo’s Naked Juice brand juices were willing to pay a premium for sustainably sourced ingredients; now all bananas in Naked Juice products are certified by the Rainforest Alliance. Through this agreement, suppliers receive a better price while adopting practices that protect their soil and resources for the future.10 A number of major retailers are responding to these challenges by implementing programs to encourage – and occasionally mandate – more sustainable business practices throughout their supply chains.

### Figure 9: Sustainable Agriculture Initiatives Being Implemented

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Initiatives Growers Are Enacting, as reported in the CDP Agriculture Supply Chain questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrient Management</td>
<td>• Install drip irrigation (water &amp; fertilizer)</td>
</tr>
<tr>
<td></td>
<td>• Monitor soil &amp; leaf tissue samples to optimize fertilizer application</td>
</tr>
<tr>
<td></td>
<td>• Incorporate plant residue into soil</td>
</tr>
<tr>
<td></td>
<td>• Apply pesticides through drip irrigation to minimize drift</td>
</tr>
<tr>
<td></td>
<td>• Perform spot applications based on monitoring</td>
</tr>
<tr>
<td></td>
<td>• Utilize weed-seeking equipment that leverages chlorophyll sensors, reducing pesticide application by 70%</td>
</tr>
<tr>
<td></td>
<td>• Install owl boxes</td>
</tr>
<tr>
<td>Pest Management</td>
<td>• Reduce equipment passes by increasing bed width (tomatoes)</td>
</tr>
<tr>
<td></td>
<td>• Minimize tillage</td>
</tr>
<tr>
<td></td>
<td>• Plant cover crops to sequester nutrients</td>
</tr>
<tr>
<td></td>
<td>• Increase crop rotation to improve soil health</td>
</tr>
<tr>
<td>Land Management</td>
<td>• Install variable frequency drive pumps</td>
</tr>
<tr>
<td></td>
<td>• Upgrade farm equipment to higher-efficiency models</td>
</tr>
<tr>
<td></td>
<td>• Upgrade lighting in buildings to minimize electricity usage</td>
</tr>
<tr>
<td></td>
<td>• Perform equipment maintenance to ensure optimal performance</td>
</tr>
<tr>
<td>Energy Management</td>
<td></td>
</tr>
</tbody>
</table>

Sustainable farming supported by food processors and retailers

Over the past 5-10 years, leading food processors and retailers have launched bold, widely publicized sustainable agriculture plans. These programs take different approaches, but their goals unanimously commit to reduce emissions and improve water and soil management in their agricultural supply chains. The following examples demonstrate the leading role increasingly being adopted by food processors and retailers:

- **Kraft Foods** has a target to increase sustainable sourcing (defined as third-party certification or verification) of agricultural commodities by 25% by 2015, from a 2010 baseline

- **H. J. Heinz** conducts sustainable farming training sessions for growers, and has a target to reduce the carbon footprint of tomato crops by 15% by 2014 in 3 California regions, from a 2009 baseline

- **PepsiCo** is piloting a farm sustainability platform with growers reporting requirements in 9 environmental indicator categories. PepsiCo seeks to leverage existing audit visits regarding quality and food safety to enhance sustainability verification

- **ConAgra Foods** aims to reduce their emissions per pound of product by 20% by 2015, while engaging suppliers through a variety of initiatives including an information database and regional dashboards sharing best practices and field/crop input and yield benchmarks (see Section V)

- **Walmart** has a target to eliminate 20 million metric tons of GHG emissions from its global supply chain by the end of 2015; as one of the largest buyers of agricultural products and processed food, it can be expected that a significant percentage of these reductions will be realized through their food and agriculture supply chain.

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10 Rainforest Alliance Website: http://www.rainforest-alliance.org/work/agriculture
Analyses such as McKinsey’s GHG abatement cost curve (Figure 8) are useful to highlight the fact that there are many opportunities for action; but a global view for all types of agriculture is of limited value in developing a strategy for emissions reductions in a specific industry. Tools and standards for measurement of the emissions associated with a specific operation, farm, or company are still being developed, optimized and harmonized (see inset on Measurement Protocols and Standards). At present, a lifecycle analysis (LCA) or product carbon footprint (PCF) is extremely useful for identifying specific emissions hotspots. What is measured can be managed – and this sometimes produces surprises. For example:

- The Innovation Center for U.S. Dairy conducted a GHG LCA for milk in 2007 and identified priority areas for reducing emissions across the value chain. Based on the analysis, the industry established a voluntary goal to reduce GHG emissions for milk by 25% by 2020, and launched ten projects estimated to reach nearly halfway to that goal while delivering $238 billion of value to the industry.\(^\text{11}\)

- Kraft Foods reviewed their entire supply chain using secondary data to develop a high-level perspective of their biggest sources of emissions and reduction opportunities, which were then disclosed publicly through CDP in 2011. Emissions embedded in their purchased agricultural inputs were found to be 17 times higher than their direct emissions from their own operations. Their agricultural supplier engagement strategy has ensued from this analysis.

- Through GHG calculations based on primary data, PepsiCo recently identified a number of growers in the UK were using as much as five times more fertilizer than required – these growers were able to reduce application of fertilizer while maintaining yields.

- PepsiCo also conducted a lifecycle analysis for its Tropicana Orange Juice product, and discovered that the largest source of GHG emissions (35%) is in the production and application of fertilizer applied to the orange trees (see Figure 10). By investigating lower carbon fertilizers, PepsiCo expects to reduce the total emissions of Tropicana orange juice by as much as 15%.\(^\text{12}\)

### Measurement Protocols and Standards

A number of standards and tools are in development to assist agriculture businesses with more fully calculating, analyzing and reporting their environmental impacts and greenhouse gas footprints, including:

- **The Cool Farm Tool:** The Sustainable Food Lab, with Unilever and the University of Aberdeen, has developed an Excel-based tool which enables farmers to estimate their emissions by answering a series of questions about their inputs, crops, and management practices

- **Agriculture Protocol:** The World Resources Institute is developing an agriculture supplement to their Corporate Standard for Greenhouse Gas Accounting over the next two years

- **The Stewardship Index for Specialty Crops:** A project led by SureHarvest, designed to develop and pilot metrics for a select group of crops

- **U.S. Sustainable Agriculture Standard:** The Leonardo Academy is coordinating a participatory industry effort to develop a sustainable agriculture standard. The standard will focus on aspirational goals relating to economic, environmental and social performance of U.S. agriculture

CDP supports the harmonization of standards and tools to reduce the reporting burden on growers. By working with these organizations to help “field test” their emerging tools through CDP disclosure and offering joint training materials, the industry can come to a consensus on methodology and key indicators.

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12 PepsiCo Launches Groundbreaking Pilot Program to Reduce Carbon Footprint of Tropicana, PepsiCo Press Release, March 18, 2010
Until emissions are measured, it is impossible to make sound decisions around priorities and investments in reduction strategies. Even if emissions reduction initiatives are implemented, without supportable data and metrics to prove their success, the benefits can go unrecognized. And if they’re unrecognized they may not be repeated, maintained or improved.

Figure 10: PepsiCo’s Tropicana Orange Juice LCA

Case Study: A Tomato Farmer’s Improving Practices

One of the tomato growers who responded to the CDP Agriculture pilot questionnaire demonstrates the challenges of measurement and reporting. The grower has been farming using sustainable practices for over 20 years, and described over 30 specific initiatives, including installing drip irrigation incrementally and using it to distribute nutrients in multiple, precise applications in order to reduce fertilizer use and corresponding costs. They completed the Cool Farm Tool (see Measurement Protocols and Standards inset on page 12) in significant detail, so that they were able to report on current emissions. However, they have no historical baseline data on water use, fertilizer or agro-chemical use, or GHG emissions. Therefore, they cannot directly attribute any decreases in emissions to any of the named improvement initiatives.

The grower notes he has undertaken these initiatives because he understands that they should save money and/or optimize yield, as well as demonstrate his commitment to sustainability in order to meet the expectations of important customers. However, without a set of established baseline data it is not possible to quantify historical performance improvements, compare against – or contribute to establishing – benchmarks, or verify that certain practices can result in a corresponding set of financial and environmental returns. The lack of baseline measurement and annual data collection and analysis is characteristic of many responding growers; actions to limit emissions were common, but the ability to quantify their outcomes – which were often fully realized only after a number of years and from a variety of variables – was extremely limited.
The primary challenges to full engagement by growers in embracing sustainable agriculture and tracking and reporting of GHG emissions – which were identified in speaking to growers, food processors and other stakeholders through the course of this pilot – were related to:

1. **Understanding** Why are you asking for this data? How will it be used? What do I have to do with climate change?

2. **Logistics** What tool should I use? What protocol or reporting framework? I’m getting too many separate data requests!

3. **Incentives** Why should I invest in initiatives that don’t directly save me money? Why should I take on the extra burden of reporting GHGs?

**Understanding: GHG reporting and climate change need to be better understood**

Given the amount of overlap between cost reduction and emissions reduction, significant progress can be made in reducing agricultural GHG emissions, regardless of growers’ understanding and opinions of climate change. However, if farmers are resistant to the idea of measuring and reporting on environmental impacts and emissions, a baseline analysis – which can yield useful information on specific areas for improving farm efficiency – may never take place.

To address this issue, food processors need to work with growers to demonstrate the value that can be realized through measurement. Focusing on improved processes and technologies that reduce costs through resource conservation can help to establish a credible business case, Growers need to see that there will be a clear benefit, not just a lever that can potentially be used against them.

**Logistics: Leverage farm-management software for data tracking**

The future of farming is more data intensive. Many growers now use farm management software to track water, fertilizer and chemical use. According to ConAgra Foods, it is now used by 75% of the farmers in their supply chain. One of the growers who participated in the CDP agriculture pilot reported, “Our farm has recently implemented new cost accounting software that enables us to track field-level activity, providing a detailed record of costs associated with each field and crop. There is potential to use this system to also track field-level environmental impacts – including greenhouse gas emissions – if the information were shown to add value to the business.”

If reporting can leverage existing data instead of requiring re-keying of data, it is more likely to increase participation, resulting in a statistically better data set. For example, buyers can ask growers to report raw data on energy, pesticide, fertilizer, water use, etc. and use software to calculate associated GHG emissions, which can then be aggregated to a corporate-level view using a standardized methodology. The software can also report back year-on-year data and benchmark a given farm against an aggregate dataset. ConAgra Foods Lamb Weston has implemented a web-based platform to share best practices and anonymous, aggregated regional performance benchmarks among contract growers through reports and visual dashboards.

The addition of a GHG-emission calculation module could be an innovative way to capture, aggregate, and analyze this data.

“We understand the unique challenges our contracted growers face in calculating greenhouse gas emissions using farm-level data. Lamb Weston’s collaborative approach to electronically capture raw data from growers and then to share regional benchmarking data back with growers benefits all. Lamb Weston gains line-of-site into growing operations throughout the season and growers get easy access to regional benchmarking data on crop yield and water, nutrient, and crop protection product use on a per-acre basis.”

Marcella Thompson, Director Sustainability, ConAgra Foods

Similarly, Walmart is planning on providing regional benchmarks and best practices to growers as part of their reporting incentive package.

Some of the benefits and drawbacks of each approach are discussed in Figure 11.

As software improves, GIS data overlaid with grower responses could tie in weather patterns, soil types, biome information and other important data for more accurate
**Figure 11: Two Approaches to GHG Tracking of Growing Operations**

<table>
<thead>
<tr>
<th></th>
<th>Farm level GHG calculations</th>
<th>Food processor level GHG calculations</th>
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</thead>
<tbody>
<tr>
<td><strong>Sample Tools</strong></td>
<td>Farmer inputs raw farm, crop, fertilizer, chemical and fuel use data, and can report out GHG metrics</td>
<td>Farmer provides access to or reports raw farm, crop, fertilizer, chemical and fuel use data to buyer, who performs calculations and provides report back to farmer</td>
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<tr>
<td><strong>Description</strong></td>
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</tr>
<tr>
<td><strong>Benefits common to both types of tools</strong></td>
<td>Insight into farm efficiency, identification of improvement opportunities, potential for improved yield/cost performance</td>
<td>Software provided by food processor; Access to regional average data for comparison of efficiency; Ability to earn incentives for performance</td>
</tr>
<tr>
<td><strong>Benefit to Farmer</strong></td>
<td>Data privacy; control of proprietary information on inputs</td>
<td>Increased confidence in data quality; Ability to create database and dashboards comparing metrics across growers; Ability to include sustainability performance in supplier scorecards</td>
</tr>
<tr>
<td><strong>Benefit to Food Processor</strong></td>
<td>Less work; import completed GHG calculations</td>
<td>Increased cost to food processor; Assumed responsibility for data; Business confidentiality issues if internal data is disseminated</td>
</tr>
<tr>
<td><strong>Downsides</strong></td>
<td>Increased workload and costs for farmer; Less confidence in data quality for food processor; Differing methodologies; Update issues as emission multipliers are revised</td>
<td></td>
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</table>

GHG calculations and comparability (normalization) between farms in different regions, of different sizes, and for different crops. This would remove some uncertainty in modeling emissions across various regions. The USDA and Colorado State University are testing a system called COMET, which promises to facilitate estimation of emissions and carbon sequestration using farm-specific data and links to databases on soil, climate and management practices.

**Incentives: The GHG reporting and reduction load needs to be shared**

Food processors, retailers, consumers, investors and future generations all stand to benefit when sustainable farming practices are adopted. But too often, the farmers are the only ones asked to bear the upfront costs and risks of early adoption.

While most, if not all, sustainable farming practices can directly benefit the farmer by reducing costs and potentially increasing yield and quality, this potential does not necessarily create access to the needed capital for investment, nor does it fully mitigate the risk of changing market conditions once an investment is made. Additionally, the time and knowledge that must be invested is substantial in order to increase capacity to gather, analyze and report emissions data and other sustainability information. The transparency that comes from tracking and reporting emissions data can be seen as a competitive risk for the farmer, unless there is sufficient incentive to establish positive financial returns for the effort.

Currently, incentives offered to farmers by their customers to adopt sustainable farming practices, and to track and disclose their emissions, are minimal. Most processors and retailers hint that “at some point” the sustainability performance of growers will be taken into account in buying decisions. CDP’s interviews with growers and food processors indicate that until the value chain shares more of the measurement and reporting burden with farmers, their engagement will remain limited (see Figure 12).

“*The idea is to integrate sustainability into buyer discussions... to have a broader adoption and growers finding added value from the program.*”

Daniel Hazman, Walmart
Growers are the furthest removed from any consumer or investor signal to respond to climate change, and are often given a tool such as the Cool Farm Tool and some introductory training and asked to calculate their emissions. Only a few leading companies, such as ConAgra Foods, are giving growers significant support such as software subscriptions and calculation & reporting assistance. H.J. Heinz, and its partner Escalon Foods, have started holding workshops – in partnership with the Sustainable Food Lab – to train growers on use of the Cool Farm Tool. More of this type of support and investment from the stakeholders further up the value chain (e.g., processors, retailers and industry groups/trade associations) who will benefit from sustainable farming practices is needed to engage growers.

Growers are business people who work to improve farm-level efficiency because it is good business. They will adopt sustainable agriculture practices on their farms as long as they believe in the business case and have access to the capital and non-financial resources required for implementation.

However, some types of practices are unlikely to be adopted without an incentive from buyers:

1. **Practices that reduce emissions without reducing costs**
   For example, low carbon fertilizers that, if adopted, would reduce GHG emissions, but may be more expensive.

2. **Initiatives with high up-front costs**
   For example, buying more efficient tractors, which will reduce emissions while saving on fuel costs, but the cost savings will accrue slowly over many years.

3. **Reporting of emissions**
   While measurement of emissions can immediately benefit a grower by highlighting areas of inefficiency and/or potential cost savings, reporting the results offers no such innate benefit.

Preferential treatment should be offered for growers who both report on emissions and show improvement in performance; incentives should be tangible and phased in on a clearly communicated timeframe.

It should be noted that this discussion of incentives is applicable where the farmer has a contractual relationship with the buyer and where the crop is traceable to the grower; for crops sold as bulk commodities (i.e., raw grains) a significant transformation would have to occur in the way these are purchased (e.g., a two-tier market for each commodity) before changes in production practices could be effectively incentivized.

**Reporting Overload?**

There is an additional layer of confusion regarding the proliferation of questionnaires and requests for information from multiple customers and stakeholders. Without a central database to coordinate these requests, confusion and a sense of overburdening are likely to abound. CDP can help by providing a standardized reporting platform through which to collect this data on behalf of multiple, diverse stakeholders.
The following are examples of successful programs and strategies that have provided sufficient incentive to farmers to begin to adopt sustainable agriculture practices and reporting activities:

- Pay grower a price premium acknowledging the added value of agricultural products that meet pre-established performance criteria

- Leverage customers to grow demand and generate revenue to pay a premium: Kraft Foods switched to 100% Rainforest Alliance certified coffee beans in their Kenco coffee brand and experienced double-digit growth in sales

- Extend the length of purchasing contracts in order to provide greater security to the grower

- Tie purchasing volumes to continuous improvement

- Use sustainability performance as a tiebreaker for awarding contracts if price and quality are equal

- Provide non-monetary incentives such as recognition and awards

- Offer farm management software with an environmental reporting module

- Facilitate the sharing of best practices and benchmarking across comparable farms
A Call to Action

By cooperating across the food value chain to increase the technical capacity of farmers to measure and report GHG emissions and to provide tangible incentives that encourage them to do so, farm-level baselines can be established that indicate where sustainability and operational efficiency meet. This will give the U.S. agriculture sector the power to put a stake in the ground and:

- Establish GHG emissions reduction plans
- Develop a market pull for sustainably-sourced food products
- Adopt large-scale growing practices that will ensure the viability of the sector and the environment
- Ensure sustainable production from existing agricultural lands upon which we and future generations rely.

“Reporting of greenhouse gas emissions from a company’s value chain will become standard practice within three to five years; the entire agricultural sector must embrace this opportunity to ensure its profitability and sustainability. Humanity relies on food and fiber to fulfill our basic needs and thus the pressure to act falls to farmers to play the most critical role in reducing emissions and climate proofing their operations.”

Paul Simpson, Chief Executive Officer, Carbon Disclosure Project
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The Carbon Disclosure Project (CDP) is an independent not-for-profit organization holding the largest database of primary corporate climate change and water information in the world. Some 3,700 organizations across the world’s largest economies now measure and disclose their greenhouse gas emissions, water usage and assessment of climate change and water risk and opportunity through CDP, in order that they can set reduction targets and make performance improvements. This data is gathered on behalf of institutional investors, purchasing organizations and government bodies and made available for integration into business and policy decision making. For more information please see [www.cdproject.net](http://www.cdproject.net)

**Report Writer: Common Fields**
Common Fields works with agricultural organizations to create strategies, develop measuring systems and implement projects that align business goals with improved environmental and social impacts. Common Fields’ clients include large producer/packers who are looking to reduce risk and increase operational efficiency, food brands who want to communicate about sustainability, and industry organizations who are positioning their sector to match the increasing demands of consumers and retailers for sustainability data. For more information please see: [www.common-fields.com](http://www.common-fields.com)

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