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US LIVESTOCK PRODUCER GREENHOUSE GAS EMISSIONS MANAGEMENT AND UNDERREPORTING

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I. AREA OF SOCIAL CONCERN

The United States (US) Livestock Producer Industry is not reporting greenhouse gas (GHG) emissions associated with the management of livestock. A study in 2013 made up of researchers from Harvard, Stanford, and NOAA determined that the US is underreporting its national greenhouse gas emissions to the UN by 4% as a direct result of Congress not requiring the EPA to collect emissions data from livestock producers, which includes the meat and dairy industry. The three major greenhouse gas emissions from the livestock producer sector include methane (CH4), nitrous oxide (N2O) an carbon dioxide (CO2)[1].

In December 2015, Congress renewed a legislation under the US Consolidated Appropriations Act of 2014 that prevents the EPA from requiring emissions reports from livestock producers, despite requiring this data from 41 other sectors. Furthermore, recent amendments made to the cut EPA funding from FY2014 levels. Therefore, WH Group has little incentive to change management practices of their subsidiaries, like Smithfield Foods, in an effort to reduce emissions. However, efficiencies can be gained by implementing management practices that reduce GHG emissions and will reduce operating costs over time. It is therefore argued that WH Group and their subsidiary Smithfield Foods should implement emissions reduction technologies and effectively monitor and report these efficiencies and reductions to encourage competitors in the industry to follow suit, and pressure government to enact policies to support these changes.

In addition to the omission of greenhouse gas reporting from the livestock producer sector, there are disincentives for operators to implement emission reduction technologies such

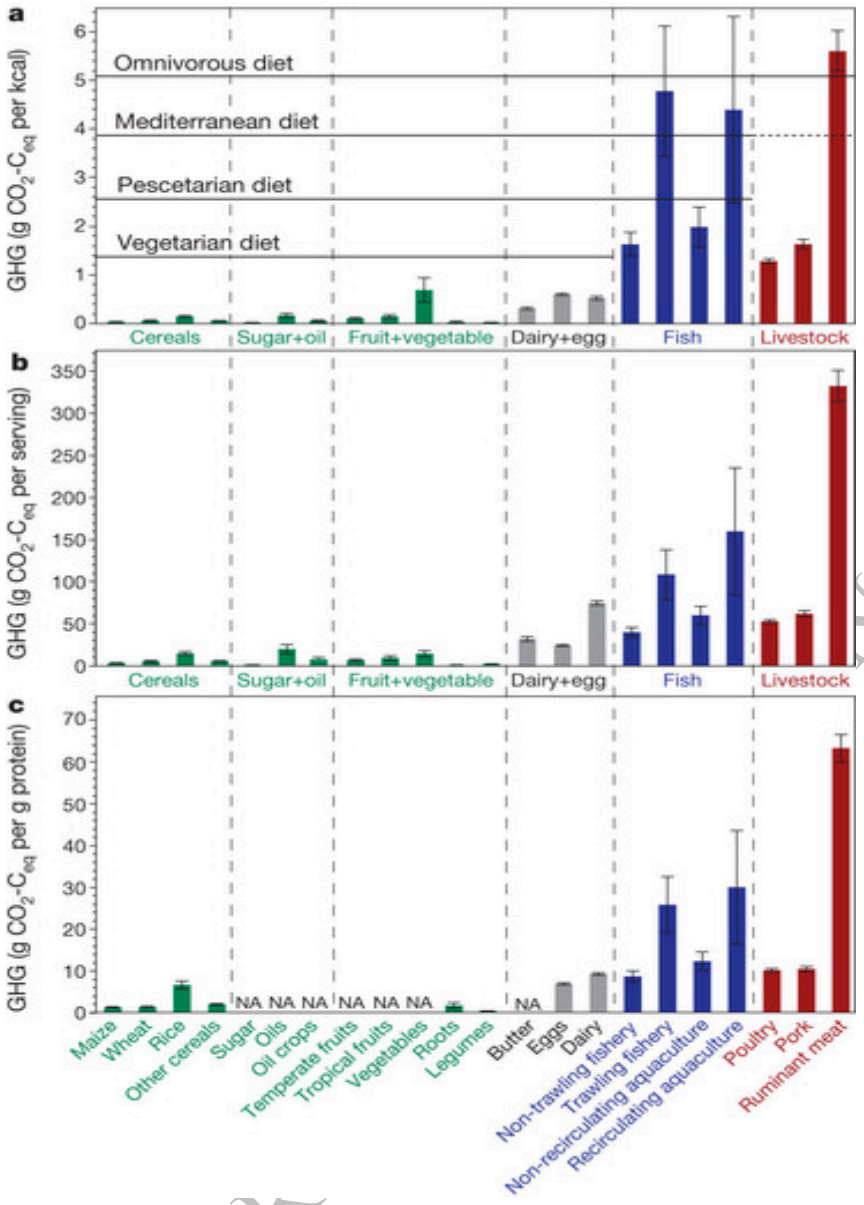
[1] http://www.fao.org/docrep/018/i3437e/i3437e00.htm

as methane capture systems which then convert waste methane to energy. Utilizing a methane capture system for electricity generation would result in significant reduction emissions through preventing the release to atmosphere as well as from reusing the methane to generate electricity thereby not using fossil fuels to run generators or energy from the grid. However, by doing so this would then trigger climate change regulations, opening livestock up to additional fees associated with compliance and reporting. By doing nothing, they avoid these EPA greenhouse gas rules.

This is a highly political issue as politicians and even most environmental groups fear public backlash against the US meat-loving diet. Despite increasing consumer awareness and localized shifts toward veganism, global demand for livestock products is projected to at least double by 2050. Scientists report that changing the US food system will have a quicker impact on slowing climate change than altering fossil fuel consumption[2]. Production of animal-source foods, particularly ruminant animals such as cattle, can increase global greenhouse gas emissions and have a larger carbon footprint than vegetarian diets, as shown below.

Figure 1: Lifecycle GHG emissions (CO2eq) for 22 different food types

[2] https://www.revealnews.org/article/us-gives-meat-producers-a-pass-on-climate-change-emissions/



Source: Tilman, David and Michael Clark. "Global Diets Link Environmental Sustainability and Human Health". Nature vol 515 pp 518-522. November 27, 2014.

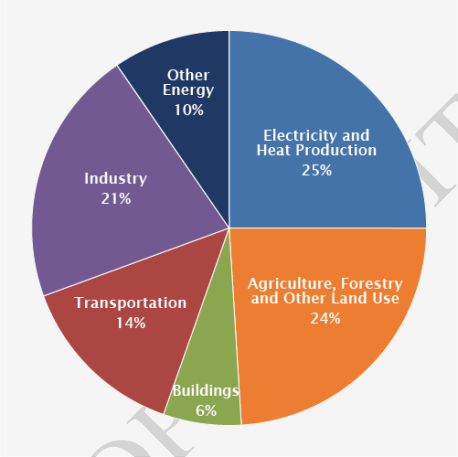
A study in the journal Nature has shown that if current global dietary trends continue unchecked, greenhouse gases from the agriculture sector could grow an estimated 80% from food production and land clearing, this is the equivalent of the 2010 global transportation emissions. The study also reported that meats from ruminants have 250 times the emissions per

gram of protein than legume[3]. If meat consumption decreased and the global diet became the average of the Mediterranean, pescetarian and vegetarian diets shown in Figure 1, there would be no net increase in food production emissions (Tilman 2014).

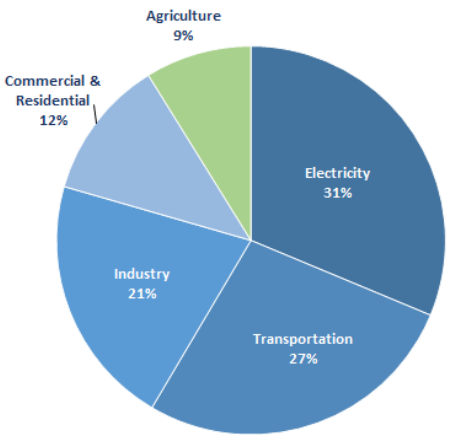
Methane from cattle accounts for 20% of greenhouse gas emissions from the agriculture industry. Emissions are generated from the cattle's enteric fermentation and farm operator's management of liquid manure[4]. Enteric fermentation and emissions refer to the methane released from an animal through the digestive process in breaking down carbohydrates[5]. According to current research, US Agriculture industry accounts for 9% of US emissions in 2013. However, as indicated in the Harvard et al study above, this is an inaccurate proportion due to underreporting from the agriculture industry.

Greenhouse Gas Emissions by Economic Sector

Global



United States



Source: IPCC (2014); based on global emissions from 2010
Source: US EPA Sources of GHG emissions –link

[3] Tilman, David and Michael Clark. "Global Diets Link Environmental Sustainability and Human Health". *Nature* vol 515 pp 518-522. November 27, 2014.
[4] VanderZaag, A.C. et al. "Measuring Methane Emissions from Two Diary Farms: Seasonal and Manure-Management Effects". Agricultural and Forest Meteorology: Oxford. 2014.
[5] https://www3.epa.gov/ttnchie1/ap42/ch14/final/c14s04.pdf

The accuracy of this data is being debated due to the fact that the EPA does not collect emissions date from livestock producers under the Greenhouse Gas Reporting Program, which is then submitted to the United Nations under the Framework Convention on Climate Change (UNFCC). The UNFCC requires emission data from livestock and manure management as outlined in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Agriculture, Forestry and Other Land Use[6]. In the 2014 Climate Action Report provided by the US to the UNFCC, agriculture sector emissions are reported however, this does not include data from livestock producers following the 2008 ban on EPA from collecting emissions reports from the US livestock industry, which was recently renewed in December 2015. In a prospectus to potential investors, WH Group reported that the company has never filed a greenhouse gas report to the EPA due to Congress intervention[7]. They also confirmed that providing this information to the EPA would not significantly affect their bottom line in hog production[8].

The following table illustrated the industrial profiles collated under the Greenhouse Gas Reporting Program, in which the agriculture industry as conspicuously absent:

	Industry: Click to View Highlights	**Most Recent Industrial Profile**
	Power Plants	2013
	Petroleum and Natural Gas Systems	2014

[6] UNFCC. "Chapter 10: Emissions From Livestock and Manure Management. 2006 IPCC Guidelines for National Greenhouse Gas Inventories". Vol 4: Agriculture, Forestry and Other Land Use.
[7] http://www.motherjones.com/environment/2016/01/us-meat-emissions-paris-cop21
[8] https://www.revealnews.org/article/us-gives-meat-producers-a-pass-on-climate-change-emissions/

	Industry: Click to View Highlights	Most Recent Industrial Profile
	Refineries	2013
	Non-fluorinated Chemicals	2013
	Fluorinated Chemicals	2012
	Metals	2012
	Minerals	2012
	Pulp and Paper	2012
	Miscellaneous Combustion	2012
	Electronics Manufacturing	2012
	Suppliers of Natural Gas and Natural Gas Liquids	2012

Source: US EPA http://www.epa.gov/ghgreporting/ghgrp-industrial-profiles

Furthermore, recent amendments made to the US Consolidated Appropriations Act of 2014 cut overall EPA funding from FY2014 levels. Specific funding cuts are listed under subpart JJ of Part 98 Part of the act which explicitly excludes funding for the collection of emissions data from Manure Management in the agriculture sector. No other area specifically relating to agriculture is referenced in this list.

98.360	Subpart JJ—Manure Management **NOTE:** EPA will not be implementing subpart JJ of Part 98. The Consolidated Appropriations Act of FY 2014 (H. R. 3547, Page 339, Section 421) continues a provision prohibiting the expenditure of funds for this purpose.	N/A

Source: US EPA http://www.epa.gov/ghgreporting/resources-subpart-ghg-reporting

In order to accurately report US emissions data to the UN and devise appropriate emissions reduction management practices, the US Congress must lift the provision under the The Consolidated Appropriations Act 2014 that bans funding to collect comprehensive emissions data from the agriculture sector.

II. SMITHFIELD FOODS

Smithfield Foods, a WH Group owned business, has been identified as a key player in being able to reform this industry as they are a $15 billion global food company in packaged meats, and the world's largest pork processor and hog producer operating in the US, Mexico and Europe. WH Group, a Hong Kong based company, acquired Smithfield in 2013[9]. Smithfield claims to seek new methods of reducing their environmental footprint and operate transparently by providing in-depth reporting on environmental impacts of their operations. They provide a statement stating general compliance with federal, state and local legislation by tracking

[9] http://bi.galegroup.com/global/company/307911?u=ucsandiego

emissions and researching methods for improvement. However, no emissions reporting data could be located in the 2014 Smithfield Food Sustainability & Financial Report[10].

According to a USDA 2009 Annual Report on Manure and Byproduct Utilization, the largest 2% of all livestock farms produce more than 40% of all livestock. Therefore, if Smithfield Foods installed methane monitoring technologies, this reporting data to the EPA would cover most of the US emissions[11]. No reports on Smithfield Foods emissions data post-2009 could be located.

III. US MUST LEAD IN GLOBAL GHG EMISSION REDUCTIONS

The United States submitted its target of reducing emissions 26-28% of 2005 levels by 2025 to the UNFCC as part of the COP21 Climate Change Summit. Economy-wide measures to reduce other greenhouse gases such as methane were also included, which specifically identified the agriculture sector[12]. In order to responsibly manage, reduce and accurately report emissions reductions, every sector of the agriculture industry must be included. This specifically pertains the livestock producers and their management of methane associated with ruminants and manure management.

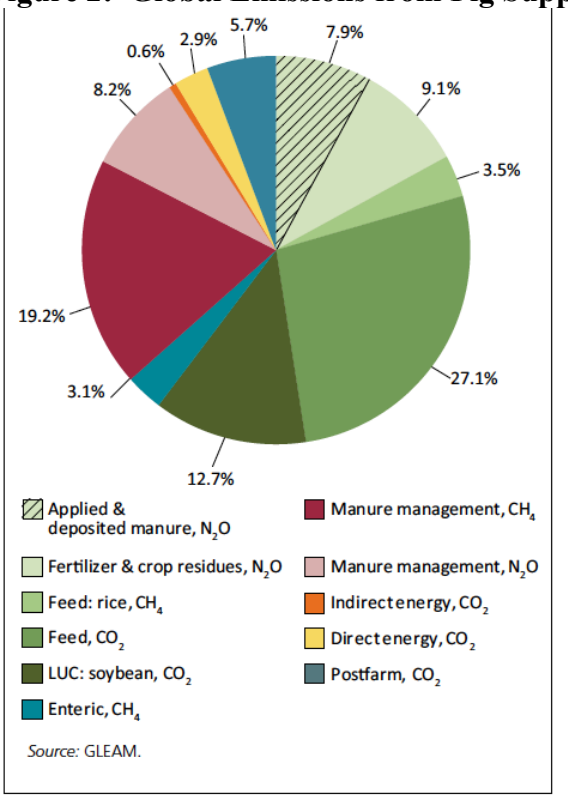
The Climate and Clean Air Coalition (CCAC) is an agreement led by the US and Canada to reduce methane and other short lived climate pollutants (SCLPs). It is a voluntary coalition consisting of 51 counties, 16 intergovernmental organizations, and various public and private institutions[13]. It is hypocritical of the United States to be a leader of this coalition by not requiring one of the country's largest methane emission sectors to reduce emissions nor require

[10] Smithfield Foods 2014 Sustainability and Financial Report.
[11] USDA. "National Program 206: Manure and Byproduct Utilization FY-09 Annual Report"
[12] https://www.whitehouse.gov/the-press-office/2015/03/31/fact-sheet-us-reports-its-2025-emissions-target-unfccc
[13] http://www.ccacoalition.org/en/news/ccac-welcomes-us-canada-joint-statement-climate-energy-and-arctic-leadership

them to monitor and establish a baseline from which to reduce. How are the other 50 countries expected to enact measures the US is not willing to implement themselves?

Data collected from emissions reporting is critical for guiding policy and management practices to address climate change; however, the US EPA has not collected emissions data from the livestock producer industry since 2010. This is a significant omission of data as The Food and Agriculture Organization (FAO) has reported that livestock producer emissions constitute 18% of global greenhouse gas emissions, with pork and poultry contributing 9% of these emissions[14]. Pork is Smithfield Foods primary product and emissions from this sector are derived from manure storage and high intensity feed production.

Figure 2: Global Emissions from Pig Supply Chains, by category of emissions [15]



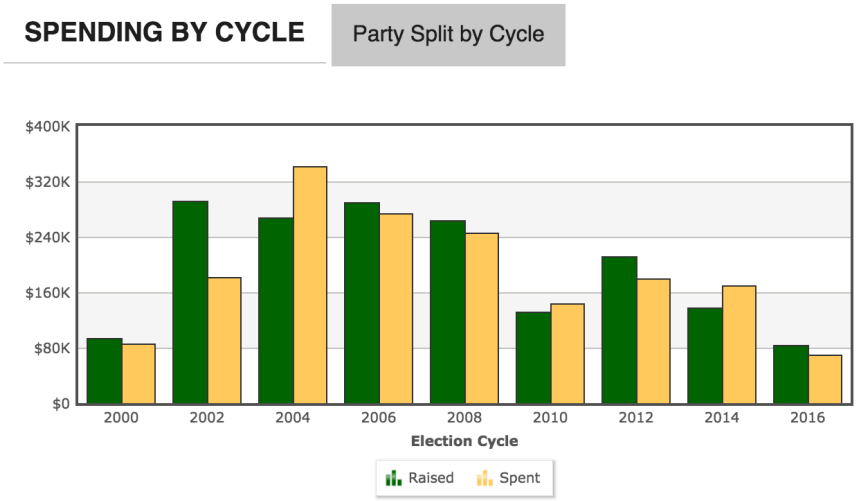
[14] http://www.fao.org/docrep/018/i3437e/i3437e00.htm
[15] http://www.fao.org/docrep/018/i3437e/i3437e00.htm

The Trans-Pacific Partnership (TPP), if passed, would boost US pork production for overseas export, particularly with Japan. US pork producers have been vocal pro-trade supporters and would benefit significantly from TPP, particularly with increased access to the Japanese market with a value of $1.8Billion[16]. In order to manage these increased emissions from increased international trade, accurate emissions reporting must be implemented.

IV. EXTERNAL PRESSURE

a. Smithfield Food Lobby Funding

The following shows a breakdown of Smithfield Food funding to political parties since 2000. Funding went to both democratic and republican members of the House and Senate. According to OpenSecrets.org, Smithfield Foods has consistently paid lobby groups in excess of $1M/year since 2000, with the most recent data from 2012. The lobby firms address issues in agriculture, energy & nuclear power, taxes, trade, food industry, fuel, immigration and labor[17]. The reports did not detail the specific of lobby efforts behind regulation reform.



[16]Submission by the National Pork Producers Council to the USITC. "Trans-Pacific Partnership Agreement: Likely Impact on US Economy and on Specific Industry Sectors". February 15, 2016.
[17]https://www.opensecrets.org/lobby/clientissues_spec.php?id=D000022254&year=2012&spec=AGR

Source: OpenSecrets: Smithfield Foods[18]

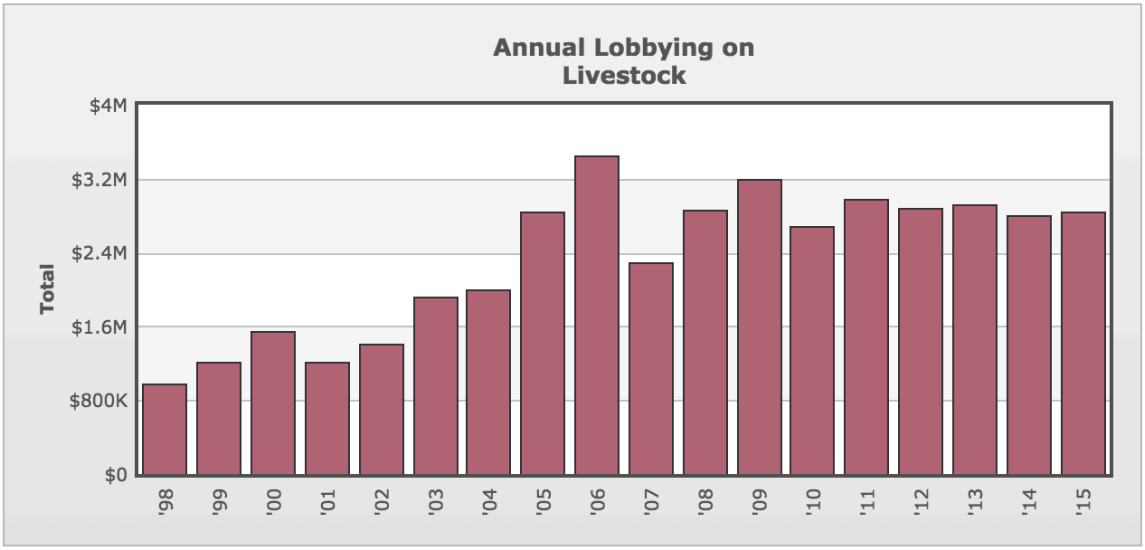
b. Livestock Producer Industry Lobby

The livestock industry is composed of ranchers and supporting organization and have faced significant challenges to compete on the global market. National Cattlemen's Beef Association, National Pork Producers Council and Texas Southwestern Cattle Raisers are the top livestock interest groups, and have contributed millions of dollars to political campaigns. Their lobby efforts are focused on livestock producer exemptions particularly from EPA air pollution regulations.

In 2014, the National Pork Producers Council paid $873,000 on federal government lobby efforts to influence policy outcomes. That year Congress continued the prohibition of collecting emissions data from manure management practices in the livestock industry under the Consolidated Appropriations Act 2014[19]. An industry high of nearly $3.5 million was paid by the livestock industry in 2006, down to $2.8 million in 2014[20]. Annual lobbying funds from the livestock industry is show below in Figure 3.

[18] https://www.opensecrets.org/pacs/lookup2.php?cycle=2016&strID=C00359075
[19] http://www.epa.gov/ghgreporting/resources-subpart-ghg-reporting
[20] https://www.opensecrets.org/industries/background.php?cycle=2016&ind=A06

Figure 3: Annual Lobbying on Livestock in the United States



Source: OpenSecrets.org

c. NGOs

Sierra Club has campaigns addressing climate change impacts, and while they do not have a specific campaign addressing the agriculture industry impact on climate change, they have ad hoc media releases addressing the subject matter[21].

Sid Learner in association with Johns Hopkins Bloomberg School of Public Health founded "Meatless Mondays" in 2003 in an effort to raise awareness to reduce household carbon footprint by cutting out some meat from their diets.

Greenpeace has campaigns to reduce emissions from the livestock industry with a primary focus in Europe[22], and has a Sustainable Foods Campaign with a US focus[23]. However, this issue of Congress restricting the collection of emissions data from producers has not been

[21] http://www.sierraclub.org/compass/2015/05/my-plate-my-planet
[22]http://www.greenpeace.org/international/Global/international/publications/agriculture/2013/Ecological-Livestock.pdf?2e6e49
[23] http://www.greenpeace.org/usa/sustainable-agriculture/

addressed publicly by any of the large US NGOs, as those listed above. The issue has been raised by media outlets such as Mother Jones, research institutions, and documentary filmmakers of Cowspiracy[24].

While there has not been an overwhelming response to regulatory insufficiencies, beef consumption in the United States has been steadily declining from 27.9 billion pounds in 2002 to 24.1 billion pounds in 2014[25] (USDA 2015), which may be attributed to NGO public awareness campaigns.

d. Consumer Pressure

In 2014, Smithfield Foods encouraged their hog suppliers to phase out the use of controversial gestation crates by 2022 in response to consumer demand addressing the inhume practice[26]. There was no regulatory impetus for issue, which illustrates the impact consumers can have on corporate behavior. It remains to be seen if Smithfield Foods does not renew contracts with suppliers that continue to use gestation stalls.

As Smithfield Foods is the world leader in pork production, demand for their products is relatively inelastic as consumers are not likely aware of options for suitable alternatives even if Smithfield Foods practices of not efficiently managing and reporting greenhouse gas emissions become a larger social issue. However, as Smithfield Foods is in compliance with national legislation, the real issue revolves around US greenhouse gas emissions regulatory reform.

[24] http://www.cowspiracy.com/facts/
[25] http://www.ers.usda.gov/topics/animal-products/cattle-beef/statistics-information.aspx
[26] http://www.usatoday.com/story/news/nation/2014/01/07/hog-crates-ban/4362353/

V. EMISSIONS REDUCTIONS OPPORTUNITIES FOR THE AGRICULTURE SECTOR

Regardless of insufficient regulatory policy managing and monitoring GHG emissions, numerous management practices have been successfully implemented showing not only a reduction of emissions but also efficiency in farming operations. Therefore, corporations such as Smithfield Foods would benefit from implementing such management procedures prior to legislative requirements to do so.

As Smithfield Foods is primarily focused on the pork industry, emissions reduction technology and procedures and the resulting efficiencies will be focused around pork management. Significant emissions reductions in pig production systems can be achieved through improvements in manure management, livestock management, improving feed quality, and installing energy saving technologies.

One approach is to use better quality feed. By doing so, this will help to lower manure and enteric emissions. Strategic breeding programs also eliminate surplus or unproductive parts of the herd thus reducing emissions that would be generated by those animals. In addition to better quality feed, manure can be managed through practices that recover nutrients in the manure and recycle that for other purposes, such as electricity generation. The EPA estimates that due to the over 8,000 dairy and hog farms in the US, methane recovery systems could generate enough electricity to power over a million homes and cut emissions by the equivalent of taking nearly four million cars off the road [27].

A 2012 study found that environmental emissions impacts can be mitigated through the application of soil to different slurry fractions. With respect to CH4 emissions, they were found

[27] http://phys.org/news/2015-08-cow-poo-power-profitable-farm.html#jCp

to be short-lived and rates returned to normal levels within three days after the slurry application[28]. A selection of emission reduction opportunities outlined in the table below.

Examples of Reduction Opportunities for the Agriculture Sector

Type	How Emissions are Reduced	Examples
Land and Crop Management	Adjusting the methods for managing land and growing crops.	• Fertilizing crops with the precise amount of nitrogen required, since less efficient nitrogen application can lead to higher N_2O emissions. • Draining water from wetland rice soils during the growing season to reduce CH_4 emissions.
Livestock Management	Adjusting feeding practices and other management methods to reduce the amount of CH_4 resulting from enteric fermentation.	Improving pasture quality to increase animal productivity, which can reduce the amount of CH_4 emitted per unit of animal product. Also, increased productivity can be accomplished through breeding.
Manure Management	• Controlling the way in which manure decomposes to reduce N_2O and CH_4 emissions. • Capturing CH_4 from manure decomposition to produce renewable energy.	• Handling manure as a solid or depositing it on pasture rather than storing it in a liquid-based system such as a lagoon. This would likely reduce CH_4 emissions but may increase N_2O emissions. • Storing manure in anaerobic containment areas to maximize CH_4 production and then capturing the $CH_4$to use as an energy substitute for fossil fuels. • For more information see EPA's AgSTAR Program, a voluntary outreach and education program that promotes recovery and use of methane from animal manure.

Source: US EPA http://www3.epa.gov/climatechange/ghgemissions/sources/agriculture.html

[28] Fangueiro, David et al. "Nitric Oxide and Greenhouse Gases Emissions Following the Application of Different Cattle Slurry Particle Size Fractions to Soil". Atmospheric Environment, vol 47 pp 373-30. February 2012.

VI. POLICY REQUIREMENTS

First and foremost, Congress must not restrict EPA funding required to collect emissions data from the agriculture sector. Smithfield Foods sustainability reports show that emissions data is being collected, and some emissions mitigation technologies and practices have been enacted. This data must be provided to the Greenhouse Gas Reporting Program to be included in the United States' national emissions accounting to ensure accurate data is provided to the UNFCC to effectively develop emissions reductions strategies in the long term goal of reducing global temperature increase below 2C.

Viable technologies for methane capture and electricity generation are successfully utilized in other countries outside of the US. Policies in the US require reform to encourage livestock producers to comprehensively implement these technologies to reduce greenhouse emissions and consumption of energy from the grid or fossil fuel generators. Current climate change regulations discourage implementation due to the increased cost of compliance for the agriculture sector. Developing a carbon pricing mechanism, essentially creating price on greenhouse gas emissions, will encourage market forces to enact these greenhouse gas reduction technologies. More robust energy policies may adversely affect farmers' incomes in the short term, but would encourage innovation and adaptation to climate change effects in the long run. A market based system of emissions control would incentivize companies such as Smithfield Foods to be innovative in the emissions management and adopt practices.

Carbon markets have performed relatively well and continue to grow in segmented global energy markets. However, there has been little incentive for the agriculture sector due to difficulty in cost-effectively measuring emissions reductions, but this can be improved with

additional research and development in measurement methodologies and evolving carbon markets[29]

The Agricultural and Industrial Byproducts National Program aims to develop and evaluate management practices and technology to use manure effectively while protecting the environment, which is then provided to policy makers to establish environmental programs and develop legislation. It is recommended that this research continue and Congress utilize the valuable data to enforce manure management and emissions reporting from all agriculture relevant sectors.

VII. CONCLUSION

Climate change is a global issue requiring global cooperation. The adoption of Olsonian cooperation strategy at COP21 has shown the greatest opportunity for achieving climate change objections through the formation of small coalition groups, such as the CCAC which aims to reduce short lived pollutants such as methane. Smithfield Foods and their parent company WH Group are in an influential position to reduce global emission reductions through refining management practices and effectively reporting and disseminating the results to encourage competitor compliance.

Emissions reductions and subsequent efficiencies gained in production should be published to encourage governments, both US and abroad, to adopt policies supporting the implementation of these technologies and practices. Acting local to bring about global change can play a significant part of Smithfield Food's Corporate Social Responsibility mission. They

[29] Gerber, P.J., et al "Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities." Food and Agriculture Organization of the United Nations (FAO), Rome. 2013.

have the capacity to bring about great success in the goal to reduce global greenhouse gas emissions and slow the effects of climate change.

Congress must revise legislation to encourage efficient management and reporting of greenhouse gas emissions with an end goal of overall national reductions. Climate change regulations must also encourage innovation through the establishment of market-based carbon pricing mechanisms.

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