The agribusiness industry presents itself as part of the solution to climate change. The major firms spend significant sums to promote the message that corporate, industrial agriculture is compatible with fighting climate change. But they are wrong. This report demonstrates that multinational agribusiness companies are part of the problem, not the solution, by revealing the true extent of their overall contribution to dangerous climate change. So far, most agribusiness companies have got away with underestimating their true impact because they only declare their direct emissions. Many emissions are not direct, but arise from the end use of their products or from their supply chains. These hidden emissions tend not to be disclosed in company reports but it is possible to estimate them by extrapolating from existing public data. In Silent but Deadly, we have used this information to estimate the real climate impact of three companies: Cargill, Yara and Tyson, which are amongst the world’s biggest firms in the cattle feed, nitrous fertiliser and beef industries respectively.

The agribusiness industry and climate change

The role of big oil and gas companies like BP and Shell in causing climate change is widely recognised. As the companies physically extracting fossil fuels from the ground, they rightly attract criticism for what they’re doing to the climate. Agribusiness multinationals, however, have received little scrutiny despite sharing responsibility for emissions levels that are not far behind those of some fossil fuel companies. The big agribusiness firms are each individually responsible for large amounts of global emissions as a result of many agricultural industries being highly consolidated globally. Just 10 companies control 98 per cent of the world market in pesticides and 10 companies control 55% of the fertiliser market.¹

A 2012 study estimated that between 19% and 29% of global emissions are associated with food production.² On the upper end of that scale (about 13.5 billion tonnes CO2 equivalent per year) that’s roughly the same as the annual emissions of China and India combined or 10 times the emissions of the aviation sector.

There are three different industries within the food production sector that have very significant
emissions, both direct and indirect. These are animal feed production, fertiliser production and the raising of beef cattle. There are clearly overlaps between these sectors in terms of emissions. A considerable amount of fertiliser goes into the production of animal feed and at least some of the emissions from raising beef cattle are associated with the animal feed that they consume.

**Beef (and dairy) production** is the most well-known agricultural activity that contributes to climate change. Cows (and to a lesser extent other ruminants such as goats and sheep) emit significant amounts of methane as a part of their digestion process. The scientific name for this process is enteric fermentation but is probably better known as farting. Methane is a greenhouse gas 21 times more potent than carbon dioxide.

**Fertilisers** are also a major source of direct emissions from agriculture. A number of different chemicals are used which have differing effects on the climate. The most dangerous of these in terms of climate change is ammonia which releases nitrous oxide, a greenhouse gas 298 times as potent as carbon dioxide.

**Cattle feed** not only causes surprisingly high levels of emissions during its production and processing but also gets fed to animals that emit large amounts of methane through enteric fermentation.

**Seed production** does not produce as many direct emissions as some of the other agricultural industries. Nevertheless, big companies like Monsanto produce proprietary seed that must be used with certain pesticides that do have a more significant carbon footprint.

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**Agroecology and food sovereignty – there are alternatives to corporate agribusiness**

Many agribusiness multinationals present themselves as being part of the solution to climate change while being responsible for huge levels of emissions. The real solution lies in cutting emissions through the application of proven alternatives which are already being practiced by communities and small-scale farmers around the world.

Agroecology is the science of sustainable farming. It is about making agriculture work with, rather than against, nature and is based on proven techniques that are used by small-scale farmers around the world. Fundamentally, agroecology is about shifting the control of land, seeds, markets and labour out of the hands of big business and back into the hands of small-scale farmers.

Food sovereignty is a closely related concept that is about establishing a right to sustainable, culturally appropriate food. It is about securing control by communities and small-scale producers over the way food is produced, traded and consumed.

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**Cargill**

**Animal feed manufacturer**

Declared emissions: 15 million tonnes CO2e

Estimated true climate impact:

145 million tonnes CO2e

Cargill is an American company based in Minnesota. It is the largest privately-owned corporation in America. In 2014, the company had overall revenues of $134.9 billion. Cargill operates in a number of industry sectors, one of which is animal feed.

Cargill voluntarily submits data on its greenhouse gas emissions to the Carbon Disclosure Project (CDP). The most recent year for which data are available is 2013. In that year, Cargill reported the following emissions (in tonnes CO2e):
Table 1:

<table>
<thead>
<tr>
<th>Scope 1 (direct)</th>
<th>8,857,479</th>
<th>59.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope 2 (purchased)</td>
<td>6,082,944</td>
<td>40.59%</td>
</tr>
<tr>
<td>Scope 3 (indirect)³</td>
<td>46,725</td>
<td>0.31%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,987,148</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Cargill’s published emissions of 15 million tonnes of CO2e are about equivalent of the annual emissions of Panama or Costa Rica.

But these official figures don’t tell the whole story. They include the direct (scope 1) emissions from things like the boilers and engines that burn fossil fuels on site. They also include the purchased (scope 2) emissions arising from the electricity consumed by the animal feed company. But they exclude the vast majority of indirect (scope 3) emissions.

Scope 3 emissions are difficult to quantify exactly, as they arise from the upstream and downstream supply chain emissions of Cargill’s products.

Upstream emissions include those from the fertiliser used to grow the crops that go into the animal feed, the soil emissions from those crops and the energy that went into their cultivation. Downstream emissions include the transport and storage of the animal feed and methane emissions from the livestock (e.g. through enteric fermentation) when it eats the animal feed and those from the slaughter, storage, transport and consumption of the meat.

These emissions are from what is known as the Corporate Value Chain – it is recognised that while companies may not have total control over the emissions from the value chain, they do have considerable influence over them.

Accurately quantifying the overall scope 3 emissions from a specific animal feed company would require a detailed analysis of these upstream and downstream emissions. This is a time, labour and data intensive process that requires access to the company’s records and production techniques that currently is not publicly available.

This lack of data forces us to use a simpler method to make a broad estimate of these emissions. We have taken existing global data on the greenhouse gas emissions of the livestock sector, and allocated them to Cargill on the basis of its share of the global animal feed market. This may not result in as detailed or accurate a figure as the first approach, but it provides a total that gives an indication of the overall scale of the company’s indirect emissions.

A recent estimate⁴ from the Food and Agriculture Organisation of the United Nations (FAO) indicates that the livestock supply chain accounts for no less than 14.5% of global greenhouse gas emissions (about 7 bn tonnes CO2e/yr), a total greater than the national emissions of the USA.

The total for the livestock supply chain can be broken down as shown in table 2 below.

We can associate all of the first category – feed production and processing – with the animal feed companies, based on their share of the global feed market.⁷ They are also linked with a proportion of the second category – enteric fermentation (emissions from cows and other ruminants). This proportion can be estimated based on the type of animal responsible for the bulk of enteric fermentation emissions, and the share or their diet made up of manufactured feed products.

The ability of cows and other ruminants to consume naturally occurring forage means that manufactured feed can often comprise a relatively small proportion of their diets. Although a 1995 report estimated that some intensively-reared cattle may have as much as 70% of their diet from concentrated feeds, globally the proportion is much lower.⁸ For the purpose of this analysis, we will assume that no more than 10% of ruminant

| Table 2: |
|-----------------|------------|------------------|-----------------|
| Category        | Percentage | Total emissions (tonnes CO2e) | Broadly comparable national emissions⁶ |
| Feed production and processing | 45% | 3.1 bn | India |
| Enteric fermentation⁶ (cow flatulence) | 39% | 2.7 bn | Brazil + Canada combined |
| Manure storage and processing | 10% | 690 mn | Australia |
| Processing and transport of animal products | 6% | 414 mn | Italy |
Table 3:

<table>
<thead>
<tr>
<th>Company name (and country where based)</th>
<th>Annual production in 2014 (thousand tonnes)</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP Group (Thailand)</td>
<td>27,650</td>
<td>6.08%</td>
</tr>
<tr>
<td>Cargill (USA)</td>
<td>19,500</td>
<td>4.29%</td>
</tr>
<tr>
<td>New Hope Group (China)</td>
<td>18,700</td>
<td>4.11%</td>
</tr>
<tr>
<td>New Hope Liuhe (China)</td>
<td>15,710</td>
<td>3.45%</td>
</tr>
<tr>
<td>Purina Animal Nutrition (USA)</td>
<td>12,700</td>
<td>2.79%</td>
</tr>
<tr>
<td>CPP China (China)</td>
<td>12,400</td>
<td>2.73%</td>
</tr>
<tr>
<td>Wen’s Food Group (China)</td>
<td>12,000</td>
<td>2.64%</td>
</tr>
<tr>
<td>BRF (Brazil)</td>
<td>10,360</td>
<td>2.28%</td>
</tr>
<tr>
<td>Tyson Foods (Broiler) (USA)</td>
<td>10,000</td>
<td>2.2%</td>
</tr>
<tr>
<td>East Hope Group (China)</td>
<td>7,600</td>
<td>1.67%</td>
</tr>
</tbody>
</table>

Diets are from feed products, with the remaining 90% from grazing or locally cultivated feeds.

Of the 39% of livestock emissions linked with enteric fermentation, we shall allocate just 3.9% to the global feed producers. With the 45% from feed production and processing, this means that 48.9 – just under half – of livestock emissions can be directly linked with the activities of feed manufacturers.

The global animal feed industry is dominated by a relatively small number of very large companies, together with many more smaller ones. The top ten companies, with annual production figures and global market share, are shown in Table 3 above.

We know that Cargill has a 4.29% share of the global animal feed market and that the Food and Agriculture Organisation of the United Nations estimates global emissions from livestock feed production and processing at over 3.1 billion tonnes CO2e, and emissions from enteric fermentation at just under 2.7 billion tonnes CO2e.

Allocating Cargill a 4.29% share of feed processing emissions, and a similar share of 10% the enteric fermentation emissions (allowing for the bulk of these emissions not from manufactured feed) gives us a total of almost 145 million tonnes CO2e.

Allowing for the Scope 1 and 2 emissions already declared via the CDP leaves us with total undeclared Scope 3 emissions of just under 130 million tonnes CO2e. The new table is shown as Table 4.

Table 4:

<table>
<thead>
<tr>
<th>Scope</th>
<th>144,724,609</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope 1</td>
<td>8,857,479</td>
<td>6.12%</td>
</tr>
<tr>
<td>Scope 2</td>
<td>6,082,944</td>
<td>4.20%</td>
</tr>
<tr>
<td>Scope 3</td>
<td>129,784,186</td>
<td>89.68%</td>
</tr>
</tbody>
</table>

To put Cargill’s undeclared Scope 3 emissions into some kind of context, 130 million tonnes of CO2e is broadly comparable to the combined national emissions of Denmark, Norway and Sweden.

Yara:

Fertiliser company

Declared emissions: 12.5 million tonnes CO2e

Estimated true climate impact:
174.5 million tonnes CO2e

Official emissions: 12.5m tonnes

Hidden emissions: 62.5m tonnes
A very similar methodology to that used to generate the estimate of Cargill’s scope 3 emissions can be applied to estimate the undeclared emissions of the companies that produce nitrogen fertilisers. In this case we shall look at the declared and undeclared emissions of Yara, a large Norwegian company that is one of the leading producers of nitrogen fertilisers.

Nitrogen fertiliser is made using the Haber-Bosch process, a chemical reaction developed in Germany just before the First World War. Originally used in the manufacture of explosives, the Haber-Bosch process uses natural gas as a raw material for the production of ammonia, a key ingredient of nitrogen fertilisers. The process is energy intensive, with the reaction taking place at high temperature and pressure.

Yara declares Scope 1 emissions via the Carbon Disclosure Project, although the most recent period for which data are available is the calendar year 2009. In that year, Yara’s declared Scope 1 emissions were 12.5 million tonnes CO2e. No Scope 2 emissions were declared, on the basis that they were extremely low relative to overall emissions. There was no declaration of any Scope 3 emissions.

As well as the emissions that occur during the production process, the application of nitrogen fertiliser to soil results in significant emissions of nitrous oxide (N2O), an extremely powerful greenhouse gas. The global warming potential (GWP) of N2O is 298 times that of CO2.

It has been estimated that, globally, the use of nitrogen fertilisers results in emissions of up to 5.8 million tonnes of N2O-N each year. Since N2O has a GWP of 298, this is the equivalent of over 1.7 billion tonnes of CO2e, comparable to the annual national emissions of Brazil.

Yara has a 3.6% share of the global nitrogen fertiliser market. Allocating Yara a 3.6% share of global N2O emissions from soil would give the company additional Scope 3 emissions of over 62 million tonnes CO2e, greater than the annual national emissions of New Zealand, and over 2.5 times greater than those of Norway itself.

Raising cattle, as mentioned above, results in very significant methane emissions from cow flatulence (enteric fermentation).

Manure management of ruminants is also an emitter of both methane and nitrous oxide, though on a much smaller scale than enteric fermentation. Methane results from the decomposition of manure in anaerobic conditions, while nitrous oxide is formed via a number of different pathways, including the nitrification of animal manure and urine, and the leaching of nitrogen from manure into soils and groundwater.

The US Environment Protection Agency (EPA) produces an annual inventory of greenhouse gas emissions within the USA, and breaks these emissions down.

From this report, we know that in 2013 (the most recent calendar year for which data is available) the production of cattle (beef and dairy) was linked to the following emissions (in million tonnes CO2 equivalent) from enteric fermentation and manure management:

**Tyson: beef producer**

- **Declared emissions:** 5.22 million tonnes CO2e
- **Estimated true climate impact:** 34.22 million tonnes CO2e

<table>
<thead>
<tr>
<th>Official emissions: 5m tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hidden emissions: 29m tonnes</td>
</tr>
</tbody>
</table>

The table shows the comparison between the declared and estimated emissions for Tyson, a beef producer.
Market information from the USA shows that the production of beef is dominated by just four companies: Tyson Foods, JBS, Cargill (mentioned above) and Smithfield Foods. Tyson is the largest of these, with a 24% share of the American beef market. Tyson also reports that beef production contributes 42% of its annual sales; they also produce large quantities of chicken, pork and processed foods.

In its Sustainability Report for 2013, Tyson Foods declare total greenhouse gas emissions of 5.22 million tonnes CO2e. These emissions are not broken down by activity or source. Tyson Foods have been invited to report emissions via the Carbon Disclosure Project, but have declined to do so, which means that it is not possible to compare their stated emissions against those of other companies reporting via the CDP.

Tyson claims to have a 24% share of the US beef market. Given that we know that the raising of beef cattle leads to the emissions of over 120 million tonnes of CO2e, we can allocate 24% of this total, or almost 29 million tonnes of CO2e, to Tyson Foods. 29 million tonnes is broadly comparable to the combined national emissions of Luxembourg, Armenia and Suriname.

This figure, just for beef production, is almost six times higher than Tyson’s declared corporate greenhouse gas emissions for their entire business. These emissions only relate to Tyson’s beef production within the USA – unlike the figures for Cargill and Yara above, it is not a figure based on global emissions and Tyson’s global market share.

It is important to note that Tyson may not be responsible for the beef cattle throughout their lives. More likely, Tyson buys them close to the end of their lives, shortly before the “harvesting” process. Emissions from enteric fermentation that take place before Tyson acquires the cattle would form part of their upstream Scope 3 emissions.

There may be some overlap between Tyson’s declared emissions of 5.22 million tonnes and the 29 million tonnes from the beef that they produce. But the lack of detail in their sustainability report does not allow us to carry out this analysis.

Tyson, like Cargill and Yara, should follow industry best practice and report not only their Scope 1 and 2 emissions, but also the Scope 3 emissions from their upstream and downstream corporate value chain. Only by doing so can they hope to have any influence over the management of these greenhouse gases.

### Climate Smart Agriculture: a real solution or industry PR gimmick?

A number of big agribusiness companies have joined forces with the UN Food and Agriculture Organisation and the World Bank to promote Climate Smart Agriculture. The main vehicle for this has been the Global Alliance for Climate Smart Agriculture (GACSA) which was launched in September 2014. Companies promoting themselves as supporters of climate smart agriculture include Walmart, Monsanto and Yara.

There are very few significant social or environmental preconditions for joining GACSA or calling a particular agricultural practice climate smart. And despite the publicity around climate smart agriculture, the concept itself is not clearly defined. It is essentially nothing more than a convenient buzz phrase that has been used as a way for huge multinationals to rebrand their methods as climate smart, regardless of whether they really reduce emissions at all. This lack of definition has allowed Yara, which is among the world’s biggest producers of nitrogen-based fertilisers (the worst type for climate impact) to join GACSA and promote itself as a practitioner of Climate Smart Agriculture.

All of this has meant that the vast majority of civil society groups active on climate change are deeply sceptical of Climate Smart Agriculture, and support proven alternatives such as agroecology and food sovereignty.
Conclusion and recommendations

Agribusiness companies cannot be allowed to present themselves as part of the solution to climate change when they are in fact a serious part of the problem. As this paper has shown, the declared emissions of multinational beef, animal feed and fertiliser companies are likely to be significant underestimates of the wider impact of these companies’ activities arising from their supply chains and from the end use of their products.

Until there is greater transparency and comparability in the reporting of scope 3 emissions, it will be impossible to ascertain the accurate carbon footprint of companies like Yara, Cargill and Tyson.

Mandatory carbon reporting of scope 3 emissions is, for this reason, vital. There is an urgent need for companies with large supply chain or downstream carbon impacts to be held to account for their share of responsibility for greenhouse gas emissions. Any such mandatory scope 3 reporting regime must be broad enough to reveal the full carbon impact of a given company. Companies must be forced to take some level of responsibility for emissions across their supply chains.

But transparency is not enough. The level of control that a small number of powerful multinationals have over agribusiness sectors such as fertilisers, seeds and pesticides is dangerous, as it allows these firms to have a disproportionate influence and control over food systems. The rebranding of unsustainable agricultural practices as climate smart agriculture is one symptom of the corporate control of food that could be disastrous for the climate.

Climate smart agriculture must be abandoned as a false solution to the problem of agricultural emissions. Public and civil society organisations should refrain from participation in business-led coalitions such as the Global Alliance for Climate Smart Agriculture that include multinationals seeking to present business as usual methods as sustainable.

Instead, we need more investment in real alternatives that have been proven to reduce emissions.

More support for food sovereignty and agroecology is vitally needed. While far less lucrative than the industrial, chemical-intensive methods used by the agribusiness industry, agroecology has been shown to increase crop yields by up to 73% without the environmental costs of traditional intensive agriculture. Promoting food sovereignty, which revolves around placing control over food systems within local communities, would also serve to displace the influence of agricultural corporations with high carbon footprints.

More information about these alternatives can be found in recent reports by Global Justice Now:

- From the roots up - How agroecology can feed Africa http://www.globaljustice.org.uk/resources/roots-how-agroecology-can-feed-africa
- Food sovereignty - tricky questions http://www.globaljustice.org.uk/resources/tricky-questions-briefing-food-sovereignty

Explaining the ‘scopes’: Direct and indirect emissions

**Scope 1** covers emissions that are the sole responsibility of the company. These could include fossil fuels burnt in the company’s factories or vehicles, or process emissions from production facilities.

**Scope 2** covers emissions associated with imported (or purchased) services, such as electricity, steam, heating or cooling. If a company imports electricity, it has control over how much electricity it consumes, but not the manner in which it is generated. We can think of the responsibility for these emissions being shared between the generator (the power station) and the consumer (the factory).

**Scope 3** covers indirect emissions, such as those associated with the upstream and downstream supply chains. If a factory imports raw materials for use in its production, the emissions from the mining and processing of the materials would come under scope 3 of the company. Likewise, emissions associated with the way that the company’s products are used and disposed of would be scope 3 emissions.
Endnotes

2 Vermeulen SJ, Campbell BM, and Ingram JSI (2012). Climate Change and Food Systems in The Annual Review of Environment and Resources. 2012. 37. p.198. http://www.annualreviews.org/pdf/10.1146/annurev-environ-020411-130608 Of this total, 86% is from agricultural production, with the remainder from pre-production activities (e.g. fertiliser & animal feed manufacture) or post-production (e.g. food transport, storage, refrigeration, catering & disposal).
3 The declared Scope 3 figure covers business travel only, and does not include any corporate value chain emissions.
5 National data are for total greenhouse gas emissions including land use change and forestry. Most recent data are for calendar year 2012. Available from the CAIT Climate Data Explorer of the World Resources Institute http://cait.wri.org
6 Enteric fermentation results in very considerable emissions of methane (CH4) from ruminant digestion. Methane is a powerful greenhouse gas with a global warming potential 21 times that of CO2
7 The FAO’s estimate for emissions from global animal feed manufacture and processing will encompass the entire animal feed supply chain, and not just the emissions from the final manufacturer of animal feed. Cargill is a leading manufacturer of animal feed, but they rely on raw materials from farmers and other companies in the upstream supply chain. When Cargill have manufactured their products, they pass them on to farmers via the downstream supply chain. Calculations based on Cargill’s share of the global animal feed market indicate that they are associated with an overall emissions figure that is significantly larger than their own declared Scope 1 and 2 emissions, reported via the Carbon Disclosure Project. So we have allocated these additional emissions to their estimated scope 3 footprint.
9 Market share is derived from the total production figure for the world’s top 200 feed companies. For 2014, this total was 454,887,000 tonnes. Data available at http://www.wattagnet.com/directories/81-the-world-s-leading-feed-producers/top_companies_table
10 Feed company production data available at: http://www.wattagnet.com/directories/81-the-world-s-leading-feed-producers Free registration required to access production data.
11 Total emissions for 2012 of just under 130 million tonnes CO2e. There are of course many other combinations of nation states that would give a similar total. Such as Cuba, Yemen, Lithuania, Norway and Uruguay.
16 Facts about Tyson Foods. Available at: http://ir.tyson.com/investor-relations/investor-overview/tyson-factbook/