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 - 4 There is no consensus
 - 5 It's cooling
 - 6 Models are unreliable
 - 7 Temp record is unreliable
 - 8 Animals and plants can adapt
 - 9 It hasn't warmed since 1998
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Archives

Climate Hustle

How much does animal agriculture and eating meat contribute to global warming?

What the science says... [Link to this page](#)

Animal agriculture is responsible for 13–18% of human-caused greenhouse gas emissions globally, and less in developed countries (e.g. 6% in the USA). Fossil fuel combustion for energy and transportation is responsible for approximately 64% of human-caused greenhouse gas emissions globally, and more in developed countries (e.g. 80% in the USA).

Animal agriculture and eating meat are the biggest causes of global warming. Becoming Vegan or cutting down on your own personal meat consumption could be the single most effective action that you can do to help reduce greenhouse gas emissions. [Planet Earth Herald](#)

The burning of fossil fuels for energy and animal agriculture are two of the biggest contributors to global warming, along with deforestation. Globally, fossil fuel-based energy is responsible for about 64% of human greenhouse gas emissions, with deforestation at about 18%, and animal agriculture between 13% and 18% (estimates from the World Resources Institute, UN Food and Agriculture Organization, and Pitesky et al. 2009).

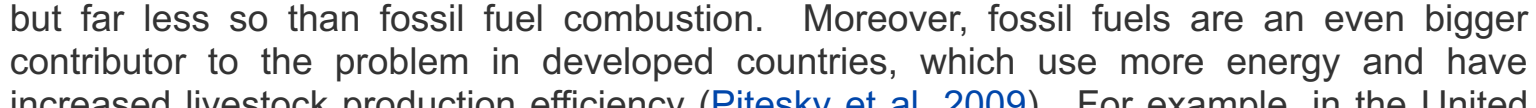
100% = 48.1 Gt CO₂e



Global human greenhouse gas emissions breakdown, from the World Resources Institute.

So, animal agriculture and meat consumption are significant contributors to global warming, but far less so than fossil fuel combustion. Moreover, fossil fuels are an even bigger contributor to the problem in developed countries, which use more energy and have increased livestock production efficiency (Pitesky et al. 2009). For example, in the United States, fossil fuel-based energy is responsible for about 80% of total greenhouse gas emissions as compared to about 6% from animal agriculture (estimates from the World Resources Institute and Pitesky et al. 2009).

U.S. GHG Emissions Flow Chart



On the main ways in which the livestock sector contributes to global warming is through deforestation caused by expansion of pasture land and arable land used to grow feedcrops. Overall, animal agriculture is responsible for about 9% of human-caused carbon dioxide emissions globally (UN FAO).

Animal agriculture is also a significant source of animal greenhouse gases. For example, ruminant animals like cattle produce methane, which is a greenhouse gas about 20 times more potent than carbon dioxide. The livestock sector is responsible for about 37% of human-caused methane emissions, and about 65% of human nitrous oxide emissions (mainly from manure), globally (UN FAO).

Beef is a bigger problem than other sources of meat

Producing beef requires significantly more resources (e.g. land, fertilizer, and water) than other types of meat production. For example, cattle also produce methane, but other sources (e.g. pigs and chickens) don't.

Eschei et al. 2014 estimated that producing beef requires 28 times more land, 6 times more fertilizer and 11 times more water than producing pork or chicken. As a result, the study estimated that producing beef releases 4 times more greenhouse gases than a calorie-equivalent amount of pork, and 5 times as much as an equivalent amount of poultry.

Eating vegetables produces lower greenhouse gas emissions yet. For example, potatoes, rice, and broccoli produce approximately 3–5 times lower emissions than a calorie-equivalent amount of pork (Eschei et al. 2014). The reason is simple – it's more efficient to grow a crop and eat it than to grow a crop, feed it to an animal as it builds up muscle mass, then eat the animal.

US human greenhouse gas emissions flowchart, from the World Resources Institute.

How does animal agriculture cause global warming?

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US human greenhouse gas emissions flowchart, from the World Resources Institute.

Greenhouse gas lifecycle assessment for common proteins and vegetables (EWG 2011).

How do the numbers get misrepresented?

There are often suggestions that going vegan is the most important step people can take to slow the global warming problem. While reducing meat consumption (particularly beef and lamb) reduces greenhouse gas emissions, this claim is an exaggeration.

An oft-used comparison is that globally, animal agriculture is responsible for a larger proportion of human-caused greenhouse gas emissions (14–18%) than transportation (13.5%). While this is true, transportation is just one of the many sources of human fossil fuel combustion. Electricity and heat generation account for about 25% of global human greenhouse gas emissions alone.

Moreover, in developed countries where the 'veganism will solve the problem' argument is most frequently made, animal agriculture is responsible for an even smaller share of the global warming problem than fossil fuels. For example, in the USA, fossil fuels are responsible for over 10 times more human-caused greenhouse gas emissions than animal agriculture.

That's not to minimize the significant global warming impact of animal agriculture (as well as its other adverse environmental impacts), especially from beef and lamb, but it's also important not to exaggerate its contribution or minimize the much larger contribution of fossil fuels.

Last updated on 28 September 2017 by dana1981. [View Archives](#)

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Comments

Comments 1 to 23:

1. **Vincent Duhamel** at 00:33 AM on 7 December, 2015

Very interesting. Thanks for putting things in perspective.

However, it seems like this confirms part of the "Myth" you wished to debunk:

"Becoming Vegan or cutting down on your own personal meat consumption could be the single most effective action that you can do to help reduce greenhouse gas emissions."

Short of going off the grid, that is. You have compared emissions from agriculture to emissions from the fossil fuel industry. Since your case seems to be built for the US where much power/electricity comes from fossil fuel, a person can hardly act so as to stop using fossil fuels. Even by selling their cars. However, they can stop eating meat.

So it seems, although the impact of animal agriculture is sometimes overblown, eating a plant-based diet would still be the single most effective action an individual could undertake, short of going off the grid. No?

2. **scaddennp** at 06:29 AM on 7 December, 2015

"eating a plant-based diet would still be the single most effective action an individual could undertake, short of going off the grid."

If you look at where the individual contributions of energy use are (eg the MacKay analysis for UK is here - I have done similar for NZ), you would see that food and even going off grid aren't that big a deal (particularly if you use non-FF heating). Getting off the plane is probably the biggest saving you can make. Finding ways to get out of the car would be next followed by sharply reducing your consumption of stuff.

3. **ecohen** at 08:20 AM on 8 December, 2015

Thanks for this great discussion.

Check out this Eshel paper-Climate impact of beef: an analysis considering multiple time scales and production methods without use of global warming potentials. R T Pierrehumbert1 and G Eshel2

Published 4 August 2015 • © 2015 IOP Publishing Ltd • Environmental Research Letters, Volume 10, Number 8

<http://iopscience.iop.org/article/10.1088/1748-9326/10/08/080002/meta>

The study conclusions include that certain forms of pastured beef have substantially lower climate impact than feedlot systems.

To fully address climate change impacts, we need to consider different types of livestock management — for their threats and potential benefits — ghg emissions reductions/sequestration as well as natural water storage, flood mitigation, and biodiversity enhancement...

It seems we should eat much less beef and when we do eat it, we need to do it the right kind...

Also, my understanding is that all agriculture (not just livestock) GHG emissions are estimated at 15% of global total by FAO 2013; and 13% by UNEP 2015.

Response:

[PS] fixed link.

4. **wideEyedPupil** at 15:35 PM on 10 December, 2015

I'm concerned with the presentation of this page

<http://www.skepticalscience.com/how-much-meat-contribute-to-gw.html>.

The Zero Carbon Australia Land Use Report found that a proper and full accounting of GHG emissions pegs Land Use at 55% of emissions using 20 year GWP. As you'd be aware 20 yr GWP is significant, given the perilous state of many climatic system and stocks of ice etc. Even using 100 year GWP which tends to obscure the effects in near term on climate systems of methane and black carbon it will soon be at 100 years.

The major contributing factors were found to be land clearing (often cyclical), savannah burning (repeated) and centric fermentation. This would make it likely that GHG emissions in North and South America might be in that vicinity given the large amount of Amazonian and other old growth forest cleared in order to grow cattle and soy crops to feed north american cattle.

90% of that 55% of national emissions using 20yr GWP is associated with livestock ruminants, mostly the large extended zone pastoral operations in northern Australia, mostly for cattle.

By presenting this argument using standard UNFCCC accounting which majorly obscures, re-assigns and ignores emissions and removal of sequestration sources associate with Land Use Sector you are in fact perpetuating a myth not debunking one.

To my best knowledge the ZCA Land Use Report was peer reviewed and supervised within MSSJ (University of Melbourne) and has not been refuted in the literature. Nor has it's conclusion that 55% of Australia's national GHG emissions using 20 yr PWG is from the Land Use Sector. I'd ask that you rename these pages to be less pejorative and more in line with the science and debate if you want to call it that.

Given that much of the old growth forest clearing going on in the world to produce more ruminant grazing pasture and crops to feed ruminants and animals in general, and that this OGF is the greatest CO2 sequester known to man, and that it's impossible to regain the sequestration levels once OGFs are logged, even after a century, it's doubly important that land use sector emissions be seen as the major problem, perhaps the greatest problem in the short term for GHGs reduction (ignoring the politics of livestock lobby vs ff lobby), then renaming this page and the old version is required.

Alastair Leith
Climate Activist and Campaigner

5. **wideEyedPupil** at 15:36 PM on 10 December, 2015

Zero Carbon Australia Land Use Report

6. **Tony_G** at 21:41 PM on 21 February, 2016

The Zero Carbon Australia Land Use Report (link fixed) mentioned above:

"A number of agricultural industries are among the most emissions intensive activities in Australia. Beef production, for example, is more emissions intensive than aluminium and steel production. Emissions from agriculture are even more significant when the impact of activities is calculated over 20 years instead of the more common 100-year accounting approach. When considered from this perspective, agricultural emissions could account for as much as 54% of Australia's total emissions."

7. **pslebow** at 13:53 PM on 30 September, 2016

Yes, the 100 horizon for methane is whistling in the dark, but methane is a no non-linearities and tipping points in the near future.

8. **Theresab** at 03:27 AM on 18 June, 2017

OK, I have a question... So, supposedly not eating meat will reduce carbon emissions and help reduce global warming correct? But so far it seems the main way animal agriculture contributes to global warming is through deforestation for feedcrops and pasture land. If more humans start eating plants instead of animals however, while the need for pastures and feed crop land will reduce, won't the need for farmland to grow all these in demand plants just increase? For example the U.S. is already unable to produce enough fruits and veggies to feed its citizens and relies on other countries as a supplement. If the decrease in land needed for animals doesn't match up to the increase in land needed for plant farming, won't this result in even more land cleared in other places to keep up with supply and demand (aka money to be made)?

9. **Tom Curtis** at 08:37 AM on 18 June, 2017

Theresab @ 03:37 AM discusses the issue directly. Essentially, deforestation contributes more to global warming than does agriculture (18.2% vs 13.5%), but most deforestation is driven by the lumber industry, not land clearing for agriculture. From agriculture, the major contributors are agricultural soils (6%) and livestock and manure (5.1%). All percentages are of global totals in CO2eq, from 2000 data.

Crops require far less land area than does pasturing cattle. Indeed, in general, you will require 10 times as much land area for animals as you will for plants for the same total food production. That said, some area on which livestock is grazed is not suitable for cropping due to inadequate rainfall or other factors.

10. **wideEyedPupil** at 18:03 PM on 8 August, 2017

"For example the U.S. is already unable to produce enough fruits and veggies to feed its citizens and relies on other countries as a supplement."

This is a ridiculous assertion. The single greatest reason USA imports fruit and vegetables is cost. Paying workers in Sth American nations \$1 a day rather than US workers \$12 an hour or whatever minimum wage is in USA today (although many workers in southern states are migrant workers from Mexico who are paid less than minimum wage), in Australia orchardists are regularly removing fruit orchards when canneries are closing, if demand for their fruit and veg went up, production would go up. Meanwhile livestock production is subsidised by way of no price on the extensive emissions over access to waterways and so on.

11. **wideEyedPupil** at 18:32 PM on 8 August, 2017

The amount of agricultural land devoted to fruit and vegetables globally is trivially small compared with the vast domains of rangelands for grazing and to a much lesser extent, cropping areas.

12. **wideEyedPupil** at 18:38 PM on 8 August, 2017

@Tom Curtis, almost all land clearing (and cyclical clearing) in Australia is for grazing ruminant livestock, themselves a huge emissions source. In nations where logging occurs (I'm thinking Indonesia, Malaysia, Brazil, ...) the logging is just a more profitable way to clear the land than burning it off. If it was most cost effective to burn it off then they'd do that, they often do both in Indonesia and the fires are so vast the smoke travels to other countries and creates air quality health impacts.

They are clearing the land for livestock principally in Sth American amazon region and crops to feed their livestock (like soy beans). In SE Asia they're often clearing for vast palm oil plantations. It's all about agriculture, if it was about logging timber they'd be harvesting it sustainably and returning logged areas to forest production. They aren't.

13. **chanut.th** at 23:02 PM on 26 March, 2018

The more we eat, the more we eat, the more we need to increase the amount of animals. And from the document, it is said that the cow has a large amount of gaseous emissions. The more the grass is, the more likely it will be the greenhouse effect. But the industry is another factor in greenhouse gases, but meat and dairy emissions have led to clean gas (<http://faculty.college-prep.org/~bernie/>), scioproject / project / Kingdoms / Bacteria3 / methanogens.htm)

The responsible animal industry has the second highest potential for methane to make clean energy.

14. **RedBaron** at 01:43 AM on 3 June, 2018

The issue is clearly what type of animal husbandry we are talking about. Managed properly Beef production can be the most effect sink, or improperly managed a very significant emissions source.

All depends if the CAFO feedlot model is used or not.

"The number one public enemy is the cow. But the number one tool that can save mankind is the cow. We need every cow we can get back out on the range. It is almost criminal to have them in feedlots which are inhumane, antisocial, and environmentally and economically unsound." Allan Savory

15. **nigelj** at 14:34 PM on 3 June, 2018

Red Baron, this is a difficult thing. On one side of this issue, prairie style beef grazing creates a good long term carbon sink. Meat is an excellent source of protein.

On the other side of the issue, meat is an inefficient form of calories compared to crops and has a significant carbon footprint (but as you say it depends how they farm). Whats more, a growing population will put pressure on available land, and this will particularly include converting areas of beef grazing to crops.

The way out of the dilemma is this: If you want your cows, you better be promoting smaller human population size!

16. **RedBaron** at 21:23 PM on 3 June, 2018

No nigelj, you are wrong there. The current factory farming style of animal husbandry is labor efficient but not land efficient or energy efficient or even cost efficient. Overall it is mostly inefficient.

Converting to regenerative ag in this case increases food output on less land at a lower cost and higher profit and improves that land rather than degrades it.

We could easily support far more population, not less.

17. **nigelj** at 06:46 AM on 4 June, 2018

Red Baron @ 16, I'm pretty sure you would get more calories per acre (or hectare) from crop land farming, or chicken farming, as against grasslands cattle farming, or indeed any conceivable form of cattle farming, no matter how efficient. The following article and research sums it up. Cattle have to eat a lot of food stocks or grasses, and burn much of it off in energy. I can't see how that would possibly change no matter how the farming is done.

However, grass-lands and beef cattle farming are important as a carbon sink, that's the other side of the equation. If we want to preserve them, the higher population pressure cannot help.

Answer me a question. Why does the world need more people? Doesn't the environmental, economic, and social evidence suggest we have more than enough people?

18. **RedBaron** at 10:46 AM on 4 June, 2018

Nigelj,

Here is what you are missing: [Earth has lost a third of arable land in past 40 years, scientists say](#)

Now what do you suppose can regenerate those highly degraded croplands? You guessed it, properly managed livestock. Completely unfit for crops yet it certainly not only can be used to provide high quality food, the production of food by grazing can if done right heal the land enough that once again it can become arable! in this case it is clear. Animals always produce more because you can't produce crops there anymore at all. The land become "farmed out".

You remove all animal husbandry and this very important tool is lost. Then we are locked into the slow slide into desertification and ultimately a crash of all human civilization as farming ends. That's not as far away as you think actually. Only 60 Years of Farming Left If Soil Degradation Continues

But what about land still capable of producing crops?

Read that carefully. It says "If soil degradation continues" emphasis on the "if". And how do we reverse this trend of soil degradation? By properly integrating animal husbandry back on the farm. When you do that correctly you produce far more calories per acre than without.

Can't see it? Look here from Australia:

Why pasture cropping is such a Big Deal

Read that carefully. See what is going on? The crop is still there, but you get a bonus of forages when the land isn't producing a crop! In fact, whether sheep or cows is irrelevant. The point is that you gain extra food production you would otherwise not had, and restore fertility to the land simultaneously.

So you get X yields PLUS the extra yields from animals.

Same goes for all other types of animal husbandry done properly. Cattle and sheep being fed to chickens and pigs, goats eating brush and weeds instead of herbicides use, Ducks yielding between rice, that is very long. In all cases though the integrated farm produces more calories per acre sustainably than crop production alone. Always!

Either it produces more because you can't even grow crops at all, or... it produces more because you use the animals to cycle waste material and turn it into fertility making crops grow better and gain a bonus additional animal foods AT THE SAME TIME.

19. **nigelj** at 11:05 AM on 4 June, 2018

Red Baron @ 18, ok those are good points, particularly the use of low quality arable land for cattle, and going back more to mixed farming, that combines crops, chickens and pigs, and this is a good sustainable multi purpose model.

I stress test ideas, to see if they stand up to being poked at, it doesn't mean I'm promoting vegetarianism or anything. Increasingly I'm becoming suspicious of any extreme solutions to most forms of problems. Eliminating all meat consumption completely seems as dubious as this very high meat Atkins diet. But I digress.

However I think you are still left with the same population problem.

20. **sauertj** at 23:18 PM on 6 July, 2018

@ wideEyedPupil #4: Your points remain unchanged. I read thru the ZCA report (linked HERE), and was unable to find any statement that substantiates your claim from #4: "The Zero Carbon Australia Land Use Report found that a proper and full accounting of GHG emissions pegs Land Use at 55% of emissions using 20 year GWP." In fact, when I read the summary to this report in the 1st paragraph of the site linked above, I read the following text: "The UNFCCC National Inventory Report suggests that sources of land use emissions, such as land clearing for agriculture and enteric (intestinal) fermentation from digestive processes in livestock, contribute 15% of national emissions." If I am reading this correctly, this seems to disagree with your statement. In addition, I glossed over the body of the whole ZCA report, and was not able to find any text indicating that land-use & agriculture accounts for 55% of emissions." The ZCA report link you provided in #5 no longer works. Could you provide an updated link with location of page to back up your "55% of emissions" text. Thank you very much!

21. **Benjamin David Steele** at 02:18 AM on 13 July, 2018

Below are two passages quoted in Nourishing Freedom by Sally Fallon. The first is by Charles Hallmark from Heath Freedom News:

If it were not for beef, the United States could produce perhaps 25% of the small grain it does. The factors that would limit our production is winter kill and tillering.

First, winter kill happens when small grains, such as wheat or oats, get into what is called the joint stage. Grain planted in the fall sprouts and grows fairly rapidly. Once it sends up the stem that the grain head grows on, and it makes the first joint in that stem, if it gets about 10 degrees Fahrenheit it will kill the plant.

To prevent this from happening, catfennel and wheat farmers graze small grains with cattle. Without cattle grazing, the wheat, all wheat planted as well as oats, would have to be planted in the spring. Usually, moisture conditions remain too wet for this to work well.

Without beef you can kiss goodbye probably to 50% of the earth's population.

Another misconception is water supposedly taken up by cattle. Water weighs approximately eight pounds per gallon. A one thousand-pound steer, at 100% water, would be 125 gallons of water. Whereas the rest of the thousands of gallons of water? If handled properly, the waste water from cattle is a very valuable resource. It removes

production by FAO 2014) to rest of world. This isnt a farming practise here, and I suspect it also isnt the practice in major producers like EU,China,India, Russia.

The question over water usage looks like a straw man. The water issues around cattle here focus on irrigation of pasture mostly, eg 1000 litres of water needed to produce 1 litre of milk. 15400 litres for 1kg of beef (eg see [here](#)). That is very high compared to plant-based protein sources.

I do not contest the value of well-managed, low-input rangeland but at first glance your sources are unconvincing and smack of rhetoric.

23. **Aaron** at 05:04 AM on 7 August, 2018

I'm wondering if anyone who has access to it has reviewed [this report](#), which suggests that eliminating beef could get most of the way toward meeting President Obama's 2020 emissions goals that he announced in 2009.

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