Q&A from 14 September 2022 Panel Discussion Event

Setting the Table for COP27: Carbon sequesterers or climate trashers? What role for grazing ruminants in a 1.5°C world?

Anonymous Attendee A 18:25
question for Francesca re "carbon transformation". Isn't the transformation process inherently losing or releasing carbon? What is left might be in a more stable form but the more dynamic the soil system the more vulnerable or less stable carbon is released?

Anonymous Attendee B 18:26
What is the net impact in terms of GHG if methane from the livestock is taken into account? - considering that the scale of wildfires appears to be reducing the way that methane is 'neutralized' within 10-12 years.

Anonymous Attendee 18:48
Has this question been answered? GHG sequestration in soil is much less than is emitted as methane or NOx in my understanding

Anonymous Attendee C 18:27
@Francesca, are you considering the effects of methane emissions?

Anonymous Attendee 18:28
How is biodiversity measured in these systems? What are the metrics? What are the goals? How can this be streamlined from producer to producer so that we have shared understanding of goals and terms and ecosystem integrity? Not just soil diversity or crop diversity but functioning self regulating native ecosystems with full systems of wildlife.

Anonymous Attendee 18:28
Wild grazers here in Colorado migrated ranges spanning hundreds of miles. The movement allowed by grazing rotation is much smaller and involves a lot of fencing. Why try to mimic the behavior of natural grazers when we could reintroduce/restore them?

Anonymous Attendee 18:34
There is some evidence and suggestions that wild ruminants but especially large non-ruminants are effective in moving aboveground C to belowground and more effectively digest forage resulting in less methane (Cromsigt et al work). Could wilder grasslands provide carbon sinks AND ecotourism opportunities for local people?

Anonymous Attendee 18:31
I understand that grassland restoration aims to maximise C sequestration for sure. Of course, there is no silver bullet for whole grassland. Can you please give an example of successful case studies to give an overview about how it look like?

Anonymous Attendee D 18:31
General q: What role do native ungulates (grazers) have to play in grassland soil C? There is evidence that Bison in N. America are more effective at grassland restoration and perform a different functional role than cattle. Wouldn't restoring native ungulates be a better approach in some grassland ecosystems to meet biodiversity and climate goals?

Anonymous Attendee B 18:38
Agreed - as only 4% of mammals on earth are wild - 34% being humans and the rest being 'food' for humans :(

Anonymous Attendee E 18:33
Getting the right balance between arable land to grow the crops that feed us and the ruminant grazers that can restore soil carbon is crucial to achieving a sustainable land use system. The UK government has promised to present a land use framework in 2023. How best could this framework achieve a suitable balance between providing the food we need and all the other ecosystem services that society relies on.

Anonymous Attendee 18:35
Are all ruminants emitting the same amount of carbon roughly, or are some better than others?

Anonymous Attendee D 18:36
Speaking about methane here, but some ruminants emit less per unit product (eg kg milk, kg meat) than others usually based on diet but also on breed/type

Anonymous Attendee F 18:38
What's a reliable source/ reference for that? The data/ stats I have found on general GHG emissions per animal/ per kilo have been conflicting with regards to ruminants.

Anonymous Attendee D 18:39
FAO GLEAM good resource: https://www.fao.org/gleam/en/ (I think the website is down right now)

Anonymous Attendee F 18:39
Thanks [name redacted] I'll check it out when it goes back up then :-) Much appreciated!

Anonymous Attendee D 18:40
No problem - feel free to email me at [email redacted] should you want to chat more!

Anonymous Attendee G 18:38
Given that grazing lands already occupy such a large majority of lands globally, and animal agriculture is a leading contributor to agricultural emissions, could each of you share what you believe is the amount of red meat that CAN be produced globally in sustainable/regenerative

ways? Is there a scientifically backed average number of acres of grassland required per cow, that allow the grazing to be regenerative, or at least neutral?

Anonymous Attendee H 19:03
check out some FAO reports, they do summaries, and this site https://www.iatp.org/

Anonymous Attendee I 18:39
One important clarifying point here is that, though ruminants are a large global land user, the land use tradeoffs of ruminant grazing are not the same as other types of agricultural land uses. Though we do grow crops to support current livestock numbers, their diets *can* be sustained through grass (and even byproducts) only while maintaining other ecosystem features like biodiversity and food production, etc. That is not the case for any other category of livestock.

Anonymous Attendee 18:40
soil and climate scientists have been recommending reduction of meat consumption. Why is the message not working? what can be done to bring consumption trends into sanity?

Anonymous Attendee J 18:45
As a future dietitian -- behavior change (especially around diet) is EXTREMELY challenging. Putting the decision all on the consumer will likely not be successful. So changing the food environment may help (decrease meat advertisement, taxes, decrease the amount that produced, etc...)

Anonymous Attendee K 18:49
Taxing the external cost?

Anonymous Attendee J 18:55
Perhaps increasing cost of meat... I haven't looked into any of these specifically. But just ideas. I'm just saying that consumers have a lot to consider when deciding what food to buy, and environmental sustainability is the least of their concern. Studies show that cost, taste, and convenience are the most important factors for deciding food choice.

Anonymous Attendee L 19:19
[regarding thread: “soil and climate scientists have been recommending reduction of meat consumption. Why is the message not working? what can be done to bring consumption trends into sanity?”]

[name redacted], totally agree, and maybe there's been a failure in science communication (compounded by big food marketing forces!). With COVID, increasing frequency of climate disaster events, and an uptick in public understanding of science, perhaps that failure could now be an opportunity.

Anonymous Attendee 18:40

For Matthew - what seems to be the ideal solution (keep on pace with cattle demand while decreasing the GHG on pace with net zero goals). Or is that still up for debate?

Anonymous Attendee M 18:41
That question—whether we have to live with zero livestock—seems awfully theoretical. What can sustainable livestock grazing support in dietary terms?

Anonymous Attendee 18:41
Is it possible that livestock might be more ecologically valuable alive than killed for slaughter? And might they be more economically valuable for farmers, if farmers are paid a carbon-sequestration subsidy?

Anonymous Attendee N 18:41
So if animals are key to the eco-systems… why would we kill them (for food)? Why is it necessary to continue to eat and abuse non-human animals? Can't they be raised and taken care of without us killing them?

Anonymous Attendee I 18:44
Because they're an important food source. Certainly the SOC sequestration potential does not rely on them being killed, but the socio-economic and food supply viability does. These are highly interconnected systems where extreme options are most often theoretical.

Anonymous Attendee N 18:47
Animals deserve to live just as much as humans do and there is absolutely no way that we are dependent on their death for us to live when there are so many alternatives

Anonymous Attendee I 18:52
That is a moral question that needs to be decided on an individual basis, not a global ecological question.

Anonymous Attendee N 19:00
When it comes to the environmental impact of the cattle industry that affects every single individual on the planet, it is far more than an individualist problem than you say

Anonymous Attendee N 19:00
**far less than

Anonymous Attendee 18:42
How much ruminant meat could provide grasslands?

Anonymous Attendee O 18:42
When we come to optimising land use - including grazing management - we surely also need to consider the resilience of those systems, including the diversity of the grazers, the diversity and complexity of the resulting landscape (grasses, shrubs, trees etc) - for resilience to the impacts

of a changing climate including floods, fires, drought, pests pathogens and disease? And hence also the resilience of food systems...

Anonymous Attendee 18:42
Assuming we want to only graze native grassland (not converted forest), and are happy to feed ruminants on residues but not dedicated crops, how much beef can we eat as a % of today's beef consumption?

Anonymous Attendee 18:42
Any comments from the panel about efforts in Brazil towards sustainable beef - planting pastures with high yield grasses and mob grazing approach.

Anonymous Attendee H 18:54
talk to the JBS boys. from the USA perspective, they are one of the top 4 packers. They are Brazilian, and operate there too

Anonymous Attendee A 18:43
Where is the evidence that introduction of short term grass/livestock into crop lands really increases carbon sequestration. A two year grass ley when its cultivated for 3 year cropping afterwards - why would that sequester and "save" carbon for a significant period?

Anonymous Attendee P 18:43
If all the domestic cattle in the world were replaced by “natural” herbivores, what effect would that have on methane output by said animals?

Anonymous Attendee M 18:43
Matthew—do we have country specific assessments of “livestock opportunity cost” that factor in food security realities?

Anonymous Attendee H 18:44
North American bison are quite wild critters in my experience. I don't want my future kids around those critters. Although a few of my neighbors do raise them domestically, they have a lot of cattle blood in them these days

Anonymous Attendee Q 18:44
I perceived the literature on the potential of grazing systems as much more controversial than presented here. What are the main points of uncertainty in this discussion from your perspective apart from stock density and management?

Anonymous Attendee 18:45
What role does climate change play in shifting to ecologically suitable consumption? Will ecosystems start to change too fast for us to shift our land use?

Anonymous Attendee 18:45

How do NPK fertilisers and biocides affect soil's ability to sequester carbon?

Anonymous Attendee G 18:46
This is the most informative chart that shows how grazing land expansion is balanced against forests overtime.

Anonymous Attendee G 18:46
https://ourworldindata.org/world-lost-one-third-forests

Anonymous Attendee M 18:46
Food insecure, dry land contexts need a livestock roadmap that factors in food security, livestock-related degradation risk, carbon, and more. Do we have those or is this a research gap? interested in multiple perspectives.

Anonymous Attendee 18:47
The current regulatory architecture of international meat trade (need to prove disease-free status on a national or subnational are basis, not on a commodity basis) militates against moving meat from areas where it can be grown in sustainable ways

Anonymous Attendee R 18:48
Apart from Crop cultivation and wildfires; Bush encroachment has been a major challenge in natural East African grasslands due to reduced forage availability to grazers in particular cattle and big wild herbivores such as wildebeest and buffalo is considered as rangeland degradation. From climate change mitigation (Carbon sequestration); Should we consider this change of grasslands to bushlands as a good or bad trend?

Anonymous Attendee I 18:50
There's contradictory literature on this issue. Shrubs themselves can sequester more SOC directly underneath them than many grasses, but the the literature suggests that total SOC stocks in shrublands is less because there's more bare ground (more bare space between shrubs than total cover with grasses), and also they are more prone to fire.

Anonymous Attendee R 18:52
Dear [name redacted]. Thanks for response that makes sense to me

Anonymous Attendee S 18:48
Is there a model which can calculate the approx number of livestock that a specific land can support?

Anonymous Attendee H 18:58
it is so context specific, climate, soil, type of livestock. Best recommendation would be to check out some extension publications for whichever specific region you are wondering about. I suppose there are some models that researchers use for global averages

Anonymous Attendee H 19:06
10 - 4 my cattle finish in a lot [feedlot], but I think globally it is tiny percent. the big C02 emitters are hogs and poultry in concentrated housing taking concentrated feeds

Anonymous Attendee H 19:06
sorry this went to the wrong feed, dunno why

Anonymous Attendee L 18:48
Francesca, you don't "have" to eat meat though! Nor fish. Not for health - it's all a choice.

Anonymous Attendee N 18:49
thank you!

Anonymous Attendee T 18:51
How to find solutions in both the 'grazing' element and the 'farming' element? so for typical US range cattle systems, most of the beef production (human edible food/protein) comes from the feedlot systems that take the weaned calves. feedlots import cereals and proteins from arable systems... Can we find/finetune the grazing system opportunities without finding a climate friendly solution for feedlots?

Anonymous Attendee H 18:52
thought that the cattle globally finished in feedlots was low, like 2-3%. maybe you are thinking a specific region?

Anonymous Attendee T 18:57
not sure about that statistic. the bulk of weaned calves from USA and canadian range systems go to finishing phases - feedlots. Much the same for lots of Brazil growing cattle...in UK the bulk of beef comes from small scale feedlots - the farmers here would call them that, but most come from housed phases...

Anonymous Attendee H 19:07
10 - 4 my cattle finish in a lot [feedlot], but I think globally it is tiny percent. the big C02 emitters are hogs and poultry in concentrated housing taking concentrated feeds

Anonymous Attendee U 18:52
I echo this last question. In terms of translating this into advice for consumers, can we yet say anything about choosing 100% grazed ruminants vs. feedlot (or even smaller scale but grain-fed?).

Anonymous Attendee S 18:52
Most of our livestock is not grazing but kept in stables...

Anonymous Attendee T 18:55
Dairy?

Anonymous Attendee U 18:56
dairy cattle are also kept indoors in the industrial farms in some countries

Anonymous Attendee G 18:55
Francesca, are you suggesting we run herds of cattle from North Dakota to California? Is that even feasible?

Anonymous Attendee H 19:09
Buffalo Commons, lol. Was a movement at one time... no not feasible, but fun to think about.

Anonymous Attendee 18:55
If people stopped having livestock, and currently grazed grasslands would as a result turn into some other natural vegetation, would this decrease the carbon sequestration potential of those lands?

Anonymous Attendee V 18:56
Clifton Park system of farming 1890 looked to using deep rooting grass/herb species to build organic matter that then provides no fertiliser arable cropping in its rotation. Livestock are a tool of managing this system. It is an old system but does it have relevance in regen [regenerative] options today.

Anonymous Attendee 18:57
It might be helpful to problematize the assumptions being made when we focus only "efficiency" of calorie production as opposed to considering calories as simply one of the co-products along with ecological benefits (water/bd conservation, reduced GHG), we absolutely need, given the crisis we are in.

Anonymous Attendee W 18:58
There's a great deal of focus on C sequestration via grazing ruminants; could the panelists speak more to the potential of sequestration on croplands? What are the best practices that contribute to sequestration on croplands (composting? no-till?) and how does that potential compare to grazing?

Anonymous Attendee X 18:59
I am curious to hear your views on what any crop fractions that do not have a market for human consumption should be used for, if not animal feed? Do you see it going to biogas?

Anonymous Attendee S 19:00
In Sweden cows are outdoors about 4 [continues]: 4-5 months per year. The rest of the year they are in the stable

Anonymous Attendee I 19:00

These numbers are only as good as the data and assumptions that they rely on, and currently we do not have good estimates on production potential of different ecoregions under improved grazing management. Emerging research in coming years should help add clarification to how much beef could be sustainably produced on these landscapes.

Anonymous Attendee 19:00
What about dairy cows and their calves ?

Anonymous Attendee 19:02
its 2 - 4 months per year depending on the region

Anonymous Attendee Y 19:01
What about quality of meat vs the volume of meat?

Anonymous Attendee W 19:02
(...and does composting actually contribute to net sequestration or is it just cycling carbon)

Anonymous Attendee D 19:03
Depends; work I completed adding compost to grassland in Colorado (two, moderate additions over six years apart) did show we can sequester C in excess of C added from the compost

Anonymous Attendee I 19:04
Research from Whendee Silver's lab suggests that the SOC sequestered in the Marin C Project was greater than just the C in the compost. That may not always be the case, but it certainly *can* sequester additional C

Anonymous Attendee W 19:08
Thank you both! Hi [name redacted]!

Anonymous Attendee W 19:10
Oops - mean to post this as a comment, not a new question - what are the mechanisms by which the additional C (beyond what is in the compost) is incorporated into the soil?

Anonymous Attendee S 19:02
even worse...

Anonymous Attendee D 19:08
Yes, to Francesca's point, @Pete @Francesca, what kind of empirical work do we need to improve models to capture dynamics of grazing in grasslands on soil biogeochemical cycling? I would think we need better work on plant physiological responses

Anonymous Attendee D 19:09
I am aware of great work on this from Yellowstone on Bison, but less aware of this specific type of work on Plant-soil-feedbacks with cattle

Anonymous Attendee 19:08
If we are to return ‘native forest’ grasslands to forest (e.g. in much of western and northern Europe) how do we get from A (40%-70%) grasslands to B (90% forest)? Do we value any of the environmental services, biodiversity and cultural services provided by some grasslands? And what’s your take on the ‘natural’ climax vegetation not being closed canopy forest but wood pasture due to the presence of large herbivores? ;)

Matthew Hayek is typing an answer...

Anonymous Attendee W 19:10
What are the mechanisms by which the additional C (beyond what is in the compost) is incorporated into the soil?

Anonymous Attendee D 19:12

[in answer to “What are the mechanisms by which the additional C (beyond what is in the compost) is incorporated into the soil?”]

change in plant production. in our case, we think it was a change in soil P rather than N because our grassland soil already had a low C:N ratio. it was also a hay system, so all the aboveground biomass removed and we still observed a ~ 0.3 Mg ha-1 yr-1 increase in soil C. So, we think it was driven by root inputs, as Francesca talked about earlier

Anonymous Attendee H 19:12
roots, bind C to the minerals. I don't have a good handle on how it works, but want to learn more too

Anonymous Attendee W 19:12
Fascinating, thank you!

Anonymous Attendee D 19:12
Here is our study:
https://www.sciencedirect.com/science/article/pii/S0167880922001189?casa_token=nXxEVNDyZd4AAAAA:4Akf2517S0w1zUmXZptJkH1zF_wrrY8ToNLVdqqC-DStU37jbU5MyDJBD0b05UOrp0-kZ1pGcw

Anonymous Attendee Y 19:14
If there is more call for improved animal welfare, if ruminants help promote ecosystems, if diverse pasture produce more nutritious meat then surely eating less, but increased quality meat (omega in fat) is a better trade off than intensive meat ?

Anonymous Attendee H 19:16

A comment to the subsidies. As a farmer, I don't want every bit of my diversified cattle and grain system (USA based) to rely on a subsidy. change of power in federal gov and suddenly I can't pay for investments I've made in better systems. I would prefer a carbon market system or even maybe a system that puts the environmental or ecosystem service value into the retail price of the finished product IF, and it is a big if, I get a higher price for it at market, and IF consumers will be willing to pay for it.

Anonymous Attendee E 19:16
There is increasing evidence now to suggest that in the UK at least the dominant vegetation would have been a mix of trees and grassland - wood pasture - rather than closed canopy woodland

Anonymous Attendee X 19:18
So; rewilding. In the context of increasing wild game and leaving grassland management to them. How will you keep the game away from the crops for human consumption? I may be narrow-minded but I do not see this as a realistic future.

Anonymous Attendee 19:19
As climate changes, areas that would “naturally” be grasslands are changing to be forested. What, in this dynamic picture, would be the natural forest or grassland to be maintained in your views?

Anonymous Attendee 19:21
This is more or less what the independent English National Food Strategy proposed, but unfortunately the government then binned it

Anonymous Attendee U 19:25
Humans make food choices based on very complex biocultural reasons. Rationality is only a very small part of it :) Yes, changing dietary patterns really needs a very holistic set of incentives/drivers.

Anonymous Attendee S 19:26
Reference?

Anonymous Attendee O 19:28
https://www.ipes-food.org/pages/politicsofprotein

Anonymous Attendee Y 19:27
Tackling the psychology of consumers but also of the farmers seems to have been an opportunity missed..

Anonymous Attendee S 19:28
We need action at all levels!

Anonymous Attendee Z 19:28
It's an interesting point, but there are probably far more efficient ways of increasing resilience in food production, e.g. breaking up big monopolies, breeding or gene editing more drought tolerant grains, etc. Even rewilding is likely to make a better contribution to resilience, e.g. pollination services for horticulture/oilseed, water storage by beavers.

Anonymous Attendee V 19:29
Farmers and consumers need clear authoritative, science based advice and policy from government - we cannot afford confused thinking while we try to combat climate change.

Anonymous Attendee 19:30
Very interesting discussion today, thanks to all.

Anonymous Attendee 18:02
will the recording be available later?

Helen Breewood (TABLE) is typing an answer...

Helen Breewood 18:02
Yes, it will be available on the TABLE website within a couple of days.

Anonymous Attendee K 18:02
tx Helen

Anonymous Attendee 1 18:06
Why is there no representation from either farmers or livestock researchers in this discussion? Wouldn't that help further the debate?

Tamsin Blaxter 18:19
We're aiming to platform experts from all relevant backgrounds across our "Setting the TABLE for COP27" events (https://www.tabledebates.org/blog/setting-table-cop27-upcoming-events) - we have a livestock scientist on the panel at our next event, and a farmer speaking at our third event.

Anonymous Attendee 1 18:21
So why not at this event? Not really a 'debate' is it?

Anonymous Attendee H 18:40
I'm a rancher and farmer from North Dakota and listening in! Enjoying these perspectives

Anonymous Attendee 1 18:41
Lots of farmers here Joanna - but it's a shame we are not represented on the panel.

Anonymous Attendee 19:24

It's a discussion about large scale macro modeling and the data about tradeoffs at the macro scale. Perhaps not the place for the perspective of one farmer on one farm…. This is not a policy making forum where I totally agree you need to represent farmers, but a science-based discussion founded in data about tradeoffs at a large scale.

Anonymous Attendee P 18:14
Pete, you say that soils can reach saturation point. Does this account for the ability to convert existing subsoil into new topsoil?

Francesca Cotrufo is typing an answer...

Francesca Cotrufo 18:16
In any soil mineral layer, the amount of soil carbon that is associated to mineral saturates (not the free particulate organic matter which however turns over more quickly). However deep soils are further from saturation

Anonymous Attendee E 18:15
Plants also release carbon compounds directly from their roots into the soil. What role does this play in the ability of the soil to sequester more carbon?

Pete Smith is typing an answer...

Pete Smith 18:20
they are part of the carbon input - so root exudates are important

Anonymous Attendee 2 18:15
How long does it take for soils to reach saturation? I have read that deciduous woodland soils may keep accumulating soils for centuries. Is that true?

Pete Smith is typing an answer...

Pete Smith 18:22
Depends on climate - faster in the tropics - slower in temperate regions. In temperate systems, it takes between 20-100 years. In the tropics can be much quicker

Anonymous Attendee U 18:16
(To Pro.Smith Pete) is it always a case that the soils reach the equilibrium eventually? Any exceptions? And how many years it generally take to reach the equilibrium?

Pete Smith is typing an answer...

Pete Smith 18:24

Peatlands continue to sequester carbon as long as they are waterlogged - the anaerobic conditions slows decomposition to the extend that peatlands continue to build (and don't saturate) - so peats are the exception

Anonymous Attendee 3 18:16
please could you give details of papers that Pete has cited

Pete Smith 18:24
Email me [name redacted] and I'll send them to you

Anonymous Attendee 3 18:46
Thank you

Anonymous Attendee Q 18:17
The theoretical potential of worldwide soil to sequester 30-40% of Co2-emissions may be misleading if we don't also try to quantify what is technically possible. Were there attempts to quantify those more realistically achievable potentials, also considering the high variability in soil measurements, even in small spacial dimensions?

Helen Breewood (TABLE) is typing an answer...

Pete Smith 18:25
Quite agree, [name redacted] - very variable - realistic potential is much lower that the technical potential

Helen Breewood 18:32
Francesca's recent paper looks at "theoretical, realistic and achievable" soil carbon sequestration potentials (https://www.science.org/doi/full/10.1126/science.abo2380).

Anonymous Attendee O 18:21
Should it be a surprise that the potential of soils in the transition to net zero (say about 30%) is about the same as the contribution of land use (change) to climate change, based on cumulative emissions (about 30%)? Fixing the broken C cycle is crucial to addressing the climate-nature crisis: which is about fossil fuels and land use...

Pete Smith 18:26
Agree [name redacted]

Anonymous Attendee 4 18:22
referring to Pete's claim that crop lands have the greater potential to sequestrate

Pete Smith 18:28
send in error

Anonymous Attendee 18:22
How much of current grassland has been converted from forests or other land usage to provide area for grazing? Could it be converted back to natural state to benefit biodiversity and sequester more carbon?

Helen Breewood (TABLE) is typing an answer...

Helen Breewood 18:24
You can find a breakdown of global land use here (https://tabledebates.org/building-blocks/what-feed-food-competition) although it doesn't answer your question about how much of that area was converted from forests - one of the panellists might be able to answer that question.

Anonymous Attendee T 18:26
Globally, I'm pretty sure that most grazing lands are rangelands are low input (natural to semi-natural) arid and semi-arid grasslands (steppe), shrublands, and savannas.

Anonymous Attendee B 18:28
well, we're still clearing rainforest for grazing now and deforested most of Europe over the last 1000 years?

Helen Breewood 18:48
Anonymous Attendee G posted this relevant link: https://ourworldindata.org/world-lost-one-third-forests (sorry if you originally asked this question, [name redacted]!)

Anonymous Attendee 18:22
Is a bio-diverse ecosystem generally a better store of carbon than a less diverse ecosystem? Why?

Pete Smith 18:33
Studies have shown that more biodiverse systems store more carbon - thought to be because they occupy more niches (e.g. roots at every depth)

Anonymous Attendee 4 18:23
that was by accident sorry :)

Pete Smith 18:28
no problem

Anonymous Attendee C 18:25
@PeteSmith. Does this anaerobic activity of peatland mean it is emitting N2O?

Pete Smith is typing an answer...

Pete Smith 18:27
No - they emit methane, but N2O emissions are low, as peats are very nitrogen poor (exception is some fens near ag land)

Anonymous Attendee C 18:32
Thank you.

Anonymous Attendee 18:25
In the context of both grasslands/grazinglands with ruminants, as well as fertilizer inputs for croplands, can you speak to the role that Nitrogen might play in soil carbon sequestration?

Francesca Cotrufo is typing an answer...

Francesca Cotrufo 18:44
soil organic matter has C:N ratios mostly ranging between 20 and 10, so for every 20 to 10 atoms of C we want to store , we'll need two to one of N. There is no evidence of N shortage for C sequestration, which actually can improve internal N recycling and avoid deleterious N losses. Most of the N for C sequestration comes from the same plant inputs, but also integrating more legumes or free biological fixation can support the N inputs for C sequestration.

Eleanor Boyle 18:28
Discussions of sustainable livestock and meat often get stuck on claims that global consumers are demanding more and more meat. This fails to recognize the supply side, the evidence that large companies over-produce livestock, then advertise aggressively to consumers to eat meat every day. How might our societies put science-based limits on livestock production and reasonable guidelines on marketing & advertising of meat and dairy?

Anonymous Attendee B 18:30
agreed - and roaming/grazing animals don't necessarily have to be livestock for food - we could try to rebuild lost wild populations, which might be nice :)

Eleanor Boyle 18:40
Thanks for that response, [name redacted]. Yes, rewilding is essential.

Anonymous Attendee 6 18:41
Agree - this seems like a central question to the whole debate! Would love to hear one of the experts answer it

Eleanor Boyle 18:54
Thanks so much for that, [name redacted]. This key issue tends to get ignored! We'd get farther if we didn't assume that heavy consumer demand for meat is natural or inevitable. I'm just starting detailed research on this, but suspect that meat (along with ultra-processed foods) is by far the most advertised food type.

Helen Breewood 19:09
For other readers - Eleanor has recently written a TABLE blog on British food policy during WW2, including rationing:
https://tabledebates.org/blog/victory-kitchen-wartime-lessons-todays-food-systems

Anonymous Attendee S 18:28
The problem they have in the NL with livestock is that relevant for the rest of the EU?

Walter Fraanje 18:36
Probably yes, but the current discussions around livestock in the Netherlands are very much about nitrogen (not so much about carbon sequestration). And the Netherlands comes with some context-specific things, not in the least it being a small country with huge pressures on land use from different sectors. There's some info on the Dutch 'nitrogen crisis' here (WUR is one of the universities involved in TABLE): https://www.wur.nl/en/dossiers/file/nitrogen.htm

Anonymous Attendee 4 18:29
Again a practical question referring to Pete's statement that croplands have the greater potential to sequestrate carbon. The potential lies in the change of land management by turning cropland into grassland, right? Or is there a promising crop land management?

Anonymous Attendee C 18:31
For example, continuous restorative cropping (understorey of white clover with grains) and/or no till/min till and/or organic?

Pete Smith 18:31
There are lots of options in croplands without converting to grazing land, including less intensive tillage, inclusion of cover crops and agroforestry for example

Anonymous Attendee 4 18:43
Okay, sure... I just heard that the humus content in the soil is subject to constant buildup and degradation, with climate being an important factor: the warmer, the higher the degradation, and that we need to make more efforts in the future to maintain humus content in agricultural soils. In addition, the humus content is said to be limited in time: as the content increases, the degradation increases. I.e. on arable soils there are limits of humus build-up that cannot be exceeded. so are these practices really enough?

Anonymous Attendee 18:31
Could these questions and answers be compiled into a document for us to read later? Would love to think through them, and also trying to listen to the discussion

Helen Breewood 18:37
Thanks for asking - we are going to save the list of questions, and may post an anonymised version later.

Eleanor Boyle 18:43
Thank you, Helen. An excellent idea to save Qs and promote deeper discussion, at a later date.

Anonymous Attendee A 18:36
Pete used the term "degraded" grassland/grazing land. Could he expand on what the characteristics of "degraded" are from the carbon sequestration perspective? For example, wet fields with low productivity grass species might be regarded as degraded from a farming perspective but would it be good for carbon storage - also please more on "sequestration" and "storage" are they really the same thing?

Pete Smith is typing an answer...

Pete Smith 18:40
Degraded usually means overgrazed - can be poached by overstocking or otherwise eroded by overgrazing. Leads to a loss of carbon inputs, and thereby to less soil organic carbon. So degraded soils have greater potential for carbon sequestration.

Anonymous Attendee 7 18:36
If livestock numbers have been decreasing over the past 30-50 years, why are methane levels increasing?

Helen Breewood (TABLE) is typing an answer...

Anonymous Attendee G 18:39
Livestock numbers have been increasing. https://ourworldindata.org/grapher/livestock-counts

Anonymous Attendee B 18:41
Global meat production has been massively increasing
https://ourworldindata.org/meat-production

Anonymous Attendee B 18:41
great minds, [name redacted] :)

Helen Breewood 18:41
There is some discussion of methane trends in our two explainers on methane (https://tabledebates.org/building-blocks/agricultural-methane-and-its-role-greenhouse-gas#AMBB4 and https://tabledebates.org/building-blocks/methane-and-sustainability-ruminant-livestock). Total ruminant methane emissions have been increasing in recent years (see section 6 of the second link).

Anonymous Attendee F 18:43
Also (layperson talking here though, so I don't have a reference), permafrost in certain landscapes (tundra/ taiga) has warmed due to global warming and is emitting methane - or it

could in the future. Sorry I don't have more information on this, but worth taking into consideration as well.

Anonymous Attendee P 18:52
What about total ruminant numbers? If there data on that that include the former herds natural ruminants?

Helen Breewood 18:55
FAOSTAT has data on livestock numbers by species - visualised by Our World in Data here: https://ourworldindata.org/grapher/livestock-counts

Anonymous Attendee 7 18:59
Is that relative to the increase in the human population?

Helen Breewood 19:12
No, I think it's absolute livestock numbers.

Anonymous Attendee U 18:44
When saying degraded land has more potential in C-seq, it kind of makes an impression that we are giving more credits to degraded land…whereas the farmers who manage their grasslands well do not get the credits, which might be tricky when it comes to policy incentives?

Pete Smith is typing an answer...

Pete Smith 18:48
Agreed - would not want to create an incentive for land managers to deliberately degrade.

Anonymous Attendee 1 18:46
Pete - can you further expand on what meat produced in an environmentally friendly way would look like please?

Pete Smith 18:50
"Less and better" meat. Reduce as much as possible, but the meat that remains in the system should be produced in a way that works with nature, rather than against it

Anonymous Attendee 1 18:52
What does that look like Pete?
You'll know I'd say that would be 100% pasture fed and in a silvopasture system - does that reflect your understanding of less and better?

Anonymous Attendee E 18:46
Methane can be rapidly absorbed by soils and broken down by atmospheric hydroxyl, processes that are most closely associated with the situations where many ruminants are

grazed in more extensive systems. Does this mean that emissions from extensively grazing livestock are being significantly overestimated?

Pete Smith 18:52
No - hydroxyl is atmospheric and not associated specifically with grazing land. Grazed livestock actually emit more methane (less digestible diets) than those fed on concentrates. An inconvenient truth!

Anonymous Attendee 18:46
where does incorporating livestock in silvopasture systems fit in? How much potential is there for increasing C sequestration potential in grasslands by incorporating agroforestry (where ecologically appropriate)

Pete Smith 18:53
My PhD student looked at this in Ecuador - the potential is quite significant

Anonymous Attendee P 18:55
Pete, can you expand on this further?

Anonymous Attendee 1 18:55
Project Drawdown suggest 5-10x more C sequestration.

Anonymous Attendee 18:46
What share of the UK is native grassland suited to grazing vs native forest that ought not be grazed?

Anonymous Attendee 18:53
From what I understand, a fairly low percentage.... 10% ? Would be good to know this figure for sure.

Pete Smith 18:55
Most of the UK would naturally revert to woodland (i.e. trees are the climax vegetation) - upland areas and peats are the exception

Anonymous Attendee 2 18:50
How are carbon emissions from ruminants affected by their diet? Specifically,, how do ruminant carbon emissions differ between ruminants that are on a diet of biodiverse natural vegetation, those fed on a non-biodiverse pasture and those fed grains and other cropped outputs.

Pete Smith 18:57
Lowest emissions from higher quality diets - so grain fed have lower emissions than grazed ruminants. But this uses crops that humans could eat...

Anonymous Attendee 2 19:02

What about biodiverse diets e.g. on a natural landscape with a wide range of grass, herb, shrub and tree forage v. grass only e.g. a ryegrass pasture. Are carbon emissions from ruminants the same for both situations?

Anonymous Attendee 6 18:50
To all experts: do you know of any serious initiatives by govts to reduce meat consumption / step up other forms of protein production? Surely this is key to solving the problem

Anonymous Attendee J 18:52
I highly recommend this systematic review -- https://health.gov/our-work/nutrition-physical-activity/white-house-conference-hunger-nutrition-and-health

Anonymous Attendee J 18:52
Wrong link: https://pubmed.ncbi.nlm.nih.gov/32167128/

Pete Smith 19:00
Lots of "meat tax" policies being discussed in various countries - none (to my knowledge) have put them in to law

Eleanor Boyle 19:14
One problem with meat taxes is that meat then becomes a food for the wealthy. Personally, I argue for fair-shares rationing of GHG-intensive consumption including meat-eating. bit.ly/3Bhba9h. Rationing in wartime, especially in Britain, actually was supported by most citizens, when they realized it assured everyone of getting some amount (their fair share) of the rationed goods. I'm hoping to find some less-controversial term than 'rationing,' and welcome suggestions! Of course the idea would garner pushback, but many people would applaud science-based limits on environmentally-problematic consumption.

Anonymous Attendee N 18:53
Isn't the dairy industry's environmental impact just as bad as the beef industry? Shouldn't we also be talking about limiting our dairy consumption? (And other animal products)

Helen Breewood (TABLE) is typing an answer...

Tamsin Blaxter 18:58
Partly because dairy animals produce milk and so calories over long periods, they generally produce more food (calories/protein) per environmental impacts than beef animals - milk protein or milk calories are still more carbon intensive than many plant sources, but generally much less so than beef. (Poore&Nemecek 2018 is an oft-cited review that covers this: https://www.science.org/doi/10.1126/science.aaq0216)

Anonymous Attendee N 19:02
But dairy cows are then shipped off and killed for beef anyway. So it's the same system.

Helen Breewood 19:04
I believe the Poore and Nemecek paper distinguishes between beef from dairy herds, and beef from dedicated meat herds - the beef herds have notably higher carbon footprint and land use per gram of protein.

Anonymous Attendee 18:56
Aren't a lot of livestock producers and meat companies using an inflated CO2 sequestration potential as an excuse to not reduce their production and profit?

Pete Smith 19:04
Yes - definitely!

Anonymous Attendee T 19:05
I suspect livestock producers and meat companies play a very small part in (over) hyping soil C seq potential of C ranching. John Oliver has a nice satire peace on the C offset industry (check youtube). C offset/credit companies are likely the main source of the hype or the companies that are buying credits and using them to greenwash their activities..

Anonymous Attendee 18:58
Matthew said that ruminants were perhaps 40% of our meat consumption, so what is the other 60%? Presumably pigs and poultry, are you suggesting that these are pasture raised and if not then they will be eating grains which will be grown on land that could be used for grassland for ruminants or cereals for humans.

Helen Breewood (TABLE) is typing an answer...

Matthew Hayek 19:05
it’s only about 1/4 of our meat consumption! In the US and globally. Our greatest consumption is chicken, followed by pork. East and Southeast Asia eats more pork than chicken though, and Muslim countries eat little to no pork.

Anonymous Attendee T 19:11
These other livestock are also fed grains but have a much higher efficiency in converting a unit of grain into a unit of protein than large ruminants.

Beef cattle can exist on marginal lands where crops can't be grown and chickens/pigs might not flourish (e.g. semiarid rangeland). But these beef cattle are still often finished on grains (at least in US).

Anonymous Attendee A 19:04
C:N is a red herring as Pete describes it for C sequestration and storage but it is not in a mixed farming system where organic matter turnover is being used as a driver for cropping production

Pete Smith is typing an answer...

Pete Smith 19:06
Agreed - the point I was making is that you don't have to add synthetic nitrogen

Anonymous Attendee 19:06
@Pete. Thanks for your answer on N&P. Is it fair to conclude that we do not need NPK fertilisers for the purposes of increasing SOC? THis seems to be conclusions from Mulvaney and Khan at Illinos Champaign.

Pete Smith is typing an answer...

Pete Smith 19:14
You do not need to add additional NPK. However, if NPK leads to more vigorous plant growth, this will feed through in to higher soil carbon

Anonymous Attendee 19:17
The argument for adding N, P fertiliser is that despite crop stubble (for example) already containing some N and P, the C:N:P ratio is so high in these materials, so by adding N/P can close this ratio leading to a greater digestibility/efficiency of conversion into SOM.

Anonymous Attendee T 19:20
Pete- SOC stocks are the balance of C input versus C mineralization. My perception is huge numbers of people believe that a positive relationship exists between C inputs and SOC. I wonder if the mineralization portion (is harder to measure) more important?

Anonymous Attendee Z 19:06
If we're talking about dramatically reducing meat consumption, when current consumption already makes disproportionately low dietary contributions, then why bother maintaining these industries at all given their climate and ecological impacts? And if production was made more extensive and less efficient, leading to higher prices, how would this affect the social distribution of meat consumption?

Helen Breewood (TABLE) is typing an answer...

Helen Breewood 19:19
One argument is that having multiple sources of food production adds resilience to the food supply - even for grain-fed livestock, the argument being that it's better to keep production of grains higher than they would be in the absence of livestock, so that that grain can be redirected to human food supply in times of supply shocks. See section "Food waste as a buffer against food insecurity" of
https://tabledebates.org/building-blocks/what-food-loss-and-food-waste#FLWBB4

Anonymous Attendee 19:07

intensive beef production brings cattle to slaughter weight faster than grazing, with attendant reductions in CO2 emissions per animal. Is this important?

Matthew Hayek is typing an answer...

Matthew Hayek 19:08
absolutely it is. It's why a shift to exclusively grass fed beef production would result in less production and/or more GHG emissions

Anonymous Attendee 8 19:14
Is that difference not partly diminished by other emissions from intensive beef productions, and assume that we must maintain current meat consumption?

Anonymous Attendee G 19:11
Could you speak to the Grazed and Confused report? Overall, it was not a positive assessment of grazing cattle's contribution to carbon sequestration outside of highly specific degraded cropland restoration examples. Some regenerative grazing advocates say it's been debunked. Is there an updated study or do the findings still stand?

Pete Smith is typing an answer...

Pete Smith 19:21
I would say they still stands. The debunking has been debunked!! Oxford is revisiting this and will be producing a new "revisit" report - watch this space

Anonymous Attendee A 19:11
It is a concerning thing that this grass/carbon/grazing debate frequently falls into unecological thinking. The idea that so called "holistic grazing" or " mob grazing" or any other buzz word is a generally useful approach is concerning. Grass management should be ecologically appropriate to location and culture.

Pete Smith 19:18
Agreed, [name redacted]

Anonymous Attendee S 19:15
In Sweden, 68% of the cereals produced are used to feed livestock. In times of human starvation in other places in the world this seems very unethical to me.

Pete Smith is typing an answer...

Pete Smith 19:18
To me too, [name redacted]

Anonymous Attendee 8 19:21

I read a report that stated that we could eat about 5 kg of meat per year if we only ate meat from cattle grazed on "natural" grassland. Today we eat 85 kg/year. I agree there is a compelling argument for reducing meat consumption substantially. We could do that and conserve biodiversity of these grasslands.

Anonymous Attendee 8 19:26
That estimate was for Sweden.

Anonymous Attendee A 19:21
What does the panel think about the Monbiot argument that existing grassland (mainly upland but not all) should be planted with trees as a carbon policy

Pete Smith is typing an answer...

Pete Smith 19:22
Agree that some should - e.g. overgrazed sheep grazing land on hills