



## The influence of nutrition on the climate

The interview with Prof Dr Stephan Clemens from the University of Bayreuth is about food-related greenhouse gas emissions and sustainable nutrition. A significant proportion of greenhouse gas emissions can be attributed to nutrition and are generated, for example, in agriculture, food production or during distribution. Carbon dioxide, methane and nitrous oxide are gases that contribute to climate change. The concept of the so-called "Planetary Health Diet" recommends a plant-based diet that is both good for the climate and for people's health. A plant-based diet with a focus on more regional products can significantly reduce the impact on the climate. Animal and exotic products can still be consumed in addition to this diet, but only make up a small proportion of the diet.

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KUestions is a video podcast format produced by the Akademie für Neue Medien (Bildungswerk) e.V. and the University of Bayreuth for the project Ernährungsradar. Experts are interviewed on various topics in the context of nutrition and report on the current state of research. The interview was conducted by Matthias Will from the Akademie für Neue Medien (Bildungswerk) e.V. and Clara Marx a Master's student of Lebensmittel- und Gesundheitswissenschaften (Food and Health Sciences) at the University of Bayreuth.

### Recommended literature on the topic

Clark MA, Springmann M, Hill J, Tilman D (2019). Multiple health and environmental impacts of foods. *PNAS*. 116:23357–23362. <https://doi.org/10.1073/pnas.1906908116>

The EAT-Lancet Commission on Food, Planet, Health (2019). Can we feed a future population of 10 billion people a healthy diet within planetary boundaries? <https://eatforum.org/eat-lancet-commission/>

Tilman D, Clark M (2014). Global diets link environmental sustainability and human health. *Nature*. 515:518–522. <https://doi.org/10.1038/nature13959>

Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S et al. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*. 393:447–492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)

## English translation of the German interview transcript

Matthias Will: Dear audience members, welcome to another interview as part of the Ernährungsradar project. The University of Bayreuth and the Akademie für Neue Medien have joined forces to bring together experts to shed light on important nutritional topics. We, Matthias Will, I'm from the Akademie für Neue Medien.

Clara Marx: And I'm Clara Marx from the University of Bayreuth and I'm studying for a Master's degree in Lebensmittel- und Gesundheitswissenschaften (Food and Health Sciences).

Matthias Will: Our topic today is "Food as a driver of greenhouse gas emissions. What influence does nutrition have on the climate?" Our guest today is Stefan Clemens, Professor of Plant Physiology at the University of Bayreuth. Professor Clemens, thank you for joining us today for an interview in the beautiful setting of the Botanical Garden here at the University of Bayreuth.

Prof Clemens: Yes, thank you very much for the invitation.

Matthias Will: Professor Clemens, climate change costs Germany 6.6 billion euros a year, at least according to calculations by the German Federal Ministry of Economics. How much do we influence climate change with our diet?

Prof Clemens: Well, you could say that the impact is enormous. We have estimates that a quarter to a third of all greenhouse gas emissions are ultimately attributable to nutrition, food production, distribution and so on. So a third, that really is a lot.

Matthias Will: One fifth of global greenhouse gas emissions are caused by agriculture. Are we actually aware of this magnitude?

Prof Clemens: I don't think so. When we talk about climate change and greenhouse gas emissions, we mostly think about mobility and heating, but very little about our food, and we should change that, because the contribution is really enormous. It's not just carbon dioxide emissions that we should be thinking about. Agriculture also causes a lot of methane emissions, and nitrous oxide is also emitted. These two gases are not released in the same quantities as carbon dioxide, but they are each much more harmful to the climate. Methane, for example, depending on estimates or calculations, is 35 to 70 times more potent as a greenhouse gas than carbon dioxide, so its contribution is very, very high.

Clara Marx: The world's population is growing continuously and most people are striving for ever greater prosperity. Is it even possible to achieve a reduction in greenhouse gas emissions under these circumstances?

Prof Clemens: It is true that we still have a growing world population and it is also the case that this growing world population is also accumulating wealth. As a result, eating habits are changing and are actually having a more harmful impact on the climate. However, I still see great potential for a reduction. It's just a huge challenge and we have to face it. And I think that, as a society, we still have far too little awareness of this challenge.

Matthias Will: The newspaper Welt once ran the headline "How the Germans are eating up the rainforest". What do you think of this pointed thesis? Is Die Welt right?

Prof Clemens: Yes, they are right, it is of course a pointed thesis, but what this thesis alludes to is the fact that meat consumption in particular makes a very substantial contribution to greenhouse gas emissions. Our cattle are largely fed by either creating grazing land elsewhere, for example through deforestation, or by growing feed. And these two factors really contribute very, very strongly to these harmful climate effects. In this respect, it is true that the more meat we eat, especially the more beef we eat, the greater the impact on ecosystems. I mean, we all know that the rainforest is disappearing at an enormous speed and a lot of it is precisely for meat production.

Matthias Will: You mention the excessive consumption of meat by Germans and, of course, the world population as a whole. How much meat do you actually eat yourself?

Prof Clemens: Well, I have tried to reduce it more and more over the last few years. However, I am not a vegetarian or vegan. I also don't think it's necessary for us all to become vegetarians or vegans, at least not for climate reasons. I mean, there may be ethical reasons why someone doesn't want to eat animal products at all, I can absolutely understand that. But when I think about the climate, sustainability issues, etc., then I think the order of the day is that we simply eat less meat. That we get to a point where meat is perhaps something that adds a bit of flavour, where we eat a steak or a normal burger every now and then. But overall, we clearly need to reduce our consumption and that's what we're trying to do in our family. I often eat in the canteen here at university, where the range of vegetarian and vegan products is now so wide that I practically always eat meat-free in the canteen.

Clara Marx: What role do substitute products play overall?

Prof Clemens: I believe that substitute products are very important, because we should also say this: we are not talking here about trying to make people give up, about self-mortification, but that eating should still be a pleasure. I believe that substitute products can also be very helpful in reducing meat consumption. I was in the USA a few weeks ago, for example, and for the first time in my life I ate an Impossible Burger, which is purely plant-based. I couldn't tell the difference between it and a beef-based burger. That simply helps when you don't experience so much change in terms of flavour and eating habits.

Clara Marx: But many substitute products are also often heavily packaged. The packaging industry itself also contributes to climate change. Would the substitute products then also drive climate change?

Prof Clemens: I think we need to realise that everything we do drives climate change and what we always need to think about in all areas of life is: How can we reduce our impact? We do that with mobility. Yes, I cycle, but I haven't completely got rid of the car and of course there are always situations where the car is needed. But less of them. That's the point and that's also the order of the day when it comes to nutrition. And I don't think we can aim for a completely climate-neutral diet - I think that's too high an ambition - but simply less. And when choosing food, we need to make sure that we have less of a negative impact on the climate.

Matthias Will: But that's a good keyword. So today, with this series, we also want to help provide tips on how to protect the climate by eating sensibly and consciously. Which foods have a good climate balance?

Prof Clemens: So the very basic answer is that plant-based products have a much better carbon footprint than animal-based products. So that actually applies across the board. Perhaps it doesn't make much sense to differentiate further here. It is simply fundamentally good to eat mainly plant-based products. Plant-based products can also provide us with everything we need, with very few exceptions. Plant-based protein sources are also of high quality. Soya protein, for example, is just about as good as protein from beef. And then we should ensure diversity and variety where possible. And perhaps the one or other animal product from time to time. But simply less.

Matthias Will: Professor Clemens, specifically, what does a day's menu look like for an exemplary, climate-conscious diet? Breakfast, lunch and dinner.

Prof Clemens: Yes, I don't think the differences are as huge as some people might fear when they hear that we should give up meat. All in all, I would like to say that we actually have a huge advantage in the fact that the diet that is slightly less harmful to the climate, that is better for our planet, is also a diet that is healthier for us at the same time. These two interests and purposes come together very nicely here. So in English there is the term "Planetary Health Diet". In other words, we are really looking for a diet that is good for the planet and for us. Specifically for breakfast: Muesli is wonderful. We have wholemeal products, so you should add relatively little sugar. But you can do that with the animal content, you can perhaps replace the milk with something else. But I don't do that, for example. I still like the taste of cow's milk much better than oat milk with muesli. But as I said, a little bit of animal products is also okay. For lunch, I think it's particularly important that we use other sources of protein. We've already talked about an Impossible Burger. I think that falafel made from chickpeas, for example, is really delicious. You can now also make very good things from pea protein. There are mushroom proteins. I recently ate something made from Quorn. It's actually a brand name, but what's behind it are fungal proteins and I couldn't tell the difference between this product and a chicken fillet. So you could have easily foisted that on me as chicken. In other words, products like these, which are now increasingly coming onto the market, can make up lunch. In addition, perhaps wholemeal pasta or rice with a certain proportion of wholemeal. And for dinner, wholemeal bread with a bit of cheese. Then you get there roughly. And everything should be accompanied by as many vegetables as possible and a little fruit.

Matthias Will: You mentioned how important it is to sensitise people to the fact that we need to pay attention to the climate damage or climate impact of our diet. Where should this sensitisation take place? In schools? Perhaps as early as kindergarten?

Prof Clemens: I believe that it should take place everywhere. So it's certainly the case that a lot can happen in daycare centres and kindergartens. In schools too. For example, I imagine that we could perhaps try to mobilise something like school gardens a little more again. I believe that we simply need to get more in touch with our food again. People need to become more aware of how something grows, how something is actually produced. And otherwise simply practise the question that is already in our minds with other things like mobility: What are the alternatives and how do I rate this compared to that? I believe that these questions can also be practised in a very playful way. However, home is of course still a very important place. It doesn't stop with children, but we can of course also reach adults. I notice, for example, that many of our students are now much more concerned with nutritional issues. When I intersperse something in the lecture, I always notice how the attention level immediately rises again. That also shows me that it works. As I said, it's not about preaching abstinence, it's about joy and enjoyment. But with an eye on what the costs actually are in each case. And there is simply a huge range.

Clara Marx: You mentioned that people should get back in touch with their food a little more and many people want to eat very regionally again. Should we then push the trend towards regional products?

Prof Clemens: I think it's a good idea to eat a regional diet. However, as with almost everything in nutrition, we shouldn't throw the baby out with the bathwater. We should not declare this a dogma. We also need to keep the entire value chain in mind when it comes to regional production. Even regionally produced beef requires a lot of land, for example for the production of animal feed. And that should also be taken into account. It's also the case that we can't necessarily eat as regionally diverse as we should. You always have to remember that if we really only ever choose regional products, then that means we have high costs, including energy costs for storage, for example. And then perhaps it's better to import products from another country in the winter months than to only use products that have been stored and produced here. So here too, I would say to take a closer look, to take this as a certain rule, perhaps for your own purchases, but not dogmatically.

Clara Marx: The global food supply is still mainly based on sugar cane, maize, wheat and rice. Now, with Russia's war against Ukraine, we can see the effects of such a one-sided focus. Which plant species could expand our diet in the future?

Prof Clemens: I would like to distinguish between two aspects here. One is dependency, which is now becoming even more apparent due to the war in Ukraine. The first thing that helps against dependency is to produce enough ourselves. And that is something that I think we in Europe need to do more of again, so that we always ensure that we have a sufficient basis. The second is how to increase diversity. That would be desirable for health reasons, but also for reasons of climate protection. It is true that we are essentially dependent on very few plant species and that there are many neglected crops that can expand our diet very nicely. One example is quinoa, which has become very popular in recent years. More and more people are trying to avoid gluten and quinoa is a pseudo-cereal that is also very good in terms of its nutritional composition. And one goal would be to increase the cultivation of plants like quinoa. You can also think about millet and buckwheat. There are various forms of nuts and other legumes that could be mobilised here, which can be cultivated locally in different regions of the world, but in many cases they have not yet been cultivated in such a way that high yields can be achieved with them. We always have to take that into account. We still have to achieve yields.

Matthias Will: Thank you very much, Professor Clemens, for the interview and for your time here today in this beautiful botanical garden at the University of Bayreuth. Thank you very much, dear audience members, and we would be delighted if you would join us for the next interview in our Ernährungsradar series. Thank you very much.