How Meat Production & Consumption affect the Climate | Interview with Climate Scientist Atul Jain

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AcTVism: Thanks for joining us today. Could you first introduce yourself and your work to our viewers?

Atul Jain (AJ): I'm Atul Jain, I'm a professor in the Department of Atmospheric Sciences at the University of Illinois Urbana-Champaign in the US and I do research on climate change and particularly my interests are related to how the climate interacts with our land processes, particularly, for example, plants, like how the climate change would impact the plants and how these changes would have an impact on hydrological cycle, as well as the carbon and the nitrogen cycle. Anything related to the land and how the land and climate interact interest us. Our study is on a global scale, we look at not only the, you know, tropical or the middle-latitude regions, but also we are interested in the high-latitude as well.

AcTVism: You are one of the authors behind a new study called `Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods`published in Nature Food (2021). Can you first explain why you decide to pursue this study and then talk about its main findings?

AJ: So we were very interested to understand what the carbon footprint of humans related to the food sector are. Particularly, I was more interested in understanding plant based versus animal based. So far many studies have looked at this issue in terms of the emissions from the food sector. But really- there is a comprehensive study to look at plant based and animal based and on a global scale- our interests were not only about looking at the plant based versus animal based, but also looking at the production versus the consumption on a global

scale. And this is the first study looking at the emissions for three major greenhouse gases: carbon dioxide, which is the major one, but the two additional important greenhouse gases methane and nitrous oxide at a spatial scale. And the major finding of our study is that obviously the animal based food, you know, contributes the most in terms of the greenhouse gas emissions. Our total greenhouse gas emissions from the food sector is about 17 billion metric tons of CO2 equivalent. What I mean by equivalent is combining all three gases carbon dioxide, methane and nitrous oxide. And to this total, about 57 percent comes from the animal based food and half of it, approximately 29 percent comes from the plant based food, and the rest comes from the other non plant based and animal based- the plants.

AcTVism: Which methods did you use to come to this conclusion?

AJ: OK, so in this study, we develop a framework, a data modelling framework. It has two component data and models, and our model actually studied the emissions at spatial scale. Not only looking at CO2 methane and nitrous oxide, but also the interaction of these gases with environmental factors. So, for example, as the climate changes, plant productivity is going to change, right? As the CO2 is increasing in the atmosphere it is also going to change the productivity of the plants. More CO2, more photosynthesis and higher uptake of CO2 by the plants. Right at the same time humans are also disturbing the land. So we also account for the human factor in terms of the land cover and land use change in our models. OK. And another factor which we also consider is that beyond farm gate, for example, we also consider the emissions from beyond farm gate, for example how much is the emission because of the production of the fertilisers? How much emissions from mining of the material, which is used for the fertiliser, as well as the transport, as well as the processes of the food, the food once it has been produced from, you know, by the funds.

AcTVism: Were you surprised by the result?

AJ: I was a bit surprised in terms of the total amount of emissions which come from animal based food, and also we look at about 170 different crop commodities in about 16 different animal based commodities. And I was a bit surprised about how much of these individual commodities are contributing to the total emissions.

AcTVism: According to the study, meat accounts for nearly 60% of all greenhouse gases from food production. It causes twice the pollution of production of plant-based foods. Does this mean that we should all become vegetarians?

AJ: This is a good question. Personally, I'm a vegetarian, but this question has to be addressed in a much broader sense. After considering the research, which is going to require

to control the greenhouse gas emissions from the food sector, because there are many other aspects of this study which we have to further look at in order to address this question. Thus a scientist like me would only actually convey to you how much of the emissions would be required to control climate change or accomplish a certain goal, such as the Paris Agreement. But when the question comes to mitigation, we have to think beyond the science of climate change. We have to think of socioeconomic aspects, but also the cost aspects. In this case, we have to also consider the macro and micronutrients deficiency and how we can accomplish or fulfil that deficiency, if you really want to go in that direction or follow the path of mitigation by shifting the diet from animal based to plant based food.

AcTVism: There is a debate about individual and structural change. Should we - as individuals- change our diets? Or do we need a transformation of the food industry? What is your view on this?

AJ: There are two aspects of this problem. One is the production side of this issue and another is the consumption side. I think that the media and others are focusing more, focussing on the consumption side. But I feel there is a lot of potential to control the greenhouse gas emissions from the production sites. Actually, our study is mainly focussing on the production. So I can talk a lot more about what are the potentials to control the greenhouse gas emissions from the production side? For example, you know, there are many agricultural activities which can be managed to control greenhouse gas emissions. So for example, our study shows that the soils contribute approximately 14 percent of the total greenhouse gas emissions. And the farmers can apply some of the management techniques, what we call, you know, regenerative practises such as the no-till method. As you know, when farmers plant the crops, they plow the soil and actually the carbon which is stored in the soil goes up in the atmosphere. But now there are some well-established management techniques by which they need not to till the land and all the carbon which is stored in the soil could remain in the soil and that emission can be controlled. OK. Another aspect would be, you can think of, you know, farmers burn the debris, you know, the residue part of the crops. Right? And it's a big issue in most of the country, not only related to climate change, but also it's a big issue related to air pollution. And there are many management practises which farmers can use to control the burning of debris. Perhaps it could also help the soil fertility as, you know, in terms of that nitrous oxide, which actually comes mainly from the fertiliser, nitrogen fertiliser use. There are many management practises the farmers can use, what we call the, you know, managing the nitrogen at the right time application, as well as the right amount. And this is one of the biggest concerns in most of the developing countries where the nitrogen is overly used and also not applied at the right time. Perhaps by using these management techniques the nitrous oxide emissions can also be reduced. In terms of the methane, which mainly comes from the antique fermentation, you know, from that, you know, the livestock stomach, because they produce methane. OK, and now there are some methane inhibitors which can be added to the feed, and those inhibitors can also control the

methane emissions. So this is the plant based side of, you know, practises which perhaps can control the greenhouse gas emissions. In terms of the consumption, which is obviously the major issue, is your diet, right, and the diet if you're serious about climate change, definitely you can think of changing your diet. Maybe not a more emission intensity diet you can eat, but you can also eat some less emission intensity diet. For example, you can switch from, you know, beef to maybe chicken, right? And you can also switch from beef to maybe pork. And so there are many, many other options available to us, right, which can help to control greenhouse gas emissions.

AcTVism: But should it be an individual responsibility to reduce greenhouse gas emissions or do we need structural change?

AJ: First, the most important is climate literacy. OK, so we should be aware of our carbon footprint. What our activities are contributing to climate change. If we are concerned about climate change, definitely all individuals should take some action to control greenhouse gas emissions. But if you really want to accomplish the bigger goal, then something bigger, you know, the policy options should be introduced in order to control the greenhouse gas emissions. More effort has to be made on a country or maybe in a, you know, work on a national scale or global scale in order to make the people aware about this problem. That's the bottom line. Policies only would work if the people are concerned about, you know, about their life in the longer term and they feel that climate change is going to negatively impact them.

AcTVism: A study published in the journal Global Environmental Change in 2020, found that countries and companies in the EU importing soy from Brazil have driven deforestation there, causing an increase in greenhouse gas emissions. How should consumers that are shifting away from meat approach this dilemma?

AJ: This is a very good question, in fact, actually, this is a very important question if you really want to go in the direction of land based, OK? You have to first understand how much of the land is currently being used to produce plant based and animal based food. OK. About 35 to 40 percent of the land currently being used to produce, you know, plant based food, about 30 percent of the cropland, I'm focussing on the cropland, is currently being used for animal based food. OK? And the rest actually, this is our total cropland I'm talking about, but there is also grazing land, OK, which is approximately 70 percent of the total, the grazing land, grassland is being used for, you know, for animal based food, a 100 percent. And the rest of the crop land is used for actually other uses, you know, the plant's production, for example, rubber or maybe cotton. OK. So if you really want to shift from animal based to plant based, right, so that land which is currently being used to produce animal based food

would go back to plant based food. I doubt that we would have this issue. We have already done some analysis and our study shows that there is enough agricultural land to produce enough food, which could fulfil the demand, at least for protein. I would not be able to say more about the micro, other micro and macronutrients, because we also have to think about, the deficiency of that micro and how we, how the humans can fulfil that and what kind of foods the humans should consume to overcome that in the macro or micronutrients. But deforestation currently is an issue, because in Brazil, most of the food goes into animal based production. So that's why there is more deforestation. But if Brazil is serious about shifting from animal based to plant based, there's plenty of land there to grow the crops, which could actually fulfil the demand for protein.

AcTVism: Your study was published right before COP26 in Glasgow. Do you expect policymakers to take these results into account in regard to controlling greenhouse gas emissions?

AJ: So my immediate concern is that so far, the focus is on the energy sector. I think if you really want to, if you are serious about the climate change control, we should think of emissions not only from the energy sector, but also from all sectors which are contributing to the greenhouse gas emissions, including the food sector, because the food sector is contributing about one third of the total man-made greenhouse gas emissions. So there are many, many options, as I have already discussed, few of them are available on the table. And we should seriously think about controlling the greenhouse gas emissions not only from the energy sector but also from the food sector. By the way, I have not mentioned it, but about 60 percent of the total greenhouse gas emissions from the food sector come from CO2, you know. So CO2 is still a major greenhouse gas, and, you know, in the case of food sector emission as well. So if you really want to accomplish the goal of net zero emissions, obviously we are not able to do it unless or until you take some action to control the greenhouse gas emissions from the food sector.

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