

# Go vegetarian to save Earth

The latest report of the IPCC recommends eating less meat for a cooler planet



Forests cleared for cultivation in the Amazon

ANANTHANARAYANAN

Fossil fuels for transport, industry and electricity are seen as the main cause of carbon emissions and global warming. Another cause of comparable increase in the CO<sub>2</sub> in the air, and one more amenable to control, is changing land use by clearing of forests to grow grain and fodder.

The Intergovernmental Panel on Climate Change, the United Nations-sponsored body to objectively guide global response to the climate challenge it faces, in a special report just published, has identified human diet as the driver for the accelerating loss of green cover across the Earth. A review of the report, in the journal *Nature*, quotes Hans-Otto Pörtner, an ecologist working with the UN as saying, "We don't want to tell people what to eat, but it would indeed be beneficial, for both climate and human health, if people in many rich countries consumed less meat, and if politics would create appropriate incentives to that effect."

The report underlines the conclusion that rising population, which is slated to grow to nine billion by 2050, would increase the demand for food, and hence, demand for land to grow

food. While forestland is being rapidly cleared to grow grain for human consumption, it is important to note that a large part used is for growing grain to feed animals that are bred for their meat. This is clearly less than optimal, for the reason that weight for weight of nutrition, particularly protein, the animal source uses substantially more resources than vegetable sources.

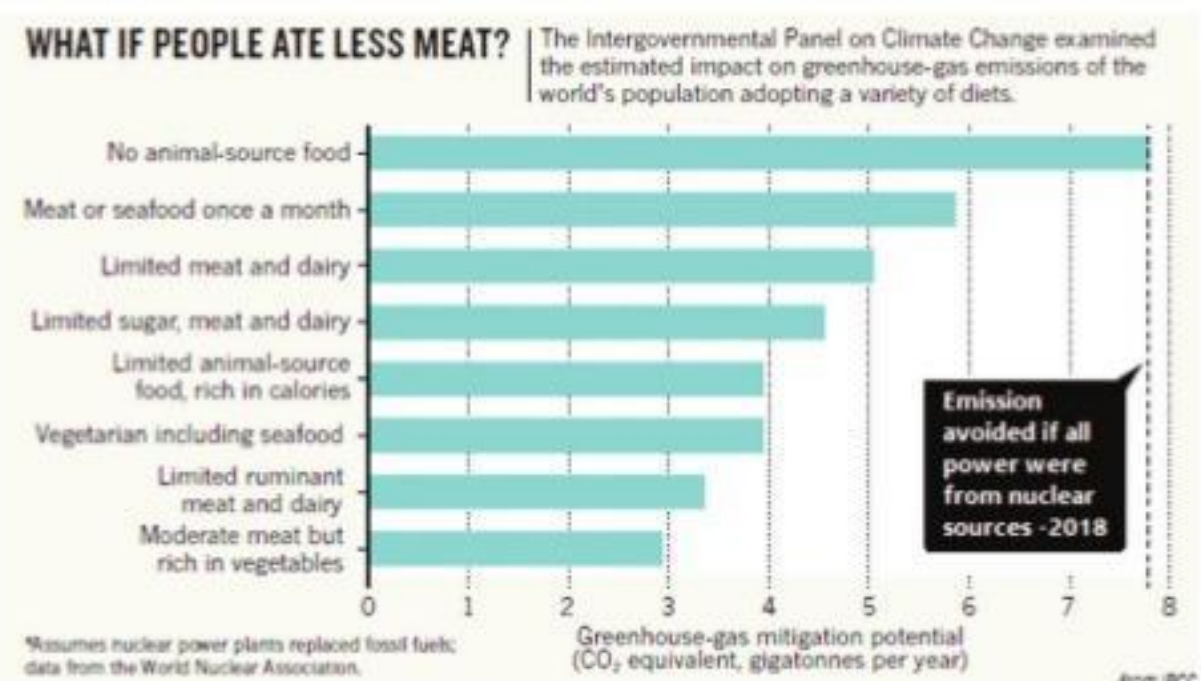
And while it would be a challenge to get the world to bid farewell to meat, Gidon Eshel, Paul Stainier, Alon Shepon and Akshay Swaminathan, from Bard College, New York, Harvard College, Cambridge and Harvard University, Boston propose a way out. They write in the journal, *Scientific Reports*, "protein conserving plant alternatives to meat that rigorously satisfy key nutritional constraints while minimising cropland, nitrogen fertiliser and water use and greenhouse gas emissions."

A first victim of clearing land for agriculture is forest cover, the all-important resource that drains CO<sub>2</sub> from the atmosphere. In the context of the degradation that is taking place in the Amazon basin, Carlos Nobre, a climate scientist at the University of São Paulo, has been quoted to say that this, over 30-50 years, would lead to

50 billion tonnes of carbon staying put in the atmosphere. The figure is alarming in the context of the current annual global output of CO<sub>2</sub>, from the generation of power, of some 35 billion tonnes. And the estimated reduction of emission, if all power generation were from nuclear sources, is eight billion tonnes a year.

Agriculture alone is estimated to be responsible for 12-14 billion tonnes of CO<sub>2</sub> every year. In comparison is a report by the Food and Agriculture Organization, which says livestock production is responsible for some nine billion tonnes of greenhouse gas emissions against just seven billion tonnes by the world's transport sector.

Apart from livestock using land for pasture and consuming agricultural production, ruminant animals are responsible for 37 per cent of global methane emissions, a greenhouse gas that has a global warming effect 23 times greater than CO<sub>2</sub>, and 65 per cent of global nitrous oxide emissions (mainly due to manure), which has 296 times the global warming potential of CO<sub>2</sub>. The livestock in the US is said to produce 130 times the excrement of the world's human population. In addition, livestock accounts for 64 per cent of ammonia emissions,



## Horse dung

The entry of the internal combustion engine and motor car, which replaced the horse-drawn carriage, is usually blamed for the rise in CO<sub>2</sub> in the air. What is often not appreciated is that just before the motor car entered the scene, London and Paris faced a major problem because of horse dung that covered the streets. With rising population and prosperity, carriages would have multiplied and streets would have been choked with dung. The greenhouse gases emitted may have been comparable with the CO<sub>2</sub> from the motor car.

which can lead to acid rain. Of all the farmed animals, of which there are 55 billion worldwide, beef is the most carbon-intensive, producing 34.6 kg of CO<sub>2</sub> per kg of meat.

Apart from carbon emissions, meat production makes things worse by record water consumption. The water consumed in producing a kilogram of beef is about 15 tonnes, compared to 400-3,000 kg for cereal crops. A vast proportion of land and water, and fuel and power resources are then used up in producing cheap meat — at the cost of rice and wheat, and ecological consequences worldwide. It is ironic that while meat production thus makes it difficult to produce grain, around 40 per cent of the world's grain produce is used for feeding animals.

In sum, about 26 per cent of the world's land is used for grazing livestock and another 33 per cent is used to grow the crops and grain to feed them. The demands of livestock have led to deforestation, soil erosion; other effects of overgrazing and the displacement of local communities. In the Amazon, 70 per cent of previous rainforest land is now pasture, with feed crops occupying a good part of

the rest.

The IPCC report notes that diet change, with eating less meat, in developed countries, could have a huge impact of containing the degradation of forests. As the picture would show, a complete shift from animal food would save eight billion tonnes of CO<sub>2</sub>, a level that could otherwise be reached only if all the power generation in the world shifted to nuclear — a tall order.

## Alternative meat

As a first step to finding replacement of meat in diets, the group writing in *Scientific Reports* analyse the nutritional value and the contribution to environment pollution of different kinds of vegetable-derived foods. Statistical analysis and studies for finding the optimum mix disclose that it is possible to match the nutrition content of a meat diet by vegetable foods and yet save significantly in the use of resources. "By replacing meat with the devised plant alternatives — dominated by soy, green pepper, squash, buckwheat, and asparagus — Americans can collectively eliminate pasture land use while saving 35-50 per cent of their diet related needs for cropland, nitrogen, and greenhouse gas emission, but increase their diet related irrigation needs by five-15 per cent," the paper says. Despite higher water needs (for crops like rice against meat sources like poultry); the diet-shift has a clear advantage.

There would be cultural challenges in changing dietary habits and adapting to a new cuisine. But the shift would represent a social engineering opportunity and a pathway that is within the individual's control. It would also be less dependent on the compulsions that influence corporates and governments, whose progress towards keeping global temperature rise below 1.5°C does not appear promising.

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# Lost in the ruins

An account of a Syrian archaeologist in exile who's mourning what the war is costing the country's scientific community



LUBNA OMAR

I used to be a Near Eastern archaeologist working in Syria. Nowadays, I am stuck in academic purgatory, observing from a great distance as the country burns, unable to help protect its history or its present.

Syria sits within what's known as the cradle of civilisation. It's part of the area archaeologists call the Fertile Crescent that stretches from modern-day Iraq to Egypt. This is where researchers believe human beings first settled down from nomadic lifestyles, where agriculture was born, where people originally domesticated animals thousands of years ago.

There were over a hundred archaeological digs ongoing in Syria before 2011, with researchers from inside and outside the country participating. What we all uncovered helps us learn more about the human species and our ancestors.

But when war broke out in 2011, archaeological excavations were suspended, and all international teams left the country. Images and videos of the destruction of cultural heritage sites started to circulate on news and social media sites. The Syrian war has not just interrupted the research that would help fill out the picture of early

human culture; combatants are actively wrecking earlier finds.

## Thousands of years of cultural heritage

Before the uprising in Syria, I worked as a zooarchaeologist, analysing ancient animal bones from sites that date back to the Bronze Age. I am one of a handful of experts in this field who is originally from West Asia.

In my research, I focused on what animal bone fragments could tell us about the people living in these ancient urban centres and how they used animals. Based on my analysis, my colleagues and I concluded that ancient communities were investing in large herds of sheep and goats during the Bronze Age, between 3,000 and 1,200 BCE. People used herd animals and others — including cattle, pigs and wild species — for food, for raw materials for tools and even as a means to communicate with the spiritual realm through sacrifice and artwork.

For the most part, animal bones alone can't reflect the richness and the level of craftsmanship in these kingdoms. A great example comes from the royal palace of Qatna, where an intricate stone sculpture of a mon-



A mosaic in the Raqqa Museum, after and before its destruction.



Video stills from the Russian Defence Ministry website purport to show the Roman-era amphitheatre on 6 June 2016, left and on 5 February 2017 right, in Palmyra

key holding a vessel that held facial paint was recovered from a massive burial chamber; it dates to 1600-1400 BCE.

Archaeologists have been able to document major changes that happened further back, in the Neolithic period, which began roughly 10,000 years ago. They've uncovered innovative prehistoric architecture such as the communal buildings of Jerf el Ahmar. They've documented cultural developments in daily life, such as the emergence and the distribution of pottery cultures and food processing and cooking techniques. They've uncovered complex funerary practices in Syria, including plastered skulls from Tell Aswad that date back to 9,500 years ago, which are considered one of the best-preserved examples of decorated human skulls.

Excavations have found many much older artefacts and fossils in this region too. In Dederiyeh cave in the northwest of Syria, one group recovered almost-complete skeletons of two Neanderthal infants, who lived sometime between 48,000 and 54,000 years ago. Recent research was able to connect their skeletal features with the shape of modern human bones. It's a crucial step to reconstruct the evolutionary relationship of our species with other hominids.

Archaeologists made other

remarkable findings at the El Kowm oasis in central Syria, close to Palmyra. There they uncovered hominid fossils alongside giant camel bones that date from around 100,000 years ago, before the time of Neanderthals in this region.

It's evident the Fertile Crescent played a vital role as a path and a home for humans and their ancestors for a very long time. It continues to host waves of communities that invented and mastered skills and techniques, which were essential for the survival of our species.

## Artefacts under fire

After the spring of 2011, archaeologists stopped working in Syria. Scientists aren't uncovering new sites or digging deeper into the long human history of this region.

Artefacts and sites are being destroyed. Outrageous looting and smuggling of artefacts are still taking place in different parts of the country. The looting of antiquities became an economic tool for the Islamic State group to maintain its supremacy in the northern part of the country. Many of the fighting factions in Syria took advantage of the rich cultural properties and smuggled what they could to Western markets and collectors.

Consequently, museums shut

down and were barricaded. Still many of them were targeted during the armed conflict, and they severely suffered.

Some sites — such as Crac des Chevaliers castle and Aleppo's ancient monuments — were caught under fire between the regime forces and the opposition. As the international community recognised the destruction of world heritage and the value of Syrian archaeology in terms of global history, fighting groups realised they could use these sites as political pawns. While the Russian Orchestra performed at the ancient amphitheatre after "liberating" Palmyra from the Islamic State group in 2016, IS retaliated when they recaptured the city in 2017 by destroying the facade of the monument.

And this chaos has been in place for the last eight years.

## Syrian archaeologists in limbo

Conducting archaeological research requires direct contact with ancient sites and materials. But the escalating armed violence in Syria continues to prevent archaeologists from resuming their work on the land. Most of the international institutions shifted their focus from Syria and moved their teams and projects to neighbouring countries.

Meanwhile, the relatively smaller number of Syrian archaeologists faces multiple challenges. On a most basic level, war is ripping through their homes. But they also face an occupational challenge: How can you pursue a career in the field in the midst of armed conflict supported by multiple geopolitical powers?

Most of this group of ambitious young archaeologists — including me — were forced to flee the country. Though currently safe from the physical danger, we still face a harsh professional reality. Competing in a fierce job market, we can only promise that someday we'll be able to travel and resume our work back where we used to belong.

Many Syrians in exile are still participating in initiatives such as Syrians for Heritage, trying to protect and restore artefacts and museums throughout the country and attempting to keep Syrian cultural heritage alive in our diaspora. I believe this mission could be successful — but only with genuine support for the Syrian people and not just their ruins.

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## PLUS POINTS

### Risks of IVF



Infertility is an emergent issue across the world. In India, not much attention has been paid to it and few studies have thrown light on how to understand the level, trends and consequences of infertility in this region.

Family planning programmes in the country have exclusively viewed the patterns of over-fertility rather than infertility. Furthermore, there is a gap in information about modern treatment facilities regarding infertility among married couples.

However, the fundamental pathology in female subjects with infertility is related to premature ovarian failure. Thus, it is logical to use supraphysiological doses of hormone-based stimulation to induce ovulation. Those eggs are, thereafter, harvested to facilitate in vitro fertilisation.

For the expectant parents, these techniques of assisted reproduction are an important means of obtaining parenthood. What have not been often clinically discussed are the medical complications that arise unpredictably during the course of IVF therapy.

These issues have been brought to the forefront by the pioneering work of Dr Bharat Bhushan, chief nocturnist at Covenant Medical Center in Lubbock, Texas, US. Through his case series, Dr Bhushan has identified the stochastic risk of formation of dangerous blood clots during IVF treatment. Numerous cycles of treatment are often required for IVF success and thus, the risks of venous thromboembolism remain a challenge.

The blood clots can form in any blood vessel including the portal veins and disrupt the functioning of the liver or lungs, causing sudden demise. Estrogen-based medicines often aid the formation of intravascular clots, which have always been a concern for hormone replacement in post-menopausal women. Deep vein thrombosis occurs during ovarian hyper-stimulation syndrome, a life-threatening situation resulting from stimulated multiple oocyte (egg) donation cycles.

Dr Bhushan's advocacy in creating awareness regarding the risk of women cancer associated with IVF therapy is noteworthy. In the long term, IVF enhances the risk of ovarian and breast cancer. While assisted reproduction brings hope to many mothers, Dr Bhushan's efforts to keep the community aware are highly significant. Being an elected Fellow of the American College of Physicians, he regularly encounters suddenly-evolving thrombotic conditions in the hospital.

An understanding of the levels of infertility among couples is crucial in order to improve the clinical management of infertility and maintain policies for the betterment of society. Different studies have made attempts to access net effects of socio-economic and demographic factors on infertility and the treatment-seeking behaviour.

Approximately, more than 20 per cent of currently married women who had never given birth reported problems of infertility. The rate of infertility was found to be higher among women belonging to the Hindu religion, scheduled castes and those residing in rural areas, studies said. Higher level of infertility was found among women who had never attended school, whereas it was lower for women with more than 10 years of schooling. Sometimes, it was seen that uneducated or under-educated women are not aware of their reproductive health problems as they are getting into marriage and reproduction at early ages, which may increase the possibility of secondary infertility.

Further, infertility rate was higher among women who were engaged in the employment sector. Late marriage of women also showed high rates of infertility. About seven per cent of women who married after 30 years of age were also reported to have primary infertility and 13 per cent of them had secondary infertility.

Subhendu Maiti

## Rolling Stones Rock



Nasa has honoured the Rolling Stones by naming a small Martian rock after the London band. The US space agency decided to call the golf ball-sized rock "Rolling Stones Rock" after it appeared to move around one metre across the surface of Mars on 26 November 2018.

Rolling Stones Mick Jagger, Keith Richards, Charlie Watts and Ronnie Wood said they were happy with the news. "This is definitely a milestone in our long and eventful history," they commented. "A huge thank you to everyone at Nasa for making it happen."

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