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We already grow enough crops to feed an extra 10 billion people



Johannes Hirn, PhD Nov 28 · 5 min read

But we need to be smarter about what we do with them

It turns out that about a quarter of the calories from crops we grow are wasted during harvest, storage, distribution, preparation or consumption. Cutting these losses would provide food for about 4 billion people¹.

On top of that, some crops that could have been eaten by humans are turned into fuels for vehicles instead (called biofuels). With relatively minor changes, these crops could be used as food for people, and would deliver enough calories to sustain about 2 billion people instead.

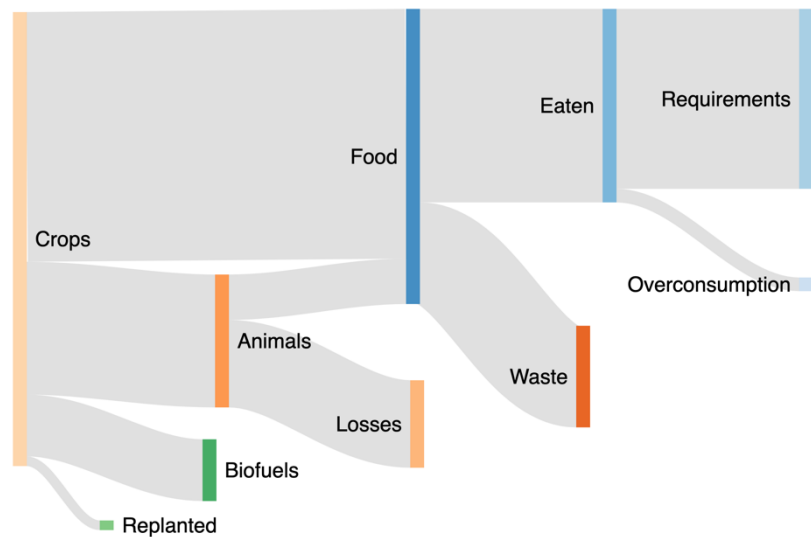
On top of that, a lot of human-edible crops globally are fed to farm animals instead.

The human-edible crops we feed to animals contain enough calories to sustain 5 billion people.

In addition to these human-edible crops, animals eat feed that cannot be eaten by people, such as grass, pasture and stover.

In return, we get milk, eggs and meat from the animals. But the nutritional value of what we get is only a fraction of what the animals eat. This is because they do use up a lot of nutrients to stay alive themselves².

Tracking calories through the global food system. The width of each flow indicates the amount of calories transferred from left to right. For instance, a larger amount of calories from



crops end up in biofuels that end up replanted to grow the next year's crop.

In terms of calories, the current system ends up delivering slightly over 2500 calories per person per day, unevenly spread around the planet. The good news is that this is slightly more than is needed for healthy living according to the United Nation's FAO.

The bad news is that not everybody gets the correct amount: some get too little, and some ingest too much. However, this is not an issue of land area or agricultural practices, but one of distribution, choices and income inequality.

Over half of the calories we grow in our crops never reach our mouths.

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If they did reach our mouths, instead of that of other animals, bins or car engines, we could at first glance expect to feed about 18 billion people.

The same analysis has been done for various types of nutrients, including proteins and iron, which are often a rationale for eating animal products.

Proteins and iron

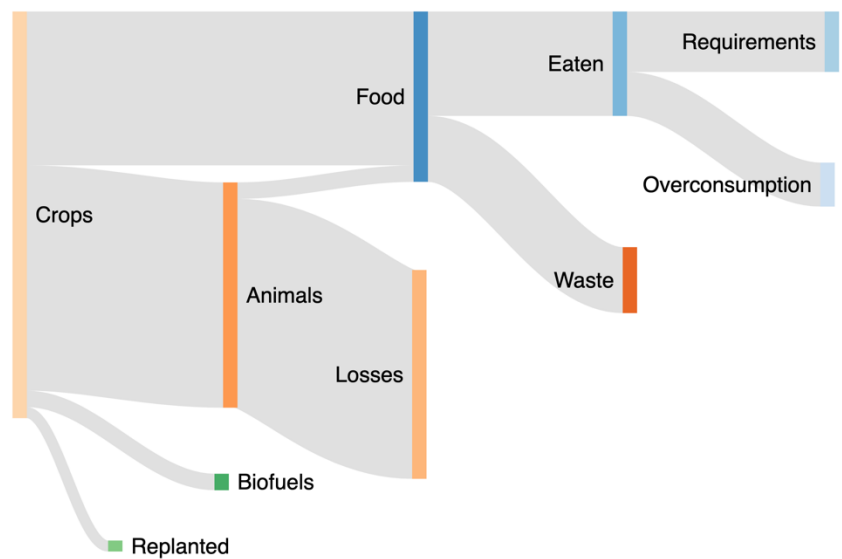
It turns out we feed more proteins to animals than we eat ourselves in total (including animal products). And that's not even counting the grass and pastures that animals eat in addition to human-edible crops.

The human-edible crops we feed to animals contain enough proteins to sustain 14 billion people.

Agriculture already provides more than enough protein for the world's population (i.e. 81 grams per day per person on average instead of the ideal 44 grams per day for an average person).

Tracking protein through the global food system. The width of each flow indicates the amount of protein transferred from left to right. For instance, more proteins from crops end up in animals' mouths than go straight into food for humans.

Unfortunately, the inequalities within the global population are even larger for proteins than for calories, i.e. many people could do with more, while some gym buffs probably should do with a lot fewer protein shakes³.

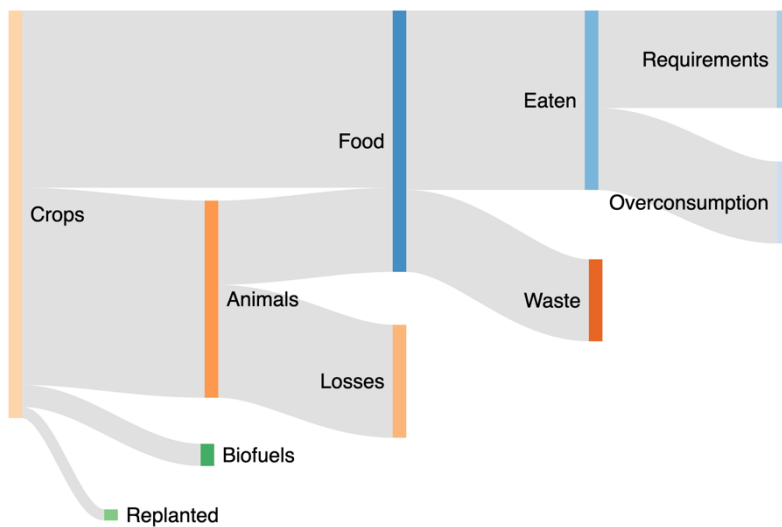


As for iron, the situation is actually worse.

The human-edible crops we feed to animals contain enough iron to sustain 26 billion people.

Tracking iron through the global food system. The width of each flow indicates the amount of iron transferred from left to right. For instance, only a small amount of the iron ingested by animals ends up in human food, whereas most is lost from the point of view of human consumption.

Many people will know that our digestive system absorbs iron from animal products more efficiently than



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from plants, by a factor of two or perhaps four. But that does not compensate for the fact that animals give us back ten times less iron than we feed them from crops (and that's not even including what they eat from pastures).

Concentration and efficiency

Animal products are a concentrated source of nutrients, but the conversion from plant to animal nutrient is not efficient, i.e. a lot of the plant nutrients do not end up in the animal product⁴.

Animal products do concentrate nutrients, but they also use up a lot of of them in the process.

In other words, animal products are a concentrated source of nutrients for special cases such as remote locations, harsh environment, severe climate or any emergency or urgent need.

Daily meals in the Western world do not fit in any of these categories.

Global implications

On the face of it, it looks as if we should be able to feed 10 billion more people with current crops, without another green revolution, without more irrigation and without cutting down more trees.

Less food for cows and sheep, more food for people, more trees, fewer greenhouse gases.

Just for comparison: today's global population is slightly less than 8 billions, and nobody is suggesting that we would even reach 18 billions any time this century, or ever for that matter. In fact, the UN expects global population to stabilise around 11 billion in 2100.

To achieve this though, a few things must happen: reduce waste, eat fewer animal products, and make sure that biofuels do not Hoover up too much of our crops.

Regarding animals, the most impactful change would be to reduce consumption of meat, and in particular meat from ruminants (cattle and sheep), because they are particularly resource-intensive. Also, their digestion produces

methane, which accounts for about one sixth of the greenhouse effect globally.

In addition, reducing the amount of animal products we use would free some pasture and grasslands. This land could be reforested, thereby capturing carbon dioxide and prevent further damage to the soil.

[1] Most of the data in this story comes from the following research article: <https://www.elementascience.org/article/10.1525/elementa.310/> and uses 2013 production and a population slightly above 7 billion (we are closer to 8 billion today).

[2] The conversion factor is particularly bad for beef. It is better for eggs and dairy.

[3] There is a long-standing myth that the set of amino-acids in plant protein is not sufficient for a healthy diet. This is not true, as long as the diet is varied and includes enough cereals and pulses/legumes.

[4] Vitamin A and B12 are exceptions to that rule, but both can be added cheaply to a diet as pills