

Miles Horner

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Transformation of the Global Food System.

Food is a necessity for all people. Every day, our current food system works to try and feed the 7 billion people we have on this planet currently. However, this system is nowhere near perfect. Every day, an approximated 2 billion go undernourished, and an approximated 2 billion people are overnourished. It is necessary that our food system evolves to make up for this disparity, allowing for everyone to be properly nourished. Additionally, the human population is growing very rapidly. It is estimated that by 2050, there will be 2 billion more people than there are now, bringing our population to about 9 billion. Our food system needs to be able to produce enough food for these incoming people while continuing to be environmentally sustainable, a task that it is nowhere near accomplishing today.

One of the biggest issues with our current food system is that it is in no way environmentally sustainable; in fact, the agricultural industry and the food system as a whole is one of the biggest contributors to climate change. The biggest way in which this manifests itself is in land use. Across the globe, vegetated land is consistently cleared to make way for crop and livestock land. This process has become so destructive that now agriculture is the world's biggest biome - 27% of the world's land is currently classified as agricultural land. The next biggest biome in the world is forests - which make up 25% of the world's land - and that number is quickly shrinking. We lose around 5 million hectares of forest every year, most of that deforestation taking place in crucial ecosystems like the Amazon rainforest in Brazil or in the jungles of Indonesia. This land use change is a problem for the environment for two reasons. The first is that forests are key in mitigating greenhouse gas emissions - they absorb carbon dioxide and turn it into oxygen. When we deforest, we replace lands that would otherwise be helping

mitigate climate change to lands that are directly contributing to it - the agricultural industry is responsible for around 18% of all greenhouse gas emissions. The second problem is loss of biodiversity. When land is changed from a natural ecosystem, especially forests, into agricultural land, habitats for many different species are completely destroyed, endangering them.

Agriculture's affinity for land use change is why it is the industry that is the most responsible for loss of biodiversity across the globe. It is estimated that 90% of species that are now endangered or have gone extinct are because of the agricultural industry. This trend cannot continue. Our food system must evolve to be more environmentally efficient if we are to continue to use the natural resources of this planet.

Another reason why our food system as it stands today is completely broken is because of how much food is lost along the production process. Anywhere between one third and one quarter of all food produced across the globe is thrown away or lost. This means that one third of all the land deforested to make way for farms is for essentially no reason, and it means that one third of all greenhouse gas emissions that come from our food system are completely unnecessary. If our food system is to adapt, we need to start mitigating this food loss. Something to note is how the ways in which food is lost differs greatly depending on the region of the world we are looking at. In North America (mainly the US), over 42% of all available food produced is wasted, whereas in the Middle East, North Africa and Latin America, only about 16% of all available food is wasted - nearly three times as much food is wasted in the US. What is also important to note is where along the supply chain this food is actually lost, as that can help understand where in each specific region changes need to be made. In the US, western Europe, China and Japan, places that are often considered to be "more developed" nations than others, the vast majority of food lost - over 50 % - is wasted by consumers. Compare this to Southern

Asia and Sub-Saharan Africa, where less than 10% of food lost is by consumers and the most food lost is in the production, handling and storage of food, around 30-40%. This can help us see where changes need to be made in the food system. In Sub-Saharan Africa and Southern / Southeastern Asia (which are the places where the broad majority of the incoming 2 billion people will be), better farming and better food storage practices need to be implemented so that food isn't lost at these stages in the process. In the so-called “developed” world, however, the problem is with the consumers. They are wasting far too much food, and for what seems to be no good reason either. This connects to another key problem with our food system - a failure of distribution. It is estimated that around 2 billion people every day go undernourished, while another 2 billion people every day are overnourished. The vast majority of those who are undernourished are in Sub-Saharan Africa, Southeastern Asia, and in much of MENA. The vast majority of those who are overnourished are people in the US, Western Europe, China and Japan. Here, we see the root of the problems with food loss in our current food system. Consumers in the developed world are being offered too much food, and are wasting too much of the food they are provided with, whereas people in the developing world are not being given enough food or the resources they need to produce enough food sustainably. When it comes to food loss, the vast majority of the work that needs to be done is in these developed countries - working to lose as little as possible and changing the seemingly entitled attitudes of their consumers.

Another key way that our food system is broken is how our current economic system, capitalism, approaches it. Capitalism, as a system, puts profit over almost everything else, and this translates into our food system. Big corporations rule the vast majority of our food system as it stands today, and that is having an incredibly negative impact on the ability of our food system to be equitable and environmentally sustainable. Today, three companies control around 50% of

the entire seed trade worldwide, 4 companies control around 93% of the worldwide grain industry, and 7 companies control the entire fertilizer industry. These are all key elements of any sort of agriculture, and although this centralization may help with short-term efficiency in production, long-term, this centralization presents huge challenges for sustainability. Large companies, time and time again, always will prefer profit, and these agricultural monopolies are no different. Sustainable agriculture is generally more expensive than industrial agriculture, and, as such, none of these companies are trying to make real concrete moves towards a more sustainable food system in the future. They are all justifying their current agricultural practices with the fact that there will be an additional 2 billion people on the planet in 2050, meaning there will need to be an increase in agricultural production by about 50%. Although this is true, the forms of industrial agriculture that they are using, with antibiotics used to grow “perfect” livestock and vast fields of monoculture, are not only inefficient in the long run, but are not environmentally friendly enough to be sustained until 2050. Industrial monoculture depletes the nutrients of the land it is on because the crops that are the most popular, like wheat, rice and maize, do not replenish the nutrients in the soil that they use. In the short term, it is cheaper to deforest and replant new land than to shift to the agricultural practices that would not deplete the land where crops would be grown. Capitalism is economically encouraging the forms of industrial agriculture that these companies are perpetuating, and it is pushing our food system into further disarray. Moving away from it will help our food system transform faster.

One of the main ways that we can change our global food system to be sustainable and able to feed the incoming 2 billion people by 2050 is by changing our agricultural practices drastically. One radical alternative that has been presented to counter industrial agriculture is agroecology. Agroecology is a science that applies the theories of ecology to agriculture. What it

means is that we should be designing our farms like ecosystems, with a broad variety of crops and other plants that work together to provide nutrients to each other and increase the sustainability of the entire system. Fertilizers are incredibly hard to replenish in monoculture - which is why industrial agriculture relies so heavily on either chemically creating more fertilizers or bringing in outside fertilizers to increase the productivity of our plants. Agro-Ecological farms have virtually no problem replenishing fertilizers, as the breadth of plants and resources in the system automatically replenish the natural fertilizers. These diverse ecosystems have continually shown themselves to be more resilient to climate change, which is especially important in less developed countries, where natural disasters and ecosystem degradation are often more common. A study of farmers in Nicaragua found that, after a hurricane, farmers that had been implementing agroecology practices such as crop rotation and the integration of other natural elements like terraces and trees into their farms were impacted much less than those who hadn't, losing 40% less topsoil than their counterparts, which meant they could keep productivity for the upcoming year. If farms can be more resistant to climate change and therefore more sustainable, the rate at which we deforest and deplete natural land can be greatly decreased. Agroecology has also proven to be more productive in the long term for farmers - a study of farmers in Zambia showed that maize farms using agroecology practices were able to increase their yields from 88%-190% over the course of four years. There are many other forms of sustainable agriculture. In urban areas, hydroponic and vertical farms are radical ways to make use of the limited space in cities to produce healthy, locally grown food for urban residents in a sustainable manner. What is key about agroecology practices is that they are easily implemented in developing economies and that they make developing farms more resistant to climate change. Making sure that the increase in food production that is inevitably going to happen in much of Sub-Saharan Africa

and Southeastern Asia is primarily agroecological is necessary if we are to feed the incoming 2 billion people to our planet sustainably.

Another thing that needs to be done if we are to change our food system to be sustainable is to alter our diets. Specifically, we need to start removing meat. Meat is substantially worse for our environment than any other form of food. The livestock industry is responsible for around 15% of all greenhouse gas emissions annually, with the vast majority of those emissions coming from beef and lamb production. Beef and lamb are both “ruminant” livestock, which means that as they are farmed, they release methane into the atmosphere. Beef specifically produces more than two times as much greenhouse gas than any other form of food production, be it animal or plant. However, beef is still one of the most consumed foods in the world, especially in the United States. A future food system needs to find nutritious alternatives to meat that are far more environmentally sustainable. One possible solution is aquaculture. Aquaculture is the practice of farming fish, and, as it stands, it is ten times less environmentally damaging than beef production. For each kilogram of food produced, beef produces 60kg of CO₂ emissions, farmed fish only produces 6kg. Aquaculture has the ability to become even more environmentally friendly than it already is, as it is a relatively new practice. Innovation in the fields of aquaculture and livestock production will be essential to producing a sustainable food system by 2050. It is possible to make livestock production more environmentally friendly, but it can only go so far. We must take the steps necessary to make livestock production more sustainable, but we must also recognize that it cannot be our primary source of nutrition.

Ultimately, one of the most important things we can do to change our food system is to promote education and to change our attitudes. One key example of this is the grocery system. Grocery stores, which, for many people in the western world, are a keystone of daily life, are

actually extremely inefficient as a means for distributing food. Consumers in the western world are obsessed with choice, which is dangerous when it comes to food. It has made it so that the grocery store system values freshness and fixed prices above most other things, and it means that grocery stores throw out a staggering amount of unsold food at the end of each day. Grocery stores promote an “ideal” food, which is dangerous because any foods that don’t live up to that ideal standard are at a greater risk of being thrown out. Farmers markets, which are much more common as the primary method of food distribution in developing nations, are much more inclusive to all involved. Farmers are able to adjust their prices based on whether or not their yields were full or of the highest quality, and consumers often will have access to food that is locally grown and often better for the environment than food that comes from large agricultural businesses you would find in a grocery store. Something else to acknowledge is the role of the individual in the change of our food system. Individuals do have some power in this process; making the decision to go vegetarian or to reduce meat consumption in your diet will have a small impact on our food system. However, we must acknowledge that the transformation of the food system is a responsibility that falls on food producers and governments who have the ability to regulate their food industries. Centering the conversation solely on the individual is dangerous, as it allows corporations to continue to destroy our environment while not experiencing any of the drawbacks. There must be a push against governments to regulate these businesses, actively trying to transform the food industry with investment in greener solutions and incentives to change industrial agriculture to agro-ecological agriculture. Additionally, education is key. Educating kids about sustainable eating, especially in the western world, is essential, and educating farmers all over the world about environmentally sustainable practices is also essential. The western world also needs to acknowledge its role in this issue. Industrial

agriculture, which is a predominantly western construction, is awful for the environment, and even though the vast majority of western consumers are overnourished, they still waste almost half of all available food produced. Western countries must be held responsible for the damage that their citizens and more specifically, their businesses are doing to our environment and our food system. The transformation of the food system must be a global effort, and all parties must work together to create a more equitable and sustainable system.

Ultimately, the push to change our food system is one of the most pressing issues of the upcoming century. The failure of humans to adapt to climate change could prove to be our downfall if adequate steps are not taken. We must remember that the movement for a sustainable future is not only fighting for a future that humans can live in, but all animals, and all plants. If we are to continue to live on this planet, we must learn to live in tandem with the natural resources and animals that have brought us to where we are today.