

Long Format

1. There is a social disconnect between farmers and consumers. People at the grocery store buy food where they don't know its story. They don't know who grew it or what the farm is like. This is typical of the global food system. There are relatively few connections among people. There is no sense of community. With the global food system, food comes from faraway mono-crop farms where chemical inputs are used for mass production and food transportation. Food produced this way typically has a higher environmental cost and is less nutrient-dense according to Kloppenberg on page 3 of *Coming Into The Foodshed*. With local regenerative farms, consumers can know their farmers and the land from which their food comes from according to Kloppenburg's moral economy. These local farms can create a community where that gets more people involved in farming so they can reduce chemical inputs and effects on the environment. A closer agriculture community will also foster the spread of conservationist ideas. On page 18 of *The agroecological revolution in Latin America: rescuing nature, ensuring food sovereignty and empowering peasants*, Altieri and Toledo write, "Today it is estimated that about 10,000 families in Nicaragua, Honduras and Guatemala practice the Campesino a Campesino method. It was via the CAC method that soil conservation practices were introduced in Honduras, and hillside farmers adopting the various techniques tripled or quadrupled their yields from 400 kilograms per hectare to 1,200–1,600 kilogram." Via the farmer-to-farmer method, the idea of planting the Velvet Bean as a cover crop allowed family farms in Central America to triple their maize yields and eliminate the use of pesticides. Their sense of community allowed for the spread of ideas that pointed the families toward retro innovation, ultimately benefiting themselves, their community, and the environment.

The many inequalities of food systems can tragically create unnecessary problems with simple solutions. For example, Schipanski et al talks about gender disparities in India's agriculture industry that exacerbate the country's malnutrition problem. On page 4 of *Realizing Resilient Food Systems*, Schipanski et al writes, "Women occupy a large and growing role in agricultural production, but the productivity of women-run farms is hampered by unequal access to resources (e.g., land, credit, inputs, and technical support). These inequities arise from poverty and distributional inefficiencies but also reflect systemic gender discrimination within male-dominated agricultural extension services and land inheritance." Women in India don't have access to the same resources

men do. As a result of this, women-led farms are suffering. India faces a malnutrition problem that could be fixed if women had access to the same resources. Giving women the same resources would allow them to be successful in India's agricultural sector, which would reduce the malnutrition problem the country faces.

Plant biodiversity can help with many issues in the food system. One very important aspect of agroecology is soil health. The health of the world's topsoil has been rapidly declining due to over-tilling and use of chemical inputs. These two things will lead to a need for larger quantities of inputs as the soil health worsens and cannot support crops anymore. More chemical inputs lead to larger nutrient quantities in runoff which severely impacts water quality. This runoff containing the nutrients from the chemical inputs can also cause algal blooms. Another important aspect of agroecology is pest management. Monocrop farms typically have more problems with pests because there is no ecosystem with natural predators. If monocrop farms have a pest outbreak, they could lose their entire yield. There is a whole myriad of problems without the use of plant biodiversity. When we went to Foot of the Mountain Farm, Lorenzo talked a lot about biodiversity. Biodiversity on their farm has helped them with pest control. Their soil health is very good, and they have lots of worms. The worms attract the birds, and the birds eat all kinds of pests. Lorenzo also mentioned they have a decent population of praying mantises. Having these natural predators allows them to limit their inputs. Drinkwater and Snapp mention in *Nutrients In Agroecosystems: Rethinking The Management Paradigm* that ecosystems can be restored by controlling carbon, nitrogen, and phosphorus fluxes. Lorenzo can do this at his farm by planting various crops, rotating them, and more notably using cover crops in the winter. This whole paragraph is a long-winded way of saying that biodiversity is key to sustaining our agriculture. This method can bring ecosystems and topsoil back to life which is key for regenerative agriculture.

2. As stated above, a pro of local food systems is the creation of a food community. More people will be inclined to get involved. There will be connections between people and their food. The consumers will know their farmers better and the story behind their food. Creating such a community can spread ideas of regenerative agriculture (as we saw with maize in Central America) that can reduce the use of mechanization and chemical inputs. Together, these two could stop farmers from entering the financial treadmill. The family farms also increased their yields three to four times. Lorenzo said that he can grow 14 acres

worth of food on two acres. This idea of agroecology on small farms allows for unexpected efficiency. This can also take us back to biodiversity. Biodiversity is part of the reason Lorenzo's farm is so efficient. On page 3 of *Reframing the local-global food systems debate through a resilience lens*, Wood et al writes, "Diversity is at the core of resilient systems. Yet food systems are currently losing diversity at multiple scales and from production to consumption, compromising both health and environmental sustainability". The way we talk about local food systems has farms planting a wide array of items just like Lorenzo. Biodiversity will allow for the local food systems to be more resilient in the face of pests, droughts, natural disasters, and unforeseen circumstances (such as Covid 19). Another pro is local food will be more nutrient-dense as the food doesn't have to travel as far which means it will be fresher, and nothing will need to be done to the food to extend its shelf life. Local Food systems can lead some people to food sovereignty as they can grow fresh organic food for themselves. If communities adopt community gardens and people create personal gardens, a lot of food can be produced in this way, saving a lot of people from buying produce at the grocery store.

Chris Newman points out a con to local food systems in *Vegetarian Diets Are Not Going To Save The World*, in a solution with small farms, people will need to eat local diets. This includes making diets seasonal. No longer will people be able to buy produce that is out of season from faraway places. As Newman states, this will be a very hard adjustment for people because the selection of food will now be limited in options. Another con is that food sovereignty won't apply to everyone in the local food systems. Vaarst et al points out on page 12 of *Exploring the concept of agroecological food systems in a city-region context*, that there are challenges with the local food system for those in urbanized areas. Urban areas are very dense in population. There will need to be a complex solution for these urban areas where food systems overlap. There are also a lot of staple food items such as coffee that require tropical climates that will now be unavailable to many people. Varst et al get into the idea that system boundaries will be very unclear considering the above statements. Building off of Varst et al, local food systems would also be very difficult for remote communities such as small island nations that typically import everything. They could try to grow their own food but would have to destroy their beautiful islands to achieve this. Even in doing so, they might not achieve the required yields for

feeding the island, so, local food systems could disproportionately disadvantage people based on geography.

Short Response:

4. Sage writes on page 7 of *Environment and Food*, “With the successful conclusion of the Uruguay round, requiring the removal by developing countries on tariffs and other protective measures to defend their farmers, large volumes of low-cost surplus grain from Northern producers were released onto Southern markets, driving down agricultural commodity prices as a consequence.” After the removal of tariffs, Northern companies sold grain at low prices to poor Southern companies which was the idea of John Block, the Agricultural Secretary in the US in 1986 so Southern countries could ensure food security at lower prices. The Southern countries became somewhat stuck buying grain from these large Northern companies such as Cargill and Conagra because these companies could offer the lowest prices. Globalization of the food system opened up the opportunity for farms to sign contracts with these companies. Unfortunately, the contracts require large amounts of food to be produced. Agricultural equipment manufacturers such as John Deere created heavy machinery that they promised would allow farmers to farm more with less manpower. However, this machinery costs loads of money that farmers cannot afford. Farmers have to take out loans to purchase this equipment. Then the contracted farms have problems with pests among other things because they are monocrop. So, they buy sprays from these same companies because this is advertised to them as the best solution.

These sprays and monocrop farming are harmful to the soil. So, the farmers end up buying chemical fertilizers from the same companies to make up for what is now poor soil quality. Chemical fertilizers don't allow for natural nutrient regeneration which will then require more fertilizer to make up for this. The farmers get caught in a cycle or “treadmill” where they have to keep buying from large companies such as Cargill and Monsanto to keep their farms running. This is an expensive cycle for the farmers to keep up with which causes them to go into debt. At this point, their only option to make more money is to keep the farm running by buying more sprays, heavy machinery, and seeds from large companies. This is the treadmill.

5. The concept of resilient farming is apparent at Foot of the Mountain Farm. On page 2 of *Reframing the local–global food systems debate through a resilience lens*, Wood et al talks about the seven resiliency principles. Some of these are diversity, partial connectedness, learning and experimentation, and broad participation. As stated above, Lorenzo has fully ensured the diversity aspect by planting a bunch of different crops and revitalizing the local ecosystem. Lorenzo imports things such as flour from a local farm so they can make baked goods. His farm is not fully reliant on one person, company, etc. However, he does purchase some things from local places. Another example is how he purchases local wood that was meant for the landfill and uses it for hügelkultur. Lorenzo mentioned ways he experiments around the farm like when they let the water runoff from their greenhouses to create a small wetland area. This allowed for the introduction of new and advantageous species to the farm's ecosystem such as hornwort. As for participation, Lorenzo is working on creating a program where people can stay at the farm to learn regenerative agriculture practices. So, there are many ways Foot of the Mountain Farm is resilient according to Wood et al.

6. Klerkx and Rose write on page one of *Global Food Security*, "It has been noted that Agriculture 4.0 has the potential to be disruptive and transformative in many ways. It may have biophysical, economic and social impacts on food and nutrition security, as well as on the ways in which agricultural production systems are designed and operated." Klerkx and Rose are referring to Agriculture 4.0 which includes a whole host of technologies such as artificial intelligence, nanotechnology, drones, etc. These technologies could reduce the amount of manpower a farmer needs by having machines do the work. AI could reduce the amount of chemical inputs farmers use by telling them the most ideal times to spray and what amounts they need. The possibilities can stretch quite far. However, as with everything, there are many problems. Just like the green revolution and heavy machinery, many farmers cannot afford all this technology and could be disadvantaged by these financial factors. This high-tech revolution could put many people out of jobs if the machines were doing the physical work. In addition, a lot of farmers will need to pay money for the infrastructure as well. This technology will require a lot of energy among other things. So, most farmers are probably not technology ready. This could cause another treadmill effect if farmers keep having to buy updated technology and need the companies to fix

the tech when it breaks down. These are just a few of the many problems that could come with Agriculture 4.0.