



Biodiversity Loss in Our Ecosystems Results in Increased Food Insecurity

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Figure 1 (Above): Legume plant fields in Ethiopia. (Source: "Inoculating Legume Plants with Nitrogen-Fixing Rhizobia Bacteria Improves Yields in Ethiopia and Could Save USD28 Million Annually in Fertilizer Costs" by Paul Karaimu, July 12, 2019, International Livestock Research Institute, <https://www.ilri.org/news/inoculating-legume-plants-nitrogen-fixing-rhizobia-bacteria-improves-yields-ethiopia-and-could>)

Within our country and all over the world, food security has become an increasingly pressing issue. Another major concern we face today is the loss of biodiversity in our ecosystems. There is also a direct relationship between food security and the biodiversity present in ecosystems. Current research on this relationship has shown that, while enough food is able to be produced through agricultural means, it also "methodically undermines the capacity of agroecosystems to preserve biodiversity."¹ This paper discusses several instances of biodiversity loss and its overall impact on the security of our food.

What is Biodiversity and its Role in the Environment?

On a local level, biodiversity refers to the amount and variety of life that is present within a given ecosystem. When biodiversity is lost, however, several issues can present themselves: new and infectious diseases, and reduced soil fertility, which results in a decrease in crop yields. Additionally, as our global population increases, more land is required in order to produce enough food to feed everyone.

Expansion of crop fields into separate ecosystems can lead to loss of plant and animal life; if these organisms are not able to adapt to the changing surroundings, then they will not be able to survive, leading to more losses in biodiversity.² When this loss occurs, food security can become endangered on a global scale; nutrition in diets can decrease

due to less adequate crops, rural livelihoods can worsen, and there can be a loss in sustainability of food as resilience becomes less prominent in our communities.³ With all of this in mind, it becomes apparent that biodiversity needs to be preserved in our ecosystems so that the security of our food does not become endangered.

Microbial Effect on Biodiversity

As the biodiversity of microorganisms decreases in a crop yield, new pathogens and harmful microorganisms have the ability to fill the void and transmit diseases not only to the crops but also to the crop-consumers. In a regular ecosystem, there is a natural competition that constantly takes place between organisms.

On the microscopic level, bacteria, viruses, and other microorganisms are competing for resources that reside in both the soil and on the crops themselves. As biodiversity is lost, however, this competition is less prevalent as species are dying out; when the non-harmful microbes are lost in these scenarios, harmful ones are able to replace them and use up the resources that the plants offer. As these new microbes spread and are ingested, new diseases and infections can arise, which could result in an epidemic as the food is distributed across the globe.⁴

Biodiversity's Role in Agriculture and Agroecosystems

Agriculture, in general, has contributed to a loss of biodiversity as these crop fields expand across the world. With this, there is a tradeoff between food security and the resulting biodiversity. As mentioned in her article, Dr. Alison Power talks about how the management of agriculture can lead to losses in wildlife habitats, and more specifically, the wildlife itself. Dr. Power has also worked extensively with the legume plants and fields in Ethiopia (Fig. 1), which have shown to be vital to protecting the biodiversity of legumes.

From this, agroecosystems can arise; these allow for many more benefits within crop fields and can greatly increase the security of our food sources. Agroecosystems can allow for the support of

biodiversity, but as mentioned before, the fate of biodiversity is reliant heavily upon the management of the agroecosystem.⁵ For example, agroecosystems can allow for the regulation of water and soil content, and they can support the effects of biodiversity on crops, such as pollination and nitrogen fixation.

However, there can also be tradeoffs that aid in the loss of biodiversity, such as emitting greenhouse gasses and creating water runoff that is filled with pesticides and other chemicals that can be poisonous to wildlife.⁶ These deficiencies in agroecosystems need to be addressed in order to preserve biodiversity; by accomplishing this, food sources around the world will be able to become safer and more secure for consumers.

Preserving Biodiversity in the Future

Overall, biodiversity is very important in keeping our food safe, and these examples have shown how biodiversity affects our overall food production. Without biodiversity, several problems can arise, including disease and loss of wildlife. In order to stop this, more manageable policies need to be adopted to protect wildlife, which will also benefit our crops and keep our food secure.

Current Research

Research has shown, however, that problems with food security and loss of biodiversity do not have to be mutually exclusive to each other; by implementing new policies and practices in our agricultural fields, both problems will be addressed.

For example, alternative agriculture, such as utilizing hydroponic techniques, has been seen to decrease losses in biodiversity, and is overall better for biodiversity conservation than conventional agriculture.⁷ The difference, here, is that conventional agriculture focuses solely on increasing the outputs and yields of crops in order to increase the efficiency of harvests at the expense of biodiversity, whereas alternative agriculture's main focus is sustainability of food sources that coincide with an increased protection of biodiversity.

Another study has shown that small farms using more alternative agricultural practices are “two to four times more energy efficient than large conventional farms.”⁸ With this in mind, it is

important that we begin to adopt these practices to save biodiversity in our ecosystems and keep our food secure.

Notes

1. Michael Jahi Chappell and Liliana A. LaValle, "Food Security and Biodiversity: Can We Have Both? an Agroecological Analysis," *Agriculture and Human Values* 28, no. 1 (2009): 3–26, <https://doi.org/10.1007/s10460-009-9251-4>.
2. Desirée J. Immerzeel, Pita A. Verweij, Floor van der Hilst, and André P. C. Faaij, "Biodiversity impacts of bioenergy crop production: a state-of-the-art review," *GCB Bioenergy* 6, no. 3 (2013): 183–209, <https://doi.org/10.1111/gcbb.12067>.
3. "The Biodiversity That Is Crucial for Our Food and Agriculture Is Disappearing by the Day," FAO, Accessed February 21, 2022. <https://www.fao.org/news/story/en/item/1180463/icode/#:~:text=%E2%80%9Cless%20biodiversity%20means%20that%20plants,%2C%E2%80%9D%20added%20Graziano%20da%20Silva>.
4. Felicia Keesing, Lisa K. Belden, Peter Daszak, Andrew Dobson, C. Drew Harvell, Robert D. Holt, Peter Hudson, et al., "Impacts of Biodiversity on the Emergence and Transmission of Infectious Diseases," *Nature* 468, no. 7324 (2010): 647–52, <https://doi.org/10.1038/nature09575>.
5. Alison G. Power, "Ecosystem Services and Agriculture: Tradeoffs and Synergies," *Philosophical Transactions of the Royal Society B: Biological Sciences* 365, no. 1554 (2010): 2959–71, <https://doi.org/10.1098/rstb.2010.0143>.
6. Power, 2959-71
7. Chappell, 3-26
8. Chappell, 3-26