Impacts of Composting in Climate Change

Climate Change, a major issue of global concern today, is still a factor unable to be controlled or managed to the point possible. Global Warming and the effect of greenhouse gases results in climate change: unsystematic change in weather patterns. In this process of minimizing this global concern, a proper household waste management system has a very important role to play. Composting is the basic and the domestic form of waste management which is considered a key tool in this global fight against Climate Change. Composting offers an environmentally superior alternative to massive landfill dumping which directly contributes to Climate Change through release of enormous amounts of greenhouse gases. If every house contributes in this fight by means of composting of domestic waste, then the Earth will surely be a better place to live.

The everyday waste comprises biodegradable waste such as kitchen waste, garden waste and papers which normally accounts up to 58% of the total waste generated. In the larger cities this quantity might even account to almost 70% of the total waste. Most of this rubbish ends in the landfills and dumping sites. Carbon dioxide and Methane are the major products when any organic waste decomposes. Methane is mostly produced along with Nitrous Oxide in low oxygen concentration/anaerobic whereas Carbon dioxide is produced readily when anything naturally rots in air/aerobic. This production of Methane is common in the landfills. Both of these gases, Carbon dioxide and Methane are greenhouse gases which contribute to global warming and climate change. Landfills are the third largest global anthropogenic source of methane, accounting for approximately 11% of the total global methane emission.

2.12 billion tons approx. of waste is yearly dumped on the landfills. Even if we could reduce this massive number by a small extent, it would be a great relief to our home planet. Composting here is considered a major step to reduce this quantity. So, what are the elements that should be composted? Any sort of organic waste including agricultural and forestry residue, manure, food processing, kitchen and garden waste, and biosolids (organic solids from treated sewage) can be composted. Composting is the biological process in which organic compounds decompose under observed conditions forming humus rich soil amendment called compost. The compost produced is very environmentally friendly and can be used as a source of nutrients for plants and soil making it more fertile and suitable for cultivation. Composting is considered to be

the easiest technology and the cheapest solution to mitigate the problem of extensive methane emission worldwide.

In simple words, composting diverts organic materials dumped in the landfills to environment friendly procedure of sustainable decomposition. Thus, directly reducing the amount of Methane that would be produced in the anaerobic decomposition in the landfills to a great extent. In 2015, an estimated 38 % of food waste was composted in the United States and about 57 % was composted in the European Union. According to UNFCC (United Nations Framework Convention on Climate Change), if all lower-income countries reached the U.S. rate of organic composting and all higher-income countries achieved the E.U. rate of organic composting, composting could avoid methane emissions from landfills equivalent to 2.1 to 3.1 gigatons of carbon dioxide by 2050. These organic wastes are termed as “Black Gold " because of their extreme nutrient values even after they are wasted. Instead of wasting this Black Gold, compost puts it to good use where it can benefit the environment and contribute to control climate change.

Microbes play an overwhelming role in composting. These tiny microorganisms rapidly break down organic matter producing heat, Carbon dioxide and humus. Research suggests that biological aerobic decomposition by soil microbes during composting reduces the greenhouse emission into the atmosphere by almost 90 percent as the emitted greenhouse gases can be used in bio-fuels as these processes of composting are well monitored and controlled.

An often overlooked but very powerful process of Carbon Sequestration is also possible due to composting. Carbon Sequestration is the process of capturing and storing Carbon dioxide and other Carbon-based greenhouse gases from the atmosphere by plants, soil and biological microbes in the soil, which ultimately help to reduce global climate change. Compost rich soil can well store Carbon as Carbonates. Such Carbonates are created when Carbon dioxide dissolves in water and percolates the soil, combining with other natural minerals such as Calcium and Magnesium. Compost further promotes healthier and more vital plant growth, in turn plants utilize the Carbon dioxide in the atmosphere for the process of photosynthesis.

Although composting is not a complex process, there always arises confusions and dilemmas. Composting does reduce Methane emission but the process itself involves Carbon dioxide emission. So, why is composting considered so significant in controlling climate change? In this scenario, we are just looking towards a specific part of a big picture. Compost pile does emit

Carbon dioxide which is a major greenhouse gas but also absorbs more Carbon dioxide concentration and amount by the means of carbon sequestration. Furthermore, the Carbon dioxide released during composting is called biogenic not anthropogenic, thus does not severely lead to global warming. Secondly, researchers have found out that large compost pits also emit potent greenhouse gas Methane in anaerobic conditions, at the bottom of the pit. Nitrous Oxide is also produced in the areas where Nitrogen concentration is higher. However, the Methane produced gets oxidized as it gets in contact with the oxygen and is of no harm. All these associated problems and dilemmas of Greenhouse gases emission can be minimized by balancing the Carbon:Nitrogen ratio and providing adequate aeration and moisture to the pit.

Composts can supply some amount of mineral Nitrogen that would otherwise be provided by chemical or mineral fertilizers. This substitution by compost heavily reduces the emission of Greenhouse gases caused by manufacturing and transportation of fertilizers. The use of chemical fertilizers also directly affects the quality of soil and natural resources around it causing environment exploitation. Compost that is incorporated with the soil will continue to break down. In the long term, the decomposed substance will be the part of the carbon pool of the soil increasing fertility of the soil. In addition, compost increases the moisture holding capacity of the soil, thus making the irrigation need limited. Limited irrigation would mean less use of energy and avoidance of the release of associated Greenhouse gases. Thus, controlling climate change.

Mathematically, composting 25 million tons of domestic waste would be equivalent of removing 7.8 million passenger cars from the road. Yearly, 2.2 billion tons of domestic waste is produced and if we could utilize the half of it by composting which is very possible in today's scenario of technological advancement, the global problem of Climate Change would easily be mitigated. Opting for composting rather than landfilling dumping will reduce the production of greenhouse gases by almost 50% and the developed countries are now investing in advanced composting procedures for more effective outcomes to solve this real world's problem of Climate Change.

Composting today has been a topic to seriously discuss because its positive impacts are directly seen in mitigating Climate Change. However a point to be argued always remains there, but being the human species, which is constantly involved in exploiting natural resources we cannot assure to completely stop global warming and eradicate climate change. The only possible steps are to reduce this global issue up to an extent that's possible. In these series of steps Composting plays an extraordinary role. Controlling the emission of 30 times more potent

Greenhouse gas, Methane from the landfills to make the organic waste useful again for plants and soil with such an easy process of aerobic fermentation is what Composting truly does.

Climate Change is real and fighting Climate Change never has to be expensive and a very difficult process. Sometimes, it's as easy as starting a community compost bin and donating it to an agricultural farm rather than sending them to landfills and dumping sites. Several procedures of composting are available in smaller as well as larger scales, now it's up to us to think wisely to let our domestic wastage contribute to Climate Change or use it as Black Gold to control Climate Change. In conclusion Composting does have a positive impact as it mitigates Climate Change up to a great extent, however it also does contribute to global warming but in a negligible amount.

Sources:

- UNFCC Sites and Platforms. (n.d.). *Composting Waste Treatment: An Ecological Solution to Poverty and Climate Change | Haiti*. UNFCC.Int. Retrieved May 24, 2021, from https://unfccc.int/climate-action/momentum-for-change/planetary-health/composting-waste-treatment-an-ecological-solution-to-poverty-and-climate-change#:~:text=The%20compost%20that%20SOIL%20produces,dioxide%20out%20of%20the%20atmosphere

- US Composting Council. (n.d.). *Compost – Combatting Climate Change*. Compostingcouncil.Org. Retrieved May 24, 2021, from https://www.compostingcouncil.org/page/ClimateChangeBenefits

- Pavlis, R. (n.d.). *Does Composting Contribute to Climate Change?* Gardenmyths.Com. Retrieved May 24, 2021, from https://www.gardenmyths.com/composting-climate-change/#:~:text=In%20simple%20terms%2C%20a%20compost,the%20warming%20of%20our%20planet.&text=Reducing%20wasted%20food%20can%20have,you%20can%20do%20about%20composting.

- Department of Primary Industries and Regional Development Australia. (n.d.). *Composting to Avoid Methane Production*. Agric.Wa.Gov.Au. Retrieved May 24, 2021, from https://www.agric.wa.gov.au/climate-change/composting-avoid-methane-production

- Diaz, J. (2019, August 16). *Compost: Your Own Personal Carbon Sequestration*. Greenpower.Ngo. https://www.greenpower.ngo/learn/2019-08-16/compost

- Martin, A. (2017, November 6). *Fight Climate Change with Compost*. Blogs.Nicholas.Duke.Edu. https://blogs.nicholas.duke.edu/exploring-green/fight-climate-change-with-compost/