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India's Soil Infertility Crisis India. A country home to over a billion people. A country that is best known for its rich culture, scorching temperatures, and rushing rivers. A country that is ruled under Prime Minister Narendra Modi. India is a country facing poverty and most importantly facing soil infertility. Soil is a geological and biological material that is not talked about often. Yet, soil is as important as the water we drink or the air we breathe. Soil provides nutrients for our crops and therefore plays a big role in agriculture. Without good soil, there would not be enough food available.

India is the second most populated country, with China taking first place. As of February 3, 2020, approximately 1,374,455,500 people make up India. Prime Minister Narenda Modi and President Ram Nath Kovind contribute to India's government, a democratic republic. Exactly 68.86 percent of people live in rural areas whereas 31.14 percent live in urban areas. Additionally, 60.45 percent of India's land is agricultural. Looking at the bigger picture, the statistic on agricultural land alone demonstrates the importance of protecting our soils. There are a variety of crops that are produced in India. To begin, crops have been divided into four categories: food, cash, plantation, and horticulture crops. Food crops consist of wheat, maize, and rice. Examples of cash crops are sugarcane, tobacco, and cotton. Coffee, coconuts, tea, and rubber make up the plantation crops. Lastly, horticulture crops include fruits and vegetables. The most prominent crops in India are rice, cotton, and wheat.

Instead of food produced from farming, India chooses to export materialistic resources. Mineral fuels like oil make up 14.9 percent of total exports in the world. Gems, metals, electronic devices, vehicles, organic chemicals, iron, steel, and cotton are other resources that have been traded internationally from India. As mentioned earlier, numerous acres of India have been converted into farmland. The average farm size in India has a variety of values. In Northwest and Southwest India, the average farm size would be less than one hectare. States in the middle of India would have one to two hectares of farmland and a few in the North would have more than two hectares. One hectare can be compared to a track field. Therefore, depending on the state would determine the amount of track fields that make up that agricultural land. India has a variety of climatic conditions. North of India have zones that are humid subtropical, semi-arid, arid, and montane. South of India have climatic zones that are tropical wet and dry, semi-arid, and tropical wet. India borders the countries of Afghanistan, Bangladesh, Bhutan. China, Nepal, Pakistan, and Sri Lanka. Waterfalls, mountains, and coastal plains surround India. The country is called the "land of rivers" since India maintains several rivers.

Family sizes determine the amount of mouths to feed. In the year of 2018, India's average people per household was 4.9. Indians most commonly live in dwellings with a mud floor. About 72 percent of households are rural and 18 percent are urban. The appearance and longevity of dwellings are better in urban areas than in rural areas. A typical family in India would eat rotis, chutney, lentils, and meats such as

chicken, goat, or fish. The food a family eats depends on their preferences and the restrictions they apply from their beliefs. Some families would be vegetarian. Although eating meat is accepted, it is strictly prohibited to kill and eat cows as they are considered sacred animals from religion. People get their food from markets, hotels, and restaurants. Markets include produce that derives from farms and in order to have good crops from these markets, there needs to be good soil. There are several ways to cook food in India. Grilling, pan frying, deep frying, boiling, roasting, and steaming are only a couple of cooking methods commonly practiced in India. In order to support themselves, people in India work.

Almost half of the employed population work in agriculture. A total of 43.21 percent of people work in the agricultural field, 39.53 percent representing males and 56.5 portraying females. Not only does farming provide people with crops but also with jobs to earn a living. Although lots of people in India struggle with having access to clean water, toilets, electricity, telephones, roads, and local markets, there are changes being made to ensure that everyone has these services. For instance, Prime Minister Narenda Modi acclaimed that by the year 2024, rural households will be provided with clean water. Moreover, BBC news features Modi saying that 200 million Indians and all villages now have access to electricity. In December of 2018, Modi launched a scheme that would electrify all households in India. People still struggle to earn a living to support themselves. Poverty is one of the biggest issues India still faces today. Malnutrition is one main cause of poverty. About 61 million children suffer sickness from no access to food. Recall that most of India's food comes from farming. Many people depend on agriculture in order to have access to food and to survive. The slightest problem in agriculture can cost people their lives.

Soil infertility is still considered severe in India but is not being brought up. There are several properties that determine the fertility of soil. The pH range, phosphate concentration, nitrate concentration, and the content of organic life are factors that influence the fertility of soil. The best pH level for soil would be a seven because it is neutral, meaning not too acidic or not too basic for microorganisms. The role microorganisms play in the soil will be discussed later. Soil in India carries a pH level of 7.9 to 8.4. This pH range is too basic for microorganisms to function properly and would result in less soil productivity. Fair amounts of nitrogen and phosphorus benefit plants. This is why fertilizer is made up of these chemicals. Nitrogen concentrations are so vital for plants because nitrogen is the building block of proteins for plants. Nitrogen levels in India have reached an all-time low. Plants will therefore receive less growth. Phosphorus promotes root growth in plants. Nonetheless, if there is a high concentration of phosphorus in the soil, there would be "deficiencies" of minerals such as zinc or calcium. The leaves of plants would turn into a yellowish color. India's phosphorus levels are around the medium to very high status. This report demonstrates the possibility of plants experiencing a mineral deficiency and perishing as an outcome. The amount of microorganisms influences soil productivity. Microorganisms serve to decompose waste, also known as detritus, and release nutrients for plants to exert. This process creates a loose and clumpy material, called humus. This topsoil is imperative for soil fertility. Due to the moisture, humus has good aeration, nutrient and water holding capacity, and workability. Without microorganisms, humus would not be formed, resulting in a great number of complications plants can experience. Crops going out of their optimal range will make them less likely to survive.

Soil infertility is an issue that still occurs to this day. There have not been any improvements made over the

years. An article that has been published in 2011 stressed the importance of soil and listed possible conservation practices. Yet, another article in 2019 still mentions the same issue without any progress being made. Farmers who are not educated on soil still use poor agricultural practices, such as irrigation, the use of pesticides, and overcultivation. These actions will lead to soil erosion. There are three types of irrigation: flood, center-pivot, and drip irrigation. Flood and center-pivot irrigation involve using excessive amounts of water on crops. Some people are not aware that too much water can lead to rapid rates of evaporation and desalination. A plethora of salt left behind would be absorbed by the stomata of the plant's leaves, having no other space to allow nutrients and water to get through. Additionally, the use of pesticides and herbicides have been commonly spoken upon when it comes to wanting sustainability in agriculture. Phorate and mancozeb are the two most commonly used pesticides on crops. Pesticides not only affect the groundwater, but also organisms around the area being sprayed. Animals would receive high concentrations of the chemicals in their tissues and can possibly die. Finally, since there are over a billion people in India, there needs to be an overproduction of crops for those to eat. Overcultivation is the result of this concept. Disturbing the soil too much can result in soil erosion. Under soil erosion, the topsoil is moved from one place to another. Too much movement would result in less humus, meaning less moisture and more aridness in the soil. This implication is frightening considering how a great deal of land in India is farm-based.

The quality of soil affects the food supply as well as the "dietary diversity". A higher soil fertility would mean a higher consumption diversity and nutrient intake. However, most importantly, soil affects the people. The chemicals from the pesticides or too many metals from poor soil treatment can lead to indigestion, particularly found in pregnant women and children. People need to appreciate soil more because it filters out
water, provides nutrients to crops, and regulates Earth's temperature. To imagine that the fertility of soil can lessen the damage of global warming and gives us food seems like an incredible feat. So why not take care of it? Taking care of soil requires a maximum team effort from everyone. We would need to have commitment, cooperation, and hope. Here are a couple of solutions for soil infertility.

The first one has to do with education. The reason why many people do not act upon global issues is because they are not knowledgeable on the subject. Soil infertility is another topic that requires research and a good level of understanding. People need to be educated on the purpose soil serves towards us and towards ecosystems. Without prior knowledge, how would we be able to come up with solutions to problems?

Another solution to ensure soil sustainability is to just leave the soil alone. We should not interfere by applying inorganic fertilizers and pesticides. The only intervention we should have is applying natural uses of fertilizer, like mulch. A documentary "Dirt! The Movie" features this woman from India. She talks about how cow manure is used to ensure high soil fertility. One farming practice that is safe would be drip irrigation. This method does not include farmers using a surplus of water on crops. Instead, miniscule amounts of water are applied onto each crop. Drip irrigation prevents desalination and soil erosion.

Third and foremost, the government should definitely be involved with this soil issue. The prime minister and president of India should take actions on preserving our soils. For instance, laws that do not interfere

with the republic democracy can be executed. Or, communities should assist with protecting the soil. High authority figures and communities included would make soil infertility a priority. Poor areas do not receive that much attention when it comes to unsanitary conditions. Poor and rich areas should receive the same amount of recognition with this soil problem. We are under a silent soil infertility crisis. No one is speaking upon this issue nor is making it a first priority.Taking care of our soil is the greatest gift of all to ensure a well-balanced economy, less poverty, and a sustainable future.

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