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**The State of the Earth: Arable Land**

From the earliest signs of urbanization, agriculture has played a crucial role in the development and survival of the human race. The term agriculture encompasses all the practices and details that tie into the domestication of plants and animals to ensure food security. These practices include growing crops using irrigation systems and fertilization methods, attending to livestock that provide meat, dairy and eggs and the storage and distribution of said products. There is no doubt that modern day societies would not function without these practices that have let humans settle; and that the progress in agricultural technologies have lead small communities to - grow and become huge metropolises. The intricacies that entail the rapid and progressive development of humans are endless, however, none of it would be made possible without arable land.

There is a distinct difference between agricultural land and arable land. The former refers to the land used for any agricultural process whereas arable land is simply land with soil that can be plowed and used to grow crops. For example, pasturable terrain that is used for livestock to graze on is encompassed in agricultural land however does not fit under the category of arable land. This being said, if the livestock are fed produce or crops that have been previously harvested, those crops were grown on arable land. The crucial factor that defines arable land is the presence of fertile soil, and for this land to be ploughed and used to grow crops, this fertile soil must be the very top layer of soil otherwise referred to *topsoil*. The substance that determines the fertility of a given soil is *humus*, a dark substance comprised of decomposed organic matter (Archibold & Strahler, 2011, p.461).

Through natural processes, it can take hundreds to thousands of years to obtain a layer just centimeters thick of humus rich soil (Archibold & Strahler, 2011, p.463). Soil composition is heavily dependent on the environment in which it is situated. According to Archibold & Strahler (2011), There are five main factors that contribute to the formation of a soil: parent material, topography, climate, biological activity and time. The older the soil being studied, the more these factors affect the initial state of the sample and therefore the more the soil’s composition will deviate from that of its parent material over time. Factors like topography are crucial to the soil’s history of composition as higher slope angles and elevations leave soils more susceptible to erosion. Climate is another very important factor in the development of soils because temperature will affect the rate at which organic matter decomposes and consequently the rate of formation of humus. Other climatological factors are also important such as precipitation that brings the nutrients resting within the topsoil lower down, increasing the nutrient richness of the lower layers of soil. Archibold & Strahler’s fifth factor, biological activity, however, may be the most essential as there must be biological activity for there to be the organic matter required to decompose to form the humus. Humus stores the nutrients from the decomposed organic matter that are crucial for plant growth and survival. Furthermore, it has been proven that humus has a positive correlation with soil porosity so the more humus there is, the more easily water and air can permeate down the roots of the plants. Therefore, the more humus in the soil, the more nutrients and thus the more porous and arable the soil is. Arable land is typically measured in hectares (ha, 1ha=10,000m2), however, other units of surface area are applicable. The topsoil itself can be measured by nutrient richness and volume. A fertile topsoil layer is usually about 8 inches or less in depth (Archibold & Strahler, 2011, p.472).

From the information given above, it safe to conclude that a world without arable land would be a world with little to no vegetation. Since arable lands are lands that are only *capable* of being ploughed and not land that *is* or *will be* ploughed, this statement can stand. Since plants are capable or producing their own food and are the source of all other organisms’ energy, hey are known are *primary producers* and without them, the entire global food web would collapse as herbivores would no longer have a source of food, therefore carnivores would also be foodless as well as decomposers and so on. Even if “only” the arable land used for agriculture were to disappear, the human race would eventually cease to exist. Without crops, livestock, as well as humans would starve allowing for worldwide famine and disease. This is why the conservation of arable lands is so important.

The loss of arable land is one of the greatest issues that faces Humans today and this loss is ironically due to human activity. Without humans, there would be no agriculture and so the concept of arable land would be lost. Aside from this fact, all the factors that have forced the Earth into the present geological epoch, the Anthropocene, tie into the earth’s ever-decreasing deficit of arable land. Data acquired by the Food and Agriculture Organization of the United Nations (UN) shows that in recent years, the amount of arable land has been decreasing dramatically. Many individual nations’ total arable land has fluctuated throughout the years but the overall net difference is negative. According to the global World Wildlife Fund (WWF), the rate at which arable land is being lost is about 10 million hectares per year (2016). This is a devastating outflux of arable land, especially because the natural influx is so slow. The UN database shows that some of the world’s top producers of food have lost enormous amounts of this practically non-renewable resource in recent years. For example, over the past 40 years, India has lost approximately 6,200,000ha of arable land; China has lost about 14,500,000ha over 30 years and the USA has lost about 37,400,000ha over the past 45 years.

With the human population growing at such a rapid rate throughout the Anthropocene, naturally there are increasingly dire pressures put on the production of many resources including natural gases, timber and of course, food. The demand for these resources are met with quick, short-term responses and solutions that have little regard for any possible long-term effects. Rising populations also call for an increase in global urban development which gives rise to many negative repercussions that play a role in the erosion and destruction of the earth’s precious arable lands leading to its desertification. These factors eventually have a negative effect not only on the environment, but also on the global economy, therefore producing a growing mass of environmental and economic drivers leading to further degradation of arable land.

With these increases in populations comes an increase of urbanization and with increased levels of urbanization comes changes in land-use. The conversion of land-use also plays a big role in the availability of arable land. Arable land that might exist on the outskirts of a city might be paved over in the process of urbanization and that soil will then be trapped and unusable for an undetermined amount of time. Another example of land-use conversion is that forested lands are often viewed as perfect nutrient-rich arable land. The catch is that there is a barrier that stands in the way of agriculture taking place. That barrier is in the form of trees, vegetation, animals and other organisms. Therefore, deforestation must take place. Martin (2008) explains that “in many countries an obvious measure of improvement is the removal of forest cover and its replacement with an agricultural crop or some other “economic” use.”. This is how a once thriving ecosystem can be demolished and quickly converted to a worthless wasteland. Deforestation has huge impacts on an ecosystem’s biodiversity, throwing the natural balance off and damaging them beyond the point of recovery (Martin, 2008). Deforestation also contributes to climate change as years of carbon sequestration will be reversed when the trees are cut down and the carbon they once stored makes its way back into the atmosphere (Martin, 2008). This carbon sequestration-reversal also applies to soils that are disrupted as carbon is stored within soil over time so that when the land is uprooted or severely compressed and compacted, the carbon will escape into the atmosphere and contribute to global warming.

The ever-increasing human population paired with the slow production of fertile soil leads to higher levels of productivity and use of the existing arable land (Lambin et. al, 2013, p.892). Unfortunately, this is not a viable solution as the over-use of the soils leads to their deterioration. Cultivating a larger number of crops on a given area of soil means that more nutrients will be drawn out of the soil during the cultivation process. This effect, along with cultivating the same crop years in a row without using the method of crop rotation or letting the soil rest, giving it time to replenish and recover lost nutrients and porosity will lead to the desertification of the once healthy arable land (Archibold & Strahler, 2011, p.463). This method ensures that the crops that are harvested each season absorb different nutrients and are cultivated in alternating seasons. This tactic allows for one group of nutrients to recover while the other is being absorbed. Even if using crop rotation, it is still important to have periods where the land will rest and the humus will have time to recover naturally.

Unfortunately, many producers of food are so focused on increasing their short-term productivity that they do not practice sustainable land management. Farmers and the food industry are only to blame in part for their poor soil management as the increasing human population demands the rapid and increased production of food. Food production is not only driven by population increase but also pressures on the food industry to provide wealthy countries with food that is not in season or found in that given country. An example of this is when summer fruits are made available during the winter in Canada. The demand for such luxuries requires the use or arable land. Because sustainable land use is deemed inefficient and more costly in the short-term, food producers tend to neglect these tactics to increase their profits. Ironically, when arable land is degraded and used so quickly, the economic value of land is reduced (Favretto et. al, 2015, p.30). This reduced value of land leads to the decreased price of arable land which in turn makes it easier for food manufacturers to buy this resource and justify their spendthrift ways.

Another example of how food producers maximize their short-term productivity is their use of fertilizers which act as an artificial topsoil and pesticides which keep unwanted organisms from consuming crops. Since the degradation of fertile soil is what is responsible for a hefty amount of total loss of arable land, using fertilizers might be natural fallback. This, however, is not the case as over time, the soil will accumulate unwanted chemicals and will render the land inhospitable for plants. These short-term solutions to increase productivity are not a suitable substitute for the proper and sustainable treatment of arable lands.

The degradation and erosion of arable lands has been an issue in the past, however, never to the degree and magnitude that it is today. For example, farming on sloping terrain leaves the land more susceptible to erosion. Furthermore, the imbalance of nutrients and soil composition can sometimes lead to the salinization and therefore infertility of the land. From Redman’s “The Growth of World Urbanism” (2005), it is clear that now is not the first time that the salinization and erosion of arable lands have been an issue. Redman (2005) describes how these factors most likely played an enormous role in the downfall of the once thriving Mesopotamian society particularly during the Ur III Dynasty. This goes to show that human environmental relations have always been delicate to balance. As they say, history is bound to repeat itself. Given that the arable land crisis humans are currently facing is on a global scale and the fundamental economic ties associated with it, the fate of the human race looks devastating.

The degradation and desertification of arable lands can lead to crop yield shortages, drought and dust storms (EDL, 2013). These consequences emphasize a top-down model where the wealthier people and countries are not severely affected as long as they can afford to continuously buy short-term solutions to keep afloat. Scherr and Yadav (2001) predicted that by the year 2020, land degradation would pose a huge threat to food production. It seems as if their prediction is correct so far. Scherr and Yadav (2001) also commented that rural livelihoods would be the most severely affected especially in the densely populated regions of the developing world whose populations consist largely of agricultural workers. There is no doubt that with little food and decreasing employment rates, developing countries will be the first to experience the true impact of these careless actions. Malnourishment will increase and with it, so will the potential for disease. These consequences could lead to forced migration and will keep affecting wealthier people until money can no longer be used as a solution. The growing scarcity of arable land could easily engender international conflict.

Many researchers like Scherr and Yadav (2001), Döös (2002) and the contributors to the Economics of Land Degradation Initiative (EDL) are all in agreement that the world is facing a global case of food insecurity due to the degradation and misuse of arable lands. The consensus for a solution is to enact sustainable land management policies in an attempt to stabilize the state of the future global food security. Example of polocies that could be implemented are

Co-founded by the Secretariat of the United Nations Convention to Combat Desertification, Monique Barbu, Minister Korea Forest Service Republic of Korea, Dr. Shin Won-Sop, Director-General Environment European Commission, Daniel Calleja and Minister Federal Ministry of Economic Cooperation and Development of Germany, Dr. Gerd Müller, The EDL is one of the most active and thorough initiatives against arable land degradation. The EDL describes themselves as “an international collaboration that provides a global assessment of the economics of land degradation, and highlights the benefits of sustainable land management” (EDL, 2013, p.7). The EDL not only wishes to stabilize food security but also wants to reduce the devastating environmental impacts that the degradation of arable land has. The EDL also explains how reducing the impact on environmental change would also save economic resources on humanitarian and relief initiatives. The ELD outline many beneficial factors of sustainable land use in their 2015 report including that “sustainable land management can create net carbon sequestration in soil and vegetation, and provide renewable, low carbon energy”. The initiative describes the crucial role of stakeholders in instating policy changes. Examples of achievable policy changes include marketing labels for eco-friendly products whose production uses sustainable land management to assist consumers in make informed decisions, direct payment for environmental services, provision of opportunities to make voluntary payments for environmental conservation or offset and provision of credit schemes and microfinance (ELD, 2015, p.133).

Many of these viable policy changes are small and seemingly trivial however, if used together, they would have a large positive impact with regards to the Earth’s arable lands and thus the global ecosystem. As people from jurisdictions around the world become increasingly aware of the impact of the depletion of arable lands, governments, legislators, non-governmental organizations (NGO)’s and others are forced to respond. These parties have been coming together using legal policy, taxes, incentives and marketing strategies to discourage practices that promote the degradation of arable land. A local example of possible policy change is that the B.C. government has recently been considering tax code as a disincentive to protect farmlands from real estate speculators (Hume & Tomlinson, 2016). The use of a bottom-up approach with policies such as these have huge potential to save the world from crippling food insecurity and the countless negative repercussions that would follow.

The world has driven progress to the point that it has become a detriment to the entire human race. This scenario can be described as a *progress trap*, a term coined by Ronald Wright in his “A Short History of Progress” (2004). The poor management and use of arable lands is not only a threat to the environment, but the global food security, economy and overall wellbeing of the human race. The deterioration of arable lands affects absolutely everyone and the negative repercussions will become increasingly apparent as populations grow, especially if the world stays on standby and does not enact change. With the countless different pressures that embody this global threat, it will take an international effort to simultaneously reduce the issues at a global, national, regional and local scale that contribute to the degradation and misuse of arable lands. The ELD has made it apparent that sustainable land use is an attainable goal and something that is very much worth our time and efforts.

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