

IMPACT OF THE CLIMATE ON AGRICULTURE AND LIVESTOCK

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Abstract

As the climate is changing rapidly, there are many industries get affected, mostly the agriculture sector. Because the food is directly related to the climate and rainfall. Due to changes in the climate, the temperature is rising, and rainfall is not frequent. If rainfall comes it used to come in the bulk lead to floods. Crop modification is needed as the climate is changing the yield of the crop is decreasing but the population is increasing. This one is a complicated problem, but the human can manage with technology and using all farming techniques to produce the food. So, technology is the key to this problem. So, shows that organic farming is an alternative in respect of quality, but it is hard to feed the world. For uncertain rainfall, water management is required. So, decrease in carbon materials not only help agriculture but also improve the quality of life we are living.

Keywords: Climate, Temperature, Rainfall, Technology, Carbon

Introduction

Climate change is real. It might seem far away, a problem you cannot see or touch or feel every day, but it is happening, and it is global to get an idea of what is at stake, just look at your plate. Food is profoundly affected by climate change from how it is produced to what we can grow in the 1st place. Climate change will hit our food production system in four ways. Through temperature water, extreme weather, and carbon dioxide.

Most of us will feel temperature first, so will crops productions of staples like corn, soybeans, and cotton are projected to increase it first, then decrease sharply as the average growing season temperature keeps getting warmer. For corn alone, it could mean a decrease of 3% in yield or more than 3 billion bushels. That is enough corn to feed 40 million people. It is not just crowded. Livestock will suffer in the heat. Related stress will mean fewer animal pregnancies, less milk production, and longer times for livestock to reach market weight.

Does anyone benefit from the heat? Yes. Past the ones that live on our livestock. That means more diseases are spread by insects. It has already happened in northern Europe as the region has warmed, bluetongue virus has moved North, killing more of these animals. The widespread disease could hit crops like

corn too as its gears warm spread from North to the Upper Midwest, and heat tolerant viruses like rusts and tobacco mosaic finish off. plants diseases in heat will be even bigger problems as climate change affects water. A dry climate means less production and more pests. Water has a complicated relationship with crops. It is all about the right amount at the right time. Too much early on for corn stunts growth. Too little, later on, does the same irrigation systems keep the balance, but their sources may dry up as droughts increase in the Mississippi Delta region, this could put 75% of the rice crop at risk. This rice will also confront another water problem. Saltier water, as sea levels rise, droughts could be brought on by more erratic rainfall. Part of a pattern of increasingly extreme weather events and when extreme weather brings violent downpours, there is another issue, Soil erosion, and runoff increase day by day. All these pieces of the climate puzzle, flood, droughts, and heatwaves can affect crops and livestock at key moments in their development. Turning even a productive season into a disaster, we are already seeing a rise in extreme weather events. 2011 was the most disastrous year on record with 16 extreme weather incidents that cost over \$1 billion. 2012 is a close second, and severe storms continue to cost us billions.

All of these changes circle back to the key driver of climate change. Increased carbon dioxide, which has its effect on agriculture. Carbon dioxide helps plants grow. More of it could help crops get bigger, but CO₂ helps weeds and invasive species grow even more. Crops that survived the weeds could be compromised with less nutritional value. for example, could have protein levels dropped by more than 10%. This is a complicated business because everything is connected. It all boils down to this climate change could leave us with less food and the food we end up with could be less nutritious. Some steps can be taken to mitigate. And adapt to these changes. They are the key to our food and our future. What will be on your plate?

Food of the future comes out of a gadget. But if you want to understand the future of food, it is probably not gadgets you should be paying attention to. People who make raising food their business say the biggest challenges coming to involve how food is grown were kind of a throwback to a different arrow.

Although the Ortmann family's farm in South Dakota appears to be old-fashioned, it was built with their vision for the future in mind. It is preferable to welcome change on your terms rather than waiting for it to forcefully embrace you. The Horsemen started rebuilding their operation from the ground up a few years ago. After discovering they were barely breaking even, they decided to switch to a traditional corn crop. After crunching the numbers, I concluded that going organic would be more cost-effective due to organic price premiums. This was not rooted in some kind of dream or wish or some philosophy. It did start with economics.

The transition from traditional to organic farming was a significant one. Rather than plowing and spraying weeds, the worms make several trips across fields to scrape them out carefully. Instead of using pesticides to fertilize, they spend months planning one of agriculture's oldest tools. Our entire process revolves around compost. We are about manure here. All of the work put in by these farmers has been well worth it. For them, the future of food is inextricably linked to the future of soil. All we eat comes from the soil, and the soil is a living organism if you boil food production down to its most basic form.

We tend to take soil for granted. The majority of our food comes from this source. History has lessons for communities that ignore the importance of soil. Take a look at the past of Western civilization's spread. In several ways, it is a story of people moving on after degrading the soil, individual droughts or political incidents, or neighborly conflict. Those are the kinds of stuff that can kind of happen. Takedown empires, however, the state of the land sets the stage if you will. One of the reasons why climate change is so critical is that farmers can feel the effects in their fields long before we do in the grocery store.

The patterns are all pointing in the direction of extremes. Rain is no longer distributed evenly across the year. It comes in smaller yet larger doses that the soil simply cannot absorb. We discovered that land that has been minimally tilled and filled with organic matter such as compost absorbs more rain and stays moist during dry spells. Others have come up with far more drastic solutions. This indoor vegetable farm in New Jersey has fully illuminated the soil and developed a new climate from the ground up.

We establish storehouses without center soil, despite the seasons or weather conditions, and also this is exactly how we can redeem land that is ending up being progressively hard as a result of climate adjustment. Another prospective weak point is the natural farming design, which is extensively used in the United States. It favors substantial procedures that are experts in a handful of crops or animals. We tend to have monoculture agriculture, which is exceptionally vulnerable to weather adjustments, climate change, and also parasites.

You know, if a condition wiped out the wheat crop all over the world, it would certainly have possibly devastating worldwide effects. I am not forecasting it will take place tomorrow; I am merely mentioning that a good farmer has to additionally be a good danger manager. Just a little portion of people have all of their holdings and also only one stock.

Little organic farms may be one part of the service to the obstacles the future holds, however in a globe whose population is heading North of 9 billion individuals, it is probably not the only remedy. That is because the human race will eat a lot more food in the next 50 years than it has in the past 10,000 years incorporated. It is a challenging problem, but it is an issue that the human race can manage. We are mosting likely to need every little thing from conventional agriculture to unique agriculture. Whatever from industrial agriculture to local scaled farming. As well as we got to keep in mind that overlying in any way is the customer and the consumer is King and also Queen, and also, they ultimately will determine what they are mosting likely to consume, and therefore what the future backers going to resemble. Feeding the future will certainly need us to expand a lot much more food. It will possibly also require us. To squander a great deal less, we get rid of concerning 35% of all food that we generate. That is both here in the United States and also elsewhere that is reduced hanging fruit that is virtually enough. If we can find out a way to handle that trouble to feed individuals over the next couple of decades. So, in our little edge of the world, we are doing what we can to enhance our soil, to expand. I wish people can see that the land is replying to what we are doing. I hope people can see that we are not starving. That we are doing OKAY financially. Knock on wood. In the Mormons believe their operation might hold cost-effective lessons for enhancing resiliency in the developing globe nations where

ranches are little. As well as populaces are big. It is not going to be a gadget that will certainly do it. There is a continuous exchange of suggestions and also of experiences. I do not desire my youngsters to claim there are all these warning signs. As well as now take a look at what we have to deal with. We are developing before the rain.

Food safety and security is just an expensive word for being positive that you understand where your food is coming from that you are not going hungry that. They are not unclear concerning where your following meal is coming from, as well as the set on food protection environment is concerned about exactly how to bring a billion individuals or two that are food unconfident today right into a state of food safety and security and also how to do that in such a way that preserves the setting as best as we can. Climate modification is among numerous elements that influence food protection, and also there are great deals of the various manner in which it might affect it.

The most noticeable one is that farming anywhere truly still depends on the climate, and also as the weather shifts with environment adjustment and also agriculture struggles to maintain up with those modifications, there is a potential for shortfalls in production which could lead to. Boosts in prices and also trouble in getting access to food. Points have been that the information rather plainly shows really solid temperature level effects on crops and also frequently individuals believe of rains is being truly essential in agriculture.

That is what I believed, as well as it is not worthless, however, what the information reveal is that a great deal of the factors you see excellent manufacturing in kind of cooler, wetter problems is as much for the cooler component when it comes to the wetter component, and what that indicates is I was moving forward as the temperature levels continue to cozy as well as are likely to warm up that. Oftentimes these results will truly dominate the overall image of what is happening to the farm. Even if you had the very same quantity of rainfall. Even if you had more rains which is not something I think that was completely valued by me or other individuals before. What we wish to recognize is our different plans are different technologies most likely to aid or harm in terms of food safety and security as well as climate modification? I believe we have a respectable understanding now that. Additional climate adjustment in addition to what we currently are committed to because of all the emissions of greenhouse gases that we have had, that we are rather positive that extra emissions on top of that would not be a good idea for food security. Currently. Being able to say just how much of a bad point is harder, however, I think we are. where the state where we comprehend quite well the basic motorists of how food safety and securities are influenced by environmental change.

Crunching the Numbers

To estimate the country-specific effect of worldwide warming on farming if carbon exhausts proceed to expand unrelentingly, the research study incorporated 2 collections of existing versions-- one from environmental scientific research and also the other from agronomy and also economics. Six leading climate

models provided quotes of future modifications in temperature as well as rainfall at a regular detail of about 2,000 land-based locations, or grid cells.

the consensus of the 6 models reveals that a doubling of atmospheric carbon focus will certainly generate ultimate general warming of 3.3 ° C. this is close to the UN Intergovernmental Panel on Climate Change (IPCC) estimate of what is called "climate level of sensitivity," or the amount of long-term global warming to be gotten out of an increase of carbon dioxide in the environment above preindustrial degrees-- an indication that the designs are creating mainstream forecasts. to establish these estimates, the baseline exhausts estimate from the most extensively utilized circumstance in the IPCC's Third Assessment Review in 2001 were fed right into the climate models. Presently, annual fossil-fuel discharges total up to 7 billion lots of carbon. Under the IPCC's business-as-usual estimate, they would rise to about 16 billion by 2050 as well as 29 billion by 2100, partially due to greater use of coal. the equivalent atmospheric concentrations of carbon dioxide would certainly reach 735 components per million (ppm) by 2085, unlike the preindustrial degree of 280 ppm and today's level of 380 ppm, Precipitation likewise increases, however just by about 3 percent.

The Impact on Crop Yields:-

The outcomes provide little support to the optimists. Around the world, the general influence of standard international warming by the 2080s is a reduction in agricultural productivity (output per hectare) of 16 percent without carbon fertilization, and also a reduction of 3 percent ought to carbon fertilization benefits emerges when outcomes are weighted by output. the losses are greater when weighted by populace or country. the sharp concentration of losses is in the establishing nations. Whereas the industrial nations experience results ranging from 6 percent losses without carbon fertilizing to 8 percent gains with it, developing country regions suffer losses of around 25 percent without carbon fertilizing and 10-- 15 percent if carbon fertilization is consisted of. For creating countries, the mean loss would be 15-- 26 percent, and the output-weighted ordinary loss, 9-- 21 percent. Losses can reach devastating degrees in some of the poorest nations (greater than 50 percent in Senegal and Sudan). Damage will normally be better in nations situated closer to the equator (see chart), where temperature levels currently often tend to be near crop tolerance degrees. Nation altitude additionally matters. Since of greater elevation and also lower average temperature levels, Uganda faces smaller losses (17 percent without carbon fertilizing) than Burkina Faso (24 percent) also though the last is situated 10 degrees further north of the equator. Whereas the significant losses are focused on the reduced latitudes, the gains, where they occur, are toward the greater latitudes. In the lack of any type of increase from carbon fertilization, the most drastically affected countries are in Africa, Latin America, and South Asia, although the majority of the world signs up a decline in farming efficiency. Will carbon fertilizing benefits assist much? the response seems yes and also no. there are still very negative outcomes for countries in Africa, Latin America, as well as southern Asia-- although some individual nations and also subregions would certainly make out better. On a more in-depth nation as well as regional malfunction, the study shows the following

In South America, there are potentially substantial losses in Argentina and also Brazil if the carbon fertilizing result does not appear, as well as modest losses in Brazil even with carbon fertilizing-- although Argentina would be better off.

In North America, there is a remarkable variation from the north to the south. For the United States, the general result would balance from a 6 percent general decline without carbon fertilization to an 8 percent increase with it. This ordinary mask huge possible losses in the southeast and in the southwest plains, where the heavy standard of the Ricardian and plant designs shows losses varying from 25 percent if there is a carbon fertilization advantage to 35 percent without the advantage. Canada, like the United States, shows little losses without carbon fertilization and also modest gains with it. And Also, Mexico reveals losses of 25-35 percent. In Africa, there are huge losses. Nigeria's losses range from 6 to 19 percent, and also South Africa's and Ethiopia's losses are a lot larger. In Europe, Germany has little losses without carbon fertilizing as well as moderate gains with it. For Spain, the outcomes are somewhat less desirable, once more mirroring latitudinal location. For Russia, without carbon fertilizing, performance declines by 8 percent; with it, Russia shows gains of 6 percent. In Asia, the contrasting photo for both the largest and also most dynamic establishing countries is stark. India creates possibly one of the most troubling solitary collections of outcomes, with losses ranging from 30 to 40 percent. China would certainly have an extra moderate array, from a 7 percent loss to a 7 percent gain. Its results appear like those of the United States: in both countries, the typical results are fairly neutral, but there are sizable losses in the southerly regions. the contrast with India is strictly constant with India's area closer to the equator. Both China as well as the United States have a latitude center of about 38 ° north, whereas India's latitude facility is about 22 ° north.

A technological rescue?

Some suggest that quick technical adjustment will increase agricultural returns a lot by late this century that any decrease caused by worldwide warming would conveniently be greater than offset. Technical change is an incorrect cure-all for several factors. First, the environment-friendly transformation has already been reduced. Estimations based upon UN Food and also Agricultural Organization information reveal that grain yields, which increased at a yearly rate of 2.7 percent in the 1960s and 1970s, have increased at only a 1.6 percent yearly price in the past quarter-century. Rising farming prices might offer rewards that would slow down or reverse this decrease, such a reaction is not ensured. Second, even if there is no more slowdown, there is most likely to be a close race between increasing food need and also increasing outcome. International food demand is anticipated to triple by the 2080s as a result of the higher world populace and also greater earnings. It also seems rather likely that a substantial share of land will certainly be shifted to the production of biomass for ethanol gas. Because of this, there is a rather precarious equilibrium in between supply as well as need, which would be seriously gotten worse by a significant damaging shock from worldwide warming.

Various Limiting Factors for Crop Development

For lasting farming and food safety for a boosting population of the globe, it is needed to expand stress-tolerant plants as well as recognize their actions under different stress problems. Concerning numerous weather anxieties, the feedback of plants varies in the expression of genetics, physiology, and metabolic rate. It was reported that plants can pick up any variation in surrounding ecological signals but even with numerous studies, only some reputed sensing units have been acknowledged. As a result of various anxieties, the body organs and also cells of the plants are harmed, as well as they respond appropriately, as an example, transcriptional responses versus different anxieties are different in detailed cells or tissues of roots. Stress-responsive protein production, high levels of connected solutes, and also higher antioxidant proportions are the cellular signals which are generated as a result of salinity, drought, and chemical effluence. These stresses are considered key stresses as well as they produce additional tensions like oxidative and also osmotic stress.

Under dry spell conditions, the elevated degree of CO₂ in fallen leave creates the initiation of responsive oxygen types (ROS) which trigger the multiple stresses in crops. In current studies, it was observed that Osmo-protectants have been created under the mixed stress problems of warmth and salinity in tomato plants, yet do not appear in private tensions. Another experiment showed that the consolidated impact of warm as well as salt tension leads to diverse metabolomic profiling which was developed with molecular as well as physical statistics.

Metabolic profiling of numerous vital plants has been adequately completed under water stress, such as rice, soybean, maize, as well as tomato. In barley, numerous metabolomic analyses have also been performed to understand the impact of water scarcity on the oxidative stage, abscisic acid, and also free amino acids. Barley cultivars were subjected to water lack to check out the hereditary variant on the metabolomic level at the grain development stage (Wu, Cai, Zhang, & Zeng, 2017). Protein production restraint is the initial metabolic signal versus the abiotic aspects (Vincent et al., 2007). Post-translational adjustments and also processing is likewise the main duties of abiotic stresses (Liu & Howell, 2010). Dry spell anxiety in coffee has been studied from a wide point of view by taking in the important functions of plant biochemistry as well as physiology. The plants subjected to multiple events of constant dry spell stress and anxieties have better photosynthesis processes, unlike plants with just one occasion of drought, tension troubled them. These plants showed sophisticated RuBisCo control and also several enzymes connected to the metabolic process. Versatility to various dry spell doses specified the genetic expressions related to dry spell resistance.

Impact on Plant's Morpho-Biochemical and Physiological Processes

With wonderful ecological variability, plants are struggling with unique climatic conditions that limit the plants' capability to adjust successfully in a series of methods. Because of more spells of rains and also warmth, plant moving is not to be the solution to this issue. Modifications in plant physiology have been valuable in one-of-a-kind climatic conditions, yet ecological variability can be high-risk for plants (Menezes-

Silva et al., 2017). The morphological, organic, as well as biochemical devices of plants, have been badly impacted by abiotic anxieties. For expected weather condition problems in the future, plant physiology reactions are forecasted to propagate quickly, with small variations in fruiting and also blooming. The ideal temperature level for plant development is in the variety of 10 to 35 ° C. Elevation. of the temperature level to a specific factor will allow plants to generate excess power however a larger increase in temperature level hampers the plant development and also the photosynthesis price eases off to deadly degrees Turgor pressure is restricted by the dry spell stress as well as a result delays cell advancement. Water shortage affects the photosynthesis enzyme's activities and also reduces metabolic expertise and eventually ruins photosynthetic machinery. Due to environmental changes, CO₂ levels multiply and slow down respiration in plants as well as improve temperature levels. Respiration prices of the plant were elevated when the temperature was elevated from 15 to 40 ° C, disturbing the morphological functions of some crops. Throughout the process of photosynthesis, the enzyme Rubisco is associated with carbon addition and also the translation of CO₂ right into an intricate energy-rich compound. Rubisco is turned on by the Rubisco activate at an optimum temperature by abolishing secondary metabolites. A small elevation in temperature level resulted in the deactivation of the Rubisco enzyme resulting in the generation of xylulose-1,5-bisphosphate which is intended to be an inhibitory substance. At an enhanced temperature level, Rubisco did not function correctly due to the Rubisco turn-on malfunction and also was unable to turn on Rubisco. ROS containing OH, H₂O₂, as well as singlet oxygen are derivatives of the metabolic process and are regulated by antioxidant defense mechanisms. ROS are mostly developed in a minimal amount under optimal problems but with the boost in concentration ecological anxiety sets off.

Plant Hormone Responses in Abiotic Stresses Under various abiotic anxieties, hormonal agents are very essential for managing lots of signaling paths and also feedbacks such as salicylic acid (SA), abscisic acid (ABA), as well as ethylene (Kurepin et al., 2017). The significant function is played by ABA in the regulation of stress and anxiety actions by the communications with some other hormonal agents as displayed in cross-talk. One of the most essential and vital hormones for regulating the weather stress and anxieties in the plant is ABA. ABA plays a significant role in different phases of plant advancement especially in stomata opening and also closing, dry spell stress and anxiety, seed germination, and also inactivity. PYR/PYL/RCAR-PP 2C-SnRK2 is identified as a signaling waterfall created by ABA and also regulates the seed inactivity efficiently. Under dry spell conditions, the plant growth is seriously retarded, as well as it increases the ABA focus in cells. ABA buildup during dry spell tension controls transpiration and also prevents stomatal disclosure (Dong, Bai, Chang, Song, & interactions, 2018). ABA likewise triggers many physiological devices in plants such as water shortage, regulates stomata to close down, as well as creates lots of stress-responsive genetics in this duration (Kuromori, Seo, & Shinozaki, 2018). ABA signaling equipment has been checked out recently and their system of operation was illuminated. The signaling waterfall included 3 units, SnRK2/OST1 (Protein kinase), PP2C (protein phosphatases), and also PYR/PYL/RCAR proteins. Two different groups of researchers located the ABA PYR/PYL/RCAR receptors. PP2C was first observed in *Arabidopsis* kos of *abi1-1* as well as *abi2-1* as well as is considered the negative controller of ABA (Leung & Giraudat, 1998). The

healthy protein kinase was accumulated and also divided as SnRK2 as well as it is the activator of ABA (Yoshida et al., 2002). Salicylic acid likewise has managed countless physical procedures in plants under difficult climatic conditions. It was identified that acetylsalicylic acid can encourage protoplast collection growth in corn, controlling cell cycle law (Carswell, Johnson, Shillito, & Harms, 1989). The duty of SA was uncovered by a group of researchers working on cell societies of tobacco, they located that SA regulates bud advancement as well as blooming initiation [106] Malamy and his colleagues were leaders in examining the Tobacco Mosaic Virus as well as established the part of SA in plant-pathogen communication. Current studies on SA defined its impacts on fruit productivity, beans nodulation, temperature level resistance, stomata closing, respiration, genetics connected to senescence, as well as cell development. Salicylic acid regulations on these occasions may be second because they manage the production of more plant stress-responsive hormonal agents.

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