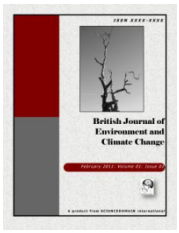

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Global Climate Change: A Threat to Food Security and Environmental Conservation

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Review Article

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ABSTRACT

Rapid socio-economic changes in some developing countries like India, China, etc., are influencing dramatically the fuel consumption pattern world over. An increase of 880 TWh of electricity consumption in transport in 2030 compared with the Reference Scenario, of which 90% occurs in PLDVs, results in about 250 Mt of additional CO_2 emissions. The rise in the amount of CO_2 in the atmosphere is 1.0 – 3.5^0C (1PCC, 2007a). If emissions of greenhouse gases, and in particular CO_2, continue unabated the enhanced greenhouse effect may alter the world's climate system irreversibly. This review attempted to examine how climate change constitutes a threat to food security and environmental conservation. Climate change (CC) refers to changes in modern climate. It reflects abnormal variations to the expected climate within the earth's atmosphere and subsequent effects on other parts of the earth. It is emphasized that CC poses a threat to food security as it impacts on natural systems and resources through erratic rainfall patterns, heightened temperature and susceptibility to pest and disease outbreaks hence decreasing crop yields and consequently increased hunger. CC negatively affects biodiversity conservation and management through exacerbated drought conditions, increased risk of wildfires leading to some extreme events like heat, waves, river and coastal flooding, landslides, storms, hurricanes and tornadoes which culminate in environmental degradation. For its effects to be reduced establishment of more forest plantations and maintenance of the existing natural and artificial forests should be encouraged. Saving biodiversity in the form of standing forests and interact lands can help prevent climate change and help communities and natural areas cope with a changing planet. At the same time, helping nature become more reification climate change through a combination of management restoration and protection strategies will help prepare places, plants, animals and people for climatic change successful adoption of living system can help ensure their ability to support the needs of people and better withstand future changes.

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1. INTRODUCTION

Climate change (CC) is seen as the variation in climate over time (IPCC, 2007a). It is also described as the change in the climate of an area as a result of some natural disorders like depletion of ozone layer, greenhouse effect, etc. (Nsikakabasi et al., 2008). CC has been attributed to human and non-human factors according to the United Nations Frame Work Convention on Climate Change (UNFCC). Variability is the characteristics of the global climate and it occurs on long and short times scales. This change in the climate has resulted to hazardous life occurrences including hurricane, drought, tornados, blizzard or monsoon (IPCC, 2007a). Poor communities show more vulnerability in particular to CC especially those concentrated in high risk areas. They tend to have more limited adaptive capacities and are more dependent on climate sensitive resources such as local water and food supplies (Mfon and Mfon, 2008). While natural climate variations have existed for millennia, anthropogenic climate change has gradually emerged since industrial revolution and especially after World War II due to the availability of cheap fossil fuels (coal, oil, natural gas) and the dramatic increase in their consumption first primarily in the industrialized countries but now increasingly also in the rapidly growing economies of the BRIC States (Brazil, Russia, India, China). Climate change has been viewed a far greater threat to the world than international terrorism (IPCC, 2007b).

Climate change may spark conflict between nations because CC turns land into deserts, melted ice fields and poisoned water supplies. It is the major threat in future decades (African Development Bank, 2002). Studies after studies (African Partnership Forum Support Unit, 2007; Maluku et al., 2008a; Alaje et al., 2010; Kalejaiy-Matti et al., 2010) have shown that CC is more evident in industrialized urban nations and as cities expand, so their food requirements and other needs. Climate change could also be viewed as any long-term significant change in the expected patterns of average weather of a specific region over an appropriately significant period of time (Kalejaiy-Matti et al., 2010). It reflects abnormal variations to the expected climate within the earth's atmosphere and subsequent effects on other parts of the earth, such as in the ice crops over durations ranging from decades to millions of years. In recent usage, especially in the context of environmental policy, climate change usually refers to changes in modern climate. Global rise in temperature is expected to significantly change patterns of rainfall, soil moisture, and other climatic factors related to agricultural productivity. The climate of the earth has warned by over 0.5^0C over the past century (Mfon and Mfon, 2008). The objective of this study is to discuss how CC is a serious threat to food security and environmental conservation.

2. CAUSES OF CLIMATE CHANGE

2.1 Global Warming

Global warming is a major consequence of climate change particularly the depletion of the Ozone layer by green house gases (Aluko et al., 2008b). Zaku (2008) maintioned that the causes of changes in the climate are indicated by the increased average temperature resulting from carbon monoxide, methane, nitrous oxide and other heat-trapping gases. The

interactions of man with the environment through agriculture, urbanization/industrialization, human settlements, logging, and deforestation, burning of fossil fuels, population explosion and others contribute significantly to CC (Kalejaiy-Matti et al., 2010). Other factors responsible for CC include the composition of gases and aerosols in the atmosphere, the amount of solar radiation reaching the earth from the sun, the effects of orbital parameters on the radiation budget of the earth, the shape and location of continents and oceans, the reflectivity of the different parts of the surface of the earth (Zaku, 2008). Human activities are also one of the drivers of climate change. These activities include increase level of consumption of the earth's resources, changes in technology, economic advances leading to increase per capita resource consumption and changes in organization of human societies. Global warming caused by anthropogenic emissions by carbon di oxide, methane and other greenhouse gases are also, the root causes of climate change (Nsikakabasi et al., 2008). Human alternations of the terrestrial surface of the earth are unprecedented in their face, magnitude and spacial reach and of these, none are more important than land cover and land use (Agbogidi and Eshegbeyi, 2008; Ekuk and Akpan-Ebe, 2008).

2.2 Poverty

The latest scientific evidence indicates that human activities are leading to increased accumulations of greenhouse gases in the atmosphere, which are altering the Earth's climate patterns at unnatural rates (Austin et al., 2003, Mondal et al., 2011b). Poverty is another major driver of CC. The poor desperate for crop lands feed themselves and their families, move into forests or cultivate marginal land, erosion-prone hillsides where soil nutrients are exhausted thereby contributing to global warming. Agriculture (cash crops and cattle ranching) also contribute to CC when undisturbed and logged rainforest area are totally cleared to provide lands for food crops, tree plantation or grazing of cattle, the climate of the affected areas may be affected. Construction of dams does not only destroy the forests and their natural roles, but often, uproots tens of thousands of people, destroying both land and their culture (Agbogidi, 2002).

2.3 Economic Pressures

These include government policies to bring more land under cultivation to grant more logging concessions and fishing agreements, and to promote industrial development, thereby encouraging economic growth and earnings of foreign exchange. These practices are driving environmental change because they encourage unsustainable, rates of resource uses or extraction (Nsikakabasi et al., 2008). The extensive removal of wood for fuel wood will continue to contribute to the ever increasing rate of deforestation. With diminishing natural forests, CO_2 in the atmosphere continues to increase since the trees that convert CO_2 to O_2 are being cut down. The US Environmental Protection Agency listed the major causes of global warming to include energy use and production, chlorofluorocarbons (refrigeration gases), agricultural practices, changes in land use and other industrial activities (Table 1).

Table 1. Causes of global warming

Activities	Level of Contribution (%)
Energy and production	57
Chlorofluorocarbons	17
Agricultural practices	14
Charges in land use	9
Other Industrial activities	3

Source: UNDP/ WORLD BANK (2003)

2.4 The Energy and Transport Sectors

The transport sector is a major contributor of emissions that are harmful to atmosphere, terrestrial ecosystems and human health. The heightened level of deforestation for roads, the use of summary cars, use of generating sets in almost all homes in every under developed and developing countries for example (due to the erratic and inconsistent power supply) is a contributory factor to climate change. Gas flaring consumes large amounts of natural gas everyday during oil extraction which contributes to atmospheric pollution by releasing considerable quantities of CO_2 they by contributing to CC. Livestock production leads to land degradation, reduces soil fertility and increase green house gases by their grazing and browsing hence Oseni (2010) noted that cows and cars have something common relating to climate change. They contribute greenhouse gases (GHGs) to the environment leading to global warming.

Rapid socio-economic changes in some developing countries like India, China, etc, are influencing dramatically the fuel consumption pattern world over (Bhangale and Mondal, 2011; Tewari and Mondal, 2011; Tandon et al., 2011). An increase of 880 TWh of electricity consumption in transport in 2030 compared with the Reference Scenario, of which 90% occurs in PLDVs, results in about 250 Mt of additional CO_2 emissions (WEO, 2009; Mondal et al., 2011b). Innovation is driving forward cleaner, 'greener' and affordable transport. CO_2 savings will be maximized if well-to-wheel impact is clearly addressed at all stages of the fuel and energy chain (Mondal et al., 2011b). Biofuel like SVOs are produced easily in rural areas where there is an acute need for modern forms of energy. In the case of agricultural applications, fuels that can be produced in rural areas in a decentralized manner, near the consumption points will be favored (Mondal et al., 2008; Tandon et al., 2011).

2.5 The Greenhouse Effect

The sun emits radiation in a band of wavelength from ultra-violet infrared radiations (U.V to IR-200nm to 200nm). This radiation passes through the atmosphere of the earth with very little absorption (Oseni, 2010). When the radiation reaches the earth, it warms the ground or the sea. The warm surface of the earth radiates energy outward at a longer infrared wave length. Unlike sunlight, infrared radiation cannot travel freely through house gases in the lower atmosphere like water vapour, CO_2, chlorofluorocarbons, oxygen etc. These gases are called greenhouse gases (GHGs) (Zaku, 2008). These gases warm up the lower atmosphere thus radiate heat back increasing the warmth of the earth's surface and consequently resulting to climate change (Abo, 2009; Kalejaiy-Matti et al., 2010). This process is analogous to greenhouse with walls and roofs made of glass or plastic. Hence,

sunlight passes through the walls easily and heats the inside and consequently, the roods and walls slow the escape of the heat.

2.6 Ozone Layer Depletion

The Ozone layer is a band of the earth upper atmosphere (stratosphere) where ozone (O_3) (an allotrope of oxygen) is produced by the action of sunlight on oxygen (Kaleiaiy-Matti et al., 2010). Mfon and Mfon (2008) maintained that ozone layer concentration is higher at the poles than the equator mainly due to wind circulation (Nsikakabasi et al., 2008). Nsikakabasi et al. (2008) further maintained that ozone layer varies with location, time and season. Ekuk and Akpan-Ebe (2008) also reported that the ozone is destroyed by chemical reaction with a number of substances that occur in the stratosphere as well as man-made chemicals and their activities. Studies by IPCC (2007a) and Oseni (2010) indicated that the ozone layer is becoming thinner and thinner thereby decreasing in its potency and capability of both acting as a blanket shielding the planet earth from ultra violet radiations as well as acting as a filter which filters lethal rays from getting to part of the earth that supports life. The presence of hole in the ozone layer has been reported by various scientists due mainly to polar thaw and connection to the chlorofluorocarbons and with the present rate of CFCs production, the ozone layer will continue to be affected thereby increasing global warming (Table 1) (UNDP/ WORLD BANK, 2003).Ozone layer depletion is basically caused by greenhouse gases like CFCs, volatile organic compounds (VOCs), sulphur (IV) oxide (SO_2), Nitrogen oxide (NO_2) Carbon iv oxide, methane (CH_4), water pour etc. These gases are emitted as industrial waste and human activities. When the ozone layer is depleted, ultraviolet and infrared radiation goes directly to the earth surface heating up the lower atmosphere and causing CC.

2.7 Deforestation

This is the displacement, destruction and degradation of forests by felling of trees followed by burning as a result of slash-and-burn-agriculture, logging activities, mining operations and oil exploration activities (Agbogidi, 2002;Omokhua and Koyoio, 2008). Deforestation is rolling back the earth's forests like floor rug and the consequences are quite drastic (Agbogidi and Eshegbeyi, 2008; Ureigho, 2010). Destruction of the world's forest accounts for nearly 20% of global green house gas emission more than the entire global transportation sector: all cars, trains and planes operating today (Ikojo, 2008; Faleyin and Abinyemi, 2010).

2.8 Agriculture

Agriculture has been seen as a prime example of how human activities profoundly impact the ecological functioning of the planet (Zaku, 2008; Olowoyo et al., 2010). Agriculture plays a major role in the global fluxes of the greenhouse gases like carbon dioxide, nitrous oxide, and methane. Many studies suggested that additional opportunities have arisen for lessening the GWP (global warming potential) by altering the agronomic practices (Robertson et al., 2000; Basu et al., 2009). Besides, humans have altered ecosystems more rapidly and extensively during the past 50 years than in any other period in human history (Cline, 2008; Mfon and Mfon, 2008) as more land have been converted to cropland during the last 50 years than in the previous two centuries. Hence, the prices of basic staples such as wheat, maize and rice have reached records highs and global food stocks are at historical low. It is also a known fact that CC is inseparable from agriculture. So to face all these new challenges, increase in the productivity level of pollution free product by application of

advanced, environmental friendly technology, which can manage and allocate efficiently all resources for sustainable development of agriculture, is necessary (Basu, 2011; Bhadoria, 2011; Mahapatra, 2011; Mondal et al., 2011a).

With the assumption by the Intergovernmental Panel on Climate Change (IPCC) that all the carbon in agricultural lime (aglime) is eventually released as CO_2 to the atmosphere, the US EPA estimated that 9 Tg (Teragram = 1012 g = 106 metric tonne) CO_2 was emitted from an approximate 20 Tg of applied aglime in 2001 (West and McBriide, 2005; Basu et al., 2009). One experimental study demonstrated that 1 ton of fly-ash could sequester up to 26 kg of CO_2, i.e., 38.18 ton of fly-ash per ton of CO_2 sequestered. This confirmed the possibility to use this alkaline residue for CO_2 mitigation (Montes-Hernandez et al., 2008; Basu et al., 2009). Use of fly-ash as soil ameliorant in place of lime could lead to reduction in CO_2 emissions, thus contributing to minimize global warming (Ferreira et al., 2003; Basu et al., 2009).

3. EFFECTS OF CLIMATE CHANGE

3.1 On Ecological System

Recently, there are changes in all levels of ecological organization such as geographical range, community and ecosystem levels as well as the tropical rainforests. Local and global extinction of species give credence to these ecological changes. Climate change is felt on planet earth now than in the pre-industrial time. Impacts such as flooding, decertification could lead to loss of agricultural lands, poisoning of water supplies and destruction of economic infrastructure such as roads thereby preventing buying and selling foods on the markets and therefore undermine food security. More than 30 million people in African currently lack access to safe water and adequate food (Umar et al., 2008). Aluko et al. (2008) noted that any change in climate is expected to manifest itself as increase in frequency of extreme events such as hurricanes, blizzards, heat waves and drought. Increases in air temperature can accelerate crop growth and consequently, shorten the growth period. In cereal crops for example, such changes can lead to poor verbalization (hastened flowering) and reduced yield (Alaje et al., 2010). Food security refers to the availability of food and one's access to it. A house hold is considered food secured when its occupants do not live in hunger or fear of starvation (Okezie and Okorie, 2009). CC may pose a threat to food security through erratic rainfall patterns and decreasing crop yields, contributing to increased hunger (Alaje et al., 2010). If climate factors such as temperature and precipitation change in a region go beyond the tolerance of a species phenotypic plasticity, then, distribution changes of the species may be inevitable. There is already a strong evidence that species are shifting their changes in altitude and latitude as a response to changing regional climates when compared to the reported past immigration rates of plant species, the rapid pace of current changes has the potential to not only affect species distribution but also render many species as unable to follow the climate to which they are adapted (Thaman, 2005). The environmental conditions required by some species such as those in alpines regions may differ leading to a rapid increase in extinction risk. CC is also predicted to interact with other drivers of biodiversity change such as habitat destructions and fragmentation or the introduction of foreign species. These threats may possibly act in synergy to increase extinction risk. Besides, more frequent extreme weather events and changing patterns of rainfall and draught can be expected to have significant impact on biodiversity (Cline, 2008). Climate change has been show to affect food security status of the climate events on rural farming household food security and the severity of food insecurity

among rural households. Climate change is a threat to ecosystem resilience. Transboundary conservation areas (TBCAS) have great potential for CC mitigation and adaptation using ecosystem based approaches. By reducing deforestation, TBCAS can help reduce the rate and mitigate the impact of CC by creating synergies, increasing resilience and producing efficiency.

3.2 On Natural Resources

Furthermore, advance CC impacts on natural systems and resources, infrastructure and labour productivity may lead to reduced economic growth, and exacerbating poverty (Zaku, 2008). These effects threaten the achievement of millennium development goals, loss of access to education while depletion of natural resources and decreasing agricultural productivity may place additional burdens on women's health and reduce time for decision making processes and income generating activities worsening gender equality and women empowerment (Ancha et al., 2010). These changes are affecting the entire world from low-lying Island in the tropics to the vast Polar Regions thus; climate change predictions are not encouraged. Predicted impacts associated with such temperature increases include further rise in global mean sea level, changes in precipitation pattern and more people at risk from dangerous vector borne diseases including malaria. The rise in the amount of CO_2 in the atmosphere is 1.0 – 3.5^0C (1PCC, 2007a). If emissions of greenhouse gases, and in particular CO_2, continue unabated the enhanced greenhouse effect may alter the world's climate system irreversibly (Mondal et al., 2011b, Tandon et al., 2011). CC has a profound and unavoidable effect on food security in Africa as increasing temperature and shifting rain patterns reduce access to food across the continents. With heightened soil temperature, arable land can be lost as a result of declining ground water levels and rising levels of transpiration. CC can lead to acidity of the soil or increasing levels of saline reduce the suitability of land for cultivation of crops and food system (Aluko et al., 2008; Umar et al., 2008). CC can lead to pest outbreaks which are capable of destroying crops. The fishing industry is not left out. Fish stocks are declining not only because of over fishing but because of declining water levels due to heightened evaporation as a result of rising temperatures (Halidu et al., 2010). Increased temperature also affects evapotranspiration which is combined effect of evaporation of water from the soil and transpiration from plants. If the rate of transpiration exceeds the rate at which plants can absorb from the soil, wilting will set in and the overall performances of plants including yield will be negatively affected.

3.3 Other Effects of CC

Other effects of CC may also include

1. decreased water availability in many region affecting agriculture and hydro-power generations.
2. widespread increased in the risk of flooding in many human settlements sequel to increased heavy precipitation affecting people living in river valleys and sea-level rise, also affecting people living in low lying coastal areas
3. a general reduction in potential crop yield in most tropical and subtropical regions .
4. loss of biodiversity and extinction of some vulnerable species.
5. altitudinal and pole land shifts in climate patterns, growing seasons and ranges of plant and human species.
6. increase in the range of and number of people exposed to vector-borne (e.g. malaria) and water borne (e.g. Cholera) diseases as well as an increase in heat

stress mortality (Ancha et al., 2008). Oni et al. (2010) reported that CC has negative effects on temperature, precipitation, tree growth and CO_2 sequestration, frequency and severity of wildlife and disease outbreak.

3.4 On Environmental Conservation and Biodiversity

CC touches every facet of life because the environment is our closest neighbor (Agbogidi and Ofuoku, 2008). CC if not adequately tackled can endanger valuable species and finally leads to extinction (Adaramola et al., 2010; Owolabi et al., 2010). Many continents and countries are experiencing CC in various ways. The changing ocean may also lead to a sharp decline in marine biodiversity with sea acidification following high temperature. Coral reefs, mangroves, boreal, tropical forests and other live forms can be vulnerable to climate change. Biodiversity loss as presently seen could be due mainly to CC. CC also has a way of increasing the risk of wildfires which will further decimate biological diversity. Extreme events like heat, waves, river and coastal flooding, drought, landslides, storms, hurricanes and tornadoes may become more intense and occurs more frequently. These severe weather and geological events have negative effects on the society and ecosystems by damaging the habitats of animals including man. Thaman (2005) mentioned that biodiversity is the key to food. If biodiversity is negatively affected by CC it goes to show that the world food security is greatly threatened stemming from imbalance in the natural ecosystem created by CC (Sathaye et al., 2006; Jones et al., 2008). Climate change has already triggered species distribution shifts in many parts of the world (Meduna et al., 2008; Adaramola et al., 2010). CC is one of the most important global environmental challenges with implications for water supply and health (Olowoyo et al., 2010).

Agriculture has been seen as a prime example of how human activities profoundly impact the ecological functioning of the planet (Zaku, 2008; Olowoyo et al., 2010) and humans have altered ecosystems more rapidly and extensively during the past 50 years than in any other period in human history (Cline, 2008; Mfon and Mfon, 2008) as more land have been converted to cropland during the last 50 years than in the previous two centuries. This has led to a hike in the prices of basic staples such as wheat, maize and rice have reached records highs and global food stocks are at historical laws. Modern agriculture has significantly contributed to destroying biological diversity because man has used more than 7,000 plant species to satisfy their needs. Besides, 75% of the food crop varieties we once grow are no longer cultivated (Thaman, 2005; Oni et al., 2010). Destruction of habitats in an area is not only a threat to endangered species but also to research potential and medicinal conservation (Agbogidi, 2002). Forest biota provide a major, irreplaceable source of new drugs and also harbour genetic variation which may have evolutionary importance e.g. pest resistance. Once lost, the genetic material is lost forever and yet no idea of what vital role it might have played in the future. CC also results in environmental degradation consequent on the alterations caused in the environment. The change affects every aspect of environment as such there is an imbalance in the integrity of natural ecosystems croplands, reduced immunities, pest and disease out breaks, etc.

4. THE WAY FORWARD

4.1 Industrial Remedy

Petroleum product which is the main source of carbon dioxide, methane and other greenhouse gases is now beginning to have an alternative-biofuel. Bio-diesel is one of these

biofuel which has gained worldwide acceptance as an environmental friendly solution to energy problem. It is an accepted option for energy security, reduction in imports, rural employment, and improving agriculture economy. Biodiesel results in substantial reduction of unburnt hydrocarbons, carbon monoxide and particulate matter. Indian Oil Corporation Limited (IOCL) reported that maintenance cost of vehicles run on bio-diesel has reduced substantially. The bio-diesel has no sulphur, no aromatics and has about 10% built-in oxygen that helps it to burn freely.USA uses Soybean for bio-diesel, India uses Jatropha curcas while many European countries are using seed or sunflower, frying oil and animal fat, Brazil uses castor oil, Malaysia uses coconut oil, Thailand and Philippine use palm oil, Greece uses cotton seed while Spain uses linseed. Furthermore, the World Ministry of Petroleum and Natural Gas had laid down a bio-diesel purchase policy which started in January 1 2006, which prescribed that companies shall purchase bio-diesel of standard quality through its notified centers at RS.25/a liter (1USD =45,700Rupees/0.0221386 to 1USD). Depending upon the market conditions, the oil companies shall be free to review the price every six months It is a multipurpose crop as reclamation of marginal soils, good growth under saline conditions, drought tolerant and high water use efficiency, an important energy crop, low labour in plants, does not compete with food crops an it is a wonder bio-fuel crop (Agbogidi et al., 2010). Although, full of high prospects, Spore (2010) stated that Jatropha is not economically viable when grown as monoculture or in plantation. Beside the tree as a plantation could exacerbate existing food insecurity throughout a community / nation. The tree does not do well in arid areas as it requires large quantities of water and fertilizer.

4.2 The Biotron

The biotron is a modular, inter-disciplinary, experimental climate change research facility developed through funding from Canadian Federal Government, the Ontario Provincial Government, the University of Western Ontario, the University of Guelph, Agriculture and Agric-Food Canada (AAFC), a rid several foundations a rid corporate contributors. The research focus is the elucidation of impacts of CC and extreme environments on soils, plants and insects. The primary focus of this facility is the evaluation of plant-based life support systems for space travel and related applications in extreme terrestrial habitats. It is also to complement environmental response. It helps to understand how natural and man-made ecosystems respond to changing environmental conditions and how such changes impact on humans and human health. With this knowledge, we should be better able to ensure the stability of food and water supplies, the containment of pollution and the prevention of diseases in plants, animals and humans. Construction of the biotron started in May 2005 and completed in 2007. Major innovations of the biotron include, first the capacity to assess the impact of climate change on the interaction of plants, insects and micro-organisms. On the roof top, six large, environmentally controlled mesocosm or biomass will provide a realistic location for testing concept developed on the laboratory bench or in growth chambers. Thus the Biotron enables the integration of experimental climate change research from the molecular scale to the mini-ecosystem scale. Secondly the earth science biome features a custom designed 6 meter high, controlled environment soil monolith system which will allow researchers to transport impact 10,000kg soil columns from the field into the facility at experimental containment temperatures ranging from approximately-30°C to 40°C. Thirdly, all imaging system analytical instruments and growth chambers from each module will be integrated through an information technology (IT) backbone that allows remote access and control from any web-browser. Lastly, the transgenic module includes two federally certified containment level 3 (C13) laboratories for work on airborne bio-hazardous plant and microbiological pathogens, with a contiguous large chamber.

Table 2. Uses of different parts of *Jatropha curcas*

Whole Plant	Roots	Leaves	Latex	Seeds	Bark	Twig
1.Planted to prevent water erosion and conservation	Used as ethno-medicine	Used as ethno-medicine	Resembles shellac	Source of oil suitable as fuel or diesel engine	Yields tannins (37%)	Used as twig for medical purpose
2.Promising live fence		Yield a dye used to give tan and brown	Used for making print.	Used as illuminant, lubrication, in soap and candle making.		Used as Diataun (Herbal tooth Brush).
3. Useful as green manure in controlling sand drift and posses allelopathic properties.		Used as botanical	Used in ethno medicine	Used as medicine both internally and externally.		Young one cooked and eaten

Source: Agbogidi et al. (2010)

The facilities summarized above represent phase II of an ongoing multi-stage project. In 1990, phase I of the project was established as the Controlled Environment Systems Research Facility (CESRF) located on the campus of the University of Guelph. The primary focus of CESRF is the evaluation of plant-based life support system for space travel and related terrestrial applications.

Research partners associated with CESRF include the aerospace, chemical and agricultural industries. The research mission of the Biotron is to accelerate our understanding of (i.e. responses to, and consequences of global climate change on terrestrial and aquatic ecosystem, assess and quantify the potential environmental benefits and risks associated with emerging biotechnologies on biodiversity and general ecosystem. A unique feature of the biotron, which strengthens its collaboration capabilities, is the capacity to provide researchers with real-time, worldwide experimental and data access and management. The core of the biotron's scientific functionality will be its secure, high-speed, web-accesib1e imaging database and data analysis system.

4.3 Agricultural Remedy

Afforestation should be encouraged via checking indiscriminate felling of trees by slash-and-burn agriculture and logging. The principle of cut one tree and plant two should be advocated. This is because carbon oxide-a greenhouse gas is used by trees during photosynthesis. Thus abundant vegetation of trees can check excess CO_2 in the atmosphere. Furthermore, the use of greenhouse gas emitting fertilizers, pesticides, weedicides etc. should be checked (controlled). Simultaneously, in future, attention should be given on some important areas related to fly-ash utilization, like proper handling of dry ash in plants as well as in fields, ash pond management (i.e., faster decantation, recycling of water, vertical expansion rather than horizontal, etc.), longterm studies of impact of fly-ash on soil health, crop quality, and continuous monitoring on the characteristics of soil as well as fly-ash (Basu et al., 2009). Saving biodiversity in the form of standing forests and interact lands can help prevent climate change and help communities and natural areas cope with a changing planet (Aloa, 2010). The destruction of the worlds forest accounts for nearly 20 percent of global green house gas emission, more than the entire global transportation i.e., all cars, trains and planes operating today. At the same time, helping nature become more reification climate change through a combination of management restoration and protection strategies will help prepare places, plants, animals and people.

Successful adoption of living systems can help ensure their ability to support the needs of people and withstand future changes. Conserving natural terrestrial, fresh water and marine ecosystem and restoring degraded ecosystem (including their genetic and species diversity) is essential for the overall goals of the United Nations Frame Work Convention on Climate Change because ecosystem play a key role in the global carbon cycle. It is adaptor to climate change while also providing a wide range of ecosystem services that are essential for human well being and the achievement of the millennium development goals. Biodiversity can support efforts to reduce the negative effect of climate change. Conserved or restored habitats can remove carbon dioxide from the atmosphere thus helping to address climate change by storing carbon e.g. reducing emissions from deforestation and forest degradation.

Moreover, conserving ecosystem such as mangrove, for example can help reduce the disastrous impact of climate change such as flooding and storm surges. Ecosystem based adaptation which integrates the use of biodiversity and ecosystem services into an overall adoption strategy can be cost effective and generate social, economic and cultural co-

benefits and contribute to the conservation of biodiversity. Conservation and management strategies that maintain and restore biodiversity can be expected to reduce some of the negative impact from climate change. However there are rates and magnitude of climate change for which natural adoption will become increasingly difficult options to increase the adaptive capacity of species and ecosystem. Conservation and management strategies include: reducing non-climatic stresses such as pollution, over exploitation, habitat loss and fragmentation and invasion alien species, wider adoption of conservation and sustainable use practices including through the strengthening of protected area network and facilitating adaptive management through strengthening monitoring and evaluation systems.

5. CONCLUSION

The paper attempted to examine how climate change acts as a threat to food security and environmental conservation. This review established that climate change negatively affects food security and environmental conservation through heightened temperature resulting in land loss, disease and fire outbreaks, yield reductions, wildfires and reduced immune system, reduction in biodiversities through species endangerment and outright extinction. For its effects to be reduced establishment of more forest plantations and maintenance of the existing natural and artificial forests should be encouraged as saving biodiversity in the form of standing forests and intact lands can help communities and rural areas cope with change planet. At the same time, helping nature become more reification climate change through a combination of management restoration and protection strategies will help prepare places, plants, animals and people for climatic change successful adoption of living system can help ensure their ability to support the needs of people and better withstand future changes.

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