

CLIMATE CHANGE CRISIS: A REVIEW OF SOLUTIONS

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ABSTRACT

This paper is a review work conducted through the collection of some research materials and field reports concerned with various climate change crisis solutions at local and global levels. It is clear that the move away from traditional methods of farming to industrial agriculture and modern food production has been hugely important in creating the crisis. The extensive use of chemical fertilizers and pesticides, the expansion of the meat industry and the destruction of the world's savannahs and forests to grow agricultural commodities are together responsible for about one third of the green house gases that are causing global climate change. As the climate change, agriculture needs to transform so that it becomes more profitable, sustainable and resilient. The smallholder farmers and producers who face the hard realities of the impacts of climate change on their livelihoods want practical solutions that work for them and their families. A return to agro-ecological farming, building organic matter by fungi, carbon sequestration by plants e.g spekboom, root-imaging technology application and community leaders role to save forests are solutions to climate change crisis.

Keywords: Climate Change Crisis, Local and Global Levels Solutions, Traditional Farming, Industrial Agriculture, Modern Food Production, Agro-Ecological Farming, Chemical Fertilizers and Pesticides.

INTRODUCTION

To meet the needs of the worlds expanding population which is projected to be a billion by 2050, farmers will have to produce more, this task will be made all the more difficult by climate change. The added challenge is to produce more but in ways that will protect the environment, especially soil and water while minimizing agriculture's contribution to climate change. Reducing agricultures carbon footprint is therefore an important consideration to limiting climate

change. And to help ensure food security, farmers across the globe will probably need to switch to more climate hardy crop varieties or even change the crops they grow, as well as their farming practices (Spore, 2015). Time is running out, for the climate crisis is gaining momentum at an alarming rate. Climate change is already seriously affecting 325 million people in a year with 315,000 dying from hunger, illness and weather disasters induced by climate change. As a consequence of the increased stress induced by the climate crisis on soils, plants and animals agricultural yields are expected to fall calamitously throughout the century, particularly in the warmer countries. The physiological conditions for production that will prevail in Africa over the next decades - temperature levels, atmospheric carbon concentrations, humidity or soil minerals - are still completely unknown. Sound research will therefore be required to gain insight into how climate change will affect plants and animals. Researchers are upgrading and adopting agricultural techniques to be able to maintain and increase production.

Climate is the average weather condition in a given place whereas climate change is a significant and lasting change in a statistical distribution of weather patterns over periods ranging from decades to millions of years (Ludi, 2009). This may be a change in weather conditions or in the distribution of weather around the average conditions e.g. extreme weather events. In a general sense, the term encompasses all forms of inconsistency. The climate crisis requires a political response with many broad social and economic changes. Even though the recuperation of soil organic matter is a feasible and beneficial way to cool the earth, climate change will continue to accelerate unless we have fundamental changes in our patterns of production and consumption (Chris Lang, 2009). The process of returning organic matter to the soil will not be possible if current trends towards increased land concentration and homogenization of the food system continue. The daunting goal of returning to the soil over 7 billion tonnes of organic matter every year will be feasible only if it is undertaken jointly by millions of farmers and farming communities who will put all the solutions into practice.

Climatic changes linked to global warming are already having a devastating impact on the lives and livelihoods of farmers and rural communities across the globe (FAO 2008). Current climate protections suggest this impact will worsen. Reducing agriculture's contribution to greenhouse gas emissions, while also increasing productivity in a sustainable way is the challenge that lies ahead. There is a need to facilitate the identification of solutions and sharing of knowledge among farmers and other key players by helping them to document

proven practices, tools or policies that promote resilience to climate change (William, 2007).

METHODOLOGY

The paper has reviewed solutions to climate change crisis form food and agricultural organizations (FAO) climate smart agriculture, the international food system and the climate crisis by GRAIN. Climate change in West Africa OFEDI and GRAIN Earth matters; tackling the climate crisis from the ground up, climate change challenges and opportunities - spare, tackling climate challenges with the help of technology and articles relevant to the subject. The approaches were analytical and this paper examined various practices of agricultural production that militate the effect of climate change.

RESULTS

AGRO-ECOLOGICAL FARMING

A return to agro-ecological farming on a massive scale would mitigate a large part of the present crisis. As all agronomists know soils contain enormous amounts of carbon, mostly in the form of organic matter. The rise of industrial agriculture, with its use of chemical fertilizers and pesticides has provoked a huge depletion of this organic matter in the soil. The tremendous global increase in the use of chemical fertilizers in farming has increased in 1961. A lot of this extra Nitrogen does not reach the plants and ends up in ground water or the air the form of carbon dioxide. The more nitrogen fertilizer is applied, the less efficient it becomes. Soil experts and farmers have long known that chemical fertilizers destroy soil fertility by destroying organic matter. When applied, soluble nutrients become available in huge amounts, provoking a surge of microbial activity and multiplication. This increase microbial activity, in turn, speeds up the decomposition of organic matter, as it is consumed at high speed, and CO_2 is released into the atmosphere. When nutrients from fertilizers become scarce, most micro-organisms die and the soil is left with less organic matter.

As soils lose organic matter they become compact, absorb less water and have a diminished capacity to retain nutrients. The chemical fertilizers are readily transformed in the soil so that nitrous oxides are emitted into the air. Nitrous oxides have a green house effect more than two hundred times as strong as that of CO_2 and they are responsible for more than 40 percent of the greenhouse effect caused by current agricultural practices and nitrous oxides also destroy the ozone layer (Grain, 2009). It would be possible to recapture this CO_2 by a whole sale return to agro-ecological farming. In about half a

century (which is the same amount of time in which large scale soil depletion occurred) the cost organic matter could be reincorporated into the soils capturing in the process more than two thirds of the present excess carbon dioxide in the atmosphere. Although it may already be too late to avert widespread environmental damage, such a strategy would offer the world a way out of the crisis.

UPLAND AGRO-FORESTRY

The increasing danger of saltwater flooding in the lowlands, and upland agro-forestry trial was launched in Palau. In 2012 with the help of youths, fruit and timber tree species, including coconuts, mahogany, avocado, soursop, tropical almond and banana were planted on the upland site together with erosion controlling lemongrass. This has help farmers who have avoided upland cultivation, on account of the day soils found there being unsuitable for crops. However, some areas of the site are showing signs of nutrient deficiency and planting of legumes to improve soil fertility is recommended.

BUILDING ORGANIC MATTER BY FUNGI

Researchers are fleshing out the mechanisms by which soil carbon sequestration takes place. One of the most significant findings is the high correlation between soil carbon levels and very high amounts of mycorrhizal fungi. These fungi help to slow down the decay of organic matter. Studies have shown that the biological support system of mycorrhizal fungi are more prevalent and diverse in organically managed systems than in soils that depend on synthetic fertilizers and pesticides. These fungi work to conserve organic matter by aggregates organic matter with clay and minerals. In soil aggregates. Carbon is more resistant to degradation than in free form, and thus more likely to be conserved. These findings demonstrate that mycorrhizal fungi produce a potent glue-like substance called glomalin that stimulates increased aggregation of soil particles. This results in an increased ability of soil to retain carbon (Tim J. Lasulle and Paul Hepperly, 2008).

CARBON SEQUESTRATION BY SPEKBOOM PLANT

Planting spekboom, a South African succulent that absorbs huge quantities of carbon dioxide is creating jobs and helping to check climate change (FAO 2008). The evergreen plant *Portulacaria afra* also known as "elephants food" has massive powers for sequestering carbon and also absorbs water and releases it into the earth like a sponge. Spekboom plants can reach a height of 2.5m and occure mainly in rocky, dry areas. Research has shown that spekboom ticket is able to remove 250 tonnes of carbon per hectare, at a rate of four tones per

year. Its capacity to offset harmful carbon emissions is equivalent to that of moist subtropical forest.

ROOT - IMAGING TECHNOLOGY

Researchers have made a breakthrough in imaging plant roots in a bid to develop varieties that can thrive in harsh conditions. The technique uses X-ray computed tomography, a technology used to diagnose soft tissue damage in humans. Scientists at the university of Nottingham UK have develop imaging software called Roo Trak to analyze the scans, testing them on maize tomato and wheat.

COMMUNITY LEADERS HELP TO SAVE FORESTS

This initiative aims to halt the destruction of forests devastated by logging and charcod production. In each local community leaders have the task of coordinating the planting and protection of trees. The agricultural department supplies technical assistance and distributes manuals on environmental education with funds provided by the government.

TECHNOLOGY

The extreme weather events are becoming increasing frequent leading to loss of crops and fully income levels for many household especially in West Africa. This is placing farmers especially small scale farmers in a precarious position, with those living in the Northern regions particularly vulnerable. In this challenging context, the use of interactive radio has been helping to create links between farmers and markets, and is providing farmers with much needed information about climate and local weather and ways of strengthening their farming systems to cope with the effects of climate change. A small number of organizations are using ICT in (Ghana to provide climate or marketing advisory services to farmers such as Esoko, the informational institute for communication and development, Farm Radio International (FRI). The radio series reinforced training workshops delivered by World Food Programme (WFP) on good agronomic and post harvest practices and quality standards. One key participatory technology is an interactive voice response system. This system allows farmers to access important messages and alerts, to listen again to radio programme segments and to record and share messages with radio stations, such as lessons they have learned in the field from implementing new methods. Information includes market prices, weather information and agricultural tips. The content is provided by the Ghana Meteorological Agency (Spore, 2015).

CONCLUSION

World Religious and political leaders from Pope Francis to president Barack Obama are calling for action against climate change to avoid catastrophic consequences, particularly for the poor. Small holders farmers in developing countries are likely to be hardest hit by climate change due to agriculture vulnerability to extreme weather patterns and the low level of resistance of farming to climate variability and change. The good news is that innovative approaches are being developed to meet this challenge (Spore, 2015). Both technical and policy measures are urgently needed to combat climate change. At a technical level, priority must be given to measures that promote the adaptation of cultural practices to the new climate, the prioritization of traditional knowledge developed locally in each region. It is important too, to be aware that traditional knowledge can have an exciting new role in helping to develop new techniques, such as rain waregard to policy measures, it is necessary to mainstream adaptation, to climate change, making sure it is systematically integrated into new projects focusing on biological diversity and into local national and regional agricultural policies. Farmers, scientists and policy makers, moreover, must work together in a climate of mutual trust to develop the sustainable use of the regions biological resources.

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