CLIMATE CHANGE: DEFORESTATION AND REFORESTATION FOR CARBON EMISSION AND SEQUESTRATION

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INTRODUCTION

The 15th Conference of the Parties to UN Framework Convention on Climate Change (COP 15) met in Copenhagen, Denmark in 2009. COP 16 met in Cancun in Mexico on the 29th of November 2010 (Clitheron, Dempster, Doidge, Marsden, Mbambisa, Signleton, Stander, van Aarde, & Ashwell, 2008). The African Ministerial Conference on Climate Smart Agriculture was hosted by South African Department of Agriculture, Forestry and Fisheries (DAFF) on the 13th to the 14th of September 2011, in Johannesburg (Kgatla, 2011). COP 17 hosted by South Africa met on the 28th of November to the 9th of December 2011, in Durban. Another Conference was held in Rio de Janairo, in Brazil in 2012 to mark the expiry of the Kyoto Protocol. The overall aim of all these diplomatic Conventions was to solicit a general commitment of the countries of the World to the Conventionôs objective on reducing carbon emission and to keeping the Earthôs surface temperature increase below 2ºC threshold. It is vegetation that can help the World achieve this objective, for vegetation and soil control the rate in which the Sun energy is returned to the atmosphere, be it infrared radiation and/or water vapour from the soil and/or plant leaves (Baede, Ahlonsou, Ding, Schimel, Bolin & Pollonais, 2010). However, humans play a big role in defeating this objective. Humans control the quantity and quality of vegetation on the planet. They have power to remove vegetation for socio-economic reasons. At the same time, the World human population is growing very fast. Production of carbon increases as the population grows. This carbon is produced from human exhalation and burning of fossils. The plant population on the other hand declines. The decline in vegetation size means decline in the natural absorption of the atmospheric carbon. It must be noted that humans also have power to restore the vegetation they destroyed.

PURPOSE

The study seeks to highlight the impact of humans in carbon emission, the significance of vegetation in the provision of oxygen and the absorption of carbon in the atmosphere, and to strike a balance between human population growth, human carbon emission rate and vegetation restoration. The study also seeks to establish a balanced human-tree ratio that may be sufficient for production of oxygen and absorption of atmospheric carbon dioxide.

METHODS

- Literature review on global warming and climate change, the role of deforestation in carbon emission and reforestation for carbon absorption, South African deforestation rate, World population growth, and humansôrole in carbon emission.
- A person-to-tree ratio was established to determine the balanced equation on the carbon emission and absorption equilibrium.

RESULTS AND DISCUSSIONS

• Population Growth

The World population is growing further and further. This growth increases the amount of CO_2 in the atmosphere. The growth was observed from 1820 to 2011. The temperature increase varied drastically as the population grew (Bradley, Lycoudi, Ovens & Stanton, 2006). Figure 1 depicts the illustration on the population growth over a period of time. From the illustration the study finds that the World population reached seven billion mark in 2011.

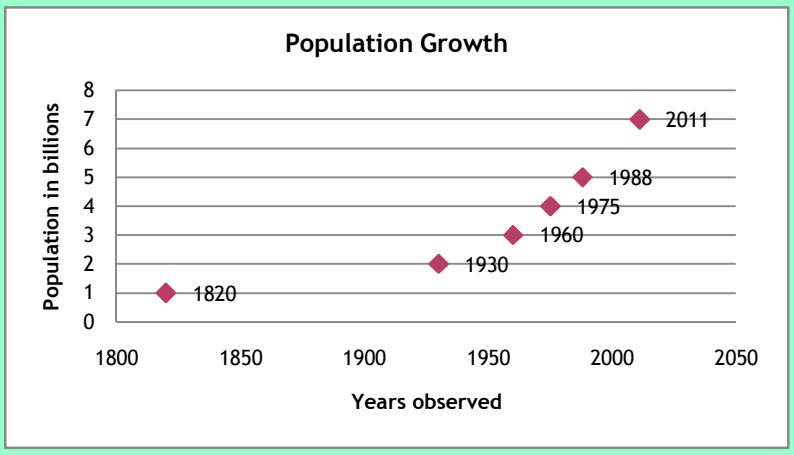

Figure 1: Population growth trend in billions over a period of time. Source: Bradley, et al. (2006)

Table 1: Analysis of the population growth trend across the various period of years under observation

Period observed	Population growth difference in billions	Period taken to produce one billion population
1820-1930	1	110
1930-1960	1	30
1960-1975	1	15
1975-1988	1	13
1988-2011	2	23

According to table 1, the Worldôs human population growth had been steady during the nineteenth century with an increase of one billion in 110 years. However, it began to explode during the early twentieth century and started to reduce the gap faster and faster as years progressed. Today it is estimated that the population growth can reach a two billion increase in a period of less than twelve years.

• Humans' Role in Carbon Emission

Human activity contributes immensely in changing the Worldôs atmospheric conditions through carbon emission (United States Environmental Protection Agency, 2010:1). This happens when humans produce carbon through burning of fossil fuel in the form of coal and gasoline (Baede, Ahlonsou, Ding, Schimel, Bolin, & Pollonais, 2010). They also produce carbon in the form of Carbon dioxide (CO_2) through exhalation. According to Hannan (1997), humanôs breath contains almost 5% CO_2. One person exhales 319.3kg CO_2 per year. A person with a car produces about 5.5 tons of CO_2 per year. 69% of South African agricultural land is used for extensive livestock grazing, and this is where most of deforestation occurs. Another cause of deforestation is directly linked to the rapid human population growth. In rural communal lands, deforestation is influenced by *inter alia* socio-economic behaviour such as overgrazing, tree harvesting, use of invasive alien plants, and unplanned human settlement. In South Africa in particular, most of the enormous amount of deforestation takes place largely in the rural provinces. Kwazulu Natal and Limpopo lead the race with 190 index value followed by Eastern Cape with 120 (Preethlall, Pillay, Gebhardt, Farham, 2010).

• Vegetation's Role in Carbon Absorption

Apart from carbon absorption, vegetation controls the rate in which Sun (infrared radiation) energy is returned to the atmosphere. It also supplies oxygen to the atmosphere for human and animal life. In average, one average size tree is enough to provide oxygen for a family of four (Clitheron *et al,* 2008). One tree on the other hand is also enough to absorb one ton of CO_2 for a family of three. One person with a car needs six trees to absorb 5.5t of CO_2 (Hannan, 1997). Figures 2 displays a simplified presentation of the ratios in flow line diagrams.

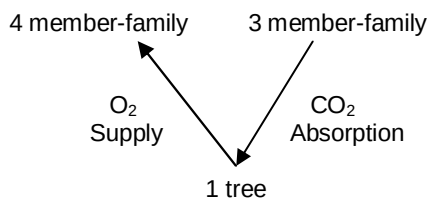

Figure 2: Family Vegetation ratios

CONCLUSIONS, RECOMMENDATIONS AND EXTENSION IMPLICATIONS

The World population is growing whereas the Earth planet is static. However, the vegetation is reduced in size and capacity. This means that carbon production is increasing whereas its absorption capacity declines. There is therefore an urgent need to ensure a balance between human and tree population on the planet. The people should take responsibility of restoring the depleted vegetation. This should start at household level. The paper therefore recommends that the following reforestation rate should be adopted and campaigned for in the communities: ñOne family of three, One treeò (3:1) and ñOne driver, One car, Six trees (1:1:6). The paper concludes that the above recommended tree planting rate may not guarantee the absorption of the carbon already in the atmosphere but may help to maintain the status quo until the Earthôs carbon absorption capacity is more than the population and the deforestation index value. Since agricultural development is both a contributor and victim of global warming, extension services therefore have a role to play in making farmers aware of the threat to their farming environment and also to encourage them to practice measures that may help sustain their practice for generations to come.

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