

# The place of the rubber tree (*Hevea brasiliensis*) in climate change

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## **Introduction**

- Climate change refers to the change in weather factors over a period of over thirty years, without likelihood of return to the former threshold of weather characters.
- The natural factors of climate change include changes in:
  - Temperature
  - Rainfall
  - Relative Humidity
  - Vegetation
  - Biodiversity including changes in pests and diseases, etc.

## **Introduction (Continued)**

- The effect of climate change on man includes:
  - Loss of means of livelihood
  - Migration
  - Lowered resistance to pests, antibodies, diseases,
  - Natural hazards (drought, flooding) etc.

## **Introduction (Continued)**

- Trees have played significant role to stabilize climate. It was reported that the emergence of trees significantly reduced atmospheric Carbon from 650ppm to 100ppm in the Aquitanian era on the Geologic Time Scale.
- Trees played a major role to bring Carbon concentration to 280ppm common among man before the industrial era.
- The current trend of climate change is traceable to industrial age which commenced about the middle of the 1700s.

## **Objective**

The objective of this paper was to highlight the place of the rubber tree in climate change adaptation and mitigation.

## **Current climate change:**

- Period of controversy:
  - + About the middle of the eighteenth century, there was the speculation that the atmosphere was experiencing changes in its composition of gasses.
  - + There were the proponents and the opposers.
  - + Over time the reality of climate change drowned the voice of those who believed that climate change was a mere fiction
- Acceptance:
  - + Following the obvious evidence of climate change such as steady change in weather factors, especially increase in temperature, there was general acceptance of the reality of climate change.

## **Current climate change (Continued):**

- Dominance of engineering techniques:
  - + After accepting the reality of climate change, the initial focus was engineering techniques such as reduction in use of fossil fuels, natural sources of energy, etc.
  - + It was difficult to accept the place of agro-allied approach to reduction of green house gasses
  - + With the application of engineering techniques to address the issue of ozone depletion, the main focus of climate change adaptation and mitigation was also application of engineering techniques

## **Current climate change (Continued):**

- Dominance of engineering techniques (Continued):
  - + There was strenuous effort to accept biological methods, especially trees
  - + Till date, the use of trees is criticised by some authorities, but such is isolated opinion, with world-wide acceptance of the place of trees in climate change mitigation and adaptation



## **Current climate change (Continued):**

- For the place of trees in climate change adaptation and mitigation, we may recognise pioneering effort of several authors such as:
  - Breshears and his team in America (Allen & Breshears, 1998; Breshears et al, 2018),
  - Omokhafa with his team in West Africa (Omokhafa, 2017 & 2019; Omokhafa et al., 2019) and
  - Several others (Munasinghe et al, 2011; Arora & Montenegro, 2011; Lewis & Wheeler, 2019).

## **Current climate change (Continued):**

- With the world-wide acceptance of tree application for climate change, the rubber tree suffered a set-back as rubber plantation was considered as a factor of deforestation in the Tropics
- Notwithstanding, the place of the rubber tree in climate change, without deforestation, is for restoration of degraded Tropical forest

## **Current climate change (Continued):**

- The breakthrough for the rubber tree:
  - Climate change has resulted in loss of natural forests, thus requiring replanting of trees.
  - It is therefore necessary to:
    - + Restore the forest ecosystem
    - + Enhance the productivity of the forest dwellers
    - + Provide means of economic empowerment of forest communities under a sustainable farm practice
  - In this regard, the rubber tree is an outstanding tree crop to meet these multiple requirements of climate change agriculture.

## **Application of the rubber tree to address climate change: Various options are hereby recommended**

- **Tree farming:**

- A mosaic of trees species is planted.
- This may be used for forest regeneration in the Rain Forest or afforestation in the humid savannah.
- Examples of successful rubber tree farming are:
  - + Rubber tree with coffee, cocoa, lemon and kola in Cote d'Ivoire (Snoecka et al., 2013).
  - + In Brazil, more than fifteen traditional forest species were interplanted with rubber tree in a forest enrichment programme. This is a typical tree farming scheme were the other tree species are not necessarily industrial crops (Rappaport and Montagnini, 2014).

**Application of the rubber tree to address climate change:  
Various options are hereby recommended**

- **Forest Restoration:**

- Where a forest can be restored by planting forest species in partially degraded forest.
- Climate change degradation of Rain Forest takes many years, not less than a decade depending on the intensity of associated human activities.
- In the phase of transition it may be possible to restore the status of the forest through planting of trees.
- Forest restoration is considered a potent source of carbon sequestration compared with plantation monoculture and agroforestry (Lewis et al, 2019).
- In this regard, where natural rubber tree is naturally growing in the forests, further ‘seeding’ can be encouraged.

## **Application of the rubber tree to address climate change: Various options are hereby recommended**

- **Afforestation:**
  - To promote tree planting and tree population in the humid savannah.
  - The Tropical grassland world-wide is often between the Rain Forest and the arid zone, sometimes the desert.
  - In this case, there is the humid savannah to the region of Rain Forest and arid savannah to the area of the desert.
  - The natural humid savannah is rich in tree population, but this is threatened by increased aridity from the desert leading to loss of trees.
  - This can be checked through conscious planting of trees, such as restoration or tree farming.
  - The rubber can be applied in this case

## **Application of the rubber tree to address climate change: Various options are hereby recommended**

- **Afforestation (Continued):**

- In Nigeria, the humid savannah consists mainly of the Guinea Savannah and there are successful clonal trials of the rubber tree in the Guinea Savannah (RRIN, 2009).
- As a fore-runner to this concept, *Hevea* breeders have conducted trials successfully in non-traditional rubber tree zones for decades (Pushparajah, 1983; Dea et al, 1997; Iqbal & Rodrigo, 2006; Priyadarshan et al, 2009; Zongdao and Yanqing, 1992).

## Application of the rubber tree to address climate change: Various options (Continued)

- **Reforestation:**

- To restore tree population in the Rain Forest or Mangrove Forest.
- A lot of forest ecology has been degraded without the likelihood of self-recovery. This has given rise to derived savannah in the case of degraded Rain Forest (Fig. 1).



A. Rain Forest



B. Derived savannah



C. Rubber tree  
plantation

Fig. 1. Tree population in Rain Forest, derived savannah and rubber plantation



## Application of the rubber tree to address climate change: Various options (Continued)

- **Reforestation (Continued):**

- The Mangrove Forest has suffered severe degradation and sometimes bare in several parts of the world (Fig. 2).
- Fortunately, the rubber tree is suitable to reclaim degraded Rain Forest and degraded Fresh Water Mangrove.



A. Undisturbed mangrove



B. Degraded mangrove



C. Severely degraded mangrove

Fig. 2. Degradation of Mangrove Forest

## **Application of the rubber tree to address climate change (Continued):**

- **Agroforestry:**
  - Intercropping and mixed farming in tree crop agriculture.
  - The rubber tree is a suitable component of agroforestry models for the purpose of enhancing tree cover for Carbon sequestration.

## **Application of the rubber tree to address climate change (Continued):**

- **Silviculture:**
  - This is cultivation of trees and especially forest species and sometimes forest of wood value.
  - Forest species can be managed in phased exploitation for sustainability in terms of:
    - + Land space
    - + Time interval
    - + Species type etc

## **Application of the rubber tree to address climate change (Continued):**

- **Protection of rubber groves:**
  - There are abandoned rubber groves in many rubber producing countries.
  - The wild rubber groves in the Amazon Basin as centre of origin of *Hevea* can be protected from exploitation.
  - Rubber tree grove is a rich source of biodiversity and Carbon sink.

## **Application of the rubber tree to address climate change (Continued):**

- **Carbon credit:**
  - Countries or companies might be given emission limit.
  - Any excess emission will attract a fee and such fee forms bases of an offer to buy Carbon credit.
  - Any country or company with Carbon emission less than her allocation may sell such credit.
  - In all cases, certification is necessary.
  - The offer of credit points, the acceptance of credit points and eventual payment is called 'Carbon Market'.
  - Carbon trading is carried out within the framework of Kyoto Protocol (UN, 1997).
  - Rubber plantations may have a chance to benefit from this scheme.

## **Application of the rubber tree to address climate change (Continued):**

- **Rubber tree and REDD+:**
  - Reduced Emission from Deforestation and Forest Degradation (REDD+) is targeted at developing countries known for degradation of forest resources to obtain means of livelihood and provide funds for social amenities.
  - The REDD+ provides a means to conserve forest resources while providing the communities with alternative sources of livelihood and social amenities.

## Application of the rubber tree to address climate change (Continued):

- **Rubber tree and REDD+ (Continued):**
  - A limitation to the rubber tree is that REDD+ compatible forest must be a virgin forest whereas rubber plantations are at mainly secondary forests.
  - Secondly, the certified REDD+ forest will virtually be unexploited during the phase of its designation as REDD+ forest.
  - Rubber tree groves, which are primary forests may qualify for REDD+

## **Application of the rubber tree to address climate change (Continued):**

- **Holistic approach:**
  - Climate change has social and economic aspects
  - Developing countries will be severely affected due to their low capacity to adjust to changes in the environment.
  - Virtually, all rubber producing countries have large proportion of communities with significant poverty index
  - Holistic approach is therefore necessary to cater for livelihood and environment at the same time
  - Within the forest region, the rubber tree can fill the gap through revenue for the rural dwellers as well as providing Carbon sink.



## **The rubber tree and the SDGs**

- The rubber tree may find application among many of the components of the Sustainable Development Goals (SDGs). Among these are:
  - Affordable and Clean Energy (SDG 7) as rubber seed oil is a source of biofuel
  - Climate Action (SDG 13): rubber tree agro-applications
  - Life Below Water (SDG 14) as aqua culture can be practiced under rubber canopy
  - Life on Land (SDG 15): rubber tree agro-applications

## **The rubber tree and the SDGs (Continued)**

- Rubber tree may also be applied in the following SDGs:
  - No Poverty (SDG 1): as source of economic empowerment
  - Zero Hunger (SDG 2): the arable intercrops and animals in mixed farming will enhance quantity and quality of food
  - Industry, Innovation and Infrastructure (SDG 9):
    - + Economic products obtainable from the rubber tree
    - + Primary source of revenue for industrialisation
  - Reduced Inequality (SDG 10): economic empowerment of deprived communities and countries will reduce inequality
  - Partnerships for Goals (SDG 17): the forum of IRRDB is that of partnership for achievement of the SDGs relevant to the interest of IRRDB

## **Conclusion**

An overview of the stages of climate change was traced to trees and *H. brasiliensis*. The rubber tree was presented with its potentials to contribute to climate change adaptation and mitigation.

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**Thank you**