Available Online at http://www.journalajst.com

ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

*Asian Journal of Science and Technology*
*Vol. 08, Issue, 11, pp.6510-6515, November, 2017*

# RESEARCH ARTICLE

## QUANTITATIVE ANALYSIS OF CARBON STORAGE CAPACITY IN THE STANDING BIOMASS OF SEMI-ARID REGIONS OF RAMDURGA TALUK, BELAGAVI DISTRICT, KARNATAKA

***Prabha, S. J., Santhosh Kumar, T. M., Shrinidhi, R. and Megha, M.**

Environmental Health and Safety Research and Development Centre, Rajajinagar, Bengaluru- 560010, Karnataka, India

**ARTICLE INFO**

***Article History:***
Received 28th August, 2017
Received in revised form
06th September, 2017
Accepted 22nd October, 2017
Published online 30th November, 2017

***Key words:***

Kyoto Protocol, Semi-arid,
Above Ground Biomass,
Below Ground Biomass,
Carbon sequestration,
Carbon conservation,
Carbon substitution,
Carbon storage potential.

**ABSTRACT**

Carbon di-oxide is a major Green House Gas responsible for today's Global Climatic Conditions ultimately leading to the destruction of ozone layer. In order to reduce the GHG emissions, Carbon sequestration is considered to be a cost-effective way of balancing environmental climatic conditions. Hot and humid climatic conditions of Ramdurga Taluk of Belagavi District supports native and dry land vegetation such as *Eucalyptus grandis*, *Acacia nilotica*, *Azadirachta indica*, *Acacia suma*, *Tectona grandis*, *Tamarindus indica*, etc. The study recorded 393 individuals belonging to 22 species and 11 families which are common to the region. *Azadirachta indica*, *Eucalyptus grandis* and *Tectona grandis* are the predominantly recorded tree species in the study area. The Total Biomass of the recorded 393 tree species was estimated to be 50.11 t/tree with *Azadirachta indica*, *Eucalyptus grandis* and *Tamarindus indica* being the trees with highest biomass values. The total organic Carbon sequestration capacity of 393 trees in the semi-arid regions was estimated to be 25.05 t/tree and the total Carbon di-oxide sequestration capacity of the trees in the study area was estimated to be around 6764.16 tonnes with *Azadirachta indica* and *Eucalyptus grandis* being the major tree species with the highest carbon storage potential. However, *Acacia nilotica*, *Tectona grandis*, *Ziziphus mauritiana*, *Tamarindus indica* and *Mangifera indica* also proved to possess significant Carbon storage capacity as they occur in large numbers and have a fairly higher biomass values. Therefore, carbon sequestration capacity of a tree predominantly depends on the number of individual tree species and its total biomass. The semi-arid dry vegetation also acts as a good reservoir with a fair amount of Carbon sequestration potential.



# INTRODUCTION

Global climatic change in the atmosphere is mainly occurs due to the accumulation of Green House Gases (GHG's) such as Carbon dioxide, Methane, Nitrous Oxide, etc (Montagnini and Nair, 2004). One of the major steps carried out for the mitigation of global climatic changes occurring due to GHG's was "The Kyoto Protocol"- an international agreement which involves several countries and its commitment towards reduction in GHG's emission targets (UNFCC, 2014). According to which several countries have committed to reduce the GHG emissions by at least 18% below 1990 levels in the span of 2013-2020 and proudly, India is also a part to this agreement (UNFCC, 2014). Carbon dioxide is considered to be a dominant GHG as a result of fossil fuel combustion and deforestation (Nowak and Crane, 2002) due to various human activities.

***Corresponding author:*** **Prabha, S. J.,**
Environmental Health and Safety Research and Development Centre, Rajajinagar, Bengaluru- 560010, Karnataka, India.

In order to balance carbon dioxide levels in the atmosphere in a cost-effective manner, trees are considered to be a major sink of $CO_2$ (Gupta and Sharma, 2014). Trees offers double advantage by storing direct Carbon and maintaining climatic conditions through biogeochemical processes (Chavan and Rasal, 2012). Basically, there are three ways through which atmospheric $CO_2$ can be balanced: Carbon sequestration, Carbon conservation and Carbon substitution (Montagnini and Nair, 2004). Carbon sequestration is a process in which atmospheric carbon is removed and is stored within the reservoir (Ramachandran Nair *et al.,* 2009); in this case, tree biomass. Carbon conservation is a process which involves conservation of existing biomass whereas carbon substitution involves conversion of tree biomass into durable wood products which can also store carbon. Of these three, carbon conservation is considered to possess a greater potential in mitigating climate change followed by carbon sequestration (Montagnini and Nair, 2004). Absorption and storage of carbon from the atmosphere into the plant tissues assists in the growth of the plant (Chavan and Rasal, 2010). Generally, trees absorb carbon dioxide during photosynthesis and store carbon in their biomass as they grow which is released into the atmosphere after the death of the tree (Vishnu and Patil, 2017) and becomes a part of the food chain and gets converted to soil carbon after entering into the soil (Suryawanshi *et al.,* 2014). As the rate of photosynthesis increases the amount of Carbon di-oxide converted into biomass also increases; thus, reducing the amount of Carbon in the atmosphere and sequestering it in the tree above ground and below ground biomass and supporting the growth of the tree (Suryawanshi *et al.,* 2014). Hence, the role of trees in reduction of Green House Gases and mitigating the global climatic change is significant. Vegetation in the semi-arid regions usually contains species which are dormant during dry seasons and become active after the first rain (Huxman, 2004). Carbon fluxes in the semi-arid regions predominantly depend on the type of vegetation, temperature and frequency of precipitation (Huxman, 2004; Poulter *et al.,* 2014). The vegetation in the semi-arid regions during the summer season generally consists of leaves developed during the early growth stage which after the late precipitation enhances their Carbon sequestration capacity (Huxman, 2004). Before the rainfall, the storage of Carbon is seen in the above and below ground biomass of the tree. However, the canopy development after rainfall enhances the rate of Carbon accumulation (Huxman, 2004). Hence, the ecosystems in the semi-arid dry regions are generally low in productivity and storage of Carbon (Grünzweig *et al.,* 2007). On the other hand, several studies have confirmed that Carbon sequestration capacity of forest lands are usually high since the quantity of Carbon stored is 50% of their standing biomass. Therefore, forest lands act as a huge natural Carbon sink (Carmi *et al.,* 2017; Tripathi and Joshi, 2015). In this case, the dense forest vegetation in Western Ghats is known to act as an efficient Carbon sink when compared to the semi-arid dry vegetation found in Belagavi District of Karnataka. However, the Carbon sequestration potential of semi-arid dry vegetation is yet to be studied. Hence, the objective of the study is to estimate the amount of carbon sequestered by the trees in the semi-arid regions of Belagavi District.

**Study Area**

Ramdurga Taluk of Belagavi District falls in the Semi-arid dry zone experiencing hot and humid climate with scanty rainfall ranging from 550-650 mm (KFD, 2001). The climatic condition of the study area is characterized by general dryness throughout the year except during monsoon season (Ravikumar *et al.,* 2011). The climatic condition in the study area predominantly supports rainfed crops and horticulture crops such as Wheat, Jowar, Maize, Bajra, Groundnut, Sunflower, Sugarcane, Mango, Sapota, Papaya, Gua, etc. Crop failures in these semi-arid regions of the study area are commonly seen due to unpredictable and uneven rainfall pattern which leads to the scarcity of water (Ravikumar *et al.,* 2011). This in turn has led to the increase in the number of irrigation projects within the study area which improves the cropping pattern, yield and economic stability of the region. The successful outcome of such irrigation projects has increased industrialisation in the study area. Simultaneously the impact of industrialisation by means of pollution is a serious issue to be considered. The role of dry vegetation in the semi-arid regions of Belagavi District in sequestration of Carbon from atmosphere has been neglected as the state is rich in dense and evergreen forest vegetation of Western Ghats. Therefore, in order to reduce the emitted pollutants in the form of Green House Gases (GHG's) and understand the significance of semi-arid dry vegetation in carbon sequestration, the present study was carried out. Eight sampling locations namely Gudgoppa, M. Chandaragi, Korekoppa, Sopadla, Itnal, Hosur, Mugalihal and Godachi Reserve Forest of Ramdurga Taluk was considered for the study. These agricultural lands predominantly grow dry-land crops along with horticulture crops. Godachi Reserve Forest (1648.20 ha) is a Southern Tropical Thorn forest with dry vegetation and rocky boulders. Some of the commonly found tree species in the RF includes *Albizia amara, Anogessius latifolia, Chloroxylon Swetenia, Diospyrous melanoxylon, Pongamia pinnata* and *Eucalyptus sp*.

## MATERIALS AND METHODS

Selection of the sampling locations was done based on the vegetation in the prevailing land use pattern. The study was carried out by using quadrat method in the month of March 2017 to estimate the tree phyto-sociological parameters such as density, frequency, Importance Value Index (IVI), etc., Shannon - Weiner Diversity of trees and the amount of Carbon sequestered within the tree biomass. As a tree has the capacity of storing 50% of its biomass with Carbon, the amount of Carbon sequestered by the total biomass including above ground and below ground biomass is estimated. The survey was carried out by laying quadrats of size 100 m x 100 m at the selected locations to study the above ground vegetation and their features. Data collected from each location/quadrat in order to estimate the amount of $CO_2$ sequestered included:

A. *Tree height and Diameter at Breast Height (DBH):* the height of the tree is measured using Theodolite instrument[5]. DBH which is estimated by measuring Girth at Breast Height (GBH) at approximately 1.3 m above the ground level (Vishnu and Patil, 2017; Suryawanshi *et al.,* 2014).
B. *Estimation of Phyto-sociological parameters:* the phyto-sociological parameters such as basal area, density, frequency, diversity, dominance and IVI is estimated by using the following formulas (Curtis and McIntosh, 1950; Rao *et al,*2015):

$$\text{Basal area (cm}^2) = \pi r^2 = \pi\,(\text{GBH}/2)^2$$

$$\text{Density} = \frac{\text{Total number of Individuals in all sampling units}}{\text{Total number of sampling units studied}}$$

$$\text{Frequency} = \frac{\text{Number of sampling units in which species occur}}{\text{Total number of sampling units}} \times 100$$

$$\text{Relative Density} = \frac{\text{Density value of species}}{\text{Sum of density value of all species}} \times 100$$

$$\text{Relative Frequency} = \frac{\text{Frequency value of species}}{\text{Sum of frequency value of all species}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$$

IVI = Relative Density + Relative Frequency + Relative Dominance

C. *Shannon - Weiner Diversity:* species diversity and dominance of the vegetation was studied by estimating the Shannon's Diversity Index (H) by using the below formula (Spellerberg and Fedor, 2003);

$H = -\sum pi \ln pi$

D. *Above Ground Biomass (AGB) of the tree:* Tree biomass is estimated using non destructive method. AGB of the tree species includes entire shoot, branches, leaves, fruits and flowers and is calculated using tree height, DBH, volume and wood density. Wood densities of trees were collected from the website www.worldagroforesrtycentre.org. The following formula is used for the estimation of AGB (Gupta and Sharma, 2014);

AGB (Kg/tree) = Volume ($m^3$) x Wood Density (Kg/$m^3$)

E. *Below Ground Biomass (BGB) of the tree:* BGB of the tree species includes live root biomass of the trees excluding fine roots having diameter < 2mm. BGB of tree is calculated by multiplying AGB with 0.26 factors of root:shoot ratio (Gupta and Sharma, 2014).

BGB (Kg/tree) = AGB (Kg/tree) x 0.26

F. *Total Biomass (TB) of the tree:* Total biomass of the tree is the sum of Above Ground Biomass and Below Ground Biomass (Suryawanshi *et al.,* 2014; Nguyen, 2012; Pandya *et al.,* 2013).

TB (Kg/tree) = AGB (Kg/tree) + BGB (Kg/tree)

G. *Estimation of Carbon storage:* carbon storage of vegetation is estimated by using the following formulas (Suryawanshi *et al.,* 2014; Nguyen, 2012);

Carbon (Kg/tree) = 50% x TB (Kg/tree)
Carbon dioxide (Kg/tree) = 3.67 x Carbon (Kg/tree),

Where, 0.5 is a default conversion factor as 50% of its biomass is considered as Carbon.

# RESULTS AND DISCUSSION

### A. Estimation of phyto-sociological parameters

During the survey, 393 individuals belonging to 22 species were recorded. The study area was dominated with *Azadirachta indica* (n=141) and *Eucalyptus grandis* (n=72) followed by *Tectona grandis* (n=48). All the tree species recorded were common to the region. *Santalum album* is the only vulnerable tree species recorded in the study area. The details of the recorded tree species are given in Table 1. Study of phyto-sociological parameters such as dominance, frequency, relative frequency, density, relative density and IVI showed that of the 22 species, *Azadirachta indica* is widely spread across the study area (IVI- 117.3) followed by Eucalyptus grandis (IVI - 42.85) and *Tectona grandis* (IVI - 25.22) indicating that the area is experiencing dry, hot and humid climatic conditions. The phyto-sociological parameters of the recorded tree species are given in Table 2. Simultaneously, Shannon-Weiner Diversity of tree species at 8 locations was studied. Tree species of high diversity was found at Korekoppa with an index value of 0.86 followed by M. Chandaragi and Itnal with the index values being 0.77 and 0.71 respectively. However, species diversity at Godachi RF was very poor due to the plantation of *Eucalyptus grandis*. The Shannon - Weiner index values at Gudgoppa, Hosur, Sopadla and Hirekoppa kere was found to be 0.53, 0.65, 0.15 and 0.59 respectively.

### B. Estimation of carbon storage capacity of the vegetation

Carbon storage capacity of the vegetation was studied by estimating total biomass of the trees. The Total biomass of 393 trees in the entire study area was estimated to be 50.11 t/tree (Table 3). *Azadirachta indica, Eucalyptus grandis, Tamarindus indica, Acacia nilotica, Mangifera indica* are some of the dominant tree species with a greater biomass values. Of which, *Azadirachta indica* and *Eucalyptus grandis* followed by *Tamarindus indica* are the species with the highest total volume and biomass. The total volume and biomass of *Azadirachta indica* are 23.148 $m^3$ and 20125.141 Kg/tree respectively.

**Table 1. Biophysical measurements of tree species recorded in the study area.**

| Botanical name | Local Name | Family | GBH (m) | Height(m) | No. of trees |
|---|---|---|---|---|---|
| *Acacia auriculiformis* | Acacia | Fabaceae | 0.55 | 7 | 1 |
| *Acacia ferruginea* | Banni | Fabaceae | 2.66 | 19.50 | 3 |
| *Acacia leucophloea* | Bilijali | Fabaceae | 5.17 | 55.50 | 9 |
| *Acacia nilotica* | Karijali | Fabaceae | 16.64 | 145.50 | 26 |
| *Acacia suma* | Mugali | Fabaceae | 4.84 | 45.50 | 8 |
| *Azadirachta indica* | Bevu | Meliaceae | 90.26 | 900.50 | 141 |
| *Balanites roxburghii* | Ingalara | Zygophyllaceae | 7.73 | 80.50 | 16 |
| *Bauhinia purpurea* | Basavanapada | Fabaceae | 0.62 | 6.50 | 1 |
| *Cassia tora* | Gold Medallion | Fabaceae | 0.54 | 9.50 | 2 |
| *Cocos nucifera* | Thengu | Arecaceae | 2.65 | 23.00 | 3 |
| *Eucalyptus grandis* | Neelagiri | Myrtaceae | 43.60 | 494.00 | 72 |
| *Hardwickia binata* | Kamara | Caesalpinaceae | 2.31 | 21.00 | 3 |
| *Mangifera indica* | Mavu | Anacardiaceae | 9.48 | 112.00 | 20 |
| *Melia dubia* | Hebbevu | Meliaceae | 3.00 | 15.50 | 2 |
| *Morinda tinctoria* | Maddi | Rubiaceae | 2.50 | 19.50 | 3 |
| *Phoenix sylvestris* | Echalu | Arecaceae | 0.26 | 3.00 | 1 |
| *Pongamia pinnata* | Honge | Fabaceae | 0.40 | 6.50 | 1 |
| *Santalum album* | Srigandha | Santalaceae | 1.94 | 29.50 | 6 |
| *Simarouba glauca* | Paradise tree | Simaroubaceae | 0.65 | 7.00 | 1 |
| *Tamarindus indica* | Hunase | Fabaceae | 7.22 | 36.50 | 5 |
| *Tectona grandis* | Tega | Lamiaceae | 19.34 | 268.00 | 48 |
| *Ziziphus mauritiana* | Bore/Elchi | Rahmnaceae | 13.26 | 135.00 | 21 |
| Total | | | | | 393 |

**Table 2. Phyto-sociological parameters of tree species recorded in the study area**

| Botanical name | Relative Dominance | Frequency | Relative Frequency | Density | Relative Density | IVI |
|---|---|---|---|---|---|---|
| *Acacia auriculiformis* | 0.0034 | 12.50 | 1.72 | 0.125 | 0.25 | 1.98 |
| *Acacia ferruginea* | 0.0306 | 25.00 | 3.45 | 0.375 | 0.76 | 4.24 |
| *Acacia leucophloea* | 0.2755 | 62.50 | 8.62 | 1.125 | 2.29 | 11.19 |
| *Acacia nilotica* | 2.2996 | 75.00 | 10.34 | 3.250 | 6.62 | 19.26 |
| *Acacia suma* | 0.2177 | 37.50 | 5.17 | 1.000 | 2.04 | 7.43 |
| *Azadirachta indica* | 67.6293 | 100.00 | 13.79 | 17.625 | 35.88 | 117.30 |
| *Balanites roxburghii* | 0.8708 | 25.00 | 3.45 | 2.000 | 4.07 | 8.39 |
| *Bauhinia purpurea* | 0.0034 | 12.50 | 1.72 | 0.125 | 0.25 | 1.98 |
| *Cassia tora* | 0.0136 | 12.50 | 1.72 | 0.250 | 0.51 | 2.25 |
| *Cocos nucifera* | 0.0306 | 37.50 | 5.17 | 0.375 | 0.76 | 5.97 |
| *Eucalyptus grandis* | 17.6345 | 50.00 | 6.90 | 9.000 | 18.32 | 42.85 |
| *Hardwickia binata* | 0.0306 | 37.50 | 5.17 | 0.375 | 0.76 | 5.97 |
| *Mangifera indica* | 1.3607 | 25.00 | 3.45 | 2.500 | 5.09 | 9.90 |
| *Melia dubia* | 0.0136 | 25.00 | 3.45 | 0.250 | 0.51 | 3.97 |
| *Morinda tinctoria* | 0.0306 | 12.50 | 1.72 | 0.375 | 0.76 | 2.52 |
| *Phoenix sylvestris* | 0.0034 | 12.50 | 1.72 | 0.125 | 0.25 | 1.98 |
| *Pongamia pinnata* | 0.0034 | 12.50 | 1.72 | 0.125 | 0.25 | 1.98 |
| *Santalum album* | 0.1225 | 25.00 | 3.45 | 0.750 | 1.53 | 5.10 |
| *Simarouba glauca* | 0.0034 | 12.50 | 1.72 | 0.125 | 0.25 | 1.98 |
| *Tamarindus indica* | 0.0850 | 37.50 | 5.17 | 0.625 | 1.27 | 6.53 |
| *Tectona grandis* | 7.8375 | 37.50 | 5.17 | 6.000 | 12.21 | 25.22 |
| *Ziziphus mauritiana* | 1.5002 | 37.50 | 5.17 | 2.625 | 5.34 | 12.02 |

**Table 3. Volume, above and below ground biomass of tree species recorded in the study area**

| Botanical name | Total Volume ($m^3$) | Wood Density (g/cm3) | AGB (kg/tree) | BGB (kg/tree) | Total Biomass (Kg/tree) |
|---|---|---|---|---|---|
| *Acacia auriculiformis* | 0.086 | 0.58 | 49.762 | 12.938 | 62.700 |
| *Acacia ferruginea* | 0.991 | 0.88 | 871.895 | 226.693 | 1098.588 |
| *Acacia leucophloea* | 0.973 | 0.76 | 739.759 | 192.337 | 932.096 |
| *Acacia nilotica* | 3.831 | 0.76 | 2911.412 | 756.967 | 3668.379 |
| *Acacia suma* | 0.880 | 1.21 | 1064.483 | 276.766 | 1341.249 |
| *Azadirachta indica* | 23.148 | 0.69 | 15972.334 | 4152.807 | 20125.141 |
| *Balanites roxburghii* | 1.971 | 0.95 | 1396.800 | 363.168 | 1759.968 |
| *Bauhinia purpurea* | 0.101 | 0.67 | 67.830 | 17.636 | 85.465 |
| *Cassia tora* | 0.028 | 0.74 | 20.874 | 3.056 | 14.809 |
| *Cocos nucifera* | 1.060 | 0.69 | 728.181 | 189.327 | 917.508 |
| *Eucalyptus grandis* | 8.112 | 0.63 | 5110.287 | 1328.675 | 6438.962 |
| *Hardwickia binata* | 0.508 | 0.73 | 370.722 | 96.388 | 467.109 |
| *Mangifera indica* | 4.053 | 0.59 | 2391.425 | 621.771 | 3013.196 |
| *Melia dubia* | 1.524 | 0.4 | 609.714 | 158.526 | 768.240 |
| *Morinda tinctoria* | 0.589 | 0.48 | 282.856 | 73.543 | 356.398 |
| *Phoenix sylvestris* | 0.008 | 0.63 | 5.177 | 1.346 | 6.523 |
| *Pongamia pinnata* | 0.042 | 0.62 | 26.126 | 6.793 | 32.919 |
| *Santalum album* | 0.137 | 0.936 | 117.594 | 30.574 | 148.168 |
| *Simarouba glauca* | 0.120 | 0.44 | 52.726 | 13.709 | 66.435 |
| *Tamarindus indica* | 4.288 | 0.75 | 3216.012 | 836.163 | 4052.175 |
| *Tectona grandis* | 2.314 | 0.55 | 1487.370 | 386.716 | 1874.086 |
| Total Biomass(Kg/tree) | | | | | 50114.831 |
| Total Biomass (t/tree) | | | | | 50.1148311 |

**Table 4. Carbon sequestration of tree species recorded in the study area**

| Botanical name | C (t/tree) | $CO_2$ (t/tree) | Total $CO_2$ (tonnes) |
|---|---|---|---|
| *Acacia auriculiformis* | 0.031 | 0.115 | 0.115 |
| *Acacia ferruginea* | 0.549 | 2.016 | 6.048 |
| *Acacia leucophloea* | 0.466 | 1.710 | 15.394 |
| *Acacia nilotica* | 1.834 | 6.731 | 175.018 |
| *Acacia suma* | 0.671 | 2.461 | 19.690 |
| *Azadirachta indica* | 10.063 | 36.930 | 5207.078 |
| *Balanites roxburghii* | 0.880 | 3.230 | 51.673 |
| *Bauhinia purpurea* | 0.043 | 0.157 | 0.157 |
| *Cassia tora* | 0.007 | 0.027 | 0.054 |
| *Cocos nucifera* | 0.459 | 1.684 | 5.051 |
| *Eucalyptus grandis* | 3.219 | 11.815 | 850.716 |
| *Hardwickia binata* | 0.234 | 0.857 | 2.571 |
| *Mangifera indica* | 1.507 | 5.529 | 110.584 |
| *Melia azadirachta* | 0.384 | 1.410 | 2.819 |
| *Melia dubia* | 0.178 | 0.654 | 1.962 |
| *Morinda tinctoria* | 0.003 | 0.012 | 0.012 |
| *Phoenix sylvestris* | 0.016 | 0.060 | 0.060 |
| *Pongamia pinnata* | 0.074 | 0.272 | 1.631 |
| *Santalum album* | 0.033 | 0.122 | 0.122 |
| *Simarouba glauca* | 2.026 | 7.436 | 37.179 |
| *Tamarindus indica* | 0.937 | 3.439 | 165.070 |
| *Tectona grandis* | 1.442 | 5.293 | 111.162 |
| Total (t/tree) | 25.05 | 91.96 | 6764.167 |

Similarly, the total volume and biomass of *Eucalyptus grandis* are 8.112 $m^3$ and 6438.962 Kg/tree respectively. The total organic Carbon sequestration capacity of 393 trees was estimated to be 25.05 t/tree (Table 4) with *Azadirachta indica* and *Eucalyptus grandis* having the highest carbon storage potential of 10.063 t/tree and 3.219 t/tree respectively. The total Carbon di-oxide sequestration of the trees in the study area was estimated to be around 6764.16 tonnes.

**Conclusion**

The study area is predominantly covered with clay, red, black cotton soils and gravelly lateritic soils with rocky strata which have a severe impact on the vegetation type and its growth. However, the soil types have moderate to good infiltration characteristics which supports sparse vegetation with stunted growth. In contrary with the dense evergreen vegetation predominantly found in the Western Ghats of the Karnataka, the semi-arid dry vegetation of the study area also acts as a good reservoir with a fair amount of Carbon sequestration potential. The total Carbon sequestration of trees depends on the frequency of occurrence of an individual tree species and its total biomass. Larger the biomass and higher the occurrence of tree species, larger the capacity of the tree to sequester $CO_2$. *Azadirachta indica* and *Eucalyptus grandis* are found in large numbers in the study area with a fair biomass and thus proves to be efficient reservoirs for storage of Carbon. From the study, *Acacia nilotica, Tectona grandis, Ziziphus mauritiana* and *Mangifera indica* also proved to possess significant Carbon storage capacity. However, the estimated amount of $CO_2$ sequestered by *Tamarindus indica* was found to be lower in spite having a greater biomass compared to other tree species as the number of individuals (n=5) was considerably lower. Hence, long living and fast growing trees are considered to be efficient reservoirs (sink) for storage of Carbon di-oxide. On the other hand, incorporation of trees in croplands is predominantly seen in the study area which is an exceptionally great way to enhance Carbon sequestration as the Carbon is stored in their above and below ground biomass. Thus, trees play a vital role in reducing atmospheric carbon di-oxide levels and balancing the climatic conditions. The study also concludes that the vegetation of semi-arid regions of Belagavi District also contributes a major role in sequestration of carbon from the atmosphere.

**Acknowledgement**

The authors are grateful to Shri. Shivanand M. Dambal, Chandana S. Dambal, Madhu Kumar C and Praveena Kumari H. N of Environmental Health and Safety Research and Development Centre for their continual encouragements and support throughout the study. The authors also thank Shri. Santhosh B. Kadkol for his invaluable contribution during field studies.

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