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Research Article

SEQUESTERED STANDING CARBON STOCK IN TREE SPECIES GROWN IN ANANTRAO THOPTE COLLEGE, BHOR, DIST –PUNE, MAHARASHTRA

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ABSTRACT

Carbon sequestration through forestry is based on two processes; firstly carbon dioxide is an atmospheric gas which circulates globally. Secondly, green plants trap atmospheric CO_2 in the process of photosynthesis and utilize it for making carbohydrates (sugar) and other organic compounds required for growth and metabolism. The increasing trend to change the land use patterns will result into lower value of carbon sinks. Conversion to agricultural land and pasture, logging operations and urbanization are some of the main pressures on forestry. The forests play a double role in relation to carbon sinks. Firstly forests prevent the emission of carbon by decomposition of its biomass. Secondly deforestation contributes to 30% of the current global emissions.

Carbon sequestrated by 32 tree species in Anantrao Thopte College campus were calculated. Bottle palm (*Roystonea regia)* 12 trees sequestrated 425.29 tons, Kasod (*Cassia siamea*) 6 trees 256.02 tons, Vad (*Ficus benghalensis*) having single big tree 215.08 tons Chinch (*Tamarindus indica)* one tree 150.19 tons, Subhabul (*Laucenea laquitifolia*) 10 trees 134.15 m/ton. Similarly lower Asana (*Bridelia retusa*) single tree 1, 15 tons, Sone khair (*Acacia polycantha*)1.15 tons. Jambhul, (*Syzygium cuminii*) two trees 1.30 tons, Silver oke (*Grevillea robusta*) one tree 2.95 tons. This is a pilot work of carbon sequestration of college campus and it is essential to promote in other college campus flora and their carbon sequestrated by plantation or original old trees in the campus.

Key words: *College Campus, Bhor, Carbon Sequestration of Tree Species*

INTRODUCTION

Developmental activities and increased transportation activities are increasing the concentration of air pollutants as greenhouse gases, especially CO2. These are leading to increased atmospheric temperature through the trapping of certain wavelengths of heat radiation in the atmosphere. The increasing carbon emission is of major concerns; it has been well addressed in Kyoto protocol (Ravindranath *et. al.,* 1997). Tree, shrub, soil and sea water play crucial role in absorbing atmospheric carbon dioxide. The trees act as major CO2 sink which captures carbon from the atmosphere and acts as sink, stores the same in the form of fixed biomass during the growth process. Therefore growing trees in urban areas can be a potential contributor in reducing the concentration of CO2 in atmosphere by its accumulation in the form of biomass.

As trees grow and their biomass increases, they absorb carbon from the atmosphere and store in the plant tissues (Mathews *et. al.,* 2000) resulting in growth of different parts. Active absorption of CO2 from the atmosphere in photosynthetic process and its subsequent storage in the biomass of growing trees or plants is the carbon storage (Baes *et al.,* 1977). In terms of atmospheric carbon reduction, trees in urban areas offer the double benefit of direct carbon storage and stability of natural ecosystem with increased recycling of nutrient along with maintenance of climatic conditions by the biogeochemical processes

India has rich biodiversity due to different climatic conditions. It has direct effect on carbon sequestration, more than 116 millions tones of CO_2 per year is sequestered contributing to reduce atmospheric carbon (SFR, 2009). The living vegetation, sea water and soils play a key role in absorbing atmospheric CO_2. The trees act as a major sink of CO_2. The green trees have high potential of tapping atmospheric carbon through photosynthesis. The sequestrated carbon is stored in the plant tissues which results in the growth (Mathews *et al*., 2000).

Recent trend of estimation of biomass is by using carbon pool present in virgin vegetation preserved on religious ground. In this respect, Somjaichi rai at village Nandhur from Bhor region was estimated for carbon sequestration (Hangarge *et al.,* 2012). Kulkarni and Kulkarni (2013) carried out carbon sequestration of Kalamviria sacred grove. Warran and Patwardhan (2001) carried out carbon sequestration work in and around Pune city. Chavan and Rasal (2010) sequestrated carbon from selected tree resources grown in Dr. Babasaheb Ambedkar Marathwada University campus. Aurangabad. Hamed *et al.,* (2013) conducted research on carbon sequestration at Pune university campus with special reference to geographical information system (GIS) . This indicates that cabon pool in university or colleage campus is essential in environmental point of view. In this respect Ananthrao Thopte College Bhor was selected for Green audit purpose and counted tree species grown in the campus. Rajgad Dnyanpeeth was established in 1972 and the college campus was established in the year 1982 by Hon. President- Anantrao Thopte under Rajgad Dnyanpeeth. The green audit of the college represents a first in our efforts to create environmental sustainability on the campus. The audit was conducted by a team of Maharashtra Vriksha Samvardhini, Pune and staff of Aanatrao Thopte college, Bhor.

Rapid environmental degradation at local, regional and college level needs to be stopped. Anantarao Thopate College, Bhor is deeply concerned and unconditionally believes that there is an urgent need to address this fundamental problem and reverse the trends. We deeply subscribe to the fact that human should be stewards of Mother nature and that we all have a profound responsibility to protect Earth's resources in proper manner.

MATERIALS AND METHODS

A) Study Area

We conducted floral survey at different sites like playground and vermicomposting site, in this 28 plants were documented like trees, shrubs, herbs, climbers and grasses. Play ground cover with herbs and grasses. New ladies hostel has more than 35 plants which are ornamentals, palms, tree, herbs, etc. College campus surrounded with some old trees and new plantations are also documented

B) Carbon footprint & Carbon sequestration

The increasing Concentration of carbon dioxide and other greenhouse gasses (GHGS) in the atmosphere is now widely recognized as the leading cause of global warming. To reduce the GHGS in the atmosphere due to the anthropogenic emission of carbon dioxide and to create or promote carbon sink in the biosphere.

The data of tree resources from the campus collected includes, girth of tree at breast height, and height of the tree. Based on the data collection equation was used to calculate carbon sequestration of the tree resources.

C) Sampling strategy

The random sampling method was used for sampling the above ground vegetation. The method is versatile, cost-effective and applicable to baseline as well as project scenario. Using different approaches such as allometric functions to calculate the biomass and extrapolating the value to per hectare and for the total project area. The following parameters were measured for estimating the above-ground biomass pool.

1) Tree Height and Diameter at Breast Height (DBH):

To estimate biomass of different trees, non-destructive method was used. The biomass of tree was estimated on the basis of DBH and tree height. DBH can be determined by measuring tree Girth at Breast Height (GBH), approximately 1.3 meter from the ground. The GBHs of trees having diameter greater than 10 cm were measured directly by measuring tape. The tree height was measured following the method suggested (16).

2) Above ground biomass (AGB) of trees:

The above ground biomass of tree includes the whole shoot, branches, leaves, flowers, and fruits. It is calculated using the following formula. (3, 34)

AGB kg = volume of tree (m^3) x wood density Kg/m^3

$V = \pi r^2 H$

V= volume of the cylindrical shaped tree in m^3

r = radius of the tree in meter
Radius of the tree is calculated from GBH of tree.
3) Belowground biomass (BGB) of tree:
The belowground biomass (BGB) includes all biomass of live roots excluding fine roots having < 2 mm diameter (34). The belowground biomass has been calculated by multiplying the above ground biomass (AGB) by 0.26 factors as the root: shoot ratio (10). Belowground biomass (BGB) kg/tree or ton/tree = aboveground biomass (AGB) kg/tree or ton/tree x 0.26.

RESULTS AND DISCUSSION

Total carbon sequestrated by each tree species. Bottle palm (*Roystonea regia)* 12 trees sequestrated 425.29 tons, Kasod (*Cassia siamea*) 6 trees 256.02 tons and Vad (*Ficus benghalensis*) having single big tree 215.08 tons Chinch (*Tamarindus indica)* one tree 150.19 m/ tons, Subhabul (*Laucenea laquitifolia*) 10 trees 134.15 m/ton. Similarly lower Asana (*Bridelia retusa*) single tree 1, 15 tons, Sone khair (*Acacia polycantha*)1.15 tons. Jambhul, (*Syzygium cuminii*) two trees 1.30 tons, Silver Oke (*Grevillea robusta*) one tree 2.95 tons, this shows that campus trees sequestrated good biomass of carbon. Table of carbon sequestration attached.

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