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ASSESSMENT OF CARBON SEQUESTRATION OF DURGAWADI SACRED GROVE FROM JUNNAR TEHASIL

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ABSTRACT: Carbon sequestration is the process of transferring CO2 from the atmosphere into the soil, plants or plant residues, and other organic solids, which are stored or retained in the unit as part of the soil organic matter. Retention time of sequestered carbon in the soil (terrestrial pool) can range from short-term (not immediately released back to the atmosphere) to long-term (millennia) storage. Western ghats are one of the Mega biodiversity centers in the world and second in India. In the present work, I studied the carbon sequestration potential of the Durgawadi Sacred grove from Junnar Tehasil. It is situated in North-western Ghats in the state of Maharashtra. According to the recorded data from the Durgawadi sacred grove field survey plateau tree cover plants are Memecylon umbellatum, Olea dioica, Syzygium cumini, Xantolis tomentosa, Atalantia racemosa, Diospyros montana, and Gnidia glauca, Memecylon umbellatum and Actinodaphne angustifolia are the most dominant species in terms of carbon sequestration. Durgawadi plateau covers floristic composition present but this plant vegetation is in the form of herb, shrub, tree and these vegetation plant species numbers are 360 in which I am focusing only Durgawadi sacred grove. In this sacred grove above mention plant species were found. These species contribute 106.4 tonnes of biomass per hector for this site. Thus the total biomass contribution by these dominant species in the Durgawadi Sacred grove for the total area of 10.3 ha is 5728.1714 tons.

KEYWORD: Carbon Sequestration, Western Ghats, Durgawadi Sacred Grove, Biomass.

INTRODUCTION

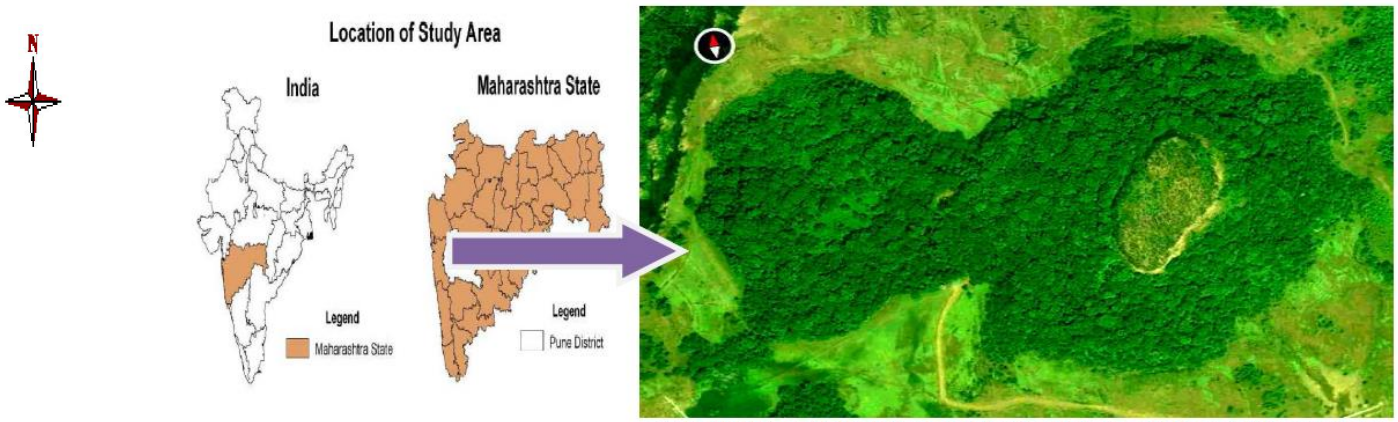
Carbon sequestration is a biological processes. It involves removing carbon from the atmosphere and depositing it in a reservoir like forest trees. Trees play an important role as carbon sink, during physiological process of photosynthesis, the atmospheric CO_2 is taken by the leaves of trees for the manufacture of food in the form of carbohydrates, proteins, lipids and their combinations thereof like starch, lignin, hemicelluloses; amino acids, proteins etc, and is diverted to other tree parts for disposal and storage. **(Dey et al., 2010), (Archana et al., 2012)** to prevent their release into the environment . Biomass and soil carbon are the two major carbon pools play a major role in living and dead plants. **(Hamed et al., 2013)..** The terrestrial forest trees have large accesses to store a sequestered carbon **(David et al. 2001).** Biomass is calculated using density of stems, height of the trees and basal area of the trees in a given location. Therefore, accurate biomass estimation is necessary for better understanding impacts of deforestation on release of carbon compounds responsible for global warming and environmental degradation. Forests sequester and store more carbon than any other terrestrial ecosystem(**Jagiwala et al., 2012; Lal et al., 2000; Annissa et al., 2013).** The prominent role of evergreen forests in carbon storage and sequestration has increased their importance several fold and brought them to the centre-stage of climate change mitigation

strategies (**Pandey et al., 2011)**. Significant amount of biomass and total organic carbon sequestered in standing trees in the campus Dr. B. A.M. University, Aurangabad was observed by estimation using non destructive method **by B. L. Chavan et al., 2010**. Carbon sequestration study which is a baseline database, can be used for different research and management purposes by the forest departments **(Kale et al., 2010; Ravindranath, Ostwald, 2008).** In India two mega biodiverse ecosystems are the Himalayas and Western Ghats, especially the Northern Western Ghats (**Savita et al., 2014)**. Carbon dioxide (CO_2) is one of the abundant greenhouse gas which causes global warming (**Jagruti Jagiwala et al., 2012).** Forests, water bodies and soil are the major sinks accumulating carbon compounds like CO_2 **(Archana et al., 2012)**.

The study demonstrates the carbon sequestration potential of ecosystems in Durgawadi Sacred grove.

Durgawadi Sacred Grove forest area

The Durgawadi is one of the largest and florally rich basalt outcrops in Pune District; located 30km from Junnar (INDIA) at the south-west corner in Junnar Taluka between **$19^0$21'96.08"N & $73^0$64'93.57"E** with an elevation that ranges from **1037–1156 m (MSL).** It has a semi-evergreen composition of Western ghats which is one of the mega biodiversity center in the world and second in India. It is situated in North-western Ghats in the state of Maharashtra. In the present survey of carbon sequestration potential of Durgawadi Sacred grove from Junnar Tehasil; *Memecylon umbellatum, Olea dioica, Syzygium cumini, Xantolis tomentosa, Atalantia racemosa, Diospyros montana, Gnidia glauca, Memecylon umbellatum* and *Actinodaphne angustifolia* are the most dominant species of trees found in this region, in terms of carbon sequestration. Besides this the region is rich in *Rubia cordifolia, Sonerila scapigera, Habenaria foliosa* and *Cynoglossum amabile*. The vegetation is mainly composed *Memecylon umbellatum* and *Atalantia racemosa* with infrequent occurrence of *Gnidia glauca* and *Actinodaphne angustifolia.* The average plant height is 3m These species contribute 556.13314 tonnes biomass per hectare and the total biomass contribution for the total area of 10.3 ha is 5728.1714 tons.



STUDY AREA- DURGAWADI SACRED GROVE FROM JUNNAR TEHASIL

Materials and Methods:

Study area- Durgawadi Sacred Grove From Junnar Tehasil includes 10.3 hectare, out of that almost 90 % is covered by Semi-Evergreen forest.

Data Collection- Extensive and repeated field surveys were carried out from 2015-2016 at both the locations to cover all the seasons of the year.

Visit to study area each season and take sample and readings like measure plant height , girth , take soil sample and analysis in laboratory Department of Botany, New Arts, Commerce and Science College, Ahmednagar.

1. **Methodology (Sampling Technique)**

Trees and lianas were sampled mostly by quadrate method . Both these are area-limited surveys. A line transect of 30m×30m was laid in each vegetation type.

Biomass carbon = (aboveground biomass carbon + belowground biomass carbon + dead organic matter carbon + Soil carbon). **(Hamed et al., 2013).**

2. **Estimation of carbon stock-**

Carbon pools are

A. Above Ground Biomass was estimated by the method of Chavan et al., (2010)

1.Size of plot - 30m X 30m for above ground biomass

2.Counting and marking of trees and measurement of each tree for height, GBH (Girth at Breast Height).

3.Density of wood referred from world agroforestry database of wood density.

4.Height of tree is measured using Abney level.

5.Volume of tree trunk calculated from = 2 π r l . **(Lal and Singh, 2000)**

6.Biomass of tree = volume X density.

B. Below Ground Biomass

Standard root to shoot ratio is used for estimation for underground biomass measurement. A review by Cairns et al. (1997), covering more than 160 species from tropical, temperate and boreal forests, estimated a mean root to shoot ratio of 0.26 with a range of 0.18-0.30. **Root Biomass = 0.26 X above ground biomass.** Amount of Carbon present is 50 % of biomass.

Soil Organic Carbon

1.Wet digestion or titrimetric determination as per Walkly and Black Method **(Walkly, Black, 1934; Tunstall, 2010)**

2.Soil bulk density is measured to calculate the volume and total soil carbon.

3.Soil samples were collected at two depths 15cm and 30cm.

C. Dead Organic Matter A – Leaf litter and Deadwood

1.Standing and deadwood biomass calculated as per above ground and below ground biomass.

2.Leaf litter biomass calculated by litter stock change method. leaf litter collected dry weight measured.

Results

It has been observed that the standing biomass of the above ground wooded parts of the trees and below part like organic soil analysis in Durgawadi Sacred Grove,

for the total area of of 10.3 ha was 5728.1714 tons. The average carbon sequestrated in Durgawadi Sacred Grove was **556.13314 ton/ha**.

Table no. 1 show quadrates studied at random plant number quadrate . It can be seen that in quadrate no. 07 was having maximum trees i.e 232 and hence maximum carbon of nearly 64 tons/ha. as seen in table no. 02.

Observation table No. 01	
Quadrate	Random Plant Number Quadrate Wise
Q1 -	94
Q2-	90
Q3-	96
Q 4-	119
Q 5-	193
Q 6-	205
Q7 -	232
Q8-	212

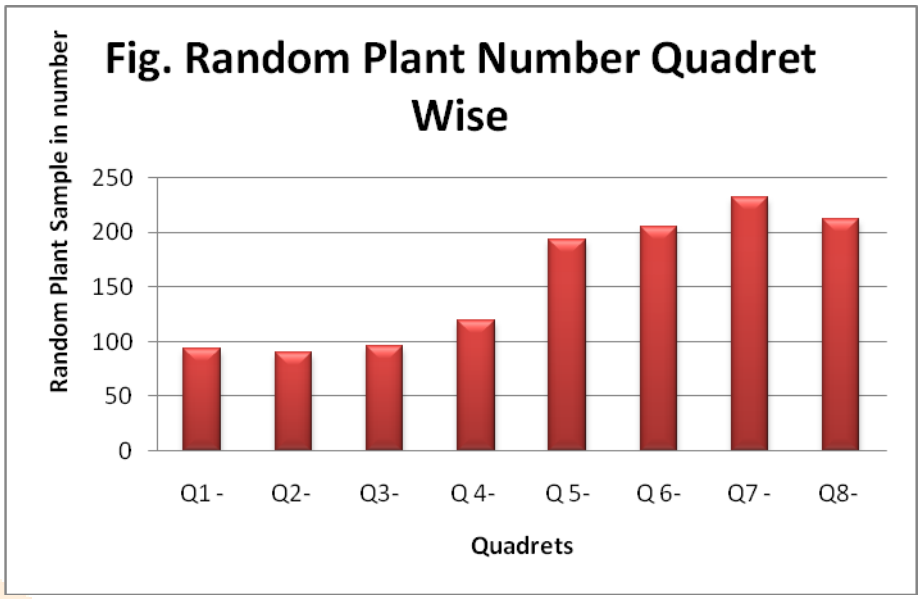
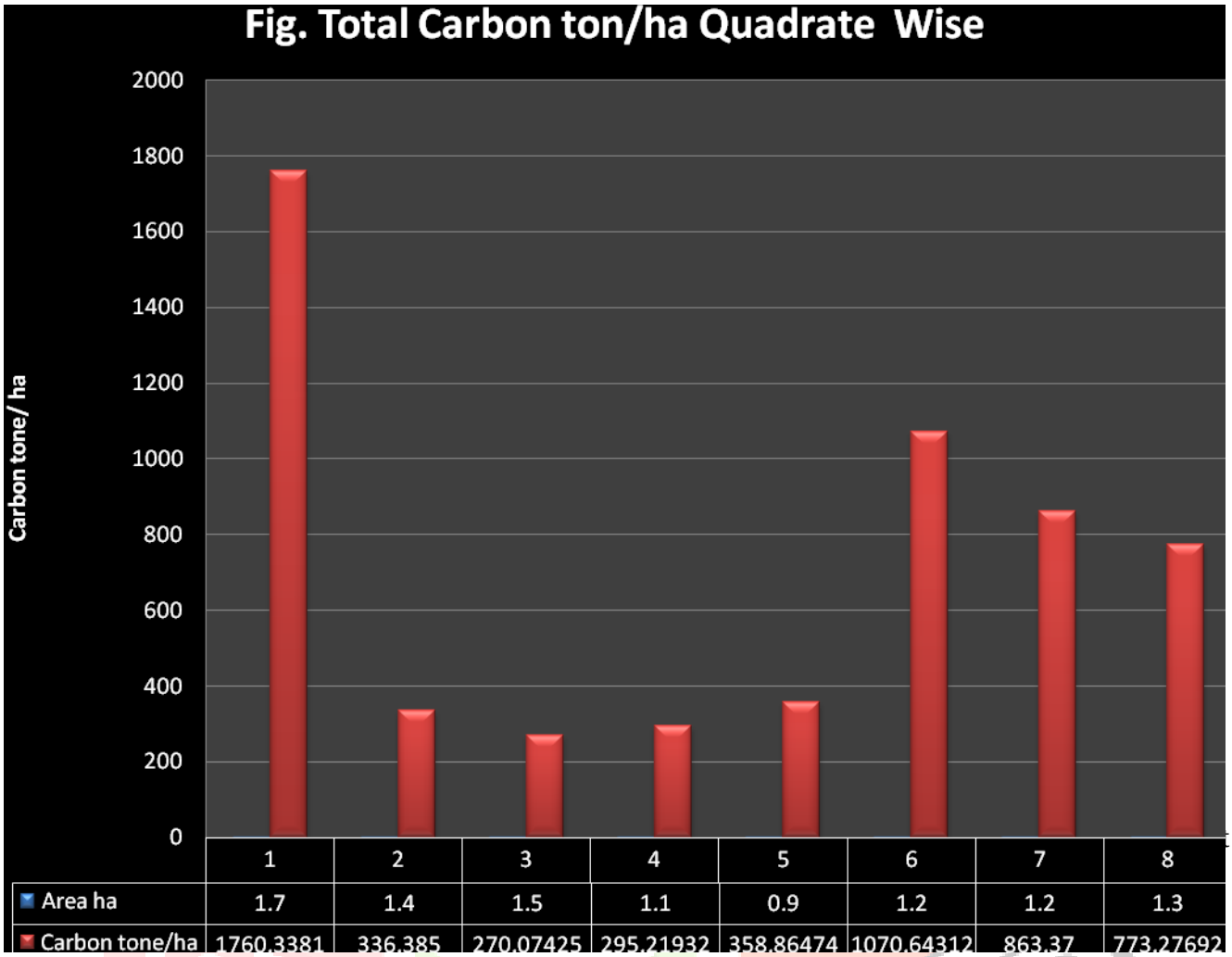


Table No. 02

Total carbon tone/ hectare								
	AGC tone/ha	Leaf Litter c/ha	SOC at 15 cm. tons/ha	SOC at 30 cm. tons/ha	Total C tons/ha	Area (ha)	Carbon tons/ha	Carbon tones/ha
Q 1	1020.86	4.794	3.254	6.585	1035.493	1.7	1760.3381	?
Q 2	173.58	3.948	56.97	5.777	240.275	1.4	336.385	?
Q 3	171.43	4.14	0.4805	3.999	180.0495	1.5	270.07425	
Q 4	205.76	3.1812	2.76	56.68	268.3812	1.1	295.21932	
Q 5	383.4	2.5056	3.095	9.738	398.7386	0.9	358.86474	**556.13314**
Q 6	881.83	3.3696	2.534	4.469	892.2026	1.2	1070.64312	
Q 7	650.6	3.384	1.503	63.988	719.475	1.2	863.37	
Q 8	553.93	3.7284	32.25	4.92	594.8284	1.3	773.27692	
						10.3	**5728.1714**	
Q- Studied Quadrates								
AGC- Above Graound Biomass								
SOC - Soil Organic Carbon at 15 cm. and at 30 cm.								



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Conclusions

Trees that are good in carbon sequestration can go a long way in mitigating effects of climate change. These studies of Durgawadi Sacred Groves forest area, highlight the need for focusing on conservation of forest areas and its ecological value. Random sampling was used to collect different variables since it was the most versatile and scientific method for estimating above ground biomass. All the terrestrial carbon pools were measured step by step.

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