

ESTIMATION OF CARBON STORAGE IN *Mitragyna parviflora* HERITAGE TREE SPECIES OF PURNA WILDLIFE SANCTUARY OF DANGS DISTRICT OF VIBRANT GUJRAT

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ABSTRACT

Trees are standing cylindrical bio-volume on any land in ecosystem. Many previous researches confirmed that, the photosynthesis is the unique mechanism through which plants respire and store the carbon in their different organs viz. shoots, branches, twigs, leaves, flowers, trunk and roots in form of above and below ground biomass. In this study we are putting carbon storage potential in *Mitragyna parvifolia* in Purna wildlife Sanctuary (PWLS) of Dangs District. Its girth is 410 cm and height is 41.0 meter, marked by Gujarat Forest Department. Carbon storage present species is estimated by non-destructive method. We found the 103.7 tonne of carbon and $\sim 3.795 \times 10^4$ tonne CO₂ sequestered in *Mitragyna parvifolia*.

KEYWORDS : Ecosystem, Purna wildlife sanctuary, carbon storage

Forests ecosystems play a crucial role in global carbon cycling acting as sink and source. Forest form an active carbon pool that accounts for 60 percent of carbon storage in the earth's land surface by Wilson and Daff, (2003). According to some workers, the tropical forest both moist and dry types, accounts for approximate 60% of global forests (Shah,1978).

Photosynthesis is the light dependent mechanism in which plants leaves capture the CO₂ from atmosphere in form of organic carbon and store in tissue's of plant body. Carbon is the foundation of life. There are four major pools of carbon through which it flows in ecosystem, these are above ground biomass, below ground biomass, forest floor and soil organic carbon. There are two main objective of the present study; 1. To estimate above and below ground green weight and dry weight, 2. Calculate the carbon storage of *Mitragyna parviflora*. This species is recorded as a heritage and tallest species type of Rubiaceae family of Gujarat State due to its girth, height and quality of trunk. Species is marked by Gujarat Forest Department (Singh,2008).

STUDYAREAS

Purna wildlife sanctuary is situated in 'The Dangs' District of Gujarat State. The sanctuary is spread over an area of 160.8 km². The sanctuary is located between parallels of latitude 20°54' 15" North and 21°31' 22" North and the longitude between 73°32' 20" East and 73°48' 30" East. It is situated in ranges of Sahyadri or Western Ghats 5B Bio-geographic region as classified by Rodgers et al., (2000) and Pearson(2005).

Forest types of Purna wildlife sanctuary belongs to South Indian Tropical Moist Deciduous Forests (3A/C1). The sanctuary is very rich in floral biodiversity. It has 551 floral species diversity. Forest area possess other species like *Tectona grandis* (dominant species), *Adina cordifolia*, *Milliusa tomentosa*, *Wrightia tinctoria*, *Terminalia crenulata*, *Dendrocalamus stricticus*, *Diospyros melanoxylon*, *Garuga pinnata*, *Largestromia lanceolaria*, *Lannea coromandellica*, *Oogenia oogenensis*, *Anogeissus latifolia* etc. tree species. *Mitragyna parviflora* (species objective) is located in compartment no.53, of Purna wildlife sanctuary (Fig.,1).

MATERIALS AND METHODS

Mitragyna parviflora belongs to Rubiaceae family of plants. This is a dry deciduous (Habitat) white (turns in yellow) flower producing and 8-15 meter height gaining tree species with grey smooth bark exfoliating in small scales. Data of girth and height is collected from secondary information's 'Heritage trees of Gujarat' by Singh, (2010). Its girth is 410 cm (161.41 inches) and height is 41.0 meter (131.51feet).

Above Ground Weight

Above ground weight is calculated from following equation:

$$W = 0.15 D^2 * \text{Height}$$

Where, W= above ground tree weight (Pounds)

D= Diameter of trunk in inches

H= Height of the tree in feet

$$W = 0.15 * (161.41)^2 * 131.51$$

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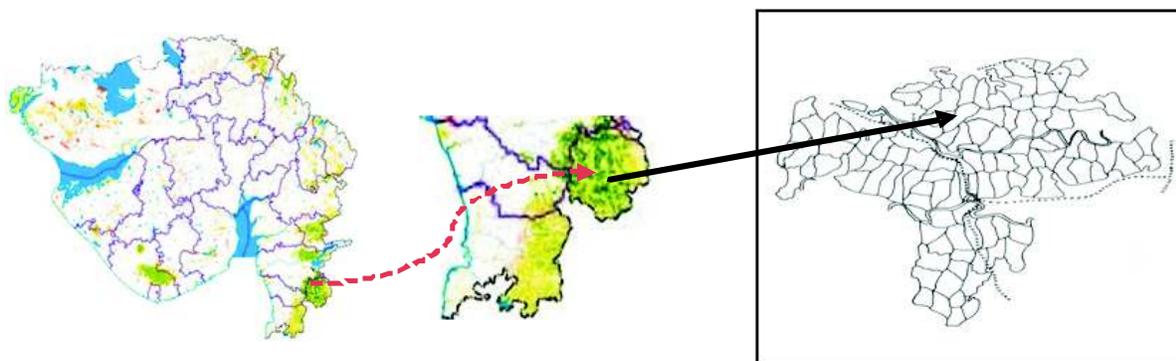


Figure 1: (1) Forest cover map of Gujarat. Source: Forest Survey of India, 2009. Map: (2) The Dangs District, Purna wildlife sanctuary. Source: Boundary map of Purna wildlife Sanctuary, www.encyclopedia.org, Arrow represents the location of current species

W= 525557.94 lbs.

The root systems weigh about 20% as much as the above ground weight of the tree. Therefore, to determine the total green weight of the tree multiplies the above ground weight of the tree by 120%.

Total Green Weight (TGW) = W * 120%

$$TGW = 525557.94 * 120\%$$

$$TGW = 630669.48 \text{ lbs}$$

The average tree is 72.5% dry matter and 27.5% is moisture. So dry weight of tree should be determined in following way:

$$\text{Dry weight} = TGW * 72.5\%$$

$$\text{Dry weight} = 630669.48 * 72.5\%$$

$$\text{Dry weight of the tree is } 457235.38 \text{ lbs.}$$

Therefore;

To determine the weight of the carbon in tree, multiply the dry weight of the tree by 50%. As we all know that, 50 % of dry biomass is considered as carbon. So,

Carbon Weight (CW) = Dry weight * 50%

$$CW = 457235.38 * 50\%$$

Carbon weight from above practices is estimated ~ 228617.7 Pounds or ~ 103.7 tonne or ~ $1.037 * 10^7$ kgC.

RESULTS AND DISCUSSION

Total green weight of *Mitragyna parviflora* 286.06 tonne and 207.39 tonne dry weight respectively. Carbon storage is estimated in heritage *Mitragyna Parviflora* 103.7 tonne. The ratio of carbon dioxide to carbon is 3.66 (44/12). So CO₂ sequestered in selected tree species is 379.54 tonne or ~ $3.795 * 10^4$ tonne in fig.,2.

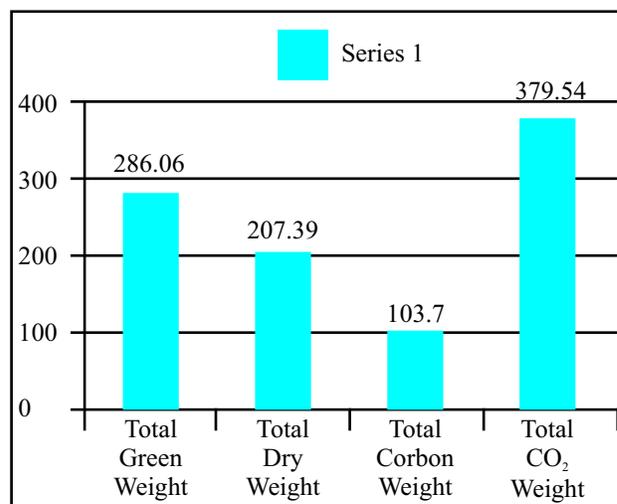


Figure 2: Carbon storage variation in total green weight, total dry weight in respect to total carbon dioxide sequestered in *Mitragyna parviflora*

CONCLUSION

Carbon storage potential in heritage tree species *Mitragyna parviflora* is estimated 103.7 tonne and CO₂ sequestered is ~ $3.795 * 10^4$ tonne. Hence, the species which store's and utilize maximum carbon from the environment should be conserved, protected and planted.

ACKNOWLEDGEMENT

Author is thankful to Gujarat Forest Department, for the record of useful and strong information about this species, as well as to protect and conserve it.

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