Evaluation of Carbon Sequestration Potential of Water smart Eucalyptus Plot Meant for small Agroforestry System in Urban Agriculture Village Boriavi-Charotar Region of Gujarat, India

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Abstract—*Agroforestry In Charotar region Of Gujarat State Booming rapidly since last Decade. Carbon sequestration through agroforestry is based on two characteristics, One is globally carbon dioxide level rose since last sanctuary consequently, efforts to remove greenhouse gases (GHG's) from the atmosphere. Another is green plants take carbon dioxide gas out of the atmosphere in the process of photosynthesis and use it to make sugars and other organic compounds used for growth and metabolism. In addition Long-lived woody plants, for en example Eucalyptus store carbon in their wood and in other tissues until their over a life span. At last decompose at which time the carbon in their wood may be released to the atmosphere as carbon dioxide, carbon monoxide or methane, or it may be incorporated into the soil as organic matter at certain time frame. The study evaluated by determining total green weight of the tree, the dry weight of the tree and weight of carbon in the tree. These sustainable Outcome evaluated for the presented study which shows in 1 acre Plot of agricultural land ¬166.6 Kg of CO_2 per 5 Years Mature single eucalyptus tree. On acre bases plot consists of 3000 Plant Sequester about 2500 Metric Tons CO_2 per 5 Years Mature tree at study site.*

1. INTRODUCTION

Primary aim is to evaluate the potential of carbon sequestration of eucalyptus agroforestry based Plot.

Objective For the present study Are as follow.

1. To determine biomass carbon stock in different Plantations.
2. To examine CO_2 co-benefit of CDM perspectives
3. To evaluate water consumption and sustainability Measures Water Consumption and

1.1 Sustainability Aspects of study:

Water management and irrigation practice shows sustainability prospective form comparison to local yearly agriculture practices. However the water requirement for the irrigation is feed form the rain as source and rest follow grey water footprint the table 1

The study site at Boriavi village equipped with own mitered Tube well for the irrigation purpose which equipped with the 7.5 HP Water Motor Pump Discharges 18000L/Hr. Thus the gray water consumption which is significantly lower than the agriculture practices of local potato crop.

Table 1: Grey Water Footprint of standing eucalyptus plant

Period Of plant Growth	Water cycle interval	Total Water Consumed (in Liters)
6-15 Month	15 days 1.5(hour)	162000
16-24 Month	22 days (1.5hour)	162000
3 Year	5 cycle (52 days) 1hour	90000
4th year	5 cycle (52 days)1.hour	90000
5th Year	5 cycle (52 days)	90000
	Total	918000

As mentioned in Table 1 about irrigation in Eucalyptus, although Potato water consumption in with local variety from gray water is 3,06,450 Water Footprint Calculation For Per Acre Potato Grown in the Flood Irrigation-Method (Saurabhkumar 2014)[1].Thus results contrasts significant water footprint as sustainability aspects.

2. MATERIAL AND METHOD:

The study area is located at (22.6276°N, 72.9347 °E) near Anand city, Gujarat, Western India. The total area of forest is 1 Acer. The Tree density ranges from 415 to 435 trees ha^{-1}, DBH from 19.2 to 34.5 cm, and tree height from 4 to 12 Meter. Annual mean rainfall is approximately 930 mm, occurring primarily from June to October. Annual mean temperature is 26 °C. Mean monthly minimum temperatures is 23 °C and mean monthly maximum temperature is 36 °C. Annual average air humidity is about 28 %. Soil is Black in the region.
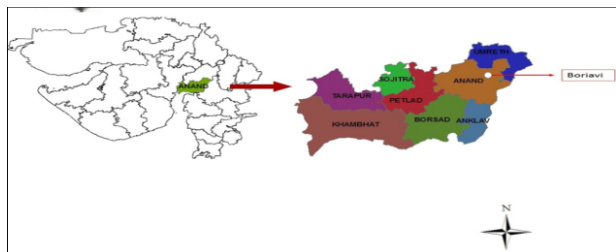
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Fig. 1: GIS based Study Location

Table 2: Geographical, Demographic, and Agricultural Profile of the Boriavi Village

Head	Distribution
Village	Boriavi
District (Country)	Anand (India)
GPS-Coordinates	22.6276°N, 72.9347 °E
Population (2011)	19,853
Total Agricultural Land Area	1460 Acres
Total Eucalyptus grown Area Growing Area	10 Acers
Soil Type	Black Soil
Timber Market	Anand/Baroda

The Method used for the study is based on the Primary observed Value form selected field of agroforestry. All data set observed in site premises and followed the standard format for the measures the parameters accordingly

(a. Maximum Diameter of Tree shown 20 Inch)

(b. Density and planting pattern of plot)

Fig. 2: Dens Standing Plantation study Site

2.2 Methodology for the Evaluation of Carbon dioxide sequestration

Methodology using for the Carbon sink is the challenge for the agro forestry. For the present study various methodology adapted. The World Agroforestry tree based method which derived from various university Research a formalized the standard database and Adopted form various research group approach. (NCSLP)[2].

2.21. Determination of the total (green) weight of the tree.

This parameter consists of vegetative growth measurement of the standing tree. Here with Above-ground weight of the tree in pounds, Diameter of the trunk in inches and Height of the tree in feet considered for the parameter the methodology adopted from Georgia Forestry Commission research report January 1986 (Report.) [3]

2.2.2. Determination of dry weight of the tree

This perimeter is consist of an Dry weight of standing tree the calculation followed from the Adopted methodology University of Nebraska[4.].

For the present study method carried out a table with average weights for one cord of wood for different temperate eucalyptus species. Taking all species in the table into account, the average tree is 72.5% dry Matter and 27.5% moisture has been considered.

2.2.3. Determination of weight of carbon in the tree.

This Parameter consists Dry weight of standing tree. The average carbon content is generally 50% of the tree's total volume.5 Therefore, to determine the weight of carbon in the tree, multiply the dry weight of the tree by 50% (General Technical Report 1992)[5].

2.2.4. Determination of the weight of carbon dioxide sequestered in the tree

This parameter consist average carbon content is generally 50% of the tree's total volume.5 Therefore, to

Determine the weight of carbon in the tree, multiply the dry weight of the tree by 50% has been considered form secondary analysis this methodology adopted form the National Computational Science Education Consortium (NCSEC).

2.2.5. Determine the weight of CO_2 sequestered in the tree per year

This parameter consists of CO_2 is composed of one molecule of Carbon and 2 molecules of Oxygen.

Here ratio of CO_2 to C is 43.999915/12.001115=3.6663.
Therefore, to determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the single eucalyptus tree by 3.6663. [1]

3. RESULTS

Table 3: Results of evaluation Parameter

Parameter	Calculation	Result
Determine the weight of carbon in the tree	On base of general assumption for Standing tree	The average carbon content is generally 50% of the tree's total volume
Determine the weight of carbon dioxide sequestered in the tree	CO2 is composed of one molecule of Carbon and 2 molecules of Oxygen. The atomic weight of Carbon is 12.001115. The atomic weight of Oxygen is 15.9994. The weight of CO2 is C+2*O=43.999915. The ratio of CO2 to C is 43.999915/12.001115=3.6663.	to determine the weight of carbon dioxide sequestered in the tree, multiply the Weight of carbon in the tree by 3.6663.
Determine the total (green) weight of the tree	W = Above-ground weight of the tree in pounds D = Diameter of the trunk in inches H = Height of the tree in feet	For trees with D < 11: W = 0.25D2H For trees with D >= 11: W = 0.15D2H
Determine the dry weight of the tree	On base of general assumption for Standing tree	to determine the dry weight of the tree, multiply the weight of the tree by 72.5%.
Determine the weight of CO2 sequestered in the tree per year	W = 0.25D 2 H = 0.25(122)(32) =1152 lbs. (Green Weight Above Ground)	1152 lbs. X 120% = 1382.4 1382.4 lbs. X 72.5% = 1002.24 lbs dry weight 1002.24 lbs. X 50% = 501.12 lbs. carbon 501.12 lbs.X 3.6663 = 1837.26 lbs.CO2 sequestered
Total Single Tree Carbon Dioxide Sequestered Per Year		1837.26 lbs. / 5 years = 367.45 lbs. CO2 sequestered per year

4. CO BENEFIT ANALYSIS

Table 4: Cobenifit analysis Form eucalyptus Plantation5.

CO2 sink/5 year By single eucalyptus Tree	Total Matured Standing eucalyptus Tree	CO2 sequestration Of Study area/5years at subjected Study site	CO2 sequestration Of Study area In 10years at subjected Study site	5Years CER on Date US $ (1US$/CER conceded)
833.36 Kg/ 5 years And 166.6 CO2 sequestered per year				
833.36 Kg	3000	2500.08 Metric Tons	5000.16-Metric Tons	2500 $

5. CONCLUSION

As per the Presented study eucalyptus contrasts vital output of carbon sequestration via agroforestry based plantation, in addition also used lesser water for the growth. Carbon sequestration in Land Use system results 833.36 Kg/ 5 years And 166.6 Kg CO_2 sequestered per year respectively. There are several methodological Challenges Arising from Difficulties Related to sampling analysis and Interpretation Makes it measurement Difficult Task. Agroforestry systems have great potential to enhance Carbon sequestration compared with tree-less agronomic systems, and therefore their implementation should be considered as a land use option in Gujarat.

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