CARBON CAPTURE IN THREE FOREST SPECIES IN META DEPARTMENT

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ABSTRACT

We depend on plants to counteract the greenhouse effect. Therefore, the solution to climate change necessarily involves preserving as many vegetation zones. The high adaptability that has plants and allowing them to withstand large changes over billions of years is to be used as a basis for scientific studies that allow us to assess the situation in future climate conditions.

The data presented in this study were obtained from three species planted in the Region of the eastern plains. Samplings were carried out in a demonstration plot located in the Metropolitan Park Maria Lucia where cultivation is more representative. Thus, although growths in other areas or varieties are different, the general has resulted in the whole of our region.

This paper presents data capture CO_2 partial (only takes two years of research, for a total of ten) per plant for comparison between forest species, but for greater consideration of balances in calculating total there which take into account the results per hectare by the knowledge of the density of planting.

Among all tree species analyzed in this work is the Melina (*Gmelina arborea*) which showed higher rates of CO_2 uptake, both in terms of the surface as per tree. In this case becoming more lush trees, more leaf area and, therefore, more capable of attracting CO2.

Keywords: Capture, Carbon, forest species, climate change.

INTRODUCCION

1.1-The atmospheric C02

Whereby certain gases, which are components of a planetary atmosphere is called the greenhouse phenomenon. Retain some of the energy emitted by the floor being heated by solar radiation affects all planetary bodies fitted with atmosphere. According to current scientific consensus, the greenhouse effect is being pointed at Earth for the issuance of certain gases such as carbon dioxide and methane, due to human economic activity. (National Parks of Colombia 2013).

Of these gases, the C02 as particularly important for its effect. Climatic conditions on the planet because it is a long-standing gas, i.e. a gas is also active in the atmosphere for a long time. Thus, for example, of CO2 emitted into the atmosphere above 50°/° take 30 years to disappear, 30% centuries and the remain 20°/° wil last several thousand years (Solomon et al, 2007).

Global carbon cycle is investigated as one of the major biogeochemical cycles due to its role in regulating the atmospheric concentration of carbon dioxide CO2, a major greenhouse gas (GTI) Increasing concentrations of carbon dioxide C02 in the atmosphere are an important contribution to climate change (Schimel et al. 1995). forests exert a major role in the global carbon cycle because they store large amounts of vegetation and soil exchange carbon with the atmosphere through photosynthesis and respiration, the: sources of atmospheric carbon when they are altered by human or natural causes (eg forest fires, use of bad harvesting systems, slash and burn for processing into non-forest use) and become creators atmospheric carbon (i.e. net transfer of CO2 from the atmosphere to the ground) during land abandonment and regeneration after disturbance. Humans can through planting forests alter the stocks and flows of forest carbon thereby altering its role in the carbon cycle and its potential to change the climate.

Forests also have the capacity to influence climate change in other ways, particularly when the man they are disturbed. For example, 1st conversion of forests into other types of land cover can affect a1 climate due to changes in the albedo or reflectivity of the ground. Addition destruction of forest biomass releasing gases to the greenhouse as the CO2, which are incomplete combustion by products such as methane (CH4). Carbon monoxide (CO) nitrous oxide (N20), among others.

1. 2 Current role of forests in the global carbon cycle.

Natural forests cover about 3.4 Gha (Gha = 10 9) thousand millions has. (United Nations Organization for Agriculture and Food [FAO] 2009). Most forests are located in low latitudes (0 25 º N & S) or tropical zone (52 °/°). Followed by high latitudes (50-75 ° N & S) or boreal zone (30°/°) and mid-latitudes (25-50 ° N & S) or temperate (18 ° / °). A worldwide scale there are also around 1.7 Gha, the other forest land with certain characteristics: including clear woodlands and chaparral, shrubs and bushes.

These lands are probably technically suitable for the forest but are now degraded or in other cases of low production due to environmental factors or misuse of man. Moreover, in the tropics there are 31 Mha (Mha = 10 6 or 1 million ha) of plantations and other 37.6 Mha in developing countries in medium latitudes most of which are in China (85%) (FAO 2009).

The low-latitude or tropical forests contain about 5? / Or Carbon reserves all world forests. Carbon is divided approximately equally between the vegetation and soil.

Tropical forests contain the 1st American majority about 53 - 4 of total tropical reserves, and Africa has the least, about 27%. These ratios reflect differences in surface rainforests of the two regions; tropical moist forests contain a high contend of biomass carbon.

1.3 Increase of carbon sinks through forest planting

According to (Brown et al. 1996) should be planted forests to reduce atmospheric concentrations of CQI. Mitigating the climate changes. The main objectives for forest plantings usually include: production of industrial wood and charcoal, traditional forest uses, protection of natural resources (e.g. water and soil biodiversity) recreation, rehabilitation of degraded lands and so on.
Plantations forest systems that serve the above objectives can be grouped into three categories based on the form is considered to limit the rate of increase of atmospheric C02: conservation management for carbon storage or replacement Carbon (Brown et at. I996). Yet frequent assessments of forest systems to mitigate emissions of C (h criticize, critics generally assume that such assessments provide for the sole purpose of the forests
Carbon capture and storage. This is often not the case the amount of carbon captured or preserved benefit is added to the traditional forests uses.

2. MATERIALS AND METHODS

2.1 Geographical location of the studio area
The research is conducted in an acre plantation of 39 hectares comprising the entire area of the Metropolitan Reforestation Production Protective Maria Lucia Park in the village of the municipality of Villavicencio Meta Llanerita.

Table 1. Ubication Metropolitan Park María Lucia

Localization	Villavicencio Municipality, Apiay Corregimiento Llanerita Vereda
Coordinates	337 meters of High. 4° 05´ 51.38” North. 73° 30´ 27.78” East
Farm Distance	15 minutes from Villavicencio, and From there to Puerto Lopez until the access 4.8 kilometers

Source: CIAM

Figure No. l Metropolitan Park María Lucia Map with the Carbon Area capture Project in three forestry species in the Meta Department del Meta.

Source: Metropolitan Park María Lucia

Planting this area was conducted in the months of August and September 2010, Ecopetrol COINAR subcontractor who performs in different ZONES reforestation as environmental compensation areas. Demonstrative half hectare planted to 3.0x3.0 meters between trees and 3.0 m between lines plant provision allows better control of erosion, due to the distribution of roots and the good coverage provided by the tree tops chosen in turn gives better against the wind control.
To find the number of trees per hectare the equation used was:
Number of plants = l 0.000 m2

DxD

H = Number of hectares.
D = distance in meters between plants.
Then we have:
10. 000 = 1.11______________
3.0 x 3.0
Table phases of handling plantation:

Table 3 phases of managing a plantation:

Plantation phase	**Years**	**Description**	**Activities**
Establishment	1-4	Trees are adaptable to the site	Ants control. Grass control every 4 months Plants feeding Fertilization
Growing	4-10	The trees grow specially in the high	First grooves until 1 year High prune and keeping of firewalls every 8 months
Reaping	10	The trees grow specially in diameters	Commercial prune. Final collecting

			The fences and firewalls maintenance

Source: FONAM

According to Table 3 our plot is still in establishment stage, weeding is done and plate them every 4 months, fertilized with organic manure, produced in the same Metropolitan Park at 5 kilos per plant and plant monitoring is performed once a week

MEASURING THE TREES

Measuring trees is mainly useful to determine the volume of timber can be obtained (Carbon captured), the measures to be taken are:

• Diameter breast height (DBH) is taken at a height of l.30 meters. to measure the circumference of a conventional tape measure was used, so you must convert the value of the circumference to diameter for which the following formula is used:

$$DAP = C / 3.1416$$

Where: DAP: Diameter is a breast height
C: Circumference of tree l, .30 m

• Total height of the trees: this measurement for a graduated pole was used. then placed on it LD1 decameter to afford the measure tree height in meters.

• The average volume of trees per species was obtained by the following equation:

$$V = 3.1416 / 4 \times DAP2 \times A \times FF$$

Where: V = Volume of tree in cubic meters3
DAP2 = diameter breast height 1.30 m
A = tree height in meters.
FF = morphic factor (0.65)

Figure N. 3.Measurement total height of tree species Melina

Source: Study Area

2.2 Used Species

YOPO - Anadenanthera peregrina (L.) Speg.

FAMILIA: Mimosacea

SCIENTIFIC NAME: Anadenanthera peregrina (L.) Speg.
COMMON NAME: Yopo.
DESCRIPTION: Small to medium 6-8 m height, outer bark gray or dark brown, with growing lines with tiny hairs on young branches tree the Leaves alternate bipinates of l5-22cm long, with tiny, narrow leaflets, with brown oval spine reddish color gland near the base and two glands near the apex. Small, numerous, stalked flowers, clustered in axillary heads, corolla white, finely pubescent color, calyx 5 toothed with bell form, pubescent, fruit type, legume flat, brown color, with rounded seeds.
USES: From the seeds a hallucinogenic substance used by shamans, which produces trance (hallucinations).
ORIGEN: Antillas South America

Melina - Gmelina arborea Roxb

FAMILY: Verbenaceae

SCIENTIFIC NAME: Gmelina arborea Roxb

DESCRIPTION: Tree reaching up to 30 meters high. The bark is pale gray color fine and smooth, and with the passage of time acquires a brown and becomes rougher. The leaves are heart-shaped and velvety on the inside. The flowers have a bright yellow orange color. The color palette of wood ranges from off-white to yellowish marr6n. The wooden heartwood and sapwood hardly different each other in terms of color.
Uses: Furniture, cabinets, interior trim, boat building and boat decks, music, moldings, tools, boxes and size ORIGIN: Asia.

FAMILY: Fabacea
Scientific name: Acacia mangium
COMMON NAME: Acacia
DESCRIPTION: Also known as Australian Teak as it has good properties of easy work and no problems were reported in sawing or unwinding eJ. Brush well and polishes easily lisay producing a glossy surface without tearing of the fiber is fücil to drilling., And turning. Nailing properties are excellent even in the ends of boards. Heartwood responds satisfactorily a1 condoms treatment using standard techniques. The natural durability is moderate, high in well-ventilated places, and some durable in contact with soil. . Resistant to termites. Widely known in the world of paper, but due to their features began to be sold as solid wood for the furniture industry and construction. The quality of this wood is compared as Teak and Oak casual situation not as belonging to the botanical group of legumes, where as fine wood and Sapan Guayacanes are located.

1. RESULTS

1.1. Measurements

Was measure the circumference of each tree species in the three project was measured to obtain the average growth by species and so found by applying equation diameter breast height {DBH) of each species.

2. ANALYSIS
During the two years of observation of the three species planted in the study area have obtained the following results:
Melina (Gmelina arborea) was the species which reaches the average height of 10.19 m, followed by yopo (Anadenanthera peregrina (L.) Speg) with 8.32 m and finally the Acacia (Acacia mangium) with 7.66 m. (See Table No. 5)
With respect to the diameter breast height (DBH) the species most development was obtained with 0.14 m gmelina thick stem 30 height 1. Acacia followed by with 0, 08 m thick stem and finally Yopo with 0 .07 m. (See Table No. 5)

Table No.5 Overall height (m), DAP (m) and volume (m3) of trees of three species of project planting time 2 years. Similarly, species that Melina was which had the highest volume of 0.73 m3 biomass followed by Acacia with 0.32 m3 and Yopo with 0.30 m3 (See Table No. 5).

	ALTURA TOTAL (m)			**DAP (m)**			**VOLUMEN (M3)**		
	YOPO	**ACACIA**	**MELINA**	**YOPO**	**ACACIA**	**MELINA**	**YOPO**	**ACACIA**	**MELINA**
ARBOL 1	7,10	7,00	9,55	0,06	0,05	0,17	0,22	0,19	0,84
ARBOL 2	8,30	7,05	10,75	0,08	0,04	0,10	0,33	0,13	0,56
ARBOL 3	8,30	7,05	10,70	0,06	0,09	0,17	0,24	0,31	0,95
ARBOL 4	7,70	6,40	10,50	0,05	0,08	0,11	0,20	0,26	0,56
ARBOL 5	7,90	8,20	10,35	0,07	0,10	0,12	0,28	0,41	0,64
ARBOL 6	7,60	7,05	10,00	0,07	0,10	0,12	0,29	0,35	0,60
ARBOL 7	8,50	9,00	10,20	0,08	0,13	0,09	0,35	0,61	0,47
ARBOL 8	8,30	8,50	10,95	0,08	0,09	0,18	0,34	0,39	0,99
ARBOL 9	8,90	8,00	10,50	0,05	0,06	0,18	0,23	0,24	0,97
ARBOL 10	9,05	7,50	8,80	0,08	0,06	0,18	0,37	0,22	0,79
ARBOL 11	9,20	8,50	10,00	0,08	0,11	0,09	0,36	0,46	0,47
ARBOL 12	8,30	**84**	10,20	0,07	0,90	0,11	0,31	**3,57**	0,60
ARBOL 13	9,45	**7,66**	9,80	0,07	**0,08**	0,16	0,32	**0,32**	0,78
ARBOL 14	8,30		10,40	0,09		0,18	0,40		0,93
ARBOL 15	7,95		10,20	0,08		0,18	0,33		0,94
ARBOL 16	**125**		9,85	**1,07**		0,13	**4,57**		0,65
ARBOL 17	**8,3**		10,40	**0,07**		0,09	**0,30**		0,49
ARBOL 18			10,20			0,18			0,93
			183			**2,53**			**13,15**
			10,19			**0,14**			**0,73**

Fuente: Datos de campo obtenidos en el área de estudio.

CONCLUSIONS

The dates generated in this study can only be considered preliminary, as this research is referred to 1O years. The data presented here correspond to the first two years of study.
According to consulting and collection of information secondary, we find that in Jos results of research conducted by institutions of national and international order fauna the total volume of biomass in a fore planting a tree such is directly proportional to the uptake. Carbon. Therefore, we can conclude that in the study area of this project, the species best behavior for the carbon uptake is Melina (Gmelina arborea) followed

2. BIBLIOGRAFÍA

BETANCOURT .A.1987 Silvicultura especial de árboles maderables, tropicales. Editorial Científico- Técnica, 1987.400p

BROWN SANDRA.1996. Los bosques y el cambio climático: el papel de los terrenos forestales como sumideros de carbono.145p.pd

CEE/FAO, 1992: The forest resources of the temperate zones. The UN-ECE/FAO 2009
Forest resources assessment. Volume 1. General forest resources information. Naciones Unidas, Nueva York.

CESAR MOTA, CARLOS ALCARAZ-LÓPEZ, MARÍA IGLESIAS, M.C. MARTÍNEZ-BALLESTA Y MICAELA CARVAJAL. Departamento de Nutrición Vegetal CEBAS-Consejo Superior de Investigaciones Científicas 30100-Espinardo, (Murcia), España.

DELANEY, M; BROWN, S; LUGO, E; TORRES Y LEZAMA, A Y BELLO- QUINTERO. 1997: La distribución de carbono orgánico en los componentes de bosques ubicados en cinco Zonas de vida en Venezuela – Revista de Ecología Tropical. (13). Pág. 697-708.

JEREZ–RICO; MORET–BARILLAS; QUEVEDO–ROJAS 2011 Curvas de índice de sitio basadas en modelos mixtos para plantaciones de teca (*Tectona grandis* L. F.) en los llanos de Venezuela, Universidad de los Andes Mérida, Venezuela

FONAM; Guía práctica para la instalación y manejo de plantaciones forestales, Perú, 2007

IPCC (Intergovernmental Panel on Climate Change). Good Practice Guidance for Land Use, Land-Use Change and Forestry. (2003). Edited by Jim Penman, Michael Gytarsky, Taka Hiraishi, Thelma Krug, Dina Kruger, Riitta Pipatti, Leandro Buendia, Kyoko Miwa, Todd Ngara, Kiyoto Tanabe
And Fabián Wagner.

PRADA ABELARDO – MATIZ IQ, CORTÉS - CASTILLO CAROLL E, QCO, Esp. Grupo de Investigación Gestión Ambiental Sostenible – GIGAS. Universidad de los Llanos, Villavicencio, Colombia

RAMÍREZ, O. A. GÓMEZ, M. Revista Forestal Centroamericana. Estimación y valoración económica del almacenamiento de carbono, no. 27 Julio-Septiembre Pág. 17- 22. 1999.

SCHIMEL, D., I. G. Enting, M. Heimann, T. M. L.Wigley, D. Rayneud, D. Alves, and U.Seigenthaler, 1995: CO2 and the carbon cycle. In: J. T. Houghton, L. G. Meira Filho,

J. Bruce, H. Lee, B. A. Callander, E. Haites, N. Harris, and K. Maskell(eds.),

TORRES, J. M., y O. S. Magaña 2001. Evaluación de Plantaciones Forestales. Ed. Limusa, México. 472 p

VÁSQUEZ, A. & RAMÍREZ A. Maderas comerciales en el Valle del Aburra. Área metropolitana. Medellín, 2005.