BIOMASS OF HERBS AND LITTER IN THE TROPICAL FORESTS OF GARO HILLS, MEGHALAYA, INDIA.

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Abstract:*The study has been carried out in the four Tropical forests of Garo Hills, Meghalaya i.eBolgan reserve, ChimaBangsi reserve, Rongrenggre reserve and Darugre reserve. The study deals with the estimation of biomass of herbs and litters. The herb and litter has been collected from 1m×1m within 0.4 ha has been plot in each study sites and oven dried. The herbs biomass and carbon ranges from 0.10-0.14 t/ha and 0.05-0.09 t/ha whereas the litter biomass and carbon ranges from 0.20-2.60 t/ha and 0.07-1.30 t/ha. The study of herb biomass and litter biomass has been neglected but it plays important role in carbon cycle therefore more study is necessary to understand the carbon cycle of different forests.*

I. INTRODUCTION

The biomass has been defined as the total quantity or weight of living organism in a given area or volume. The Carbon management is a serious concern confronting in today's world, since the beginning of the industrial revolution, carbon dioxide concentration in the atmosphere has been rising alarmingly, *i.e.*, from 270 ppm prior to the industrial revolution to about 394ppm in December, 2012 (Manua Loa observatory, 2013; Bohre *et. al.*, 2013). The main source of disturbance in the state forests were deforestation, shifting cultivation, urbanization and forest fragmentation (Rao and Hajora, 1986; Tripathi *et al.*, 2010). For almost 50% of world's population, biomass is the main source of energy (Karekezi & Kithyana, 2006; Salunkhe *et al.*, 2016).The production of biomass is well define of ecosystem growth and herbs being in the low tropic level that were controlled by nutrients in the soil associated environmental factors and also effect by grazing. According to Whittaker (1966), the herbaceous flora content few amount of total biomass in the forest ecosystem which plays an important role in ecological characteristics and dynamic stratum in the forest layer (Gilliam *et al.*, 1986). According to Moore and Allen (1999), defined that it is an important to quantify the understory vegetation for determining the forest dynamics because it influence on nutrient cycling and energy flow layer, which may provide an idea of the resource availability. The study of biomass for herbs and litter in the area has been limited study on the ecological study therefore it is necessary to carried out.

2. MATERIALS AND METHODOLOGY:

The study has been carried out in four different forest of Garo Hills. The following are the forest reserves in which study has been carried out Bolgan reserve that has been located in 25°34'9.40404" N and 90°4'7.15512"E, Chimabangsi reserve has been found in 25°900"N and 90°846"E, Rongrengre reserve has been found in 25.57717°N and 090.52845°E and Darugre reserve has been in 25°37.198'N and 090°45.974'E.

In the study area four quadrats in each study sites has been plot in which the quadrats of 1 m x1m within 0.1 ha has been plot. The herbs and litter has been collected from the quadrats plot i.e 1 m × 1 m. Above-ground biomass of herb species and litter has been estimated by harvesting and oven dried (Singh and Dadhwal 2009).The oven dry has been weight and reading has been recorded.

The soil temperature has been measured at 10 cm depth using soil thermometer (Globe, 2014) and reading has been recorded. The soil moisture content has been calculated using the following equation

$$\% \text{ moisture content (MC)} = \frac{\text{Weight of moist soil (M)-Weight of dry soil (D)}}{\text{Weight of dry soil (D)}}$$

3. Results:

The present study has been carried out in four different Tropical forests of Garo Hills, Meghalaya.The herb biomass and carbon ranges from 0.10-0.14 t/ha and 0.05-0.09 t/ha, whereas the litters biomass and carbon ranges from 0.20-2.60 t/ha and 0.07-1.30 t/ha. In the present study the herbs biomass and litters biomass has been studied in which the result reveals that herbs biomass is less than the litter biomass in the study area. As well as the herbs carbon is lower than the litter carbon (**Table 1.)**.

The herbs biomass correlate negatively that has been shown in the **fig. 2**, in which the herbs biomass decreases with increase in soil moisture content % whereas litter biomass does not correlated with the moisture content in the study sites.

The correlation regression of herbs biomass and soil temperature as well as litter biomass and soil temperature has been recorded in the study area. According to the results, as the temperature rises the herbs biomass also rises up whereas the litter biomass has been recorded to be decrease. Therefore the study of soil temperature and biomass of herbs and litter can be said as highly correlated with each other.

The correlation regression of herbs biomass and elevation has been given in the **fig.4**, in which the herbs biomass decreases as the elevation increases as shown in the figure accept in Rongrenggre reserve which is equal to the lowest elevation i.e. Chimabangsi reserve it may be due to canopy cover whereas the relationship of litter biomass increases with increases in elevation.

4. Discussion:

According to several ecologist the particularly in temperate forests has been found to be approximately stored 3 fold more carbon than do in living, in litter and in mineral soil (Post *et al.*, 1982; Wang *et al.*, 1999 and Salunkhe *et al*, 2014) and litter

layer may have been stored 5-20% of total carbon (Karjalainen, 1996). According to Batjes, (1996) and Van de Walle *et al*., (2001); climatic factor such as temperature and precipitation have greater effects on the litter layer and top-soils in the forests.

The soil moisture content (%) were negatively correlate in the present study, it may be due to high dense of vegetation leads to drastically severe moisture deficit in deeper layer (Li *et al.*, 2008; Yang *et al.*, 2012). In the present study the litter biomass correlation is less, since soil moisture play least role in litter decomposition activities (Luz *et al*., 2007).

Therefore, the present study is correlated with the temperature where the herbs in which the result indicates that as herbs biomass increases with increase in soil temperature where as litter biomass decreases with increase in soil temperature. The herbs biomass increase with increase in temperature since the relatively low temperature 13 to 18 ºC has been recommended for herbs (Mortensen, 2014). But litter decreases with increase in soil temperature may be due to exposure to solar radiant's, directly affect on microbial populations by inhibition microbial activities by slowing down the rate of litter decomposition changes with increase in temperature of soil (Verhoef *et al.*, 2000; Johnson, 2003, Pancotto *et al*., 2003; Smith *et al*., 2010; Almagro*et al*., 2015). The herbs grow well in middle altitude and lower altitude (Xu *et al.*, 2017); therefore the present study shows negative correlation in the above **fig.4**. The litter decomposition was significantly lower at the higher Altitude (Margesin, 2018) due to less microbial activities and indicates that the present study shows higher litter biomass in higher elevation. The slow activities of microbial in higher altitude were due to decrease in temperature in higher altitudes.

5. Conclusion:

The study of herbs biomass and litter biomass has been neglected therefore little literature has been available to interpret the biomass of herbs and litter in the ecosystem. Since the biomass of herbs and litter content less in ecosystem the few work had been done. But according to the present the litter biomass is more than the herbs biomass which is comparable to the Salunkhe *et al*., (2014). The study of herb biomass and litter biomass has been neglected but it plays an important role in carbon cycle therefore more study is necessary to understand the carbon cycle of different forests of the region.

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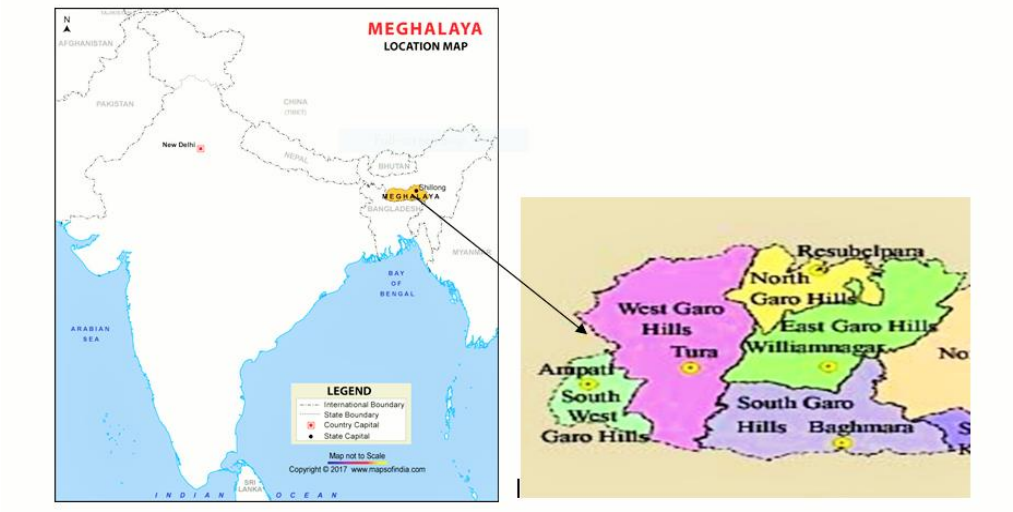

Fig.1: Map of the study sites

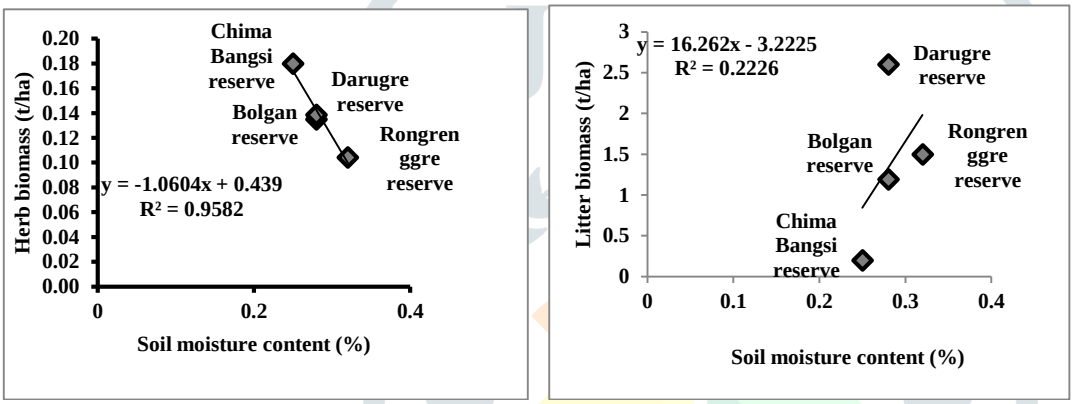

Fig.2: The correlation regression between soil temperature with herbs and litter biomass in Tropical forests of Garo Hills, Meghalaya.

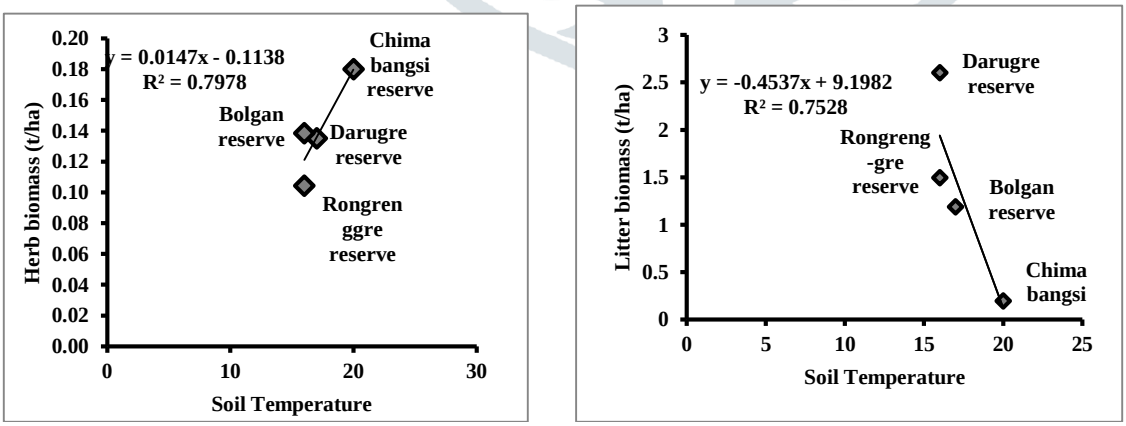

Fig.3: The correlation regression between soil temperature with herbs and litter biomass in Tropical forests of Garo Hills, Meghalaya.

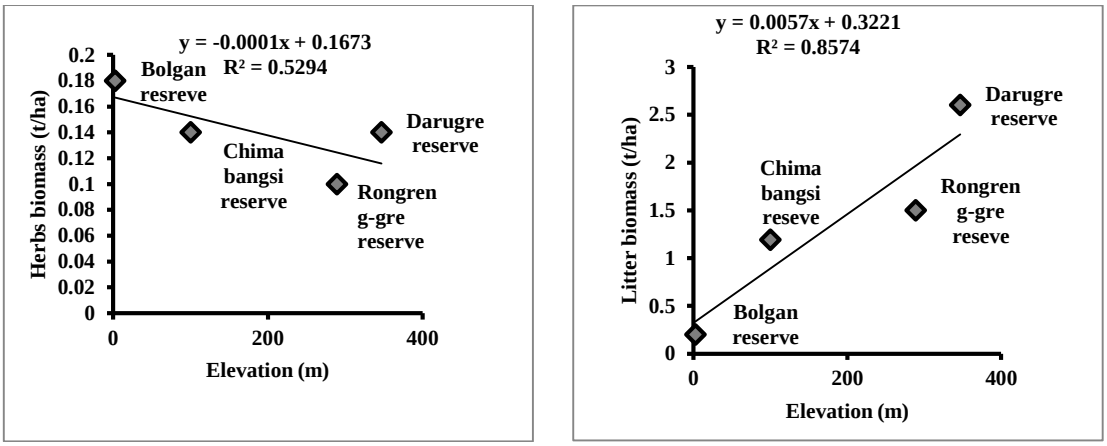

Fig.4: The correlation regression between elevation with herbs and litter biomass in Tropical forests of Garo Hills, Meghalaya.

Table1. The biomass and carbon of herbs and litter in Tropical forests of Garo Hills, Meghalaya.

Study sites	Herbs biomass (t/ha)	Herbs Carbon (t/ha)	Total litter (t/ha)	Carbon (t/ha)
Bolgan reserve	0.14	0.07	1.19	0.59
Chimabangsi reserve	0.18	0.09	0.20	0.07
Rongrenggre reserve (EGH)	0.10	0.05	1.50	0.75
Darugre reserve	0.14	0.07	2.60	1.30