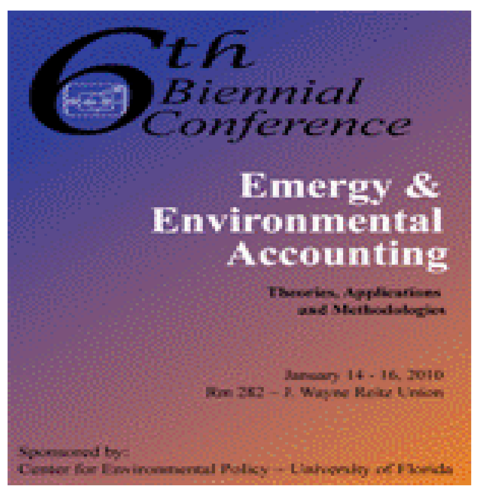

UNICAMP

APPLICATION OF A MINI - MODEL FOREST RECOVERY

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Introduction

In Brazil, cattle production is an activity far from desirable according to environmental standards and social function of property. This activity can be extensive or intensive. Extensive mode reveals low rural employment, low profitability and high erosion. The intensive mode generates great environmental impact due to the use of chemical inputs (Figure 1).

Figure 1: Area used for degraded pastures

Brown and TILLEY (1991) have modeled the recovery of forests in Florida for a period of 500 years. A natural forest self-recovers in 500 years and if there is bio-remediation, recovery time is reduced to 100 years (Figure 2).

Inspired by this study, we have decided to do the same in Brazil. In this work, we will analyze the biomass composition dynamics, through the study, modeling and simulation of a dense ombrophilous forest (Atlantic Forest).

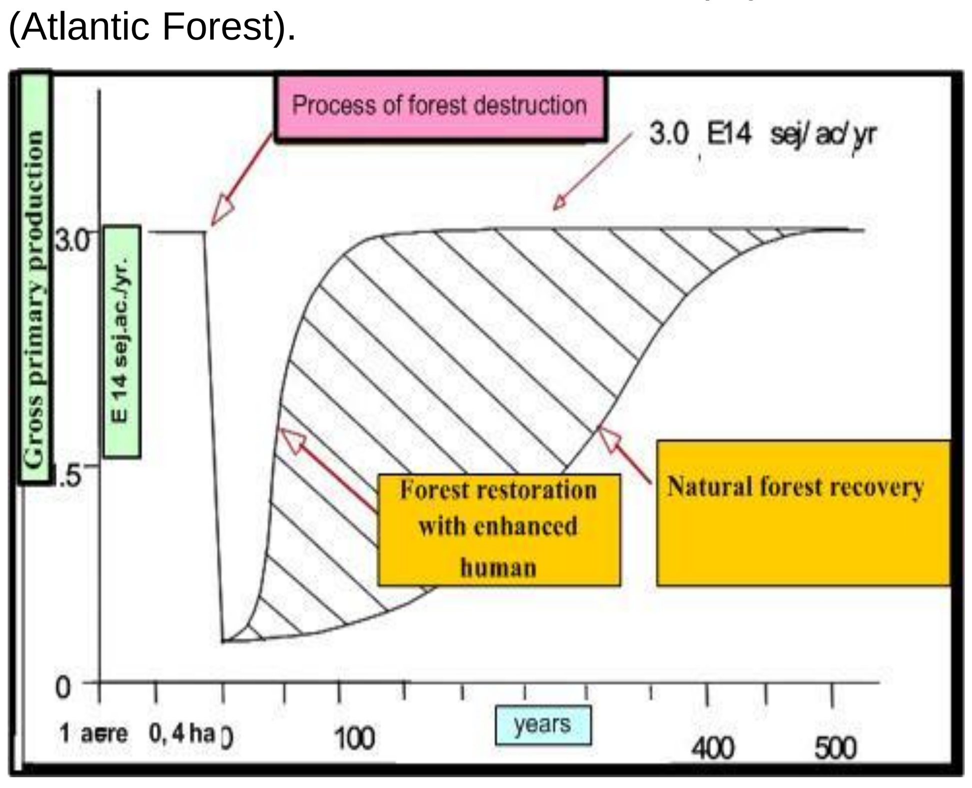

Figure 2: Restoration of natural forests with and without human intervention (BROWN and TILLEY, 1991).

The present study proposes to show the most appropriate way of recovering degraded areas. In order to do this, we will evaluate the productive potential of a site or location, through a reforestation proposal (GÖTSCH 2002, ODUM, 1994, REIS et al., 1985, PEREIRA, 1990) (Figures 3 and 4).

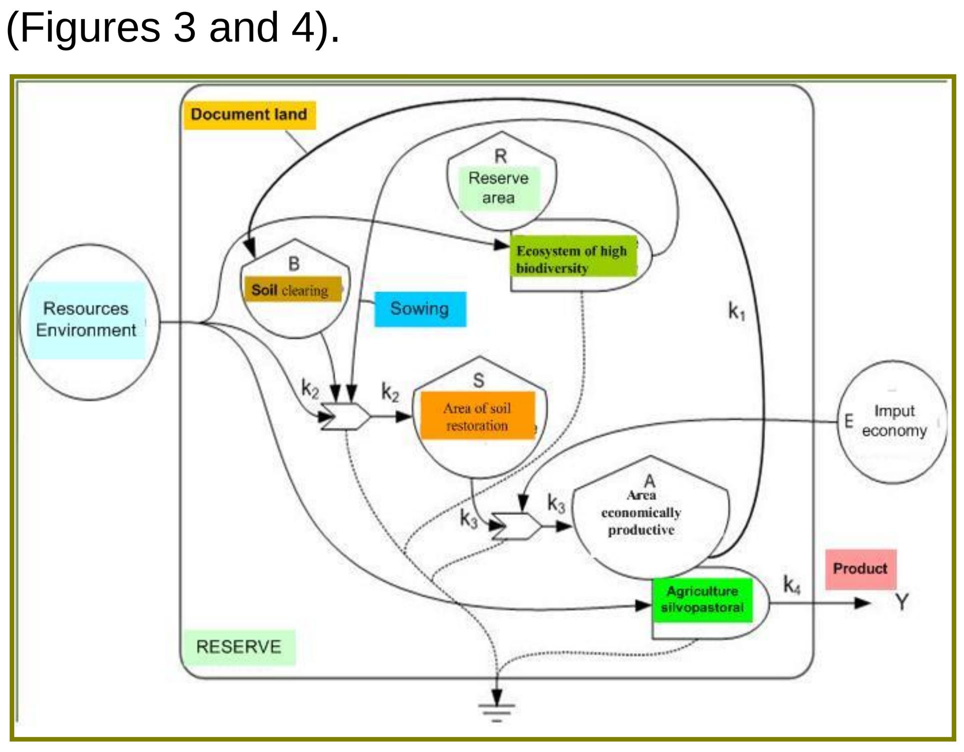

Figure 3: Diagram of the function of biodiversity of degraded areas in the reserve (RESERVE), (ODUM, 1994).

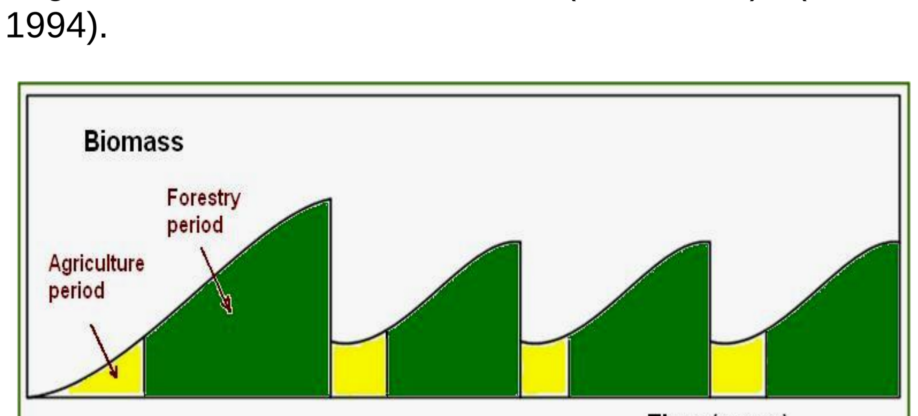

Figure 4: Sustainable forest management in its various stages

After the process of forest recovery, mixed cycles can be established under agricultural and forestry as proposed by Odum (1994).

Main Objective

The main objective of this research is to study the dynamics of biomass recovery of native forests in areas degraded by erosion.

Study Area

Duas Cachoeiras farm (SDC), located hearby the city of Amparo, São Paulo, Brazil. It is a rural area in the hills of the mountain range, developing agro crops with organic creation of livestock and over thirty-five years has been recovering degraded areas (Figure 5).

Figure 5: SDC's Landscape, 2009.

Farm Engenho das Palmeiras, located in the city of Itapira , São Paulo, Brazil (Figure 6).

Figure 6: Farm Engenho das Palmeiras' landscape, 2009.

Methods

With the help of a GPS and tapes, we will measure the grown trees, and then estimate aerial biomass (Figure 7). We will calculate the CAP (circumference of tree measured at 1.30 m (at breast height) above the ground) and transform the value of CAP in DBH (diameter at breast height) following the rules of CONAMA (NATIONAL COUNCIL ON THE ENVIRONMENT).

We will use the equation of Nelson et al. (1999), Alves et al. (1997) and Saldarriaga et al. (1988), in order to estimate the aerial biomass (B).

$B = 0.749\ (D^{2{,}011})$

D = diameter at breast height (cm)

B = Aerial Biomass (dry weight) (kg/tree).

Finally, we will obtain the total biomass (BT) using the equation by Cairns et al. (1997):

$BT = (B + \exp(-1.085 + 0.926\ \ln(B))$

B = Aerial Biomass

BT = Total Biomass

Figure 7: Measurement of the CAP (Circumference of tree measured at 1.30 m (at breast height) above the ground).

In the SDC farm, forest areas of 0 to 5, 11 to 25, 26 to 70 years were studied and in Engenho das Palmeiras farm, 200 years' forest areas were studied (Figures 8, 9, 10 e 11).

Figure 8 : SDC 0 to 5 years forest

Figure 9 : SDC 11 tol 25 years forest

Figure 10 : SDC 26 to 70 years forest

Figure 11 : Engenho das Palmeiras, forest to 200 years forest

Results

In this work we used the RENEW model (Figure 12) and obtained a similar plot (Figure 13) of H.T. Odum and E.C. Odum´s (1994) study.

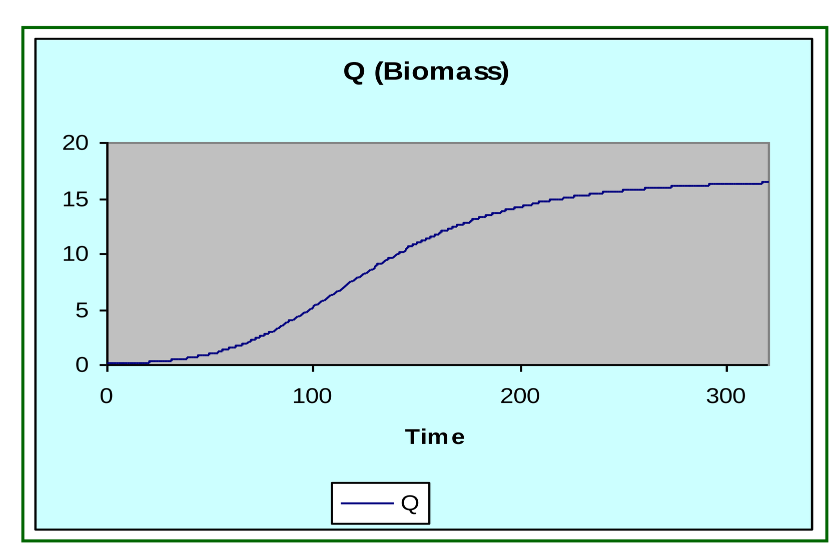

Figure 12: Model RENEW

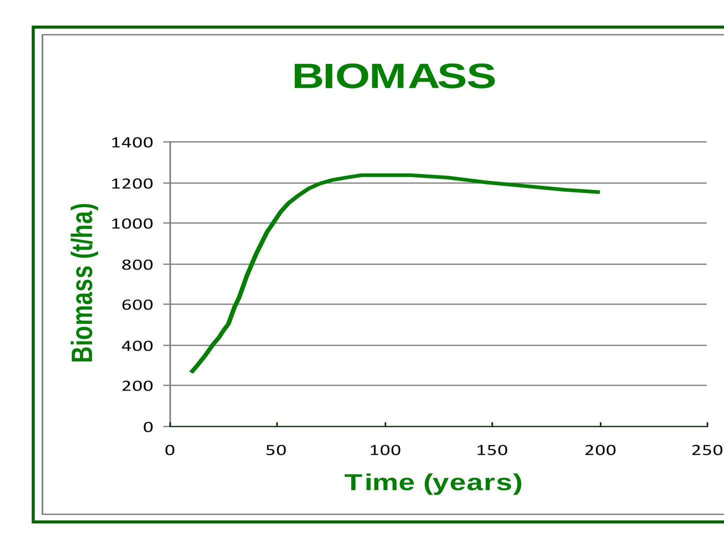

Figure 13: Experimental model

Biomass averages of total parcels

0 to 5 years: 262 t/ha
11 to 25 years: 470 t/ha
26 a 70 years: 1191 t/ha
70 until 200 years: 1147 t/ha.

Simulating human intervention each 50 years in the studied forests, we obtained a chart as shown in Figure 14.

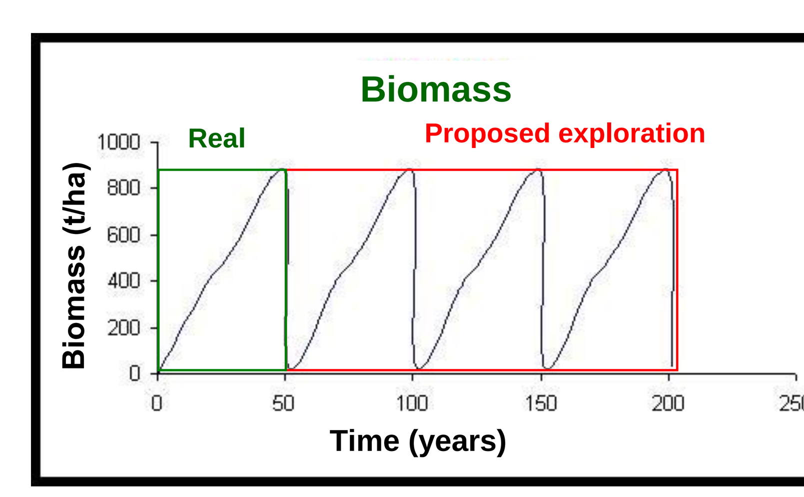

Figure 14: Biomass x time / human intervention

Conclusion

Studying the dynamics of biomass recovery of native forests in degraded areas with the proposed operation will allows us to draw a picture of the recovery time of native Atlantic forest in Brazil.

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(The photos of this research were taken by Thiago J. Roncon)

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C A P E S

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