Evaluation of the Physical Attributes of Soil under Different Uses and Management in the Territory of the Zona da Mata in Rondônia, Brazil

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Abstract— *The results of soil use is widely known mainly for the productivity and visual aspect of plant development. In order to characterize the results of the different soil management, this study was carried out on family farms in the Zona da Mata Territory in Rondônia. The samples were submitted to physical attributes analysis of density, total porosity, macroporosity, microporosity, aggregate stability and organic matter analysis. The soils under different uses were negatively influenced when compared to the forest, having in average decrease in total porosity, macroporosity, organic matter and increase in microporosity and density.*
Keywords*— *Attributes soil. Management soil. Rolim de Moura.

I. INTRODUCTION

The colonization of the state of Rondônia had a great increase in the 1970s and 1980s, with the overthrow of large areas of the forest for agricultural practices and most extensive cattle ranching. This occupation was mainly done by people with low technology and capital investment, where the practice of cleaning the pastures for the use of fire predominated for many years and, in addition, the vast majority of the pastures never received any liming and correction fertilization or maintenance. The results of these modes of use of the Rondônia soils have brought many problems in chemical, physical and biological attributes (Días Filho, 2003, Schlindewein et al., 2012, RUDNICK 2015, HENRIQUE, 2016 and PEREIRA 2017).

The exploitation of the soil in its various uses alter its properties. According to Cardoso et al. (2011), assessments of changes in soil properties resulting from impacts of anthropogenic intervention on natural ecosystems can be an important tool to assist in the monitoring of environmental conservation, since they allow characterizing the current situation, alert to risk situations and, sometimes, predict future situations, especially when used as reference to the original native vegetation (FREITAS L de, 2015).

Henrique (2016) found lower values of density for the use of the forest soil compared to different managements

evaluating the quality of the soil in areas altered by the uses in the central region of the state of Rondônia. According to Rudnick (2015) the anthropic action, from the soil management, increases the density, which affects the macroporosity, generally causing the reduction of the total porosity.

An important tool for study in cultivated soils is the stability of aggregates, since it allows to evaluate the resistance or fragility of the soil in relation to the factors that can influence in the formation and distribution of the same (FERREIRA, 2010 and RUDNICK 2015).

The physical attributes of the soil influence the decision making on how it can be better managed. The success of agricultural projects are often dependent on these attributes. (GUIDOLINI, 2015).

Thus, the objective of this work was to compare the changes in physical attributes and organic matter of the soil under different uses: extensive grazing, rotational grazing and coffee crop comparing them with the forest.

II. MATERIAL AND METHODS

The present work was carried out in the territory of Zona da Mata, located in the central-south region of the state of Rondônia (Picture 1), composed of 07 municipalities: Alta Floresta D'Oeste, Alto Alegre dos Parecis, Castanheiras, Nova Brasilândia D'Oeste, Novo Horizonte do Oeste, Rolim de Moura and Santa Luzia D'Oeste.

Picture 1 - Territory of Zona da Mata - RO
CGMA / STD / MDA adaptation, March 2015

The selected properties for the collection of the samples were based on the following uses and management of soils: permanent forest (MT) to serve as reference, extensive pasture of Brachiaria (*Brachiaria brizantha*) with more than 20 years of use and that never received liming and fertilization (PT), pasture of mombaça (Panicum maximum) rotary with three years of use, fertilized with urea and potassium chloride (PR) and coffee crop (LV), being three crops of clonal conilon coffee (*Coffea canefora*) with 4 years belonging to the municipalities of Alto Alegre dos Parecis, Rolim de Moura and Alta Floresta D'Oeste, a crop with 8 years of cultivation belonging to the municipality of Nova Brasilândia D'Oeste; two traditional conilon coffee farms,

one with 10 years belonging to the municipality of Novo Horizonte D'Oeste and another with 15 years of cultivation belonging to the municipality of Santa Luzia D'Oeste; the coffee plantations, with the exception of the cultivation of 15 years of cultivation, received liming and fertilization in the cultivation lines without any analysis or technical recommendation.

EMATER-RO has indicated its properties and the search has been performed with the agreement of the owners.

Each site selected for collection was divided into four homogeneous parts, from a visual point of view (quadrants), with an area of approximately 0.25 ha, serving as a repetition. All samples were randomly collected in zig-zag, in the 0-10 and 10-20 cm layers, and

for organic matter and stability of aggregates were collected in four subsamples to form a sample composed by quadrant, samples for density and porosity analyzes were collected with 100 cm-3 volumetric rings.

The physical analyzes were performed according to the methodology described by EMBRAPA (2011) and organic matter by the methodology of Tedesco et al, (1995). The results of the laboratory analyzes were submitted to analysis of variance for each site with Tukey test at 5% probability in a 4 x 2 factorial scheme, with 4 replications, 4 soil uses and 2 depths.

III. RESULTS AND DISCUSSION

The forest soils had lower densities in the 0-10 cm layer for all sampling sites when compared to other types of soil use, already in the 10-20 cm layer and in the average of the two layers, most of the soils of the showed this tendency (Table 1).

For the depth factor the density means differed statistically to Alto Alegre from Parecis, Alta Floresta D'Oeste, Nova Brasilândia D'Oeste and Novo Horizonte D'Oeste. Henrique (2016) also verified increase in soil density in depth evaluating the soil quality in areas altered by the uses in the central region of the state of Rondônia.

The Alto Alegre dos Parecis property in PT soil use presented the highest result for the total porosity (0.73 $cm^3.cm^{-3}$) and for microporosity 0.62 $cm^3.cm^{-3}$) at 0-10 cm depth (Table 1). Although it presents a greater total porosity than the MT use, the animal load of PT soil use and the trampling effect may contribute to the reduction of macroporosity that was 50% lower than the MT soil use.

In the property of Nova Brasilândia D'Oeste, in the average of the results of the use of the use, the LV presented the lowest result 0.48 $cm^3.cm^{-3}$ of total porosity, consequently lower results for macroporosity and higher results for microporosity. This reduction of total porosity and macroporosity can be attributed to the preparation of

The minimum densities found were 0.92 $g\ cm^{-3}$ in the depth of 0-10 cm and 1.10 $g\ cm^{-3}$ in the depth of 10-20 cm in the Alta Floresta D'Oeste property. These values can be attributed to the influence of MT litter where soil organic matter (SOM) can improve physical and chemical attributes. Similar values were also found by Rudnick, (2015); Henrique, (2016) and Pereira (2017). According to SILVA et al., (2012) MOS contributes to the improvement of physical attributes such as density and porosity, as well as its effect on soil aggregation.

Soils with the highest average soil density values for all sampling sites were 1.60 $g\ cm^{-3}$ at depth of 0-10 cm and 1.72 $g\ cm^{-3}$ at depth of 10 -20 cm in the Rolim de Moura property in LV use (Table 1). Similar values were also found by Rudnick, (2015) and Henrique, (2016). Lima et al. (2007) found that densities greater than 1.69 g cm-3 may be restrictive to root growth.

the soil, which in the first moment increases macroporosity and total porosity, but after some rainfall the porosity is reduced as a function of the reorganization of the aggregates that are generally reduced due to the preparation of the soil and the decrease of organic matter.

In Alta Floresta in the uses of the soil (PT and PR), Novo Horizonte D'Oeste (PT, LV and PR), Rolim de Moura (PT) and Santa Luzia D'Oeste (PT, LV and PR) had results below 0 , 10 $cm^3\ cm^{-3}$ for macroporosity, which is considered restrictive for the growth of roots of plants, according to Carmo et al. (2011) and Cardoso et al. (2011).

In the Alto Alegre dos Parecis property, the PR soil use had a higher percentage of stable aggregates larger than 2 mm in the two depths, obtained by wet sieving (84.12 and 54.77%, respectively) (Table 2). Perusi and Carvalho (2007) and Henrique (2016) found greater stability of the aggregates in soils under pasture when compared to annual crops, they attributed the result to the grass root system.

Table.1: Density, total porosity, macro and microporosities in different soil uses and sampling sites in the state of Rondônia

Uso do Solo	Densidade			Porosidade total			Macroporosidade			Microporosidade		
	Profundidade (cm)											
	00-10	10-20	Média	00-10	10-20	Média	00-10	10-20	Média	00-10	10-20	Média
	-------- g cm⁻³ --------			-------- cm³.cm⁻³ --------			-------- cm³.cm⁻³ --------			-------- cm³.cm⁻³ --------		
Alto Alegre dos Parecis												
Mata (MT)	1,13bB	1,37aa	1,25b	0,60abA	0,53aA	0,56a	0,22aA	0,19aA	0,21a	0,37bA	0,34aA	0,36b
Pastagem (PT)	1,26abB	1,45aA	1,36ab	0,73aA	0,53aA	0,63a	0,11bA	0,09bA	0,1b	0,62aA	0,44aB	0,53s
Lavoura (LV)	1,47aA	1,45aA	1,46a	0,45bA	0,55aA	0,5a	0,16abA	0,09bA	0,12b	0,29bB	0,46aA	0,38b
Pasto Rotacionado (PR)	1,36aA	1,44aA	1,40ab	0,56abA	0,53aA	0,54a	0,12bA	0,15abA	0,13b	0,44abA	0,38aA	0,41ab
Média	1,31 B	1,43A	-	0,58A	0,54A	-	0,15A	0,13A	-	0,43A	0,40A	-
CV%		8,14			18,60			33,19			24,50	
Alta Floresta D'Oeste												
Mata (MT)	0,92cB	1,28aA	1,10b	0,69aA	0,61aB	0,65a	0,28aA	0,23aA	0,25a	0,41aA	0,38aA	0,40b
Pastagem (PT)	1,55aA	1,40aA	1,47a	0,53bA	0,47bB	0,50b	0,09bA	0,10bA	0,09b	0,44aA	0,37aB	0,41ab
Lavoura (LV)	1,21bB	1,46aA	1,33a	0,59bA	0,5bB	0,54b	0,12bA	0,10bA	0,11b	0,47aA	0,4aB	0,43ab
Pasto Rotacionado (PR)	0,4abA	1,37aA	1,39a	0,54bA	0,52bA	0,53b	0,08bA	0,08bA	0,08b	0,46aA	0,44aA	0,45a
Média	1,27B	1,38A	-	0,59A	0,52B	-	0,14A	0,13A	-	0,44A	0,40B	-
CV%		9,08			5,83			24,84			8,12	
Nova Brasilândia D'Oeste												
Mata (MT)	1,17bB	1,37bA	1,27b	0,61aA	0,60aA	0,61a	0,27aA	0,26aA	0,27a	0,34abA	0,34aA	0,34ab
Pastagem (PT)	1,35abB	1,55abA	1,45a	0,59abA	0,58aA	0,59a	0,23aA	0,23aA	0,23a	0,36aA	0,35aA	0,36ab
Lavoura (LV)	1,47aA	1,63aA	1,55a	0,48cA	0,48bA	0,48b	0,20abA	0,14bA	0,17b	0,28bB	0,34aA	0,31b
Pasto Rotacionado (PR)	1,45aA	1,62aA	1,53a	0,52bcA	0,48bA	0,50b	0,14bA	0,13bA	0,13b	0,38aA	0,36aA	0,37a
Média	1,36B	1,54A	-	0,55A	0,54A	-	0,21A	0,19A	-	0,34A	0,35A	-
CV%		8,54			7,96			19,89			10,59	
Novo Horizonte D'Oeste												
Mata (MT)	1,15bA	1,30bA	1,22b	0,58aA	0,58aA	0,58a	0,19aA	0,22aA	0,21a	0,38aA	0,36aA	0,37a
Pastagem (PT)	1,34abB	1,57aA	1,45a	0,58aA	0,46aB	0,52ab	0,05bA	0,06bA	0,05b	0,53aA	0,4aB	0,47a
Lavoura (LV)	1,45aA	1,51aA	1,48a	0,49aA	0,48aA	0,48b	0,07bA	0,09bA	0,08b	0,42aA	0,39aA	0,41a
Pasto Rotacionado (PR)	1,32abB	1,52aA	1,42a	0,48aA	0,49aA	0,49b	0,06bA	0,05bA	0,05b	0,43aA	0,44aA	0,44a
Média	1,31B	1,47A	-	0,53A	0,50A	-	0,09A	0,11A	-	0,44A	0,4A	-
CV%		7,71			12,14			34,99			18,98	
Rolim de Moura												
Mata (MT)	1,12bA	1,30bA	1,21b	0,66aA	0,59aA	0,63a	0,27aA	0,19aB	0,23a	0,39aA	0,40aA	0,4a
Pastagem (PT)	1,72aA	1,64abA	1,68a	0,46aA	0,57aA	0,52a	0,11cA	0,09bA	0,10c	0,36aA	0,49aA	0,42a
Lavoura (LV)	1,6aA	1,72aA	1,66a	0,56aA	0,49aA	0,52a	0,19bA	0,15abA	0,17b	0,37aA	0,34aA	0,35a
Pasto Rotacionado (PR)	1,40abA	1,49abA	1,45ab	0,61aA	0,51aA	0,56a	0,14bcA	0,14abA	0,14bc	0,47aA	0,37aA	0,42a
Média	1,46A	1,54A	-	0,57A	0,54A	-	0,18A	0,14B	-	0,40A	0,40A	-
CV%		11,86			19,06			25,53			27,72	
Santa Luzia D'Oeste												
Mata (MT)	1,14bB	1,37aA	1,25b	0,51bcA	0,53aA	0,52bc	0,16aA	0,16aA	0,16a	0,35cA	0,37aA	0,36b
Pastagem (PT)	1,52aA	1,47aA	1,49a	0,42cB	0,51aA	0,46c	0,09aA	0,12aA	0,10b	0,33cA	0,39aA	0,36b
Lavoura (LV)	1,30abA	1,41aA	1,35ab	0,68aA	0,55aB	0,61a	0,06bB	0,11aA	0,09b	0,61aA	0,44aB	0,53a
Pasto Rotacionado (PR)	1,46aA	1,49aA	1,48a	0,56bA	0,61aA	0,58ab	0,09bB	0,16aA	0,12ab	0,47bA	0,45aA	0,46a
Média	1,36A	1,43A	-	0,54A	0,55A	-	0,10B	0,14A	-	0,44A	0,41A	-
CV%		10,31			9,89			24,20			12,82	

Note: Averages followed by the same letter, lowercase in the columns and upper case in the rows, within the same sampling location, do not differ by Tukey test at the 5% probability level.

For the depth factor the density means differed statistically to Alto Alegre from Parecis, Alta Floresta D'Oeste, Nova Brasilândia D'Oeste and Novo Horizonte D'Oeste. Henrique (2016) also verified increase in soil density in depth evaluating the soil quality in areas altered by the uses in the central region of the state of Rondônia. The Alto Alegre dos Parecis property in PT soil use presented the highest result for the total porosity (0.73 cm³.cm⁻³) and for microporosity 0.62 cm³.cm⁻³ at 0-10 cm depth (Table 1). Although it presents a greater total porosity than the MT use, the animal load of PT soil use and the trampling effect may contribute to the reduction of macroporosity that was 50% lower than the MT soil use.

In the property of Nova Brasilândia D'Oeste, in the average of the results of the use of the use, the LV presented the lowest result 0.48 cm³.cm⁻³ of total porosity, consequently lower results for macroporosity and higher results for microporosity. This reduction of total porosity and macroporosity can be attributed to the preparation of the soil, which in the first moment increases macroporosity and total porosity, but after some rainfall the porosity is reduced as a function of the reorganization

of the aggregates that are generally reduced due to the preparation of the soil and the decrease of organic matter. In Alta Floresta in the uses of the soil (PT and PR), Novo Horizonte D'Oeste (PT, LV and PR), Rolim de Moura (PT) and Santa Luzia D'Oeste (PT, LV and PR) had results below 0 , 10 cm^3 cm^{-3} for macroporosity, which is considered restrictive for the growth of roots of plants, according to Carmo et al. (2011) and Cardoso et al. (2011).

In the Alto Alegre dos Parecis property, the PR soil use had a higher percentage of stable aggregates larger than 2 mm in the two depths, obtained by wet sieving (84.12 and 54.77%, respectively) (Table 2). Perusi and Carvalho (2007) and Henrique (2016) found greater stability of the aggregates in soils under pasture when compared to annual crops, they attributed the result to the grass root system.

Table.2: Distribution of the mass percentage of aggregates larger than 2mm obtained by wet sieving in different properties of the state of Rondônia.

USO DO SOLO	00-10	10-20 %	Média	00-10	10-20 %	Média
	------Alto Alegre dos Parecis-----			-----Novo Horizonte D'Oeste-----		
Mata (MT)	59,93 bA	21,80 bB	40,87 bA	87,52 aA	67,75 aB	77,64 aA
Pastagem (PT)	73,38 aA	52,62 aB	63,00 aA	83,39 aA	76,01 aA	79,70 aA
Lavoura (LV)	47,60 bA	48,27 aA	47,93 bA	59,51 bA	40,02 bB	49,77 bA
sto Rotacionado (PR)	84,12 aA	54,77 aB	69,44 aA	81,36 aA	67,43 aA	74,39 aA
Média	66,26 aA	44,36 aB	-	77,95 aA	62,80 aB	-
CV%		41,50			40,07	
	--------Alta Floresta D'Oeste-------			----------Rolim de Moura----------		
Mata (MT)	74,66 aA	59,18 aB	66,92 aA	80,30 aA	62,02 aB	71,16 aA
Pastagem (PT)	80,96 aA	48,55 bB	64,76 aA	79,84 aA	64,16 aA	72,00 aA
Lavoura (LV)	44,06 bA	22,87 cB	33,46 bA	47,42 bA	35,48 bA	41,45 bA
sto Rotacionado (PR)	75,16 aA	62,90 aB	69,03 aA	82,18 aA	73,79 aA	77,99 aA
Média	68,71 aA	48,38 aB	-	72,43 aA	58,86 aB	-
CV%		30,67			40,36	
	-----Nova Brasilândia D'Oeste----			-------Santa Luzia D'Oeste-------		
Mata (MT)	73,80 abA	67,18 aA	70,49 abA	83,94 aA	43,79 aB	63,86 aA
Pastagem (PT)	82,52 aA	68,27 aA	75,40 aA	57,49 bA	37,57 abB	47,53 cA
Lavoura (LV)	33,69 cA	29,74 bA	31,71 cA	61,70 bA	30,62 bB	46,16 cA
sto Rotacionado (PR)	66,83 bA	59,44 aA	63,14 bA	63,36 bA	47,28 aB	55,32 bA
Média	64,21 aA	56,16 aB	-	66,62 aA	39,81 aB	-
CV%		39,93			34,22	

Note: Averages followed by the same letter, lowercase in the columns and upper case in the rows, within the same sampling location, do not differ by Tukey test at the 5% probability level.

The highest number of stable aggregates larger than 2 mm (80.96%) in the depth of 0-10 cm was higher than in the depth of 10-20 cm (62.90%), in the use of PR soil in Alta Floresta D 'West (Table 2). Stability of larger aggregates in the superficial layers is expected due to the higher levels of MOS (Table 3), where it generally presents greater biological activity.

Greater stability of aggregates greater than 2 mm in pasture soils (PT and PR) was observed. Perusi and Carvalho (2007) also found greater stability of the aggregates in soils under pasture compared to annual crops, and attributed the result to the root system of the grasses that induced aggregation and gave greater stability to the soil structure.

Table.3: Soil organic matter in different soil uses and sampling sites in the state of Rondônia.

MOS

USO DO SOLO	00-10	10--20 g.dm⁻¹	MEDIA	00-10	10--20 g.dm⁻¹	MEDIA
	---Alto Alegre dos Parecis--			**--Novo Horizonte D'Oeste--**		
Mata (MT)	30,2 aA	12,8 aB	21,5 a	23,1 abA	10,9 aB	17,0 ab
Pastagem (PT)	34,6 aA	13,4 aB	24,0 a	19,1 bA	9,0 aA	14,1 ab
Lavoura (LV)	30,8 aA	18,2 aB	24,5 a	13,2 bA	8,2 aA	10,7 b
Pasto Rotacionado (PR)	31,6 aA	17,0 aB	24,3 a	34,1 aA	12,0 aB	23,0 a
Média	31,8 A	15,3 B	-	22,4 A	10,0 B	-
CV%		30,70			45,19	
	----Alta Floresta D'Oeste----			**-------Rolim de Moura-------**		
Mata (MT)	30,1 aA	19,2 aB	24,6 a	44,2 aA	20,4 aB	32,3 a
Pastagem (PT)	22,0 aA	12,4 abB	17,2 b	14,5 bA	11,9 aA	13,2 b
Lavoura (LV)	25,3 aA	12,8 abB	19,0 ab	16,7 bA	6,0 aA	11,3 b
Pasto Rotacionado (PR)	22,6 aA	9,9 bB	16,3 b	24,2 bA	9,9 aA	17,0 b
Média	25,0 A	13,6 B	-	24,9 A	12,0 B	-
CV%		22,34			54,03	
	-Nova Brasilândia D'Oeste-			**----Santa Luzia D'Oeste----**		
Mata (MT)	29,9 aA	7,0 aB	18,5 a	21,0 aA	8,9 aA	14,9 a
Pastagem (PT)	14,2 bA	4,9 aB	9,6 bc	24,5 aA	13,2 aA	18,8 a
Lavoura (LV)	8,1 cA	3,2 aB	5,6 c	28,0 aA	6,5 aB	17,3 a
Pasto Rotacionado (PR)	16,2 bA	4,4 aB	10,3 b	31,1 aA	10,9 aB	21,0 a
Média	17,1 A	4,9 B	-	26,1 A	9,9 B	-
CV%		28,31			59,75	

Note: Averages followed by the same letter, lowercase in the columns and upper case in the rows, within the same sampling location, do not differ by Tukey test at the 5% probability level.

In the properties located in the municipalities of Alta Floresta D'Oeste, Nova Brasilândia D'Oeste, Novo Horizonte D'Oeste and Rolim de Moura, LV soil use presented the smallest percentage of aggregates larger than 2 mm in the two depths (44.06 and 22.87%), (33.69 and 29.74%), (59.51 and 40.02%) and (47.42 and 35.48%) respectively. In the conventional preparation, operations and soil management, cut and expose SOM to the attack of the microorganisms to make the decomposition and thus decreases the stability of the aggregates (BENITES et al., 2005). As can be seen in Table 3, MOS results were lower in these properties for LV soil use.

The results of the averages of soil organic matter between the soil use factor in the Alto Alegre dos Parecis municipality did not statistically defer (Table 3). This result was not expected, since MT has a great formation of vegetal mass. According to Morais et al. (2012) in an area of native vegetation there is greater formation of

vegetal mass and consequently large amounts of organic residues.

In Alta Floresta D'Oeste the MT presented the highest values for MOS (30.1 and 19.2 g dm⁻¹) in the depth of 0-10 and 10-20 cm respectively. This result can be attributed to the fact that organic matter is directly associated with non-human interference, without the use of agricultural implements and cultural treatments. According to Freitas (2015) studying the chemical attributes of a red latosol submitted to different managements in the environment with native forest, it is possible to verify a greater influence of MO and CTC, indicating that the forest removal and the agricultural use reduced the levels of organic C not alone.

In the case of Nova Brasilândia D'Oeste, Rolim de Moura and Santa Luzia D'Oeste, the use of the MT soil presented the highest results in the averages between soil uses (18.5 g dm⁻¹, 32.3 g dm⁻¹ e 21, 0 g dm⁻¹) respectively. There is a decline in the stock of organic matter after the conversion

of native forests into agricultural systems. According to Portugal et al. (2010) and Freitas et al. (2011), this reduction can be attributed to the increase of soil erosion, to the faster processes of mineralization of organic matter and to lower amounts of organic inputs in managed systems compared to native forests.

In Novo Horizonte D'Oeste, PR use showed the highest result in averages between soil uses for organic matter (23.0 g dm⁻¹). Soil preparation and management of rotational grazing may have contributed to root growth and forage mass formation. Fernandes et al. (2013) evaluated the total organic carbon in revegetated areas and desertified areas and found statistical differences between the areas, and the revegetated area showed higher rates of total organic carbon after one year of planting.

All the properties had a higher concentration of SOM in depth of 0-10 cm. FONTANA et al. (2011), when studying the compartments of organic matter in soil with different coverages, found lower values of total organic carbon at higher depths, as well as higher levels of total organic carbon in native forest compared to cultivated soils.

It was verified that the soils under the different uses (PT, PR and LV) had a negative influence on the physical attributes (Total Porosity, Macroporosity, Microporosity and Density) compared with MT (Table 4).

The anthropic soils had a decrease of 9.8 and 8.8% in total porosity and of 47.8 and 42.9% in Macroporosity in the depth of 0-10 and 10-20 respectively. Increase of 13.2 and 8.1% in Microporosity at depths of 0-10 and 10-20 cm respectively.

Table.4: Mean of the percentage of soil physical attributes (total porosity, macroporosity and microporosity) of different soil uses compared to forest soil.

USE OF THE SOIL	TOTAL POROSITY			MACROPOROSITY			MICROPOROSITY		
	Depth cm								
	00-10	10--20	Avarage	00-10	10--20	Avarage	00-10	10--20	Avarage
	%								
WOODS	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
ANTROPIZED*	90,2	91,2	90,7	52,2	57,1	54,7	113,2	108,1	110,6

*Soils with uses for agriculture or livestock: extensive pasture, rotated pasture, crop and Mata. The anthropic soils had a 29.1 and 13.5% increase in soil density and lost 23.3 and 23.1% of organic matter in the depths of 0-10 and 10-20 cm respectively (Table 5).

Table.5: Average of the percentage of soil and organic matter density of different soil uses compared to forest soil.

USE OF THE SOIL	DENSITY			MATERIA ORGANICA		
	Depth					
	00-10	10—20	MEDIA	00-10	10--20	MEDIA
	%					
WOODS	100,0	100,0	100,0	100,0	100,0	100,0
ANTROPIZED*	129,1	113,5	121,3	76,7	76,9	76,8

*Soils with uses for agriculture or livestock: extensive pasture, rotated pasture, crop and Mata.

IV. FINAL CONSIDERATIONS

Therefore, soils under different uses (extensive grazing, rotational grazing and coffee cultivation) have negative influences on physical attributes, and in the general average the anthropic soils have a decrease in total porosity, macroporosity and organic matter. And increase in microporosity and density.

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