

Ensaaios nas Ciências Agrárias e Ambientais 4

Jorge González Aguilera
Alan Mario Zuffo
(Organizadores)



Atena
Editora

Ano 2019

Jorge González Aguilera
Alan Mario Zuffo
(Organizadores)

Ensaio nas Ciências Agrárias e
Ambientais 4

Atena Editora
2019

2019 by Atena Editora

Copyright © da Atena Editora

Editora Chefe: Profª Drª Antonella Carvalho de Oliveira

Diagramação e Edição de Arte: Geraldo Alves e Natália Sandrini

Revisão: Os autores

Conselho Editorial

- Prof. Dr. Alan Mario Zuffo – Universidade Federal de Mato Grosso do Sul
Prof. Dr. Álvaro Augusto de Borba Barreto – Universidade Federal de Pelotas
Prof. Dr. Antonio Carlos Frasson – Universidade Tecnológica Federal do Paraná
Prof. Dr. Antonio Isidro-Filho – Universidade de Brasília
Profª Drª Cristina Gaio – Universidade de Lisboa
Prof. Dr. Constantino Ribeiro de Oliveira Junior – Universidade Estadual de Ponta Grossa
Profª Drª Daiane Garabeli Trojan – Universidade Norte do Paraná
Prof. Dr. Darllan Collins da Cunha e Silva – Universidade Estadual Paulista
Profª Drª Deusilene Souza Vieira Dall’Acqua – Universidade Federal de Rondônia
Prof. Dr. Eloi Rufato Junior – Universidade Tecnológica Federal do Paraná
Prof. Dr. Fábio Steiner – Universidade Estadual de Mato Grosso do Sul
Prof. Dr. Gianfábio Pimentel Franco – Universidade Federal de Santa Maria
Prof. Dr. Gilmei Fleck – Universidade Estadual do Oeste do Paraná
Profª Drª Girlene Santos de Souza – Universidade Federal do Recôncavo da Bahia
Profª Drª Ivone Goulart Lopes – Istituto Internazionele delle Figlie de Maria Ausiliatrice
Profª Drª Juliane Sant’Ana Bento – Universidade Federal do Rio Grande do Sul
Prof. Dr. Julio Candido de Meirelles Junior – Universidade Federal Fluminense
Prof. Dr. Jorge González Aguilera – Universidade Federal de Mato Grosso do Sul
Profª Drª Lina Maria Gonçalves – Universidade Federal do Tocantins
Profª Drª Natiéli Piovesan – Instituto Federal do Rio Grande do Norte
Profª Drª Paola Andressa Scortegagna – Universidade Estadual de Ponta Grossa
Profª Drª Raissa Rachel Salustriano da Silva Matos – Universidade Federal do Maranhão
Prof. Dr. Ronilson Freitas de Souza – Universidade do Estado do Pará
Prof. Dr. Takeshy Tachizawa – Faculdade de Campo Limpo Paulista
Prof. Dr. Urandi João Rodrigues Junior – Universidade Federal do Oeste do Pará
Prof. Dr. Valdemar Antonio Paffaro Junior – Universidade Federal de Alfenas
Profª Drª Vanessa Bordin Viera – Universidade Federal de Campina Grande
Profª Drª Vanessa Lima Gonçalves – Universidade Estadual de Ponta Grossa
Prof. Dr. Willian Douglas Guilherme – Universidade Federal do Tocantins

Dados Internacionais de Catalogação na Publicação (CIP) (eDOC BRASIL, Belo Horizonte/MG)

E59 Ensaio nas ciências agrárias e ambientais 4 [recurso eletrônico] / Organizadores Jorge González Aguilera, Alan Mario Zuffo. – Ponta Grossa (PR): Atena Editora, 2019. – (Ensaio nas Ciências Agrárias e Ambientais; v. 4)

Formato: PDF

Requisitos de sistema: Adobe Acrobat Reader.

Modo de acesso: World Wide Web.

Inclui bibliografia

ISBN 978-85-7247-040-7

DOI 10.22533/at.ed.407191601

1. Agricultura. 2. Ciências ambientais. 3. Pesquisa agrária - Brasil. 4. Recursos hídricos. I. Aguilera, Jorge González. II. Zuffo, Alan Mario.

CDD 630

Elaborado por Maurício Amormino Júnior – CRB6/2422

O conteúdo dos artigos e seus dados em sua forma, correção e confiabilidade são de responsabilidade exclusiva dos autores.

2019

Permitido o download da obra e o compartilhamento desde que sejam atribuídos créditos aos autores, mas sem a possibilidade de alterá-la de nenhuma forma ou utilizá-la para fins comerciais.

www.atenaeditora.com.br

APRESENTAÇÃO

A obra “*Ensaio nas Ciências Agrárias e Ambientais*” aborda uma série de livros de publicação da Atena Editora, em seu Volume IV, apresenta, em seus 22 capítulos, conhecimentos aplicados ao manejo de recursos hídricos com um grande apelo Ambiental.

O uso adequado dos recursos naturais disponíveis na natureza é importante para termos uma agricultura sustentável. Deste modo, a necessidade atual por produzir alimentos aliada à necessidade de preservação e reaproveitamento de recursos naturais, constitui um campo de conhecimento dos mais importantes no âmbito das pesquisas científicas atuais, gerando uma crescente demanda por profissionais atuantes nessas áreas, assim como, de atividades de extensionismo que levem estas descobertas até o conhecimento e aplicação dos produtores.

As descobertas agrícolas têm promovido o incremento da produção e a produtividade nos diversos cultivos de lavoura. Nesse sentido, o uso do recurso água sob novas tecnologias e manejos está sendo constantemente otimizados e, em constantes mudanças para permitir o uso racional e os avanços na produtividade das culturas. A evolução tecnológica, pode garantir a demanda crescente por alimentos em conjunto com a sustentabilidade socioambiental.

Este volume traz artigos alinhados com o manejo de recursos hídricos e manejo de recursos vegetais. Temas contemporâneos de interrelações e responsabilidade socioambientais tem especial apelo, conforme a discussão da sustentabilidade da produção agropecuária e da preservação dos recursos hídricos.

Aos autores dos diversos capítulos, pela dedicação e esforços sem limites, que viabilizaram esta obra que retrata os recentes avanços científicos e tecnológicos nas Ciências Agrárias, os agradecimentos dos Organizadores e da Atena Editora.

Por fim, esperamos que este livro possa colaborar e instigar aos profissionais das Ciências Agrárias e áreas afins, trazer os conhecimentos gerados nas universidades por professores e estudantes, e pesquisadores na constante busca de novas tecnologias e manejos que contribuíssem ao aumento produtivo de nossas lavouras, assim, garantir incremento quantitativos e qualitativos na produção de alimentos para as futuras gerações de forma sustentável.

Jorge González Aguilera
Alan Mario Zuffo

SUMÁRIO

CAPÍTULO 1	1
APLICATIVO MÓVEL PARA ANÁLISE DE CONFORTO TÉRMICO DE AMBIENTES	
Arilson José de Oliveira Júnior	
Sílvia Regina Lucas de Souza	
DOI 10.22533/at.ed.4071916011	
CAPÍTULO 2	9
DIMENSÕES DA GOVERNANÇA DA ÁGUA NO NORDESTE BRASILEIRO	
Bismarck Oliveira da Silva	
José Gomes Ferreira	
Rayane Teixeira de Lira dos Santos	
DOI 10.22533/at.ed.4071916012	
CAPÍTULO 3	25
DISCUSSÃO SOBRE AS CONDIÇÕES FÍSICAS E QUÍMICAS DA ÁGUA DO SISTEMA DE ABASTECIMENTO DA CIDADE DE POMBAL-PB	
Viviane Araújo de Sousa	
Yasmin de Sousa e Lima	
Airton Gonçalves de Oliveira	
Andrea Maria Brandão Mendes de Oliveira	
Luiz Fernando de Oliveira Coelho	
Everton Vieira da Silva	
Francisco Alves da Silva	
DOI 10.22533/at.ed.4071916013	
CAPÍTULO 4	35
(DES)COMERCIALIZAÇÃO DAS REDUÇÕES CERTIFICADAS DE EMISSÕES DOS PROJETOS NO MECANISMO DE DESENVOLVIMENTO LIMPO DO BRASIL	
Ana Cândida Ferreira Vieira	
Marcos Elias Michelotti de Souza Barros	
Rogério Aires Urquiza Toscano	
DOI 10.22533/at.ed.4071916014	
CAPÍTULO 5	49
GAT CBH-LN: ASSESSORIA TÉCNICA AO COMITÊ DAS BACIAS HIDROGRÁFICAS DO LITORAL NORTE	
Camylla Rebeca Melo da Cunha	
Mirella Leôncio Motta e Costa	
DOI 10.22533/at.ed.4071916015	
CAPÍTULO 6	60
GERENCIAMENTO DOS RECURSOS HÍDRICOS PARA A RESISTÊNCIA E RESILIÊNCIA DO SEMIÁRIDO BRASILEIRO	
Jeisiane Isabella da Silva Alexandre	
Guilherme Teotônio Leite Santos	
Vitor Hugo de Oliveira Barros	
José Martins de França Neto	
Adriana Thays Araújo Alves	
DOI 10.22533/at.ed.4071916016	

CAPÍTULO 7 65

ÍNDICE DA PERCEPÇÃO AMBIENTAL A PARTIR DA AGRICULTURA FAMILIAR EM COMUNIDADES RURAIS DO NORDESTE BRASILEIRO

Airton Gonçalves de Oliveira
Lílian de Queiroz Firmino
Maele Guedes Passos
Renato dos Santos Albuquerque
Viviane Araújo de Sousa
Ricélia Maria Marinho Sales

DOI 10.22533/at.ed.4071916017

CAPÍTULO 8 80

INTERCEPTION OF RAINFALL BY NATIVE CAATINGA SPECIES, NORTHEAST BRAZIL

Mayara Andrade Souza
Jacob Silva Souto
Kallianna Dantas Araujo
Élida Monique da Costa Santos
Danúbia Lins Gomes
Elba dos Santos Lira
João Gomes da Costa
Jessé Marques da Silva Júnior Pavão
Aldenir Feitosa dos Santos

DOI 10.22533/at.ed.4071916018

CAPÍTULO 9 90

LINFOMA CANINO - RELATO DE CASO

Natália Dias Prestes
Ive Francesca Troccoli Hepper
Luzia Cristina Lencioni Sampaio

DOI 10.22533/at.ed.4071916019

CAPÍTULO 10 95

SUPRESSÃO DO BIOMA MATA ATLÂNTICA NO MUNICÍPIO DE PARAÍBA DO SUL-RJ, ANALISADO SOB A ÓPTICA AMBIENTAL E SOCIAL, ENTRE OS ANOS 2002 A 2012

Luan Silva Alves Bastos
Saulo Paschoaletto de Andrade
Giselli Martins de Almeida Freesz

DOI 10.22533/at.ed.40719160110

CAPÍTULO 11 107

TECELAGEM DE TERRITÓRIOS: A EXPERIÊNCIA DA CARAVANA AGROECOLÓGICA E CULTURAL RUMO AO VALE DO RIBEIRA/SP

Paolo Marti Grasson Pereira de Souza Viola
André Ruoppolo Biazoti

DOI 10.22533/at.ed.40719160111

CAPÍTULO 12 120

TURISMO SUSTENTÁVEL E ARRANJO PRODUTIVO LOCAL: MENSURANDO A SUSTENTABILIDADE AMBIENTAL NA COSTA DO DESCOBRIMENTO

Wilson Alves de Araújo
Mônica de Moura Pires

DOI 10.22533/at.ed.40719160112

CAPÍTULO 13 139

USO DA SEPARAÇÃO BOTÂNICA NA AVALIAÇÃO DA PORCENTAGEM DE CAPIM ANNONI 2 (Eragrostis plana Ness) PRESENTE NA PASTAGEM EM UM SISTEMA SILVIPASTORIL NA REGIÃO DA CAMPANHA, RS

Melissa Batista Maia
Ivone Maria Barp Paim Vieira
Sidnei Junior Souza Rocha
Alexandre Costa Varella

DOI 10.22533/at.ed.40719160113

CAPÍTULO 14 144

USO DE VANT E PROCESSAMENTO DIGITAL DE IMAGENS NA QUANTIFICAÇÃO DA COBERTURA VEGETAL DO SOLO MANEJADO COM TRITON EM DIFERENTES VELOCIDADES

Ana Beatriz Alves de Araújo
Suedêmio de Lima Silva
Joaquim Odilon Pereira
Jonatan Levi Ferreira de Medeiros
Priscila Pascali da Costa Bandeira
Poliana Maria da Costa Bandeira
Erllan Tavares Costa Leitão

DOI 10.22533/at.ed.40719160114

CAPÍTULO 15 152

UTILIZAÇÃO DA ENERGIA SOLAR NA PRODUÇÃO DE BIODIESEL

Luiz Antônio Pimentel Cavalcanti
Fabiano Almeida Nascimento

DOI 10.22533/at.ed.40719160115

CAPÍTULO 16 165

VALORAÇÃO ECONÔMICA AMBIENTAL DA DISTRIBUIÇÃO DE ÁGUA DA COSANPA E COLETA DE RESÍDUOS SÓLIDOS NA CIDADE DE CONCEIÇÃO DO ARAGUAIA-PA

Ana Carolyna Aparecida Silva Villela
Danilo Epaminondas Martins e Martins
Gromon Cunha Bernasconi
Joandson Fernandes Campos
Rozana da Silva Reinaldo
Jullyana Cruz de Oliveira
Maicon Oliveira Miranda

DOI 10.22533/at.ed.40719160116

CAPÍTULO 17 171

VALORANDO O RIO APODI-MOSSORÓ

Ana Beatriz Alves de Araújo
Celsemy Eleutério Maia

DOI 10.22533/at.ed.40719160117

CAPÍTULO 18	181
VARIABILIDADE TEMPORAL DE PRECIPITAÇÕES NO MUNICÍPIO DE SANTA CRUZ DO CAPIBARIBE – PE, BRASIL.	
Guilherme Teotônio Leite Santos Vitor Hugo de Oliveira Barros José Martins de França Neto Jeisiane Isabella da Silva Alexandre Adriana Thays Araújo Alves	
DOI 10.22533/at.ed.40719160118	
CAPÍTULO 19	189
VARIABILIDADE TEMPORAL DE PRECIPITAÇÕES NO MUNICÍPIO DE TORITAMA – PE, BRASIL.	
José Martins de França Neto Vitor Hugo de Oliveira Barros Guilherme Teotônio Leite Santos Jeisiane Isabella da Silva Alexandre Adriana Thays Araújo Alves	
DOI 10.22533/at.ed.40719160119	
CAPÍTULO 20	200
VIABILIDADE E CARACTERIZAÇÃO LUMINOTÉCNICA DE LÂMPADAS <i>LIGHT EMITTER DIODE</i> (LED)	
Letícia Passos da Costa Dian Lourençoni Mariela Regina da Silva Pena Marcelo dos Santos Kawakame Luan Silva Jurandir da Silva	
DOI 10.22533/at.ed.40719160120	
CAPÍTULO 21	205
VIABILIDADE DO COMPOSTO DE LODO PROVENIENTE DA FABRICAÇÃO DE CELULOSE E PAPEL NO CULTIVO DE ALFACE	
Marcia Aparecida Simonete Letícia Moro Maria Tereza Warmling Maria Izabel Warmling Diego Fernando Roters Claudia Fernanda Almeida Teixeira-Gandra	
DOI 10.22533/at.ed.40719160121	
CAPÍTULO 22	212
SISTEMA DE SUGESTÃO DE DENSIDADE PARA PLANTAÇÕES DE BANANA UTILIZANDO VEÍCULOS AÉREOS NÃO TRIPULADOS	
Luan Carlos Casagrande Yuri Crotti Renan Cunha dos Santos Roderval Marcelino Rodrigo Maciel Wilson Gruber	
DOI 10.22533/at.ed.40719160122	
SOBRE OS ORGANIZADORES	222

INTERCEPTION OF RAINFALL BY NATIVE CAATINGA SPECIES, NORTHEAST BRAZIL

Mayara Andrade Souza

Program of Post-Graduation in Environmental Systems Analysis, Cesmac University Center

Maceió-AL

Jacob Silva Souto

Program of Post-Graduation in Agronomy, Federal Rural University of Paraíba

Garanhuns-PE

Kallianna Dantas Araujo

Program of Post-Graduation in Geography, Federal University of Alagoas

Maceió-AL

Élida Monique da Costa Santos

Institute of Geography, Development and Environment, Federal University of Alagoas,

Maceió-AL

Danúbia Lins Gomes

Postgraduate Program in Biological Diversity and Conservation in the Tropics, Federal University of

Alagoas, Maceió-AL

Elba dos Santos Lira

Institute of Geography, Development and Environment, Federal University of Alagoas,

Maceió-AL

João Gomes da Costa

Program of Post-Graduation in Environmental Systems Analysis, Cesmac University Center

Maceió-AL

Jessé Marques da Silva Júnior Pavão

Program of Post-Graduation in Environmental Systems Analysis, Cesmac University Center

Maceió-AL

Aldenir Feitosa dos Santos

Program of Post-Graduation in Environmental Systems Analysis, Cesmac University Center

Maceió-AL

ABSTRACT: As Brazil has biome richness and different types of vegetation cover, it is important to understand the influence of vegetation on hydrological processes. Studies indicate that 90% of the research on the interception of rainwater by vegetation is conducted in Amazon and Atlantic Forest, and this information is almost nonexistent when it comes about Caatinga. The aim of this study was to evaluate the internal precipitation and rainfall interception losses in Murici (*Byrsonima gardneriana* A. Juss), in the municipality of Olho D'Água do Casado-Alagoas. The experiment considered 21 individuals of Murici, who received interceptors to capture the internal precipitation and the "Ville de Paris" rain model was utilized to obtain the total precipitation, from January to December 2012. The readings were performed at each rain event and measured with a graduated cylinder. The rainfall events in an area with Murici occurrence indicate that the internal precipitation and the losses by interception corresponded to 16 and 83.87% of the rainfall, respectively, the distribution of rainfall index in 2012 was characterized by 17 events of low

intensity rainfall with values lower than 20mm; internal precipitation presented greater expressiveness in the rainy season in relation to dry season.

KEYWORDS: Semi-arid, Nutrient cycling; Rainfaall, Variability.

RESUMO: Como o Brasil dispõe de uma riqueza de biomas e diferentes tipos de cobertura vegetal é importante à compreensão da influência da vegetação nos processos hidrológicos. Estudos apontam que 90% das pesquisas sobre interceptação da água da chuva pela vegetação são realizadas na Amazônia e Mata Atlântica, sendo quase inexistentes essas informações quando se trata da Caatinga. Desse modo, objetivou-se avaliar a precipitação interna e as perdas por interceptação da chuva em plantas de Murici (*Byrsonima gardneriana* A. Juss), no município de Olho D'Água do Casado-Alagoas. O experimento considerou 21 indivíduos de Murici, os quais receberam interceptômetros para captação da precipitação interna e utilizou-se o pluviômetro modelo "Ville de Paris" para obtenção da precipitação total, no período de Janeiro a Dezembro 2012. As leituras foram realizadas a cada evento de chuva e mensuradas com proveta graduada. Os eventos de chuvas em área com ocorrência de Murici indicam que a precipitação interna e as perdas por interceptação, corresponderam a 16 e 83,87% da precipitação, respectivamente; a distribuição do índice pluviométrico no ano de 2012 foi caracterizado por 17 eventos de chuva de baixa intensidade com valores inferiores a 20 mm; a precipitação interna apresentou maior expressividade no período chuvoso em relação à época de estiagem.

PALAVRAS-CHAVE: Semiárido, Ciclagem de nutrientes, Precipitação pluvial, Variabilidade.

1 | INTRODUCTION

Forest cover is one of the most important barriers in the interception process of rainfall, since it allows some of the water to reach the soil surface with less impact (SHINZATO et al., 2011). Coupled to this fact, this is extremely important in water balance of ecosystems by changing the water and nutrient input mechanism on the soil surface (DINIZ et al., 2013).

For the authors, in an ecosystem the process of nutrient cycling is influenced by rainfall and the contact with the forest canopy that retains particles of a chemical-physical nature brought about by the leaching of metabolites from the tissues of leaves, trunks, of the particles deposited on the surface of the vegetation by rain, these nutrients return to the soil.

Rainfall occurs when vegetation is fractured through interception processes and effective precipitation. It is understood by interception of the rainfall that reaches the surface of vegetation, being redistributed as internal precipitation when the water enters between the openings of tree canopies (ARCOVA et al., 2003) and flow through the water trunk that is retained in canopy along with tree trunks that are then drained to the ground (OLIVEIRA JUNIOR and DIAS, 2005). The internal precipitation, added to the

flow through the trunk, results in effective precipitation (ALVES et al., 2007).

Water volume that reaches the soil and the amount of nutrients, according to Diniz et al. (2013) depend on factors such as vegetation type, morphological aspects of the forest, dominant precipitation regime in the region, vegetation cover density, tree diameter, rainfall intensity and wind speed (SILVA et al., 2009; ALVES et al., 2007).

The rainwater focus on forest cover and brings nutrients of mineral and organic constitution that return to the soil, contributing to forest nutrition, being an important process in the biogeochemical cycling (SOUZA, 2006). The understanding of this process in semi-arid region of the Brazilian Northeast is essential for contribution to the sustainability of forest ecosystems.

According to Giglio and Kobiyama (2013) the redistribution of rainwater by interception is little known in Caatinga, emphasizing the higher quantitative importance of interception in water balance, since the water stress stands out from the socioeconomic point of view, especially in the Caatinga.

In this context, it is advisable to know the quantification of rainwater interception by the crown of the plants and the nutrients present in it, especially in ecosystems with Caatinga vegetation and native plants of this biome such as Murici (*Byrsonima gardneriana* A. Juss) which presents medicinal and nutritional properties with potential for human consumption and as animal fodder.

Therefore, the aim of this study was to quantify the internal precipitation and rainfall interception losses in Murici (*Byrsonima gardneriana* A. Juss) in the municipality of Olho D'Água do Casado, Alagoas.

2 | MATERIAL AND METHODS

The study area is located in a private area in the municipality of Olho D'Água do Casado, Alagoas, located in the semi-arid Meso-region and Alagoas Microregion of São Francisco semi-arid region (ALAGOAS, 2015).

The region climate is BSh - Semi-Arid Tropical, according to the classification of Köppen (LIMA, 1977), with precipitation of 545,6 mm/year. The predominant soils in the region are lithic Neosol, constituted by stone fragments and Flossic Neosol, derived from environments with alluvial sedimentation (LEPSCH, 2002; EMBRAPA, 2006).

The area selected for the experiment was an area of natural vegetation, which was deforested for agricultural use, with native plants such as Murici (*Byrsonima gardneriana*) remaining in the locality, the study species.

The experiment was performed during the period from January to December 2012, consisting of 21 Murici matrices for the installation of rainwater harvesting structures, obtaining as inclusion criteria height of at least 2,5 m and circumference greater than 10 cm. The hydrological variables performed during the monitoring were: open or total precipitation, internal precipitation, interception losses and vegetation characteristics.

In order to obtain the total precipitation (TP), a “Ville de Paris” rain model was

installed in an open environment at a height of 1,5 m from soil surface, with a catchment area of 400 cm², distant 100 m from the evaluated plants.

Rainfall collections in the experimental area were performed at each rainfall event with the aid of a graduated cylinder, reading the water slide (mm).

For internal precipitation (IP), plastic intercepts (canister) with a capacity of 5 liters, a hose and a funnel with an internal diameter of 19 cm were used, with an area of 283,53 cm², installed at a height of 1,5 m from soil surface in the projection of the canopy, so the water accumulated in the funnel was led by the hose and stored in the plastic container.

The amount of rain incident on total precipitation (TP) and internal precipitation (IP) was calculated by the expression: $h = (V/S) \times 10$, where: h = precipitated rainfall height (mm); V = volume of rainwater (cm³) and S = catchment area (cm²).

The interception (I) was calculated by the equation: $I = TP - IP$, where: TP = total precipitation and IP = internal precipitation.

It was not considered in this calculation the rainfall flow through the trunk, because the values obtained were very low, less than 2% (FERREIRA et al., 2005).

The rainfall values were grouped into four classes according to the methodology of Izidio et al. ($20 \leq PC < 40$ mm) and fourth class ($PC \geq 40$ mm), the second class ($10 \leq PC < 20$ mm).

The experimental design was completely randomized, where 21 plants (sample units) were randomly selected and monitored in 17 rainfall events. The results were statistically analyzed by Tukey test at the 5% probability level and correlated with total precipitation data.

3 | RESULTS

Throughout 2012, variability was observed in the volume of total precipitation (Figure 1). The distribution of rainfall occurred over six months reaching a total volume of 166,9 mm, recorded in 17 events (Figure 1). Rainfall was concentrated in the period from May to August, with the highest volume in July (64,4 mm), presenting highest number of events (6), characterizing the rainy season (Figure 1).

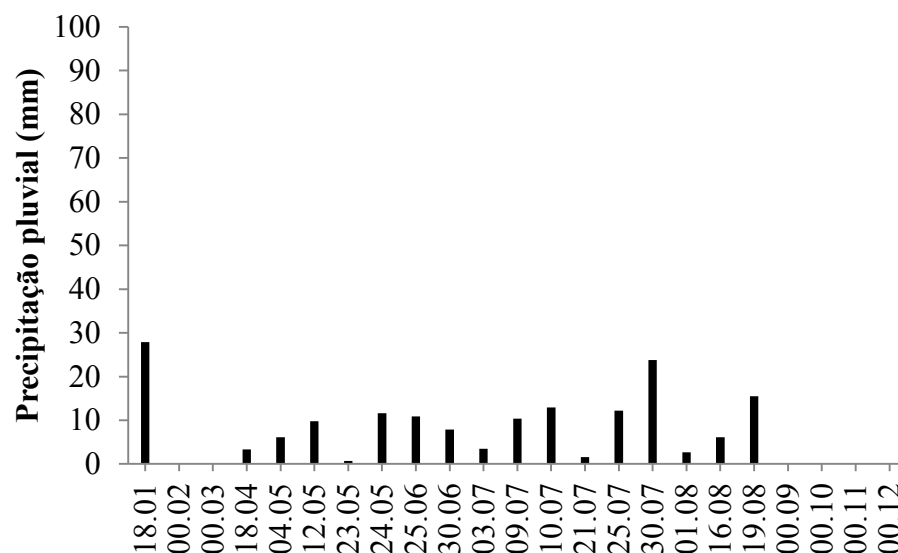


Figure 1. Rainfall (mm) observed during the period of January to December, 2012, in Olho D'Água do Casado, Alagoas.

It was observed that 9 of the 17 rainfall events had a volume lower than 10 mm, corresponding to 50% of total events, with total precipitation corresponding to 24,98%. There were seven events with volume between 10 and 20 mm, presenting 97,3 mm, totalling 58,29% of the total precipitation. Only one event was recorded in the class between 20 and less than 40 mm (Table 1).

In general, in 2012, the highest number of low-intensity rain events occurred, with values of less than 20 mm predominant (Table 1).

Precipitation classes	Number of Events	TP (mm)
PC < 10 mm	9	41,7
10 ≤ PC < 20 mm	7	97,3
20 ≤ PC < 40 mm	1	27,9
PC ≥ 40 mm	0	0

TABLE 1: Precipitation classes (CP), number of events and total precipitation (TP) for classes in Olho D'Água do Casado, Alagoas

The internal precipitation (IP) reached a total volume of 26,70 mm, corresponding to 16% of total precipitation (Table 2).

Month	Events	TP		IP		I	
		(mm)	(%)	(mm)	(%)	(mm)	(%)
January	1	27,9	16,72	16,39	61,39	11,40	8,14
April	1	3,3	1,98	0,24	0,90	3,06	2,19
May	4	28,2	16,90	1,84	6,90	26,36	18,83
June	2	18,8	11,26	1,51	5,67	17,29	12,35
July	6	64,4	38,59	5,03	18,86	59,27	42,34
August	3	24,3	14,56	1,68	6,29	22,62	16,16

Table 2. Mean values of total precipitation (TP), internal precipitation (IP) and interception (I) of Murici (*Byrsonima gardneriana* A. Juss.), Olho D'Água do Casado, Alagoas, 2012

The highest percentages of internal precipitation (IP) occurred in the months of January (27,9 mm, 61,39%) and July (64,4 mm, 18,8%), due to this fact, the occurrence of rains of greater magnitude in those months that contributed to a greater wetting of the vegetation.

Precipitation total loss by interception was 83,87% (Table 2). It is important to note that of the 17 rain events, 9 of these events were less than 20 mm, resulting in greater interception, due to the initial wetting process of the leaves (Table 2).

Of the precipitate total in 2012 (166,99 mm) the losses per intercept corresponded to 133,99 mm, meaning that only 26,1 mm reached the ground.

The total volumes of internal precipitation (IP) and interception canopy (IC) presented variation (Table 3). In the analysis of variance between the months that presented the highest number of rainfall events (Table 3), no significant difference was found for internal precipitation (IP), total precipitation (TP) and interception (I). However, it was observed that in the month of greatest precipitation, greater interception was observed through the canopies of Murici.

Month	IP		TP	I
	----- mm-----			
May	5,05 a		9,17 a	4,11 a
June	5,66 a		8,93 a	3,27 a
August	4,60 a		8,10 a	3,49 a
F Test	0,84		0,94	0,92
p>F	0,07 ns		0,03 ns	0,08 ns
C.V %	64,18		57,45	67,13
Mean	4,01		9,10	3,89

Table 3. Mean values of internal precipitation (IP), total precipitation (TP) and interception (I) of Murici (*Byrsonima gardneriana* A. Juss.), Olho D'Água do Casado, Alagoas, 2012

The accumulated values of the internal precipitation component (IP) for the rainy season (May-August) and dry (February-April) were 8,38 and 0,24 mm, respectively. In relation to the interception (I) in the rainy season was corresponded to 102,92 mm and in the dry season 3,06 mm, showing seasonal differences for these variables (Table 4). The internal precipitation during the rainy season was influenced by the increase of the total precipitation, presenting 31,43% of the precipitation in the rainy season and less than 1% in the drought period, demonstrating the reduction of precipitation.

Period	Internal precipitation (IP)		Interception (I)	
	mm	%	mm	%
Rainy	8,38	31,43	102,92	73,52
Drought	0,24	0,90	3,06	2,19

Table 4. Internal precipitation values (IP) and interception (I) by the tree canopy of Murici (*Byrsonima gardneriana* A. Juss.) in the rainy and dry seasons, Olho D'Água do Casado, Alagoas

4 | DISCUSSION

In the year of 2012, the total precipitated volume corresponded to 166,9 mm/year, being below the historical average of this region that is 545,6 mm/year (DCA, 2013), a characteristic feature of this region being the low aridity index and recurrence of droughts (MINISTÉRIO DA INTEGRAÇÃO NACIONAL, 2010).

There were 17 rain winds, with 50% presenting values less than 10 mm and only one event between $20 \leq CP < 40$ mm. The results obtained were very similar to the data collected by Albuquerque and Costa (2012) in Caatinga of Coreaú city, Ceará, which registered 40 rainy events with 11 low volume events (< 5 mm / day), with only 2 events records with rainfall greater than 30 mm.

Precipitation when in low volume as seen in most of the events recorded in the present study does not saturate the canopies and would cease immediately after the occurrence of the event. The internal precipitation is characterized by water that enters the openings of canopies (ARCOVA et al., 2003) and according to Moura (2013) when the events are of low volume these contribute of reduced form in the internal precipitation.

Vegetation cover has a direct influence on the redistribution of rainwater, where the tree canopies form a damping system and direct the droplets that reach the soil in a smoother and less impacting way, in order to provide greater humidity for soil and water available for vegetables (TONELLO et al., 2014).

Analyzing the internal precipitation in *Byrsonima gardneriana* species, it was also observed a variation of the values as a function of their morphology (leaf and crown size), the highest contributions of the plants that presented canopies and larger leaves; and plants arrangement in the area, with lower contribution of the internal precipitation verified in the isolated plants.

Similar behaviour was observed by Diniz et al. (2013) in a study conducted in Pinheiral-RJ with different succession stages of Rain Forest that observed lower values of internal precipitation in the smaller areas of canopies, since the smaller volume of rainwater was intercepted in canopies. In areas where the canopy was larger, a large part of precipitation was intercepted and retained in the canopies and gradually reached the ground, contributing to recharge of soil water.

For Brazil et al. (2017) although the Caatinga composition occurs predominantly of trees and shrubs with small leaves, the high rates of evaporation contribute to the interceptions as high as those recorded in regions with different climates, such as Rain Forest.

In a study about loss of interception in an area covered by Caatinga, Ceará, located in the Aiuaba Ecological Station in a preservation area (MEDEIROS et al., 2009), verified an internal precipitation value of 81% of the total precipitation, higher than that observed in the present study. Oliveira et al. (2011) highlights that this variation in internal precipitation depends of the total precipitation above the canopy.

In other ecosystems such as in the Eastern Amazon, the results were higher than the present study, as observed by Oliveira et al. (2008) that recorded internal precipitation of 76.8% of total rainfall. In Rain Forest, Diniz et al. (2013) recorded internal precipitation of 80% of the total precipitation. Sari et al. (2016) in Rain Forest in southern Brazil found internal precipitation between 75,97 and 82,40%. It is important to highlight that these different results are due to the unevenness of the vegetation structure and the climatic conditions of each region.

Moura (2013) affirms that with rain contribution, there is a greater turbulence in the leaves and branches causing the rain retained in the vegetation to be moved and fall. In addition, when canopy is saturated, the rain is practically not retained and this contributes to internal precipitation increase.

Interception compared to other studies about caatinga vegetation is considered high. Medeiros et al. (2009) at the Aiuaba Ecological Station, Ceará registered an index of 13%, and Marinho et al. (2002) Paraíba semi-arid region of 42% rainfall interception by vegetation.

In the Rain Forest, Arcova et al. (2003) found maximum interception of 18,6% of external precipitation. In a research project in the Capoeira area, Paraná, Thomaz (2005) observed interception of 36% and Lorenzon et al. (2013) in two areas with different regeneration stages, 84,39% (initial regeneration area) and 73,04% (advanced regeneration area).

In the monitoring performed by Tonello et al. (2014) in areas of *Eucalyptus cloezina*, *Pinus caribea* var. Hondurans and Semideciduous Seasonal Forest observed losses by interception of 13,8 , 15 and 22,8%, respectively.

Oliveira et al. (2008) also found variation between the values of internal precipitation (IP) and intercept by the canopy (IC), attributing this fact to the variation of total precipitation incident above the canopy. Izidio et al. (2013) studying the interception of rainfall in Caatinga area, observed that interception losses did not decrease as the rainfall height increased.

The quantification of interception in the water balance in Caatinga vegetation is rare and scarce, and new studies are necessary to cover other Caatinga physiognomies until sufficient studies of physiognomy of this biome have been made (GIGLIO and KOBAYAMA, 2013).

5 | CONCLUSIONS

- Monitoring of rainfall events in an area of Murici (*Byrsonima gardneriana* A. Juss.) Indicates that the internal precipitation and interception losses corresponded to 16% and 83.87% of precipitation, respectively;
- The distribution of the rainfall index in the year 2012 was characterized by 17 events of low intensity rainfall, generally with values lower than 20 mm;
- The internal precipitation presented greater expressiveness in the rainy sea-

son in relation to the dry season.

6 | ACKNOWLEDGMENTS

To CNPq for the scholarship and support for conducting the research. To Mr. Agaiton Gonçalves de Souza for assistance in field activities. To Federal University of Paraíba and To Biogeography and Environmental Sustainability Research Group of Federal University of Alagoas.

REFERENCES

- ALAGOAS. **Perfil Municipal: Olho D'Água do Casado**. 3. ed. Maceió: Secretaria de Estado do Planejamento e Desenvolvimento Econômico, 2015. 24 p.
- ALBUQUERQUE, F. N. B de; COSTA, J. S. da. **Rainfall interception in different physiognomies of caatinga (Coreaú, CE)**. Geografia Ensino & Pesquisa, Santa Maria, v. 16, n. 3, p. 63-75, sept/dec. 2012.
- ALVES, R. F.; DIAS, H. C. T.; OLIVEIRA JÚNIOR, J. C. de; GARCIA, F. N. M. **Evaluation of net precipitation in a fragment of Mata Atlântica in different regeneration stages in the municipal district of Viçosa, MG**. Revista Ambiente e Água, Viçosa, v. 2, n. 1, p. 83-93. jan/apr. 2007.
- ARCOVA, F. C. S.; CICCIO, V.; ROCHA, P. A. B. **Net precipitation and interception by Mata Atlântica in an experimental catchment in Cunha, São Paulo, Brazil**. Revista Árvore, Viçosa, v. 27, n. 2, p. 257-262, mar/apr. 2003.
- BRASIL, J. B. et al. **Rainfall characteristics and vegetation interception in the Caatinga biome**. Irriga, Botucatu, v. 22, n. 3, p. 560-574, july/sept. 2017.
- DCA-DEPARTAMENTO DE CIÊNCIAS ATMOSFÉRICAS. **Dados climatológicos do Estado de Alagoas**: Campina Grande: UFCG-CTRN, 2013. Disponível em: <www.dca.ufcg.edu.br>. Acesso: abril de 2013.
- DINIZ, A. R., M. G. et al. **Precipitation and nutrient contribution in different successional stages of atlantic forest, Pinheiral, Rio de Janeiro State**. Ciência Florestal, Santa Maria, v. 23, n. 3, p. 398-399, july/sept. 2013.
- EMBRAPA – EMPRESA BRASILEIRA DE PESQUISAS AGROPECUÁRIAS. **Soil classification system**. Rio de Janeiro: Embrapa solos, 2006.
- FERREIRA, S. J. F.; LUIZÃO, F. J.; DALLAROSA, G. **Throughfall and rainfall interception by an upland forest submitted to selective logging in Central Amazonia**. Acta Amazonica, Manaus, v. 35, n. 1, p. 55-62, jan/mar. 2005.
- GIGLIO, J. N.; KOBIYAMA, M. **Rain Interception: A Review with Emphasis on Monitoring in Brazilian Forests**. Revista Brasileira de Recursos Hídricos, Porto Alegre, v. 18, n. 2, p. 297-317, abr/jun. 2013.
- IZIDIO, N. S. de C. et al. **Rain interception by caatinga vegetation of the microcatchment in semiarid of cearense**. Revista agro@ambiente on-line, Boa Vista, v. 7, n. 1, p. 44-52, jan/mar. 2013.

- LEPSCH, I. F. **Soil formation and conservation**. 1. ed. São Paulo: Oficina de textos, 2002. 177 p.
- LIMA, I. F. **Geographic fundamentals of the physical environment of the State of Alagoas**. 1. ed. Maceió: Série Estudo de Regionalização, 1977. 93 p.
- LORENZON, A. S.; DIAS, H. C. T.; LEITE, H. G. **Net precipitation and interception in a forest fragment with different stages of regeneration**. Revista Árvore, Viçosa, v. 37, n. 4, p. 619-627, jul/ago. 2013.
- MARINHO, L. S.; SILANS, A. M. B. P.; BARBOSA, F. A. R. **Interceptação da chuva pela vegetação de caatinga**. In: SIMPÓSIO DE RECURSOS HÍDRICOS DO NORDESTE, 6., 2002, Maceió. Anais... Maceió: UFAL, 2002.
- MEDEIROS, P. H., J. C. ARAUJO and A. BRONSTERT. 2009. **Interception measurements and assessment of Gash model performance for a tropical semi-arid region**. Revista Ciência. Agrônômica, Fortaleza, v. 40, n.2, p. 165-174, abr/jun. 2009.
- MIN – MINISTÉRIO DA INTEGRAÇÃO NACIONAL. **New delimitation for the Brazilian semi-arid region**. 2005. Available in: <<http://www.min.gov.br>> Accessed March 20, 2010.
- MOURA, A. E. S. S. **Bases for water resources management: study of hydrological processes in the Tapacurá river basin**. 2013. 109 f. Thesis (PhD in Agricultural Engineering)- Federal Rural University of Pernambuco, Recife, 2013.
- OLIVEIRA, L. L. et al. **Sazonalidade e interceptação da chuva na Floresta Nacional em Caxiuanã – Amazônia Oriental**. Scientia Plena, v.7, n.10, p. 1-10, 2011.
- OLIVEIRA, L. L. de. et al. **Net precipitation and interception in Caxiuanã, in the Eastern Amazonia**. Acta Amazonica, Manaus, v. 38, n.4, p. 723-732, dec. 2008.
- OLIVEIRA JUNIOR, J. C.; DIAS, H. C. T. **Net precipitation in a forest fragment of Mata Atlantica**. Revista Árvore, Viçosa, v. 29, n. 1, p. 9-15, jan/feb. 2005.
- SARI, V.; PAIVA, M. C. D.; PAIVA, J. B. D. **Rainfall interception in different forest formations in the southern region of Brazil**. Brazilian Journal of Water Resources, Porto Alegre, v. 21, n. 1, p. 65-79, jan/mar. 2016.
- SHINZATO, E. T. et al. **Stemflow in different forest fragments of Ipanema National Forest in Iperó, Brazil**. Scientia Forestalis, Piracicaba, v. 39, n. 92, p. 395-402, dec. 2011.
- SILVA, F. L. da. et al. **Throughfall and rainfall interception in two urban tree**. Revista da Sociedade Brasileira de Arborização Urbana, Piracicaba, v.4, n.3, p.32-48, 2009.
- SOUZA, L. C. de. **Nutrient dynamics in rainfall, soil solution and groundwater in three forest typologies on Espodossolo, on the coast of Paraná**. 2006. 93 f. Thesis (PhD in Forest Engineering) - Federal University of Paraná, Curitiba, 2006.
- THOMAZ, E. L. **Assessment of rainfall interception and throughfall in brushes and secondary forest in Guarapuava-PR**. Revista Geografia (Londrina). 14: p. 47-60. 2005.
- TONELLO, K. C. et al. **Net precipitation in different forest fragments of Ipanema National Forest**. Revista Árvore, Viçosa, v. 38, n. 2, p. 383-390, mar/abr. 2014.

SOBRE OS ORGANIZADORES

JORGE GONZÁLEZ AGUILERA Engenheiro Agrônomo (Instituto Superior de Ciências Agrícolas de Bayamo (ISCA-B) hoje Universidad de Granma (UG)), Especialização em Biotecnologia Vegetal pela Universidad de Oriente (UO), CUBA (2002), Mestre em Fitotecnia (UFV/2007) e Doutorado em Genética e Melhoramento (UFV/2011). Atualmente, é professor visitante na Universidade Federal de Mato Grosso do Sul (UFMS) no Campus Chapadão do Sul. Têm experiência na área de melhoramento de plantas e aplicação de campos magnéticos na agricultura. Tem atuado principalmente nos seguintes temas: pre-melhoramento, fitotecnia e cultivo de hortaliças, estudo de fontes de resistência para estres abiótico e biótico, marcadores moleculares, associação de características e adaptação e obtenção de *vitroplantas*. Tem experiência na multiplicação “*on farm*” de insumos biológicos (fungos em suporte sólido; *Trichoderma*, *Beauveria* e *Metharrizum*, assim como bactérias em suporte líquido) para o controle de doenças e insetos nas lavouras, principalmente de soja, milho e feijão. E-mail para contato: jorge.aguilera@ufms.br

ALAN MARIO ZUFFO Engenheiro Agrônomo (Universidade do Estado de Mato Grosso – UNEMAT/2010), Mestre em Agronomia – Produção Vegetal (Universidade Federal do Piauí – UFPI/2013), Doutor em Agronomia – Produção Vegetal (Universidade Federal de Lavras – UFLA/2016). Atualmente, é professor visitante na Universidade Federal do Mato Grosso do Sul – UFMS no Campus Chapadão do Sul. Tem experiência na área de Agronomia – Agricultura, com ênfase em fisiologia das plantas cultivadas e manejo da fertilidade do solo, atuando principalmente nas culturas de soja, milho, feijão, arroz, milheto, sorgo, plantas de cobertura e integração lavoura pecuária. E-mail para contato: alan_zuffo@hotmail.com

Agência Brasileira do ISBN

ISBN 978-85-7247-040-7



9 788572 470407