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REVIEW ARTICLE

BASIC INFILTRATION ANALYSIS IMPLEMENTING MODIFICATIONS TO THE PORCHET METHOD

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ABSTRACT

The main objective of this research was the analysis of basic infiltration implementing the modified Porchet method at three points of different soil textures, to address this it was required to establish the pertinent theory, then the method was developed and Modified Porchet was proposed, and finally, a new infiltration test method of easy implementation was established. First of all, in accordance with the established hypothesis, it was possible to demonstrate that the Porchet method for performing soil infiltration tests accepted modifications, establishing a new Porchet method modified by TIBLA. With the Porchet method modified by TIBLA, it was possible to quantify basic infiltration, resulting in a loamy texture for the first point, a loamy texture for the second point, and a clayey loam texture for the third point.

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INTRODUCTION

According to Delgadillo et al. (2016), infiltration is defined as the vertical entry of water into the soil profile. Delgadillo et al. (2016) explain that the infiltration process is a practice for the design and evaluation of irrigation on a plot. In this sense, Delgadillo et al. (2016) describes soil infiltration capacity as the rate at which water can be applied to its surface without runoff (Delgadillo & Pérez, 2016, p. 1). According to Úbeda Rivera et al. (2018) considers the infiltration process to be very important, given that it visualizes the phases of the soil, whether liquid, solid, or gaseous. Considering that water composes the liquid phase of the soil, without it, the soil would be dead; it only contains rock and air, which are the components of the solid and gas phases (Úbeda Rivera et al., 2018, p. 890). Úbeda Rivera et al. (2018) emphasizes that water is life in the soil, as in the rest of the ecosystem components. There are a large number of organisms in the soil that require water to perform their vital functions. Another criterion they emphasize is that it aids the decomposition of matter, among other functions necessary for the completion of the energy flow cycle (Úbeda Rivera, Delgado Dallatorre, & Zaldívar-Cruz, 2018, p. 890). On the other hand, Úbeda Rivera et al. (2018) explains that infiltration is governed by two forces: gravity and capillary action. Úbeda Rivera et al. (2018) also describes the very small pores that push water through capillary action, also working against the force of gravity. For Úbeda Rivera et al. (2018), the infiltration rate is affected by soil characteristics such as ease of entry, storage capacity, and the rate of transmission through the soil (Úbeda Rivera, Delgado Dallatorre, & Zaldívar-Cruz, 2018, p. 890). Furthermore, Alvarado Batres et al. (2017), in agreement with (Gurovich, 1985), states that the infiltration process is of great practical importance since its velocity generally determines the amount of runoff water, thus allowing the risk of erosion during floods or very intense rainfall to be detected (Alvarado Batres & Barahona-Palomo, 2017, p. 23). There are various methods for measuring the infiltration rate, or infiltration velocity, the most notable being the permeameter, the double ring method, and the Porchet method, each with its own characteristic of ease of implementation. Continuing with Alvarado Batres et al. (2017), they state that the permeameter method is a modification of the permeameter presented by Talsma and Hallam (1980). This permeameter consists of a Mariotte tube constructed with two intrinsic tubes that act as a reservoir, maintaining a constant hydraulic head in a hole drilled in the ground. (Alvarado Batres & Barahona-Palomo, 2017, p. 24). Alvarado Batres et al. (2017) report that, according to Selker et al. (1999), the double-ring method is the most common test for estimating soil hydraulic properties. Horton (1939) established, for the case of a soil subjected to precipitation with an intensity always greater than the infiltration capacity, an empirical relationship to represent the decline in infiltration over time (Alvarado Batres & Barahona-Palomo, 2017, p. 24).

The Porchet test, in its own words, is used to determine infiltration. It is also known as the constant-level method or test. It measures the rate at which water infiltrates into a hole where the test will be performed. These methods are performed in situ in unsaturated soils, with holes of varying depth (ABC Geotechical Consulting, 2025). In this sense, the Porchet test is the method that will be studied to verify whether an easily implemented modification is acceptable for infiltration testing in different soil textures. The main objective of this research is to analyze basic infiltration using the modified Porchet method. To address this, it is necessary to establish the relevant theory underlying the research, then develop a method that adapts modifications to aid implementation in infiltration testing, and finally, establish a new, easily implemented method. For the above, the following research hypothesis is highlighted: will the Porchet method accept modifications to facilitate infiltration tests in different soil textures?

METHODOLOGY

This study is framed within the quantitative methodological approach, which allows for the exploration of the phenomenon or variable, in this case infiltration. Therefore, it is necessary to evaluate the Porchet method, according to Hernández Sampieri et al. (2014):

"Quantitative studies are based on previous research. They are used to consolidate beliefs (logically formulated in a theory or theoretical framework) and accurately establish behavioral patterns in a population" (p. 10). In this context, the research seeks to evaluate the Porchet infiltration method with additional, clear criteria that allow for easy-to-implement modifications, assessing its importance and explaining its implementation in detail through in situ experimentation. The Porchet method is a procedure used to measure water infiltration into the soil, allowing for the assessment of the soil's capacity to absorb water. The basic steps for this method are described below:

Materials Needed

A drill or probe to make a hole in the ground.
A PVC cylinder or pipe (usually 45 cm tall and 8 inches in diameter).
A container for measuring and pouring water (such as a ruler, a water meter, or a graduated container).
Water.
A stopwatch or clock.
A water level (optional, but recommended).

Steps for Performing the Porchet Method

Site Selection. Choose a representative area of the soil you wish to study. Ensure it is free from surface water (such as nearby ponds or rivers) and has not been recently disturbed.

Site Preparation. Clean the soil surface, removing any debris (leaves, stones, etc.) that could interfere with infiltration.

Cylinder Installation. Insert the cylinder or pipe vertically into the soil to a depth of approximately 15 cm. Ensure it is secure and that the top edge is level with the soil surface to prevent water from spilling over.

Cylinder Filling. Fill the cylinder with water. to a defined level (usually about 15 cm above the top edge of the cylinder). This will serve as a reference for measuring infiltration.

Measuring Infiltration Time. Once you've filled the cylinder, start timing. During the test, monitor the water level in the cylinder. Record the drop in water level at regular intervals (e.g., every 1 minute at 10-minute intervals, every 2 minutes at 5-minute intervals, every 5 minutes at 8-minute intervals, every 20 minutes at 5-minute intervals, every 30 minutes at 2-minute intervals, and every hour at 2-hour intervals) until water stops infiltrating, indicating that the soil's saturation capacity has been reached.

Execution Time: The study was carried out over a period of one month, from March to April 2025. The first week was spent preparing the conditions for the in-situ test, the second week was spent analyzing the results, and the third to fourth weeks were spent preparing the final research report.

Data Collection Technique and Method: Record the water levels and the corresponding time for each measurement. The notes should be made on a data collection form; this should be repeated with at least three tests at different points.

Infiltration Calculation: Infiltration can be calculated by observing the amount of water that has penetrated the soil as a function of time. Calculate the average infiltration rate by dividing the amount of infiltrated water (in cm) by the total time (in minutes) of the measurement.

Results Interpretation: Analyze the collected data to determine the soil's infiltration capacity. This can be useful for agricultural applications, stormwater management, and understanding soil characteristics.

Sources: Various sources of information were used for data collection, including:

Scientific articles on methods implemented to calculate soil infiltration. Photographs and on-site observations as a method of documenting the study area. Data collection form. Bibliography and previous studies on infiltration calculations. Web portals specialized in developing infiltration methods.

Universe: The universe to be studied: all soils in a particular watershed.

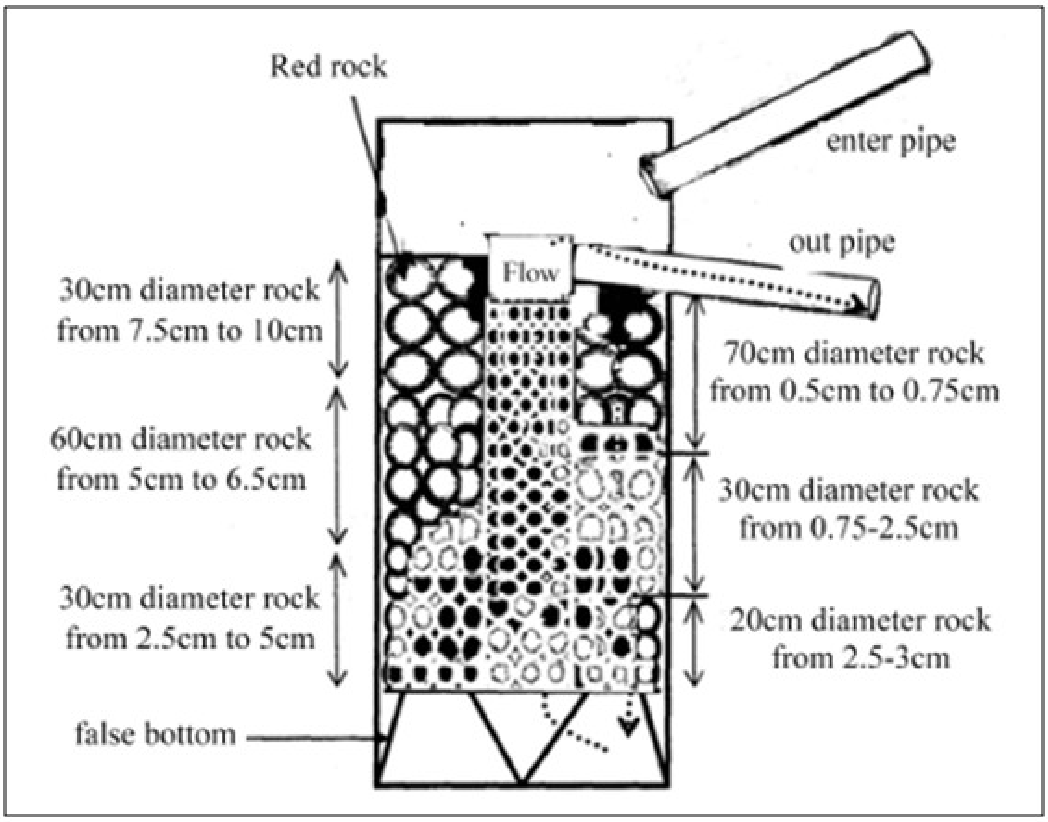
Population: All soils of different types (sandy, clay, silty) in that watershed.

Sample: Three randomly selected sampling points to measure infiltration in different soil types in the watershed. The first point has the following coordinates: N 1316299; E 586515; the second point N 1316136; E 586442; and the third point N 1317815; E 588628.

Inclusion Criteria: Include areas with specific climatic conditions.

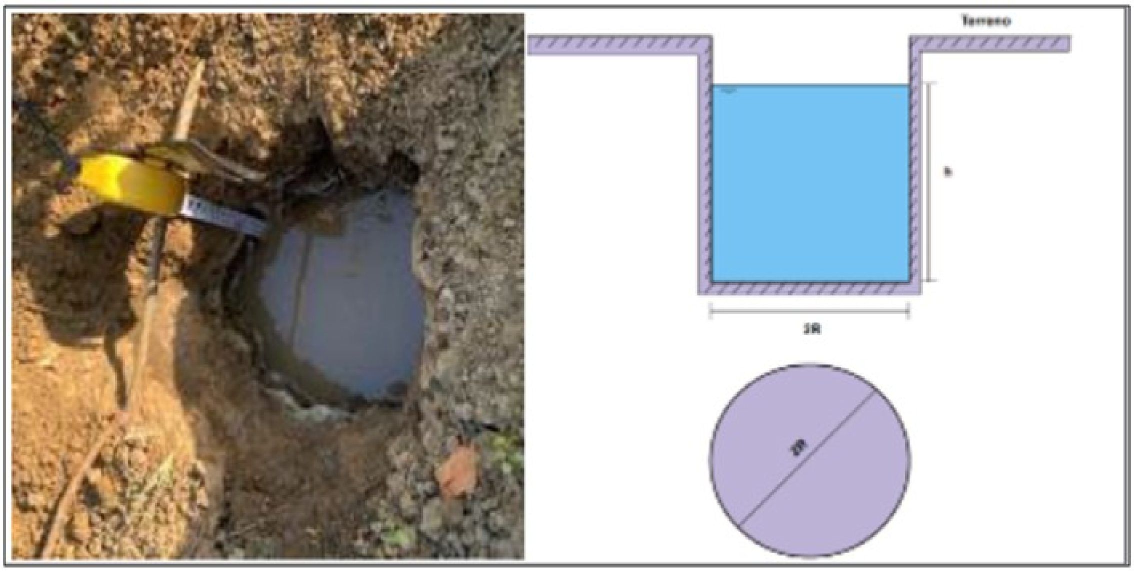
Exclusion Criteria: Exclude areas with extreme humidity or dryness that are not representative of the typical conditions to be studied.

Theoretical Aspects: The Porchet method for infiltration testing, author Quiliche Carrasco (2021), in his thesis for a degree in geological engineering, defines it as the hydrological process by which water enters the soil through its surface. He used the Porchet method, which consists of excavating a cylindrical hole with a constant radius and a depth no greater than 20 cm, in which he measured the decrease in the water level over time (Quiliche Carrasco, 2021, p. 41). The theoretical basis of this research is based on the work of Picado (2019) and Picado (2022). The first author conducted a filtration study using red rock material, which yielded results in the characterization stage of the water effluent from the stabilization lagoon system tested at the San Marcos treatment plant in Carazo. This study assessed the importance of the filtration system as a device for load removal from parameters associated with biological activity. The hydraulic efficiency of the system works interchangeably under different retention periods, allowing for the measurement of hydraulic load, flow rate, volume, and infiltration rate through the porous medium (Picado, 2019, p. 817). The test equipment was built as a prototype using local materials, thus innovating equipment for this type of test. See Figure 1.



Source: developed by (Picado, 2019, p. 810)

Figure 1. Filter prototype



Source: retrieved from (Muñoz, Opolenko, et al., 2023, p. 130)

Figure 2. Conventional Porchet method

According to the research carried out by Muñoz, Opolenko, et al. (2023), where they highlight the characterization of the soil and its relationship with the infiltration process, they used the conventional Porchet method, where an infiltration layer was obtained in a time of 120 minutes, and they were analyzed with the Horton method (1939) to determine the infiltration capacity, see figure 2. As a result of the above, author Picado (2022), in his research "Calibration of the infiltration rate curve from the LN trend line at eight sites of interest, based on infiltration tests conducted," developed a practical methodology to obtain a logarithmic trend expression to determine the average infiltration of a field test, using the double-ring method (Picado, 2022, p. 1114). In this sense, this same methodology proposed by Picado (2022) will be used to adapt the Porchet method.

Picado (2022) reports that the equation that allows determining the accumulated infiltration (Iacum) is given by Kostiakov (1932) and improved by Philips (1957). It can be expressed as follows:

$$d = K * t^{m} \quad (1)$$

Where:

d = accumulated infiltration over time t (mm)
K = a constant that depends on the initial soil structure (dry). It is the laminar infiltration at the first instant greater than zero (mm)
m = a constant that depends on the stability of the soil structure against water,
0>m<1
K in sandy or loamy soils with cracks shows values between 10 and 30, soils with stable structures against water show values of m greater than 0.6

To obtain the values of K and m, the following is done:

$$\log(d) = \log(K) + m * \log(t) \quad (2)$$

equation that responds to the straight line $y = b + a * x$

Where:

log d = y; dependent variable
log K = b; intercept (soil constant)
m = a; slope of the line (soil constant)
log t = x; independent variable

Solving by least squares, we have:

$$m = \frac{\frac{\sum(logt*logd)}{n} - \frac{\sum logt}{n} * \frac{\sum logd}{n}}{\frac{\sum(logt)^2}{n} - \left(\frac{\sum logt}{n}\right)^2} \quad (3)$$

From equation 2, logK is solved, and K is obtained.

Then equation (1) becomes:

$$d = K * t^m \quad (4)$$

This is the accumulated depth over time for a soil being studied. This way, we can predict any accumulated depth based on a given test time. Using the above expression, the accumulated infiltration versus time is graphed.

To determine the average infiltration rate, the following expression is used:

$$\boldsymbol{I} = \frac{\boldsymbol{d}}{\boldsymbol{t}} \left(\frac{\boldsymbol{mm}}{\boldsymbol{h}}\right) \quad (4)$$

Substituting 1 in 4 we have:

$$I = \frac{d}{t} = \frac{K*t^m}{t} = K * t^{m-1} \quad (5)$$

Where:

I = infiltration at time t (mm/h)

k = K*m*60
-n = m-1

The following expression is obtained

$$I = k * t^{-n} \quad (6)$$

The result of the average infiltration is compared with the following table related to the soil texture, the average infiltration is closely related to the soil texture.

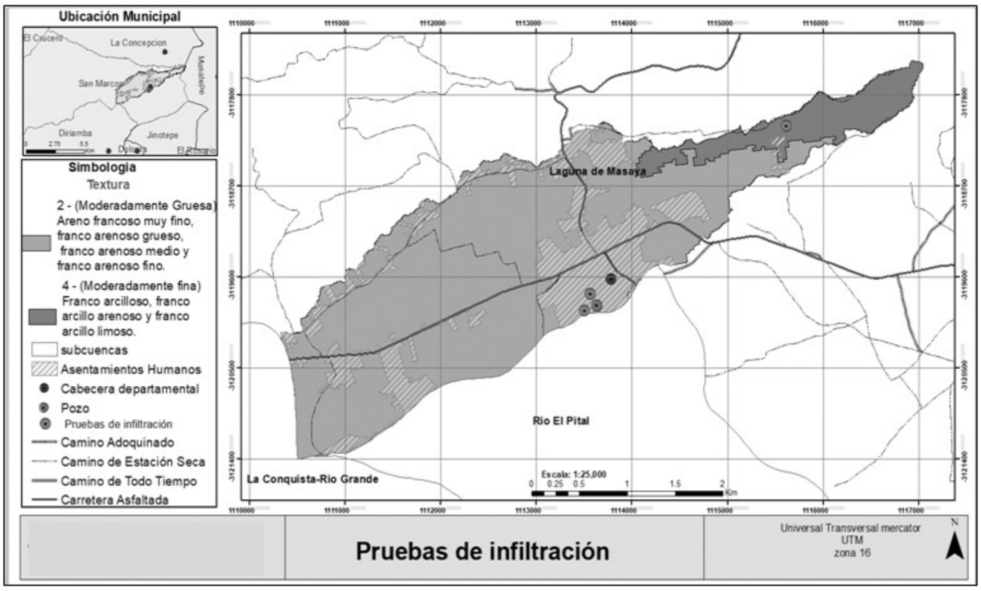
Table 1. Average soil infiltration values (mm/h)

Soil texture	Basic infiltration. Variation range (mm/h)
Clayey	< 5
Clayey loam	5 – 10
Loamy	10 – 20
Sandy loam	20 – 30
Sandy	30>

Source: retrieved from (PROSAP, 2022, p. 11)

RESULTS

The study points are hydrologically located in the Masaya Lagoon sub-basin, which in turn belongs to the San Juan River basin. Politically and administratively, the points are located in the municipality of San Marcos, department of Carazo. The coordinates are: The first point has the following coordinates: N 1316299; E 586515; the second point N 1316136; E 586442; and the third point N 1317815; E 588628. See Figure 3.



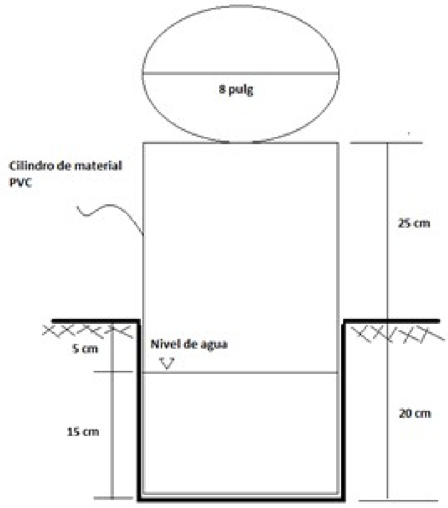
Source: prepared by the authors, based on data from INETER (2025).

Figure 3. Micro-localization of points in studies

Conclusión

Based on Porchet's definition, the modification to Porchet is proposed; the conditions for collecting the modeled information for the study are as follows.

PVC pipe with a diameter of 8'', with a length of 45 cm



Source: own elaboration. (2025).

Table 2. Modeling for the study of filtration

Table 2 shows the initial conditions for the test. This is a variation on the test established by Porchet. This variation is called TIBLA, which stands for Time, Infiltration, Berm, Pipe Length, Sectional Area.

The measurements taken are shown in Tables 3, 4, and 5:

Table 2. Data obtained from the test in point 1

Time	INTERVAL (t)	T. Acum. (min)	Reading (cm)	Initial Reading (cm)	Partial sheet (mm)	Sheet Acum. (mm)	I basic (mm/h)
08:13:00	0	0	0	15	0	0	
	1	1	14.4		6.0	6.0	360.0
	1	2	13.7		7.0	13.0	210.0
	1	3	13.0		7.0	20.0	140.0
	1	4	12.8		2.0	22.0	30.0
	1	5	12.6		2.0	24.0	24.0
	1	6	11.9		7.0	31.0	70.0
	1	7	11.6		3.0	34.0	25.7
	1	8	11.5		1.0	35.0	7.5
	1	9	11.5		0.0	35.0	0.0
	1	10	11.4		1.0	36.0	6.0
	5	15	7.4		40.0	76.0	160.0
	5	20	6.0	15	14.0	90.0	42.0
	5	25	12.8		22.0	112.0	52.8
	5	30	11.4		14.0	126.0	28.0
	5	35	10.0		14.0	140.0	24.0
	5	40	8.8		12.0	152.0	18.0
	5	45	8.3		5.0	157.0	6.7
	5	50	7.5		8.0	165.0	9.6
	5	55	6.4	15	11.0	176.0	12.0
	5	60	14.0		10.0	186.0	10.0
	10	70	11.3		27.0	213.0	23.1
	10	80	8.0		33.0	246.0	24.8
	10	90	7.2		8.0	254.0	5.3
	10	100	6.4	15	8.0	262.0	4.8
	10	110	10.8		42.0	304.0	22.9
	20	130	7.0	15	38.0	342.0	17.5
	20	150	11.5		35.0	377.0	14.0
	20	170	5.8	15	57.0	434.0	20.1
	20	190	10.0		50.0	484.0	15.8
	20	210	5.0		50.0	534.0	14.3
Observation:	After three hours of observation, infiltration stabilized. The results characterized the soil as loamy.					**Ave.**	**16.3**

Source: own elaboration. (2025).

Table 3. Data obtained from the test in point 1

Time	INTERVAL (t)	T. Acum. (min)	Reading (cm)	Initial Reading (cm)	Partial sheet (mm)	Sheet Acum. (mm)	I basic (mm/h)
08:13:00	0	0	0	15	0	0	
	1	1	14.4		6.0	6.0	360.0
	1	2	13.7		7.0	13.0	210.0
	1	3	13.0		7.0	20.0	140.0
	1	4	12.8		2.0	22.0	30.0
	1	5	12.6		2.0	24.0	24.0
	1	6	11.9		7.0	31.0	70.0
	1	7	11.6		3.0	34.0	25.7
	1	8	11.5		1.0	35.0	7.5
	1	9	11.5		0.0	35.0	0.0
	1	10	11.4		1.0	36.0	6.0
	5	15	7.4		40.0	76.0	160.0
	5	20	6.0	15	14.0	90.0	42.0
	5	25	12.8		22.0	112.0	52.8
	5	30	11.4		14.0	126.0	28.0
	5	35	10.0		14.0	140.0	24.0
	5	40	8.8		12.0	152.0	18.0
	5	45	8.3		5.0	157.0	6.7
	5	50	7.5		8.0	165.0	9.6
	5	55	6.4	15	11.0	176.0	12.0
	5	60	14.0		10.0	186.0	10.0
	10	70	11.3		27.0	213.0	23.1
	10	80	8.0		33.0	246.0	24.8
	10	90	7.2		8.0	254.0	5.3
	10	100	6.4	15	8.0	262.0	4.8
	10	110	10.8		42.0	304.0	22.9
	20	130	7.0	15	38.0	342.0	17.5
	20	150	11.5		35.0	377.0	14.0
	20	170	5.8	15	57.0	434.0	20.1
	20	190	10.0		50.0	484.0	15.8
	20	210	5.0		50.0	534.0	14.3
Observation:	After three hours of observation, infiltration stabilized. The results characterized the soil as loamy.					**Ave.**	**16.3**

Source: own elaboration. (2025).

Table 4. Data obtained from the test in point 2

Time	INTERVAL (t)	T. Acum. (min)	Reading (cm)	Initial Reading (cm)	Partial sheet (mm)	Sheet Acum. (mm)	I basic (mm/h)
09:22:00	0	0	0	15	0	0	
	1	1	13.50		15.0	15.0	900.0
	1	2	12.90		6.0	21.0	180.0
	1	3	12.20		7.0	28.0	140.0
	1	4	11.30		9.0	37.0	135.0
	1	5	10.70		6.0	43.0	72.0
	1	6	10.00		7.0	50.0	70.0
	1	7	9.20		8.0	58.0	68.6
	1	8	8.80		4.0	62.0	30.0
	1	9	8.20		6.0	68.0	40.0
	1	10	8.00		2.0	70.0	12.0
	5	15	6.00	15	20.0	90.0	80.0
	5	20	10.30		47.0	137.0	141.0
	5	25	7.40		29.0	166.0	69.6
	5	30	6.40	15	10.0	176.0	20.0
	5	35	10.00		50.0	226.0	85.7
	5	40	7.40		26.0	252.0	39.0
	5	45	6.20	15	12.0	264.0	16.0
	5	50	12.00		30.0	294.0	36.0
	5	55	10.00		20.0	314.0	21.8
	5	60	8.50		15.0	329.0	15.0
	10	70	6.60	15	19.0	348.0	16.3
	10	80	11.80		32.0	380.0	24.0
	10	90	7.20		46.0	426.0	30.7
	10	100	6.00	15	12.0	438.0	7.2
	10	110	10.60		44.0	482.0	24.0
	20	130	7.30		33.0	515.0	15.2
	20	150	7.20	15	1.0	516.0	0.4
	20	170	8.80		62.0	578.0	21.9
Total	170						
Observation:	After three hours of observation, infiltration stabilized. The results characterized the soil as loamy.					**Average**	**17.6**

Source: own elaboration. (2025).

Table 5. Data obtained from the test in point 3

Time	INTERVAL (t)	T. Acum. (min)	Reading (cm)	Initial Reading (cm)	Partial sheet (mm)	Sheet Acum. (mm)	I basic (mm/h)
08:22:00	0	0	0	15	0	0	
	1	1	14.20		8.0	8.0	480.0
	1	2	14.18		0.2	8.2	6.0
	1	3	13.99		1.9	10.1	38.0
	1	4	13.90		0.9	11.0	13.5
	1	5	13.85		0.5	11.5	6.0
	1	6	13.80		0.50	12.0	5.0
	1	7	13.76		0.4	12.4	3.4
	1	8	13.72		0.4	12.8	3.0
	1	9	13.69		0.3	13.1	2.0
	1	10	13.64		0.5	13.6	3.0
	5	15	9.89	15	37.5	51.1	150.0
	5	20	13.90		11.0	62.1	33.0
	5	25	13.12		7.8	69.9	18.7
	5	30	12.72		4.0	73.9	8.0
	5	35	12.05		6.7	80.6	11.5
	5	40	11.76		2.9	83.5	4.4
	5	45	11.02	15	7.4	90.9	9.9
	5	50	10.68		43.2	134.1	51.8
	5	55	10.02		6.6	140.7	7.2
	5	60	9.83	15	1.9	142.6	1.9
	10	70	13.05		19.5	162.1	16.7
	10	80	12.28		7.7	169.8	5.8
	10	90	11.85		4.3	174.1	2.9
	10	100	11.01		8.4	182.5	5.0
	10	110	9.55	15	14.6	197.1	8.0
	20	130	8.20	15	13.5	210.6	6.2
	20	150	8.32	15	66.8	277.4	26.7
	20	170	8.80		62.0	339.4	21.9
Total	170						
Observación:	After three hours of observation, infiltration stabilized. The results characterized the soil as clay loam.					**Average**	**10.9**

Source: own elaboration. (2025).

The methodology was developed for the first trial; only the results for the other two trials will be presented. See Table 6.

Step 1: Calculate the logarithms to obtain the multipliers m and logK

Table 6. From the data of the first test, it is solved by least squares to obtain the multipliers m, logK

	X	Y	X	Y		
ID	t. Acum. (min)	Sheet Acumulated (mm)	Log (t)	log(d)	Log(t)*Log(d)	$(Log(t))^2$
1	1	6	0.00	0.78	0.00	0.00
2	2	13	0.30	1.11	0.34	0.09
3	3	20	0.48	1.30	0.62	0.23
4	4	22	0.60	1.34	0.81	0.36
5	5	24	0.70	1.38	0.96	0.49
6	6	31	0.78	1.49	1.16	0.61
7	7	34	0.85	1.53	1.29	0.71
8	8	35	0.90	1.54	1.39	0.82
9	9	35	0.95	1.54	1.47	0.91
10	10	36	1.00	1.56	1.56	1.00
11	15	76	1.18	1.88	2.21	1.38
12	20	90	1.30	1.95	2.54	1.69
13	25	112	1.40	2.05	2.86	1.95
14	30	126	1.48	2.10	3.10	2.18
15	35	140	1.54	2.15	3.31	2.38
16	40	152	1.60	2.18	3.50	2.57
17	45	157	1.65	2.20	3.63	2.73
18	50	165	1.70	2.22	3.77	2.89
19	55	176	1.74	2.25	3.91	3.03
20	60	186	1.78	2.27	4.04	3.16
21	70	213	1.85	2.33	4.30	3.40
22	80	246	1.90	2.39	4.55	3.62
23	90	254	1.95	2.40	4.70	3.82
24	100	262	2.00	2.42	4.84	4.00
25	110	304	2.04	2.48	5.07	4.17
26	130	342	2.11	2.53	5.36	4.47
27	150	377	2.18	2.58	5.61	4.74
28	170	434	2.23	2.64	5.88	4.97
29	190	484	2.28	2.68	6.12	5.19
30	210	534	2.32	2.73	6.33	5.39
		Suma	42.79	60.01	95.23	72.97

Source: own elaboration. (2025)

$m = -0.0055$

$logK = 2.0081$

$K = 101.8899$

Step 2: **From the results of the multipliers, equation (4) is applied to obtain d = accumulated water layer, see table 7.**

Table 7. Result of the accumulated sheet in mm

$d = 101.8899 * t^{-0.0055}$		
ID	t. Acum. (min)	Sheet acumulated (mm)
1	1	101.89
2	2	101.50
3	3	101.28
4	4	101.12
5	5	100.99
6	6	100.89
7	7	100.81
8	8	100.73
9	9	100.67
10	10	100.61
11	15	100.38
12	20	100.22
13	25	100.10
14	30	100.00
15	35	99.92
16	40	99.84
17	45	99.78
18	50	99.72
19	55	99.67
20	60	99.62
21	70	99.54
22	80	99.46
23	90	99.40
24	100	99.34
25	110	99.29
26	130	99.20
27	150	99.12
28	170	99.05
29	190	98.99
30	210	98.94

Source: own elaboration. (2025).

Applying equation 5, the following multipliers are obtained:

$$k = 33.47$$
$$-n = -1.01$$

Step 3: Once the multipliers were obtained in the previous step, the basic infiltration was calculated with expression 6 from the first test. See table 8.

Table 8. Basic infiltration result in mm/h

$I = k * t^{-n} = -33.47 * t^{-1.01}$					
ID	**t. Acum. (min)**	**log(t)**	**1.01*log(t)**	**log(I)=log(k)-n*log(t)**	**I (mm/h)**
1	1	0.000	0.000	1.525	33.47
2	2	0.301	0.304	1.221	16.62
3	3	0.477	0.482	1.043	11.04
4	4	0.602	0.608	0.917	8.25
5	5	0.699	0.706	0.819	6.59
6	6	0.778	0.786	0.739	5.48
7	7	0.845	0.854	0.671	4.69
8	8	0.903	0.912	0.613	4.10
9	9	0.954	0.964	0.561	3.64
10	10	1.000	1.010	0.515	3.27
11	15	1.176	1.188	0.337	2.17
12	20	1.301	1.314	0.211	1.62
13	25	1.398	1.412	0.113	1.30
14	30	1.477	1.492	0.033	1.08
15	35	1.544	1.560	-0.035	0.92
16	40	1.602	1.618	-0.093	0.81
17	45	1.653	1.670	-0.145	0.72
18	50	1.699	1.716	-0.191	0.64
19	55	1.740	1.758	-0.233	0.58
20	60	1.778	1.796	-0.271	0.54
21	70	1.845	1.864	-0.339	0.46
22	80	1.903	1.922	-0.397	0.40
23	90	1.954	1.974	-0.449	0.36
24	100	2.000	2.020	-0.495	0.32
25	110	2.041	2.062	-0.537	0.29
26	130	2.114	2.135	-0.610	0.25
27	150	2.176	2.198	-0.673	0.21
28	170	2.230	2.253	-0.728	0.19
29	190	2.279	2.302	-0.777	0.17
30	210	2.322	2.345	-0.821	0.15
				Average	**3.70**

Source: own elaboration. (2025).

The results obtained from the infiltration tests are as follows: at the first point, the basic infiltration rate was 16.3 mm/h, with an average infiltration rate of 3.70 mm/h; at the second point, it was 17.6 mm/h, with a basic infiltration rate of 5.89 mm/h; and at the third point, it was 10.0 mm/h, with an infiltration rate of 2.80 mm/h. The graphs for each of the tests performed are presented below.

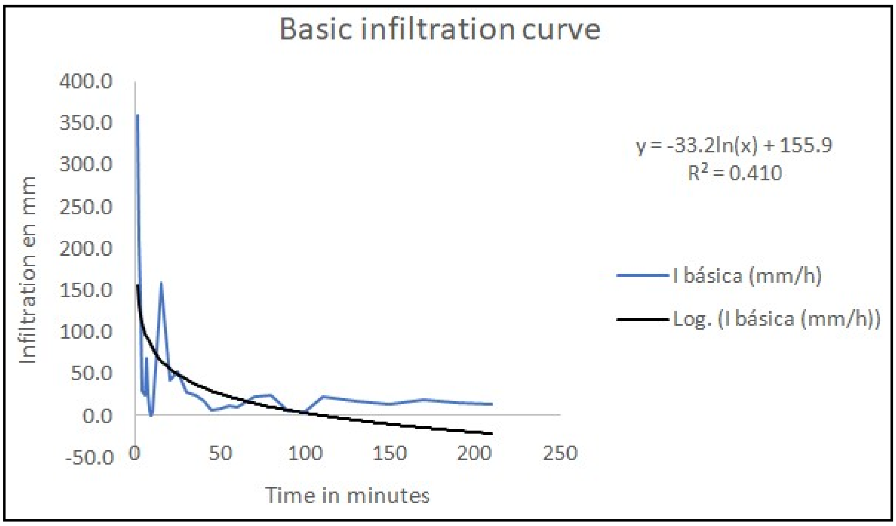


Figure 4. Basic infiltration curve with data from the first point.

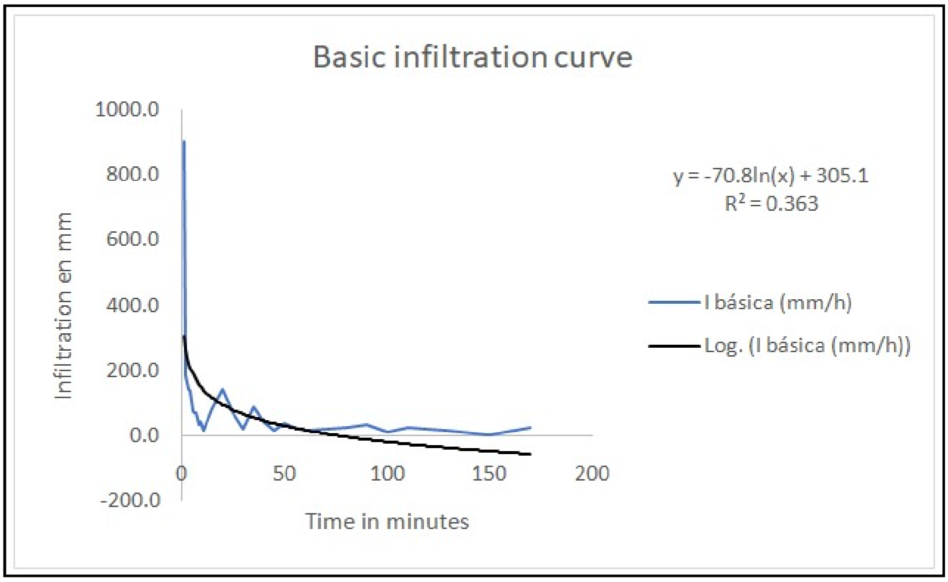


Figure 5. Basic infiltration curve with data from the second point

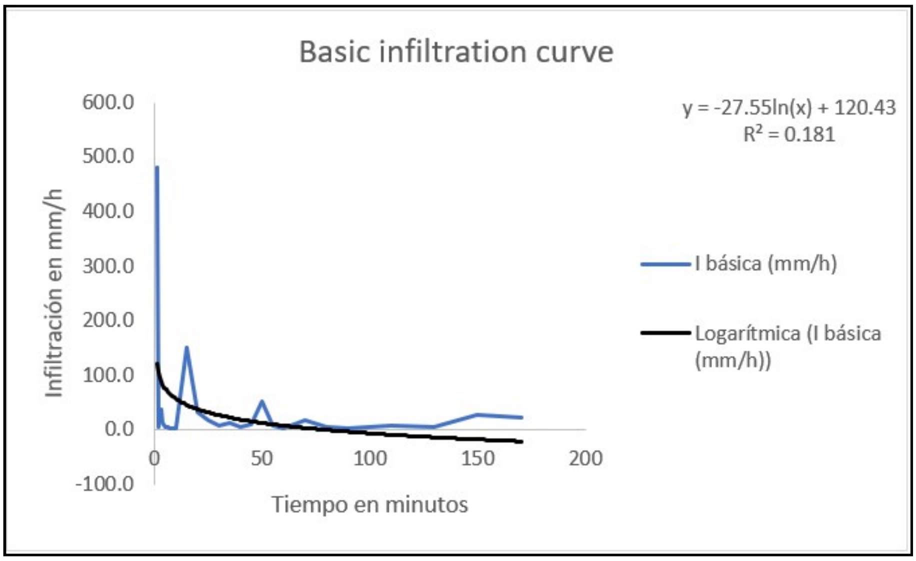


Figure 6. Basic infiltration curve with data from the third point.

According to the calculated basic infiltration values, the first point has a loamy texture; the second point has a loamy texture; and the third point has a clayey-loam texture.

CONCLUSION

The Porchet infiltration method, proposed by Kostiakov (1932) and improved by Philips (1957), and its TIBLA variant represent complementary approaches to analyzing water infiltration in soils. The original Porchet method is based on theoretical principles that account for the variability of groundwater flow, providing an effective estimate of water movement through different soil layers. The TIBLA variant, for its part, introduces significant improvements by integrating easy-to-use modeling and simulation techniques that allow for a more accurate and adaptive assessment, considering not only hydraulic behavior but also factors such as soil heterogeneity and the influence of changing climatic conditions. In comparison, although the Porchet method is fundamental to a basic understanding of infiltration processes, TIBLA offers a more dynamic and flexible approach, ideal for situations where accuracy and adaptability to variable conditions are crucial, such as in water resource management, environmental sustainability, water balance, and recharge studies. This distinction underscores the usefulness of both methodologies, highlighting the importance of choosing the appropriate method based on the specific requirements of the infiltration analysis. Therefore, it can be said that the Porchet method for performing infiltration tests accepts modifications to facilitate testing in different soil textures, thus establishing a new definition of the infiltration process, which is defined as follows: Infiltration is considered the time it takes for water to infiltrate a given berm through a circular section of material defined by length L and area. TIBLA-modified Porchet.

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