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ESTIMATION OF INFILTRATION RATES IN THE SUDDAGEDDA BASIN, EAST GODAVARI DISTRICT, A.P.

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ABSTRACT

Suddagedda basin is adopted as a representative basin of east flowing rivers of medium sized basins in the east coast of India by the Institute. The basin soil mainly grouped into clay loams to clay, sandy loams and forest and loamy skeletal. As a part of experimental studies in the basin total 28 infiltration tests have been conducted using double ring infiltrometers. Using the experimental data the average infiltration rate of the soil groups are obtained from fitted Horton's equation. The correlation coefficient between observed data and fitted Horton's equation varied between 0.83 to 0.99. The average infiltration rates in clay loams to clay, sandy loams and forest & loamy skeletal are 2.50, 3.94 and 7.12 cm/hr respectively. The highest average initial infiltration rate (39.2 cm/hr) and average final infiltration rate (4.7cm/hr) were observed in forest & loamy skeletal soil and lowest average initial infiltration rate (19.4 cm/hr) and average final infiltration rate (1.31 cm/hr) were in agricultural land. According to landuse classifications the highest average infiltration rate was obtained in Barren land (6.9 cm/hr) and lowest rate in agricultural land (2.50 cm/hr). A map showing the spatial distribution of average infiltration rates in the Suddagedda basin was prepared.

1.0 INTRODUCTION

1.1 General

Infiltration is one of the important phase of the Hydrological cycle, controling the movement of water on the surface and subsurface zones. Infiltration is the phenomena of entry of waters into the ground. The rate and quantity of water which infiltrates is a function of soil type, soil moisture, soil permeability, ground cover, drainage conditions, depth of water table, and intensity and volume of precipitation. The soil type helps identify the size and number of capillaries through which water may flow into the ground, while moisture content helps identify capillary potential and relative conductivity.

Infiltration is one of series of process responsible for modifying precipitation and converting it to runoff and resulting in addition to soil moisture storage. Thus, if the infiltration characteristics of a basin under given condition are known, one can roughly estimate the quantity of rainfall excess that is likely to result from a given storm and thereby have an idea of resulting flood. The infiltration process and other hydrological processess (as run-off, evapotranspiration, etc.,) are inter related through a common dependence on soil-moisture conditions, the simulation of infiltration is best achieved in a model incorporating all the relevant processes.

1.2 Factors affecting infiltration

The variations in the Infiltration capacity are large. Soil characteristics, climate conditions and other numerous factors are expected to affect the infiltration. The flow chart showing the factors affecting the infiltration rate is given in Fig. 1. Some of them are as follows.

1.2.1 Soil texture and structure

The structure of soils is mainly influenced by the aggregation of soil particles. The organic matter content helps to maintain a favourable structure by promoting soil aggregation. In some soils a compact dense layer of soil at shallow depth from the surface can greatly limit the rate of the downward movement of water. Under this condition the voids above the dense zone may be

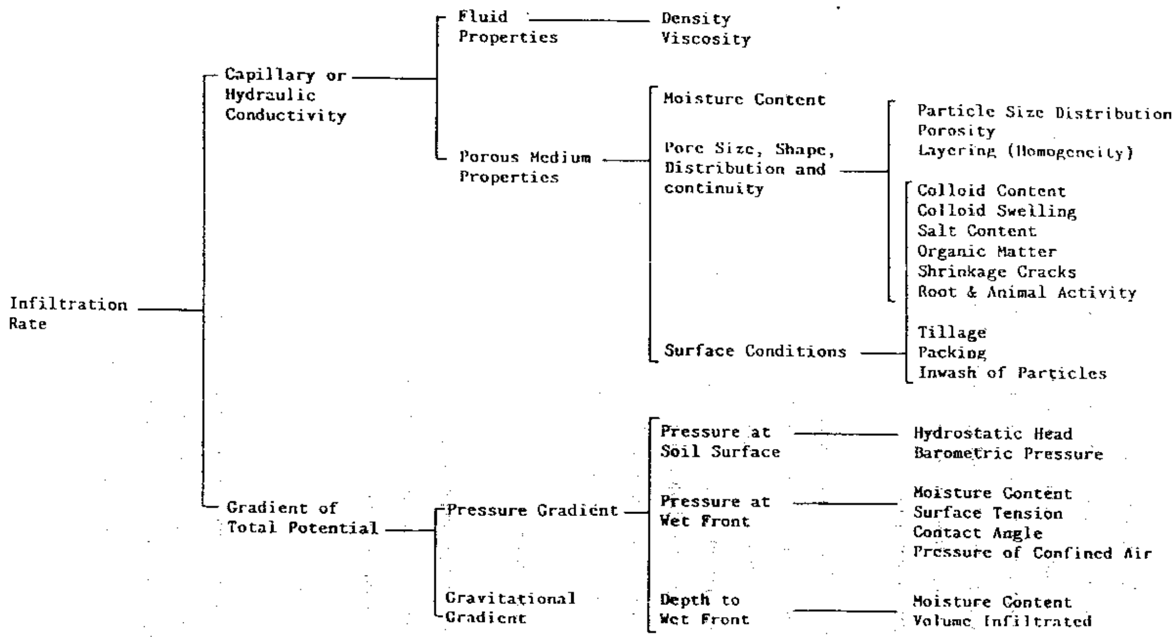


Fig. 1 Factors affecting the Infiltration rate

rather quickly filled and the infiltration rate thereafter reduced to a minimum. If, however, the lateral slope of the dense layer is favourable, substantial lateral movement of infiltered water may take place as subsurface flow in which case the rate of infiltration will be maintained at a fairly high rate. The moisture content of the soil is mainly responsible for influencing the infiltration. Obvisouly, greater is the soil-moisture content, lesser is the rate of water intake by infiltration.

1.2.2 Rainfall Characteristics

The infiltration rate is influenced by the rainfall duration and its intensity. The duration of sustained heavy rainfall results in a steady reduction in the infiltration capacity until the rate of infiltration attains a nearly constant value. When the rainfall rate is less than the infiltration capacity, all rainfall will be infiltered as long as rainfall occurs. Intense rainfall has the effect of progressive reduction of the infiltration capacity because of increased supply of moisture to the surface layers of the soil, mechanical compaction of soil by impact of raindrops and the inwash of fine material.

1.2.3 Human Activities

Cultivation of land, disturbing thereby soil aggregation besides destroying openings made by burrowing animals, insects and decayed roots. Over plowing under wet conditions destroy even the normal aggregation of the soil. Developing a gross cover or crop on normally bare ground results in an increase of the infiltration capacity. Where heavy pedestrian or vehicular traffic occurs on a soil, the surface is rendered relatively impervious.

1.3 Use of Infiltration Processes

Infiltration has an important place in the hydrological cycle. Detailed study of infiltration processes meets the following purposes.

(i) Estimation of peak rates and volumes of runoff in planning of dams, culverts and bridges etc.,

(ii) Estimation of surface runoff and overland flow

(iii) Planning of watershed engineering

(iv) Estimation of groundwater recharge

(v) Assessment of soil moisture deficits and planning irrigation and drainage systems etc.,

A few studies had been carried out by Rawat J. et al 1993, Omkar et al 1993, Soni et al, 1988, 1985 for estimating the infiltration rates in various basins in different parts of India using Double ring infiltrometers.

2.0 SCOPE AND PURPOSE OF THE STUDY

As defined by Toebes and Ouryvaeu (1970) representative basins are basins which are selected as representative of a hydrological region i.e., a region within which hydrological similarity is presumed. They are used for intensive investigations of specific problems of the hydrological cycle under relatively stable natural conditions. Thus a sparse features of a given region and their variations over large natural zones. For conducting representative basin studies the basic perception of the drainage basin system is necessarry. A basin is closed system are those which possess clearly defined boundaries, across which no import or export of materials or energy takes place. The open system requires a continuing energy supply and removal of energy. The advantage of the open system approach arise from the facts that it places emphasis upon adjustment and upon relationship between basin characteristics and hydrological parameters upon the multivariate character of the many hydrological phenomena, and upon the total hydrological environment.

The Suddagedda basin is chosen by Deltaic Regional Centre, National Institute of Hydrology, Kakinada as a representative basin of medium size catchments in the east coastal region of India. As a part of representative basin studies infiltration tests were conducted using Double ring infiltrometer to obtain the following information about the basin.

(i) To understand the infiltration processess in the basin.
(ii) Establishment of Infiltration rate curves at different combinations of soil and landuse/cover in the basin.
(iii) Estimation of average infiltration rate at each location using fitted Horton's equation.
(iv) Estimation of average infiltration rates in each soil type.
(v) Estimation of average infiltration rate in each landuse type.
(vi) The spatial distribution of average infiltration rate in the basin.

3.0 STUDY AREA

3.1 Location

Suddagedda is a typical East flowing river and representative of the East flowing rivers that are lying between rivers Godavari and Mahanandi and having their originals in Eastern Ghats and joining Bay of Bengal without forming any deltas. The basin lies between latitude 17° 09'10"N and 17° 30'45" N, and longitude 82° 08'30"E and 82° 19'15"E. The total catchment area is 658.3 km^2 and sloping towards southeast. Eastern Ghats are lying on the northern side of the basin in the form of a series of hill ranges that trend from northeast to southwest. The location map of the basin is shown in Figure 2. The stream rises, in vatangi reserved forest area in Rajavommangi mandal of East Godavari district in Andhra Pradesh at an elevation of about 700 m. The basin area is under tropical climate with hot summers and cold winters. More than half of the rainfall is contributed by southwest monsoon between June and September while the remaining rainfall is by north-west monsoon during the months of October and November.

3.2 Hydrogeology

A major portion of the proposed basin is underlain by Khondalites, granites and charnockites. The central and western parts of the basin is underlain by alluvium. The southern part of the basin is underlain by Khondalite suite for rocks, basaltic formation and Tirupathi sandstones. Groundwater in the crystalline rock is restricted to weathered and fractured zones and is being exploited mostly by dug wells, dug-cum-borewells. Filter point wells/shallow tube wells in the central and western part of the basin are constructed down to 30 m to 50 m.

3.3 Soils and Landuse

The predominant soils in the basin are black clay, red and light brown sandy soils towards the northern part of the basin, red soils are predominant in the hilly tracts with the forest. The basin is broadly classified into three soil types. They are clay loams, sandy loams and forest and loamy skeletal soils (GWD, 1993). The soil groups are shown in Fig 3.

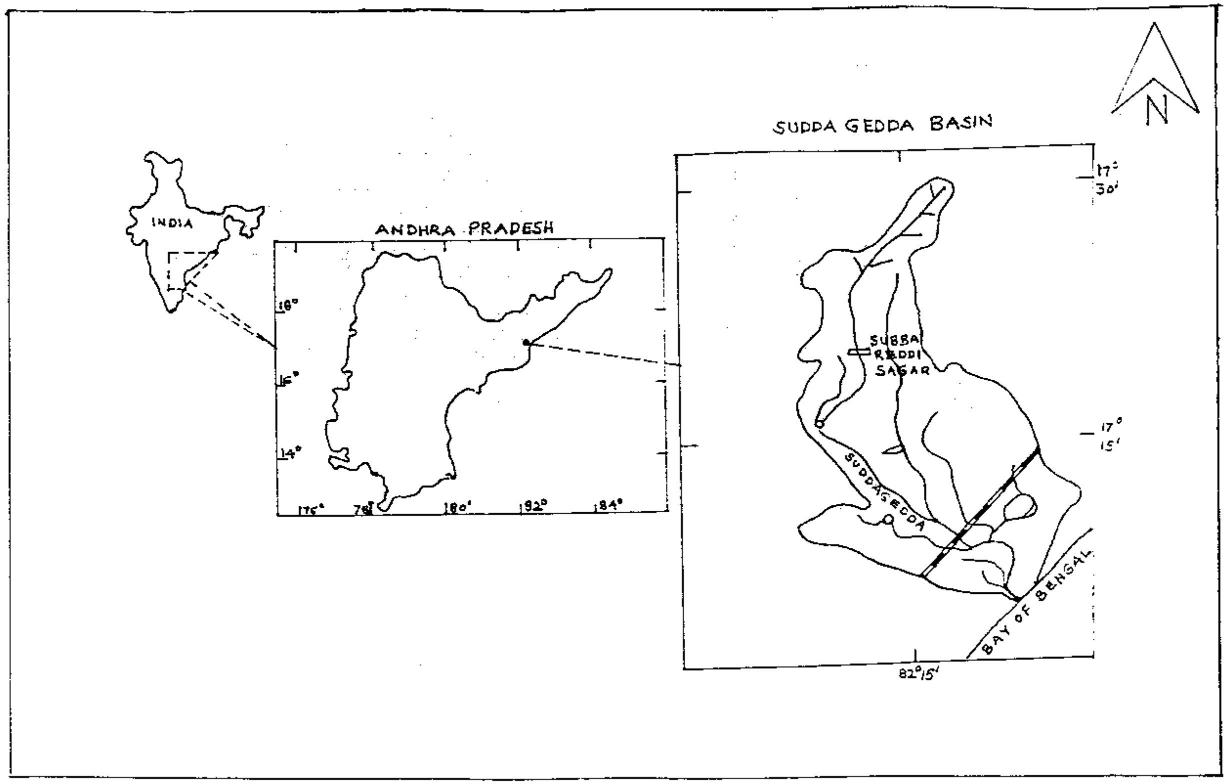
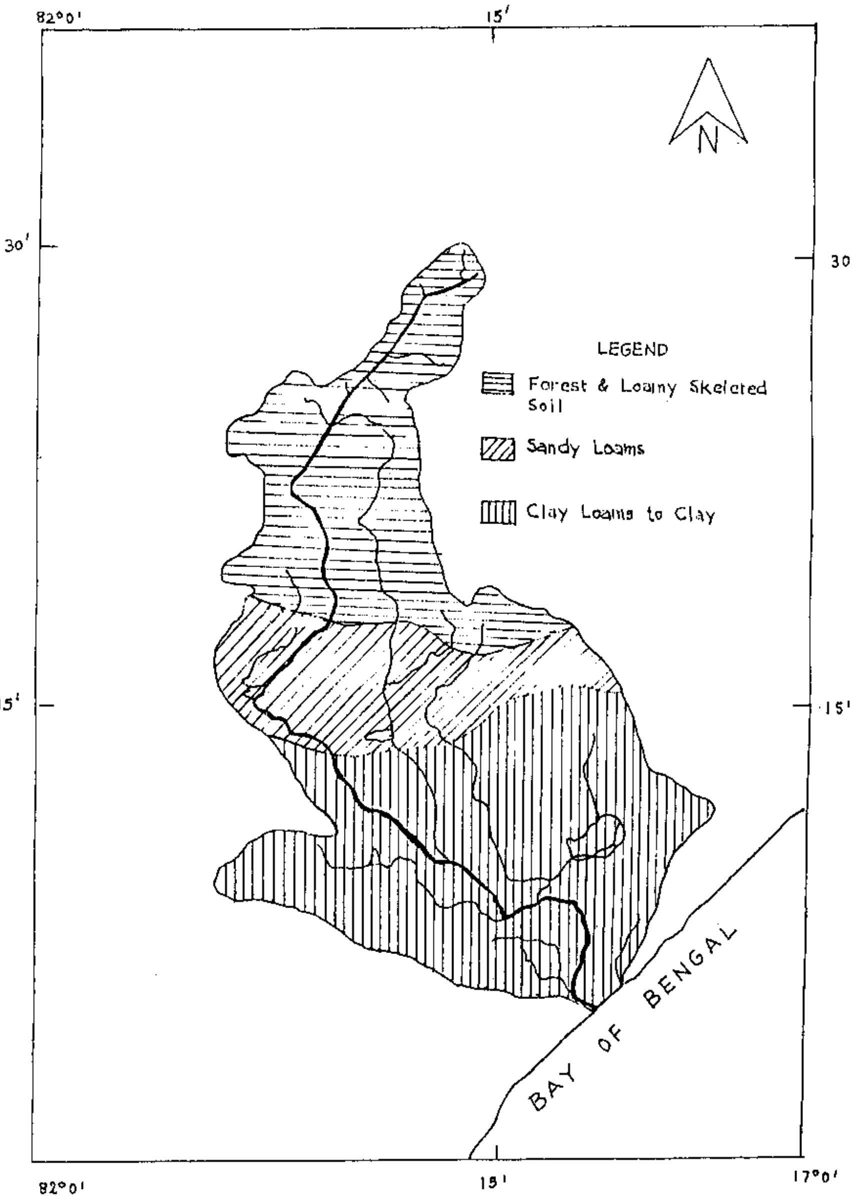


Fig. 2 Location map


82°0'
15'
30'
30'
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N
LEGEND
Forest & Loamy Skeleted Soil
Sandy Loams
Clay Loams to Clay
BAY OF BENGAL

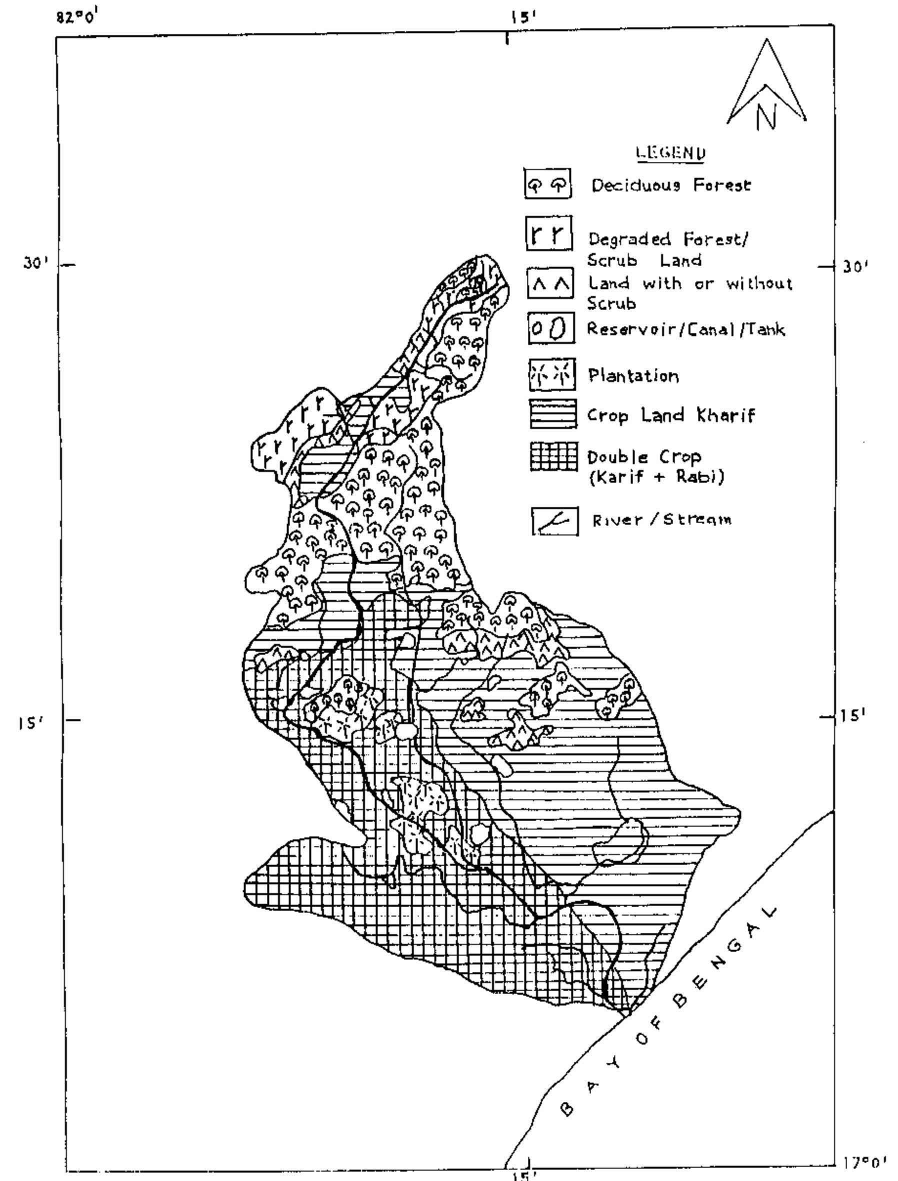

FIG.4 Land Use/Land Cover Map of "SUDDAGEDDA" basin

The main crops grown in the area are paddy, banana, sugarcane and commercial crops like chilies and cotton. Paddy and banana are grown under Subbareddy Sagar Project and under wells. The entire northern part is covered by deciduous forest and degraded forest lands. The broad landuse/cover distribution in the Suddagedda basin is shown in Fig 4.

4.0 METHODOLOGY

Keeping in view the complexity of the infiltration process, the measurement of infiltration rates and volumes should be accomplished under field conditions. Infiltration rates in silts and rocks can be determined in several ways. Laboratory determination involve placing soil or rock cores in suitable containers and allowing water to percolate through known soil cross sections. Unless soils are equigranular and loose, laboratory values may differ from values obtained in the field. In the present study the infiltration rates are estimated at different places by field experiments. The suddagedda basin has been classified into clay loams to clay, sandy loams and forest & loamy skeletal having 52%, 20% and 28% of total area respectively. Infiltration tests were conducted for agriculture, mango garden, grass land, barren land and plantain gardens. Photographs of few landuses are shown in Plate I to IV. These experiments were conducted during the month of March 1996 and 1997.

4.1 Double ring Infiltrometers

In recent years, for the determination of infiltration rate double ring infiltrometer is be ing widely used. This consists of two concemtric rings of 45cm and 30 cm in diameter of mild steel plates, and a couple of tanks with the same diameter as that of the rings to feed water to maintain constant head of water. A constant depth of water i.e. 20cm can be maintained by suitably adjusting the position of the nozzle of the tube which is connected to the water container (plate I). Hammer is generally used to drive the rings into ground.

Procedure

(i) Selection of the suitable site for experiment based on soil type, landuse and rainfall intensity.

(ii) The cylindrical rings are to be driven for about 20cm below the ground level, using suitable hammers.

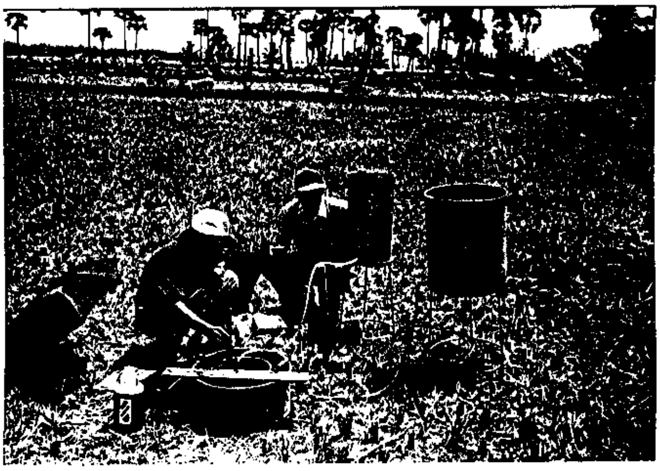

PLATE -1 INFILTRATION TEST IN AGRICULTURE LAND

PLATE-2 INFILTRATION TEST IN AGRICULTURE LAND

PLATE-3 INFILTRATION TEST IN MANGO GARDEN

PLATE-4 INFILTRATION TEST IN PLANTAIN GARDEN

(iii) Two constant head devices with a marking of maximum water level will be lowered in to both the rings (inner and outer) through a flexible pipe and inturn this should be connected to graduated container. There will be a nozzle for controlling the water flow from the container Constant head device (float) will aid in maintaining the water level and to note the readings.

(iv) In the next stage water will be supplied from the container tube. The minimum water level in the rings should be upto a depth of 10cm. The fall of water level in the tanks corresponds to a depth of water infiltrated.

(v) The readings may be taken at definite intervals till constant readings are obtained.

(vi) Finally a graph may be drawn with time as X-axis and infiltration rate on Y-axis.

The following precautions are to be taken while using double ring infiltrometer.

i) The water used in infiltrometer tests must be of the same quality and composition as the water in the real systems.
ii) Distance between the rings should be maintained equally on all sides.
iii) While inserting rings the disturbance in soil layers should be minimum.
iv) Water level in the inner ring and outer ring should be equal.

4.1 HORTON'S EQUATION

Permeability and rates of soil infiltration, will fluctuate with time and location. Beaver (1977) found using an infiltrometer, that infiltration can be represented by Horton's equation (Horton, 1939, 1940). This method gives an expression for time varying infiltration. The volume of infiltration is the area under the infiltration curve and the volume of rainfall is the area under the rainfall intensity curve.

$$f(t) = f_c + (f_o - f_c)\, e^{-Kt}$$

Where

$f(t)$ = infiltration rate as a function of time (cm/hr)

f_c = final, or ultimate, infiltration rate for a hydraulic gradient of unity, this is analogous to the soil permeability.

f_o = initial infiltration rate

k = recession constant (hr^{-1})

t = time -units compatible with k

The total volume of infiltrate using Horton's equation is determined by integrating the area under the curve,

or

$$F = \int_0^t f(t)\,dt = f_c t + ((f_o - f_c)/k) * (1 - e^{-Kt})$$

Where

F = total infiltration volume, cm(in) or other consistent units.

Use of this equation form allows for more accurate estimation of infiltration because it is bases the potential infiltration on the amount of infiltration which has occurred, not on the amount of time elapsed (Wanielista, 1990). Also, use of data from double ring infiltrometer testing is usually conducted with the assumption that there is always a head on the infiltrating water. The use of this form of the equation allows for the use of data from these double ring infiltrometer tests, however the condition of a water head having to be maintained is not required in the watershed simulation. Using infiltration test data at each site the recession constant(K) is calculated. Then Horton's equation is fitted with observed data. The correlation coefficient between observed data and Horton's equation is calculated to find the best fit of the equation. The average infiltration rate is obtained from Horton's equation by deviding the infiltration volume by duration of the storm/experiment. The average infiltration rates are compared for different soil types in the basin. Similarly the average infiltration rate at various landuse classes in the basin are also compared. Using the average infiltrate rate at various locations in the basin the spatial distribution map is prepared.

5.0 RESULTS AND DISCUSSIONS

Total 28 infiltration tests have been conducted using double ring infiltrometers in Suddagedda basin. The location of these tests are shown in Fig. 4(a). The basin soil has been grouped into three types. They are clay loams to clay, sandy loams and Forest & loamy skeletal having an area of 340 km^2, 137 km^2 and 181 km^2 respectively. The results of each experiment and fitted Horton's equation are shown in Fig 5 to 33. The initial and final infiltration rate, average infiltration rate, correlation coefficient of each experiment with corresponding soil and landuse are shown in Table 1.

Clay Loams to Clay

Clay loams are found in the lower parts of the basin. Total 15 experiments have been conducted in this soil type. Total three landuse types have been covered in the region. They are Agricultural land, grass land and plantain garden. The initial infiltration rate varies between 36 cm/hr to 4.5 cm/hr. Similarly the final infiltration rate varies between 6.0 cm/hr to 0.20 cm/hr. For each experiment data Horton's equation is fitted and the average infiltration rate obtained. The average infiltration rate varied between 7.22 cm/hr to 0.83 cm/hr. However, the average initial infiltration rate, the average final infiltration rate and average infiltration rate for the clayey loams to clay soil are 19.42 cm/hr 1.31 cm/hr and 2.05 cm/hr respectively. The correlation coefficients show that the reasonable fit of experimental data (Table 1) is achived in the Horton's equations develp ed.

Sandy Loams

Sandy Loams are found in the middle parts of the basin. Total 8 experiments have been conducted in this classification. Mainly six landuse classes had been covered in the sandy loams. The initial infiltration rate varies between 12 cm/hr to 56 cm/hr. Similarly the final infiltration rate varies between 8 cm/hr to 0.35 cm/hr. The average infiltration rate (obtained by Horton's equation) varies between 9.91 cm/hr to 0.89 cm/hr. Finally, the average initial infiltration, average final infiltration and average infiltration rate are calculated as 26.12 cm/hr, 2.74 cm/hr and 3.94 cm/hr respectively.

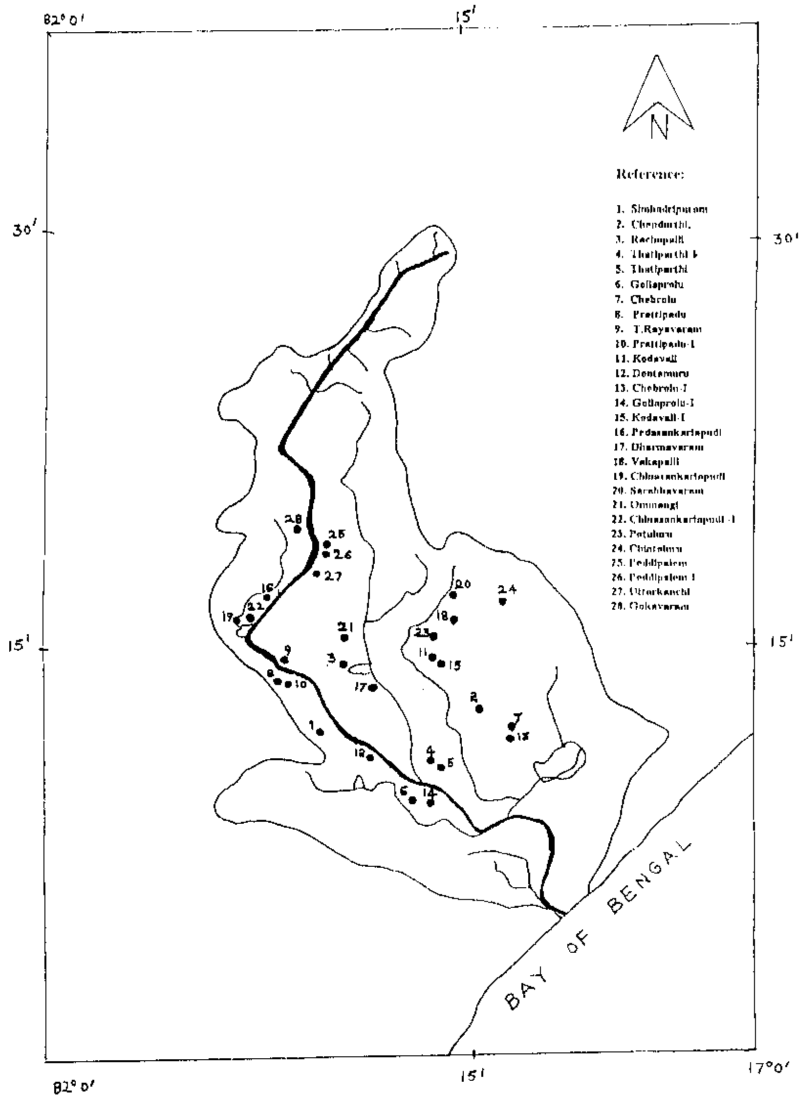

Fig. 4 (a) Location of Infiltration tests in the Suddagedda basin

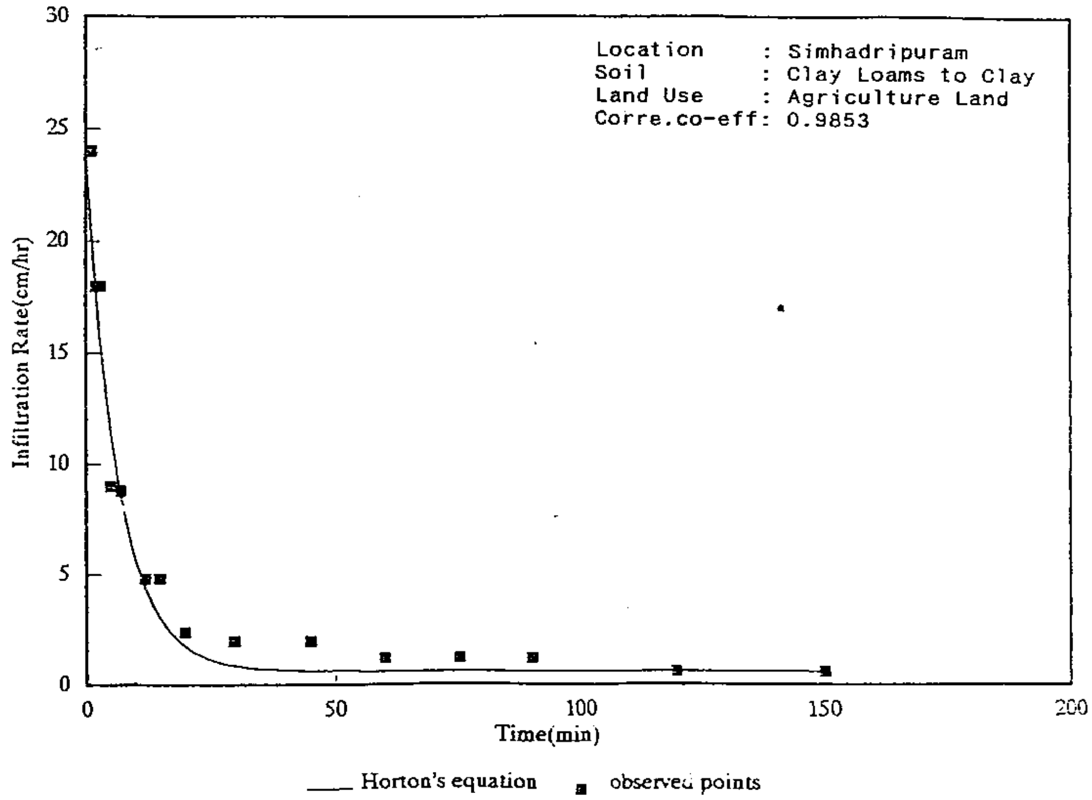

FIG. 5 HORTON'S INFILTRATION RATE CURVE

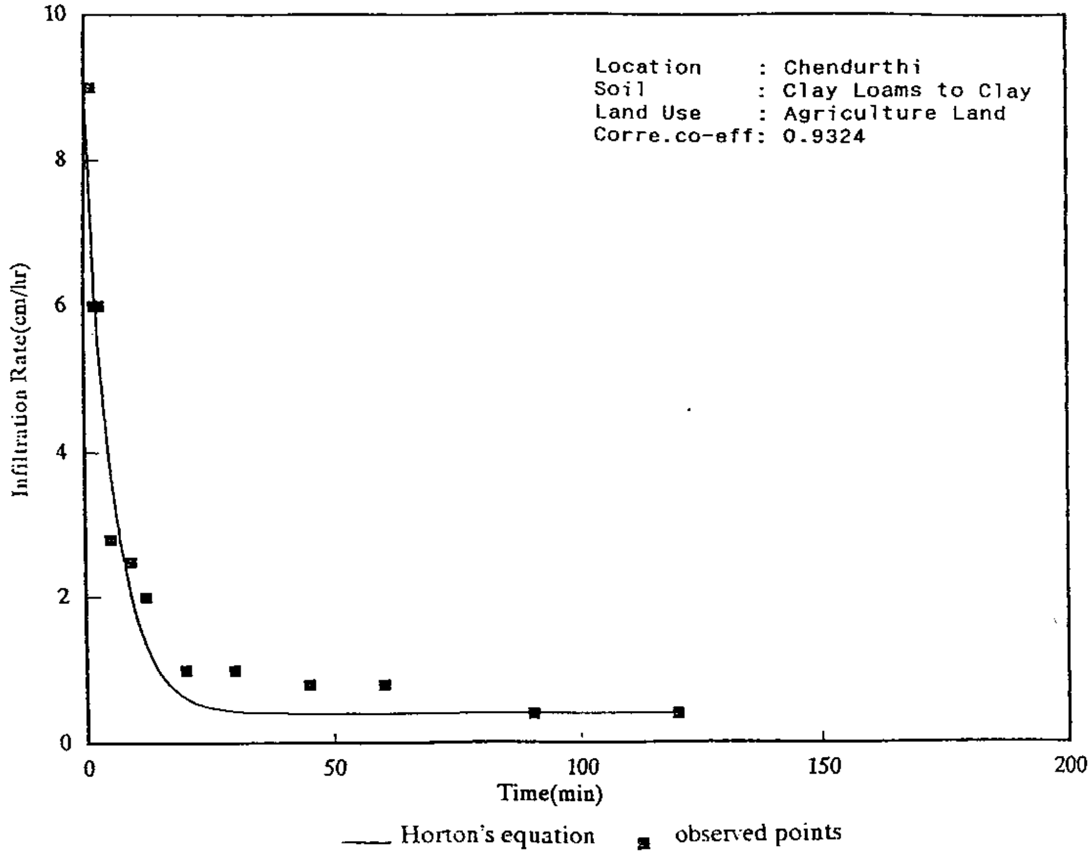

FIG. 6 HORTON'S INFILTRATION RATE CURVE

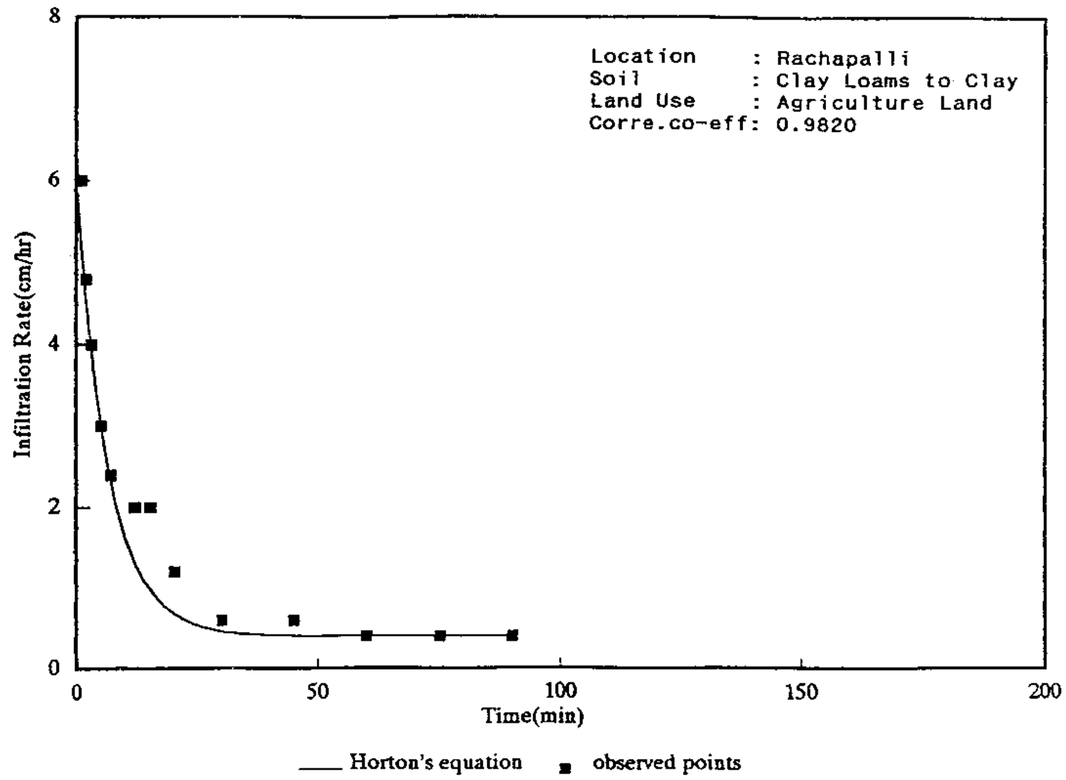

FIG. 7 HORTON'S INFILTRATION RATE CURVE

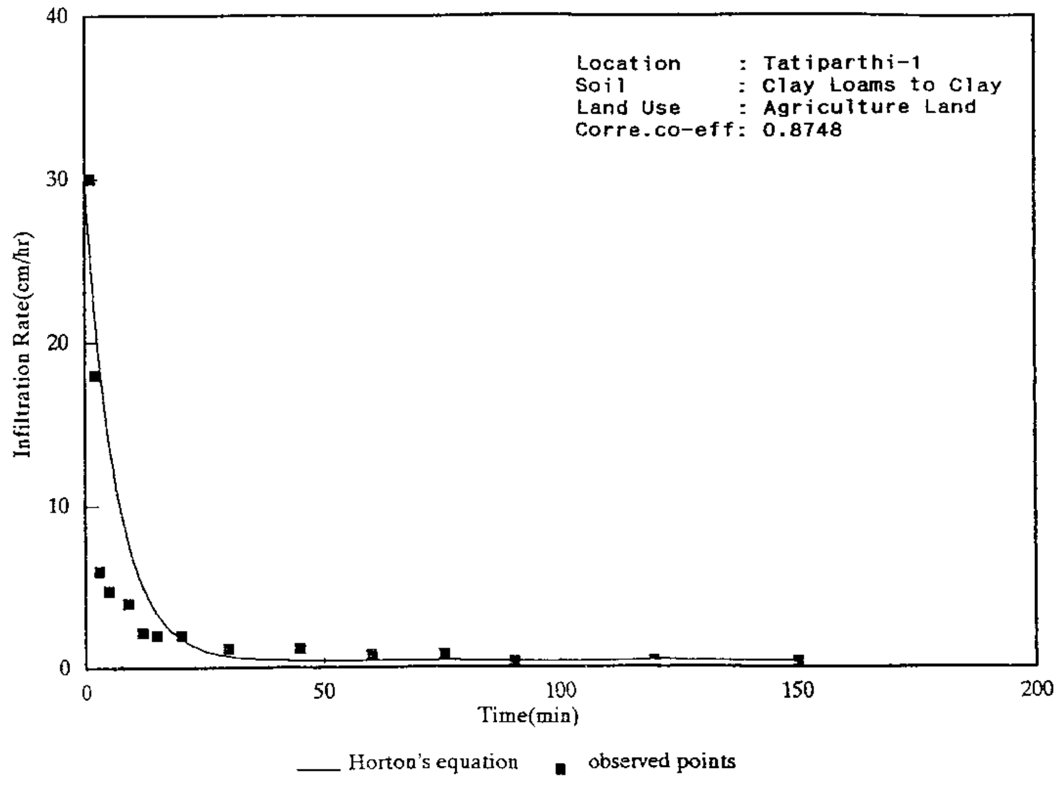

FIG. 8 HORTON'S INFILTRATION RATE CURVE

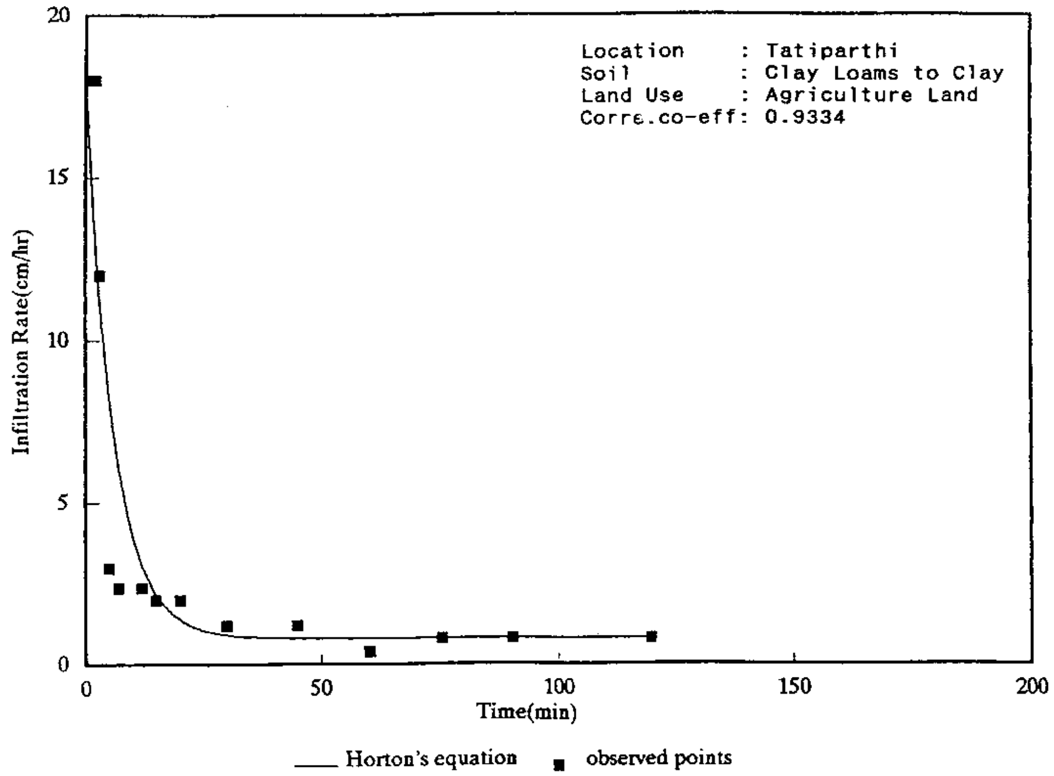

FIG. 9 HORTON'S INFILTRATION RATE CURVE

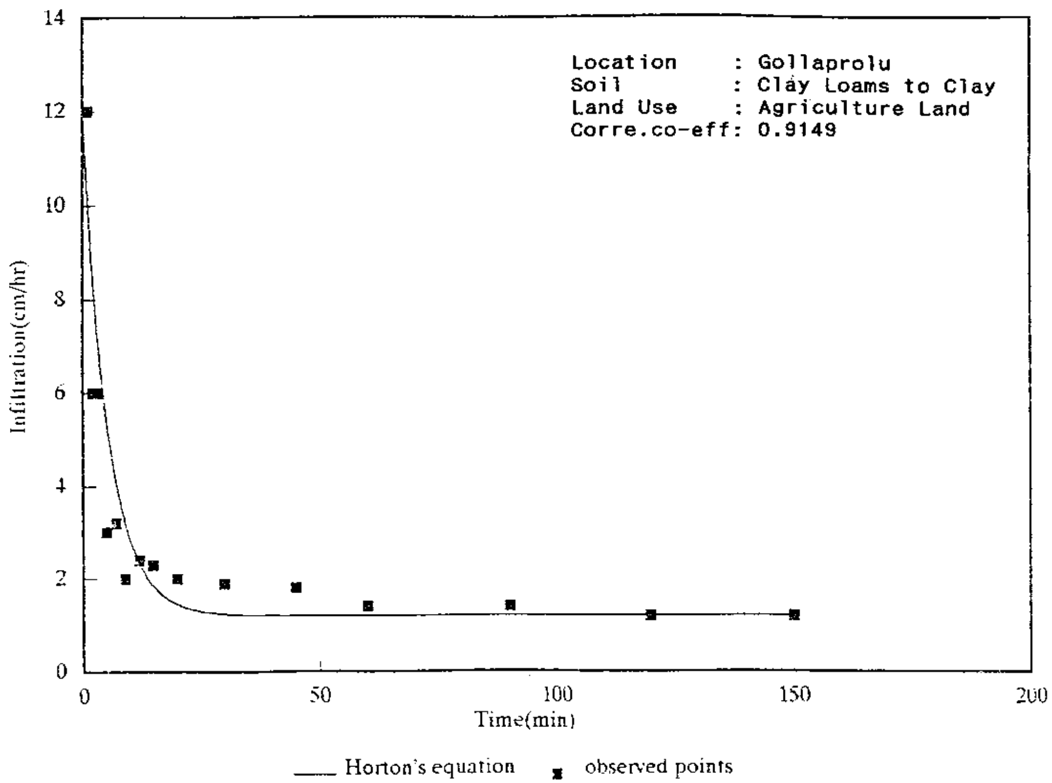

FIG. 10 HORTON'S INFILTRATION RATE CURVE

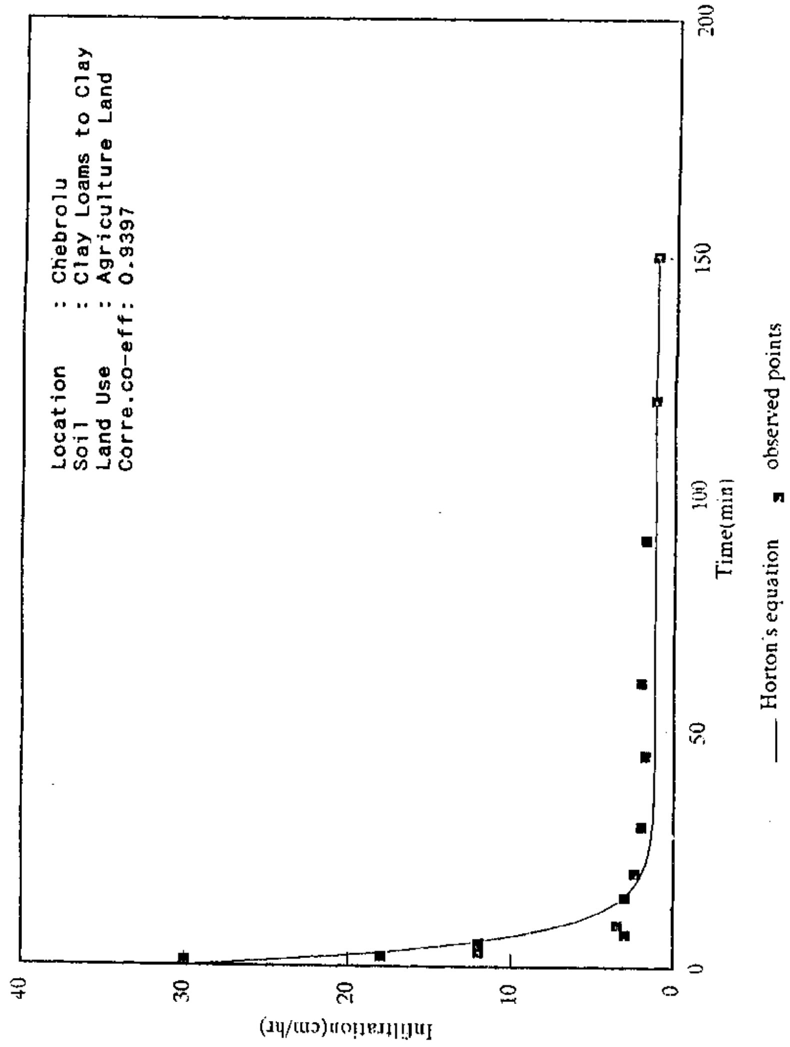

FIG. 11 HORTON'S INFILTRATION RATE CURVE

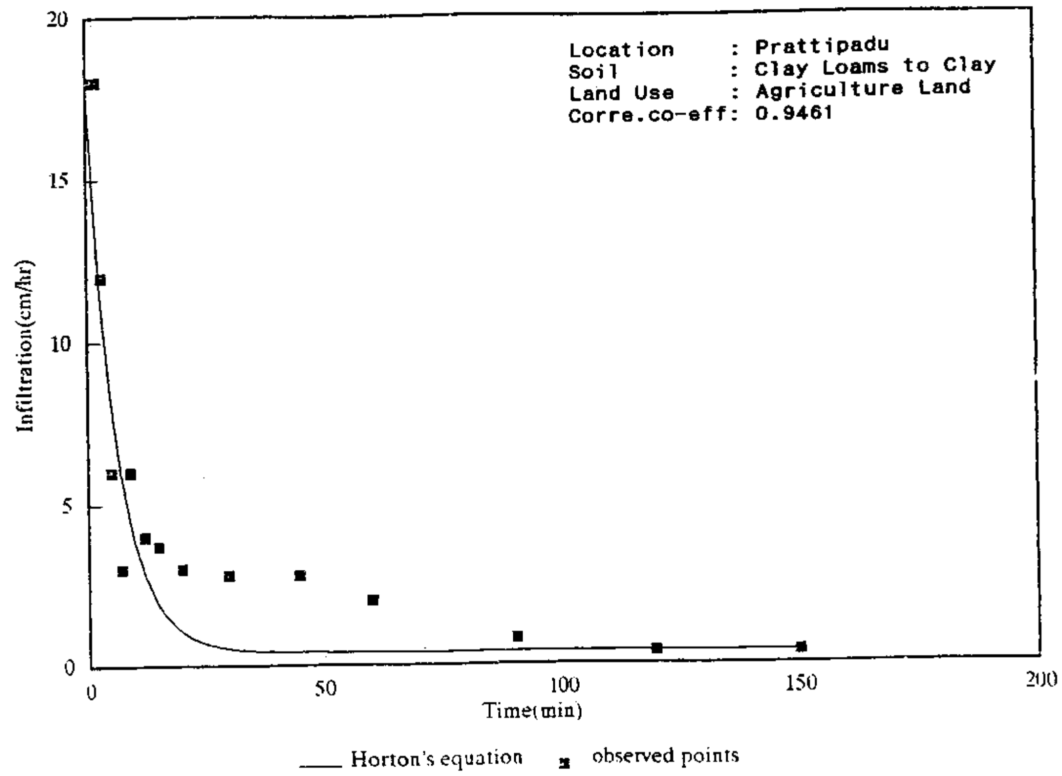

FIG. 12 HORTON'S INFILTRATION RATE CURVE

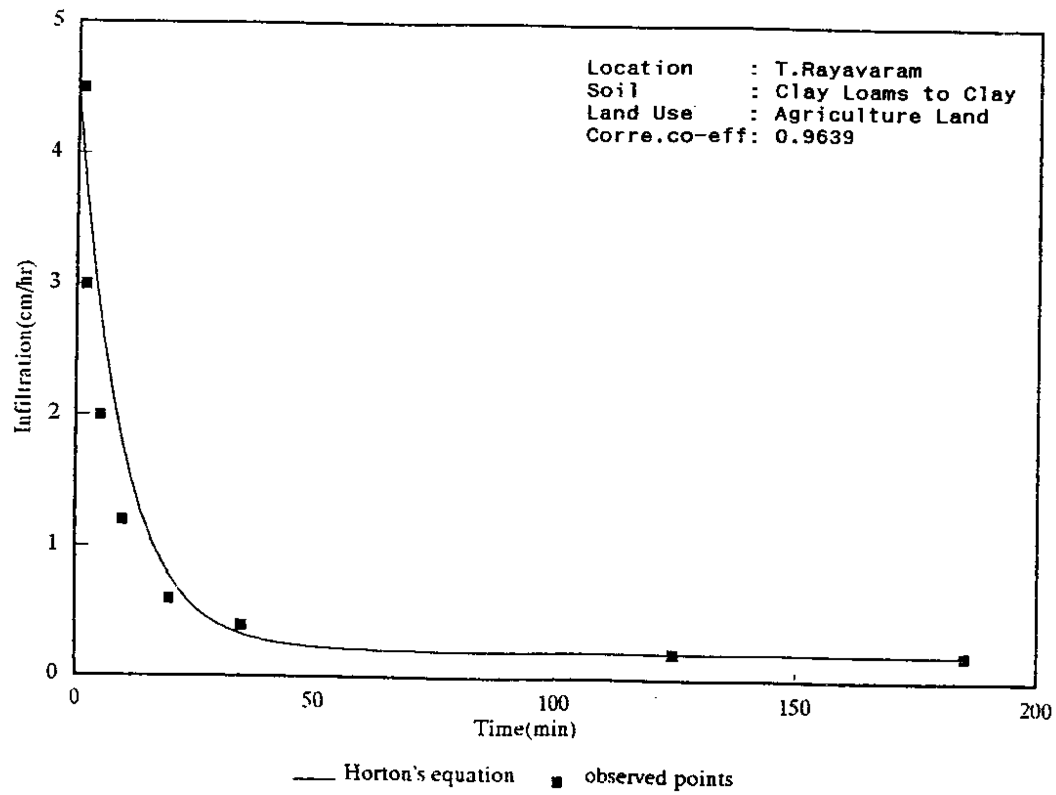

FIG. 13 HORTON'S INFILTRATION RATE CURVE

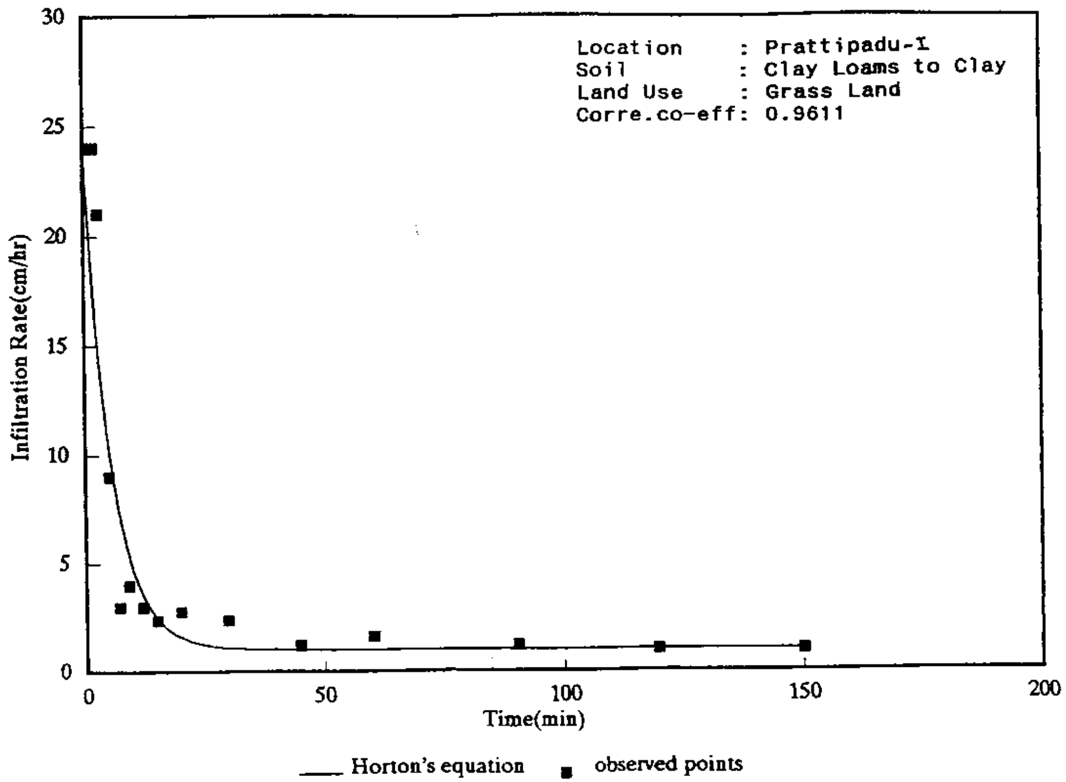

FIG. 14. HORTON'S INFILTRATION RATE CURVE

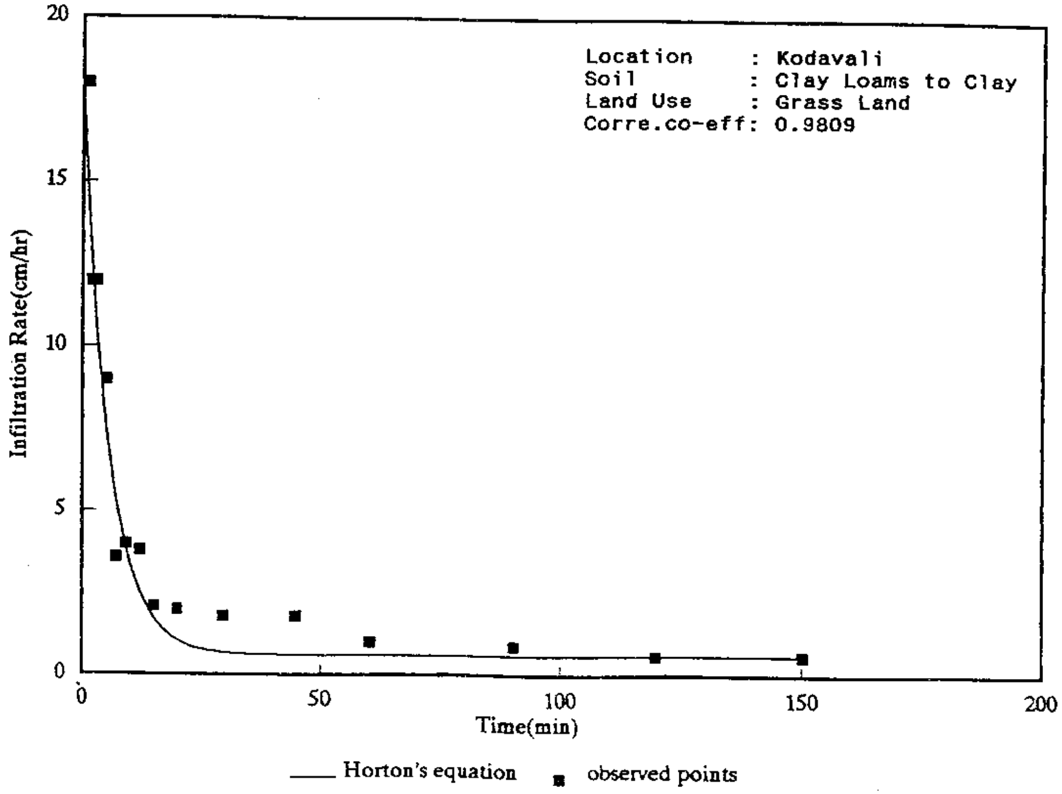

FIG. 15 HORTON'S INFILTRATION RATE CURVE

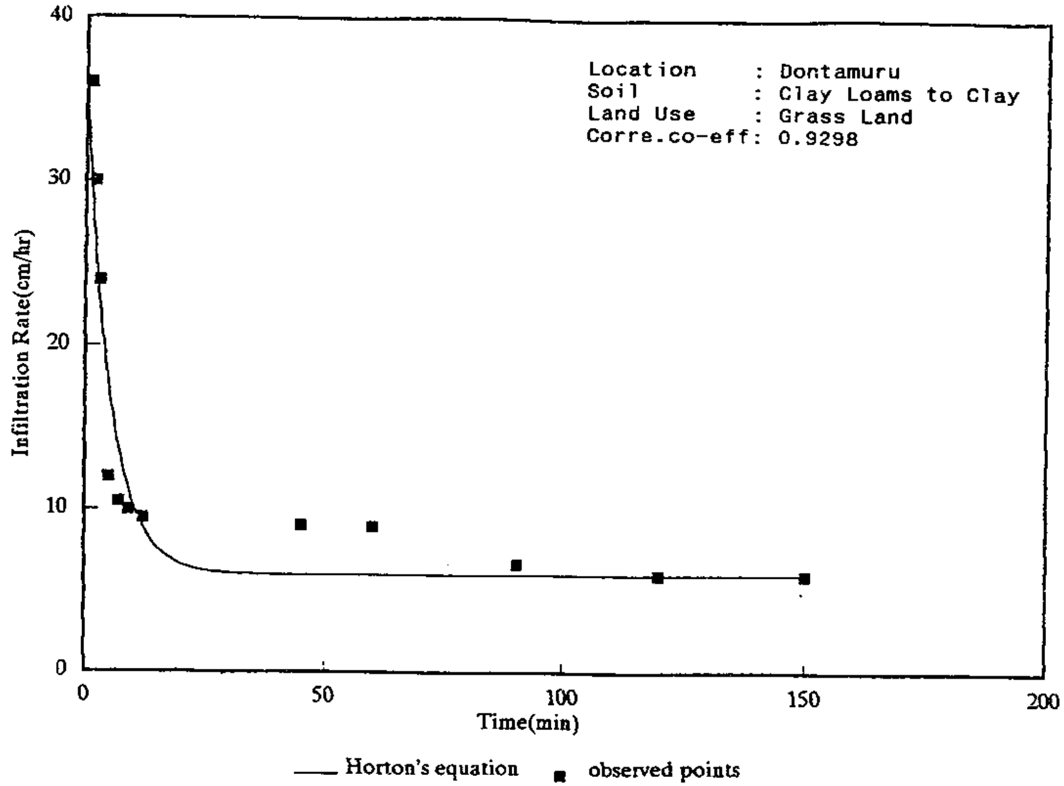

FIG. 16 HORTON'S INFILTRATION RATE CURVE

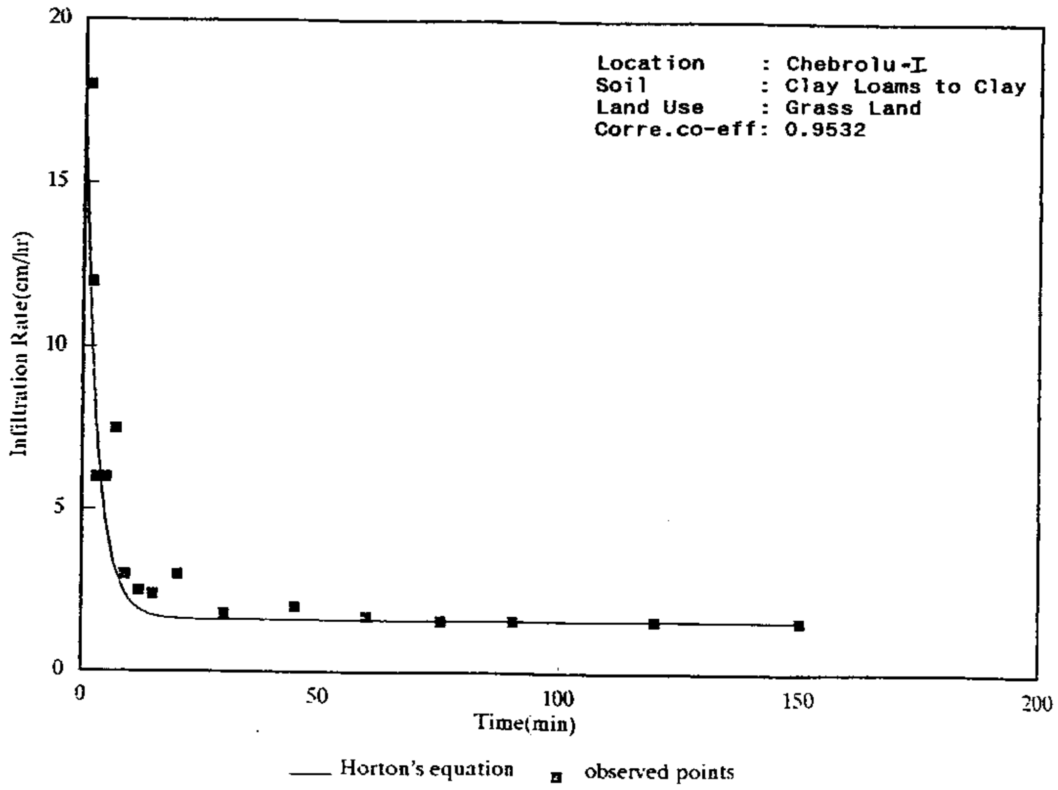

FIG. 17 HORTON'S INFILTRATION RATE CURVE

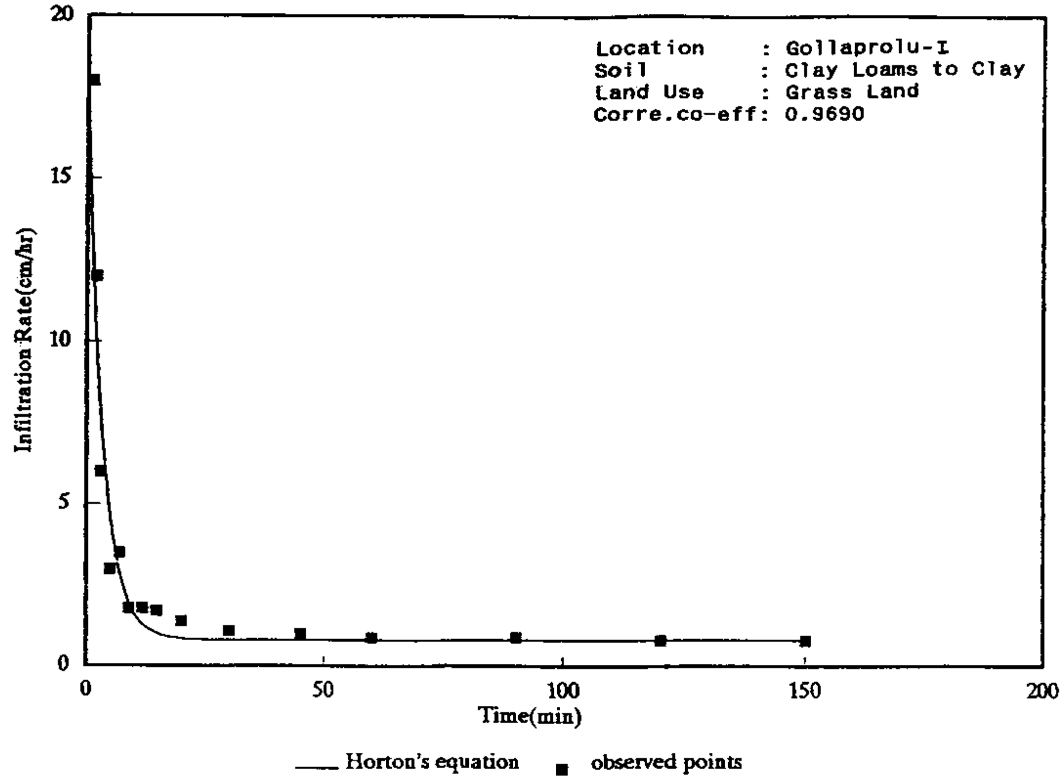

FIG. 18 HORTON'S INFILTRATION RATE CURVE

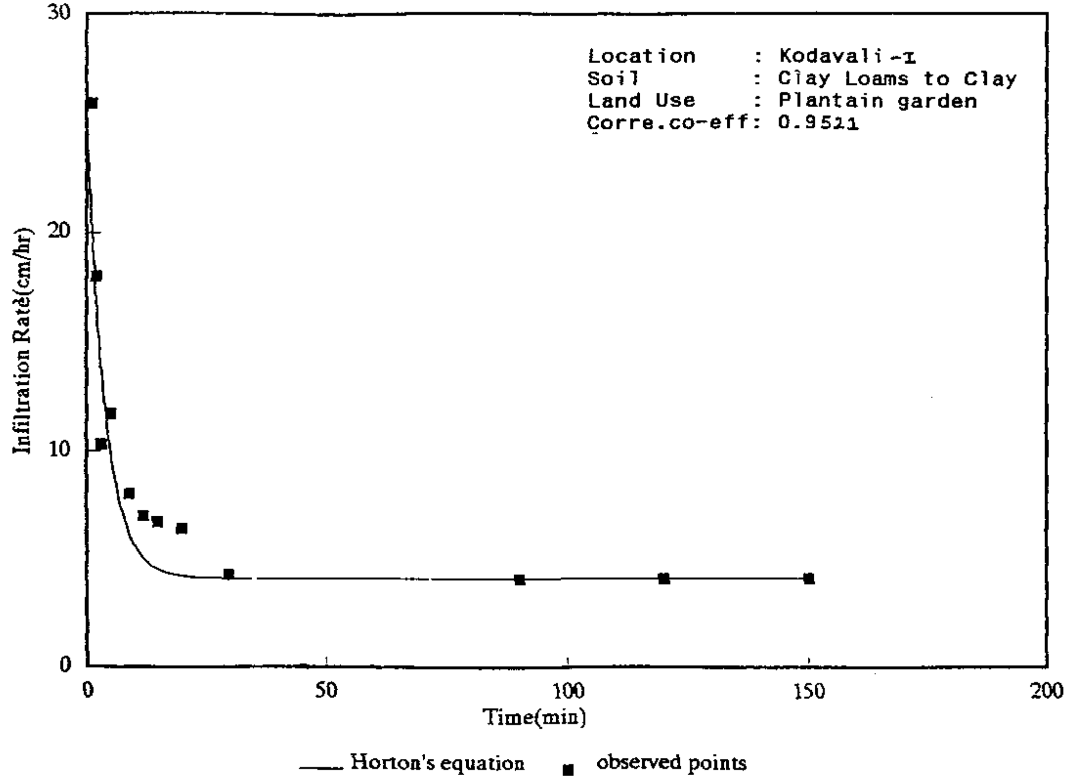

FIG. 19 HORTON'S INFILTRATION RATE CURVE

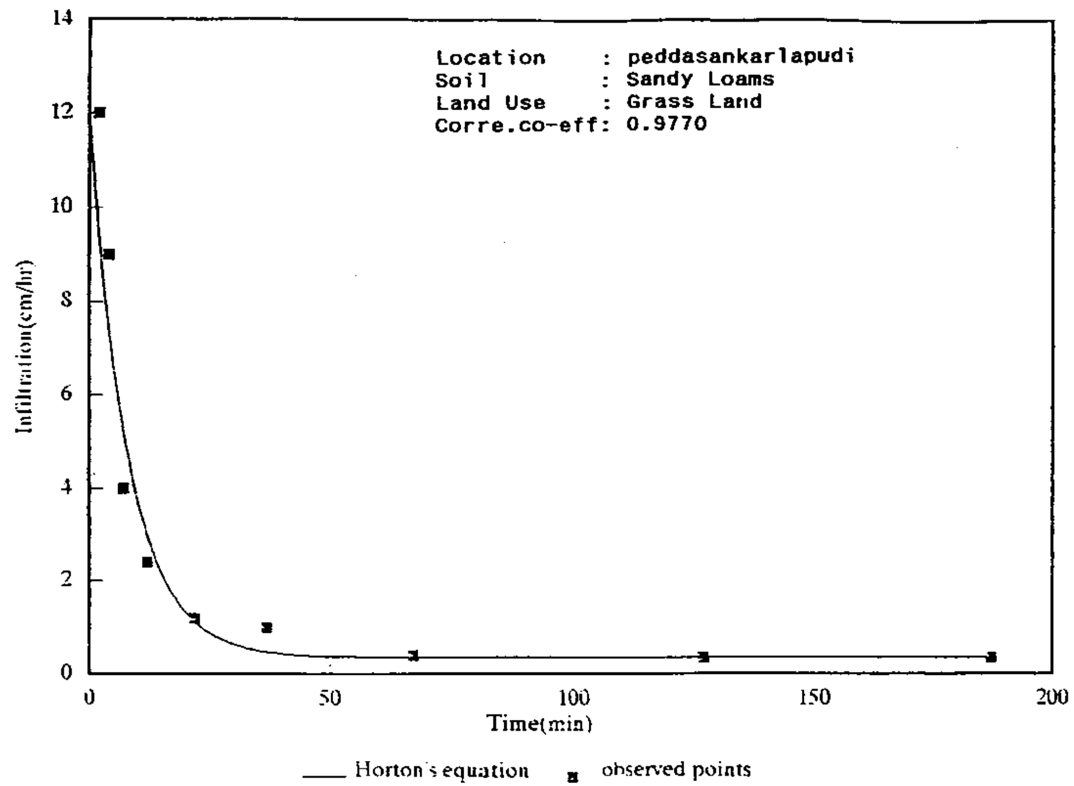

FIG. 20 HORTON'S INFILTRATION RATE CURVE

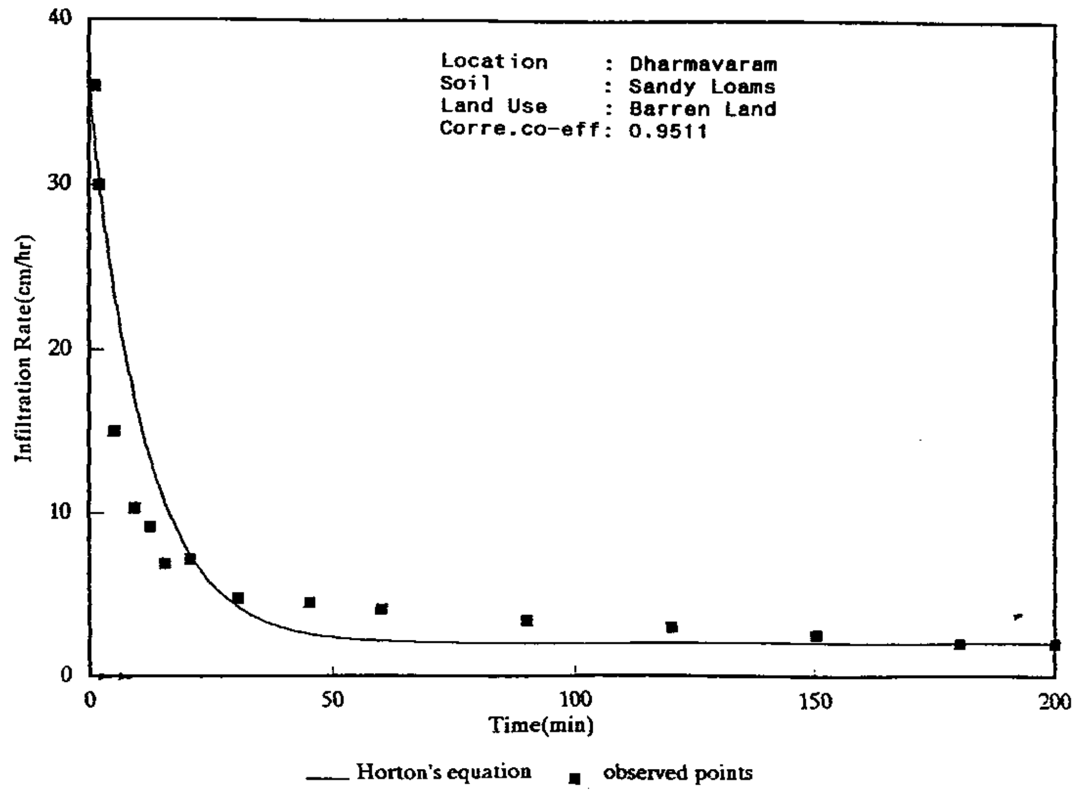

FIG. 21 HORTON'S INFILTRATION RATE CURVE

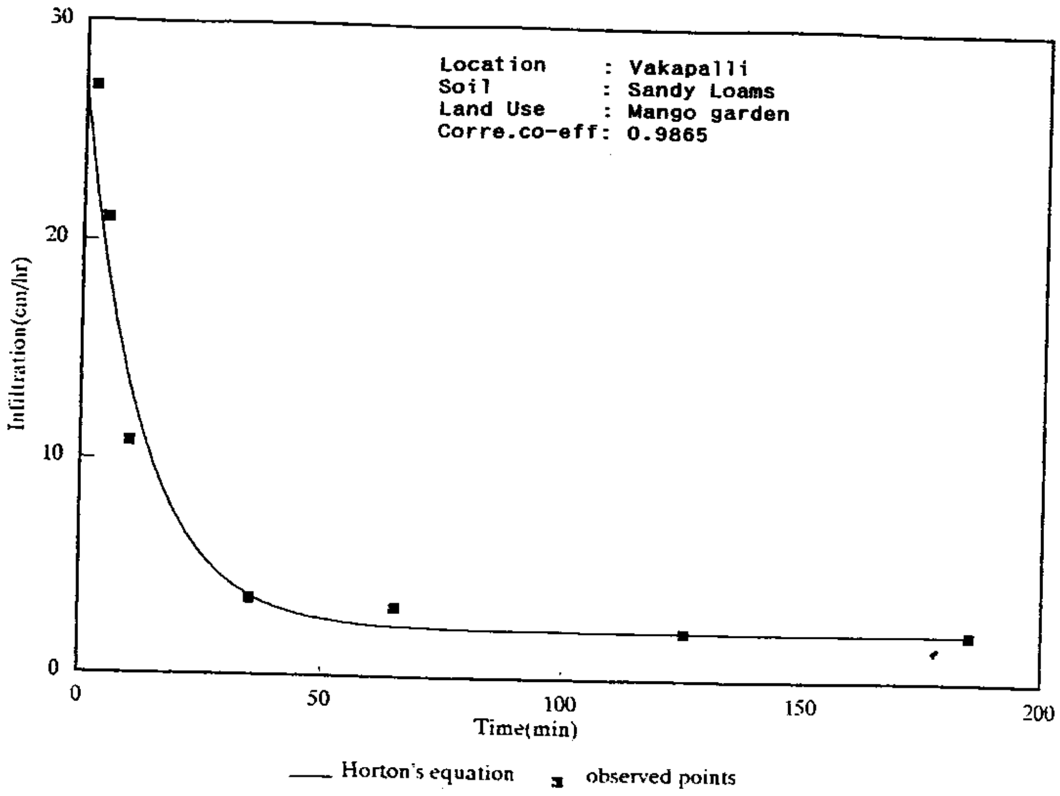

FIG. 22 HORTON'S INFILTRATION RATE CURVE

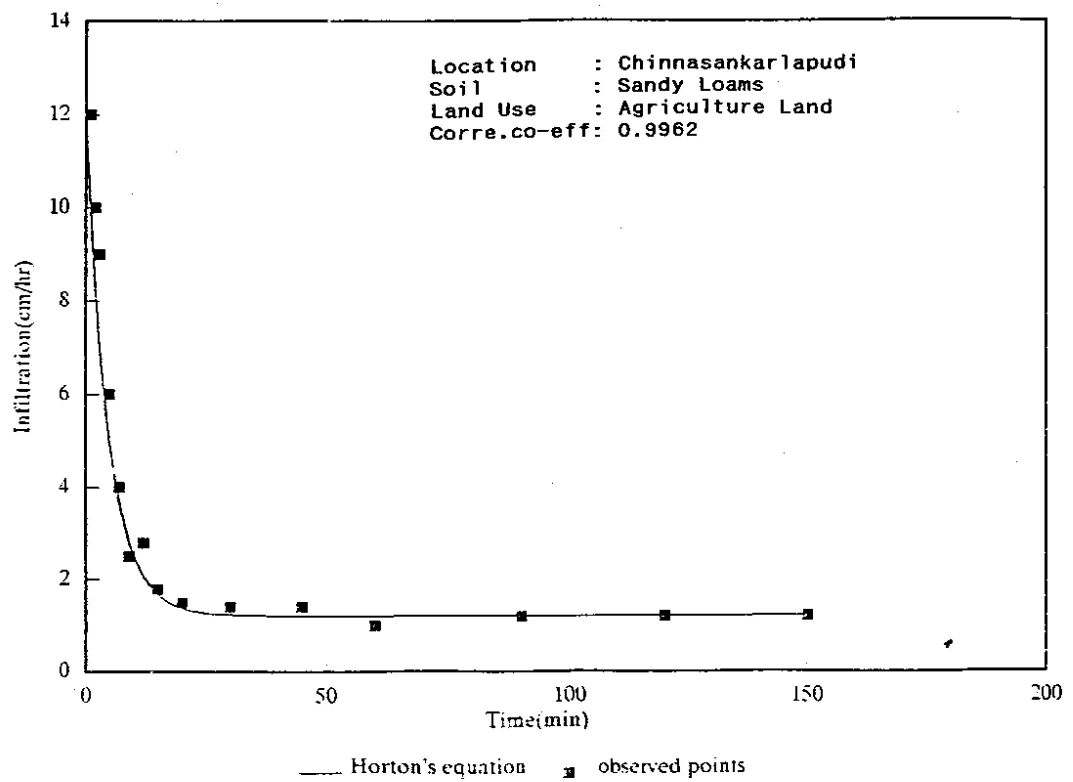

FIG. 23 HORTON'S INFILTRATION RATE CURVE

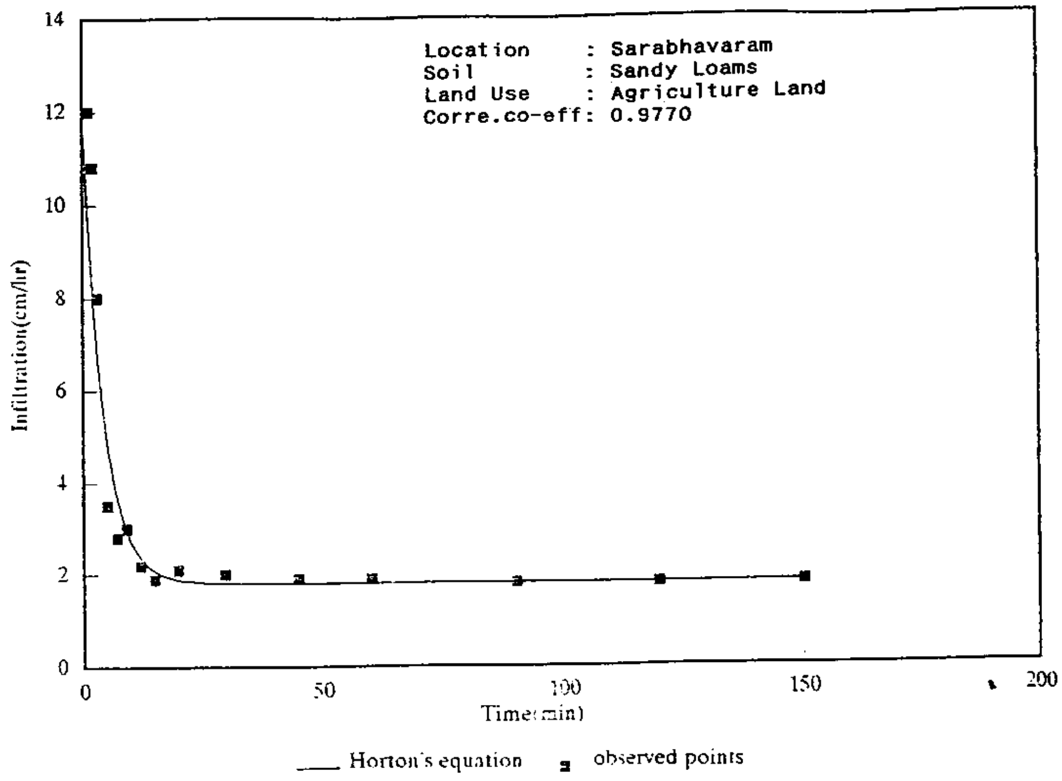

FIG. 24 HORTON'S INFILTRATION RATE CURVE

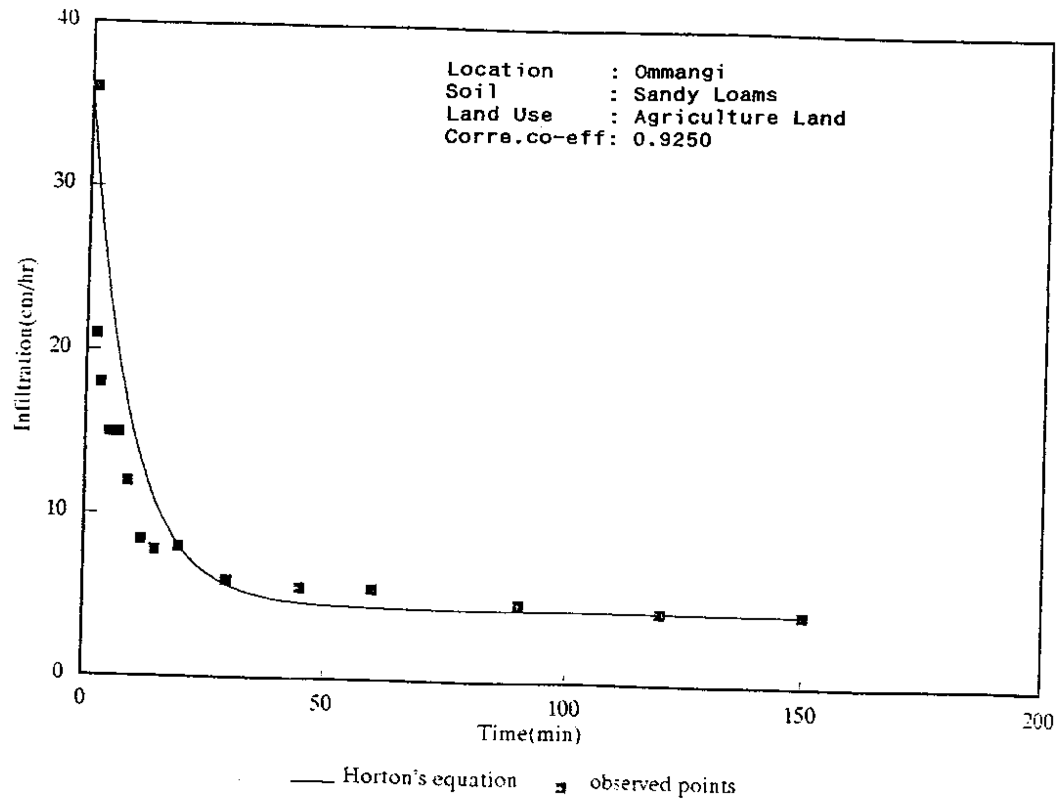

FIG. 25 HORTON'S INFILTRATION RATE CURVE

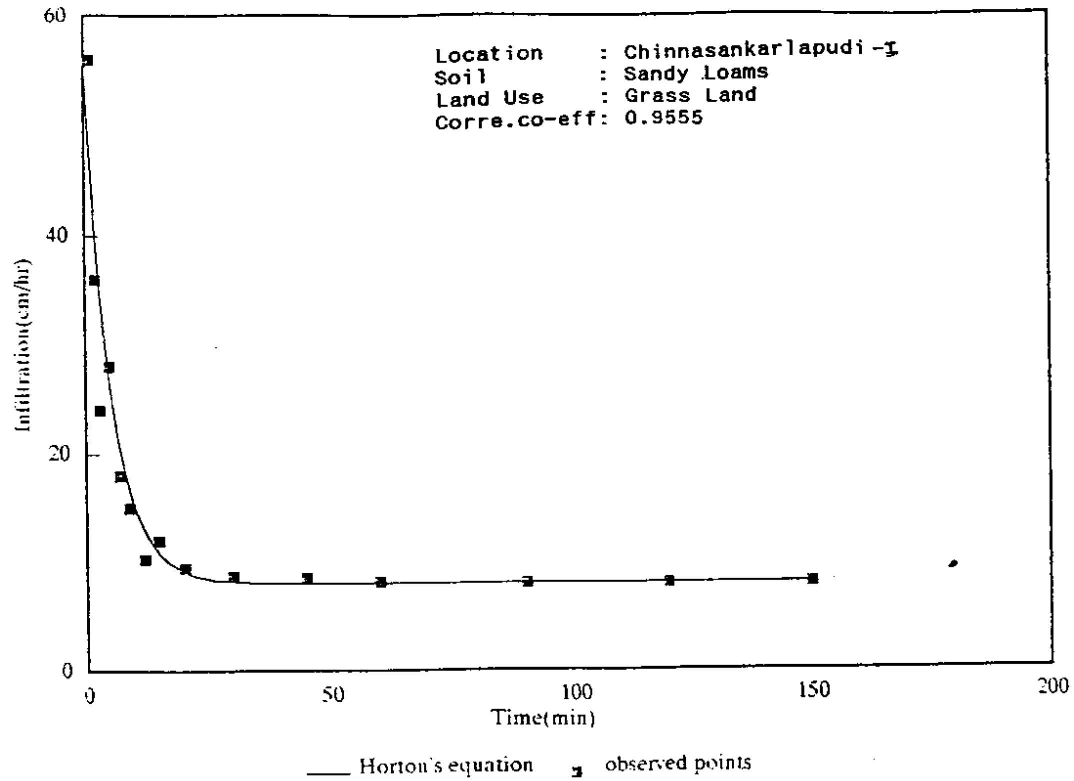

FIG. 26 HORTON'S INFILTRATION RATE CURVE

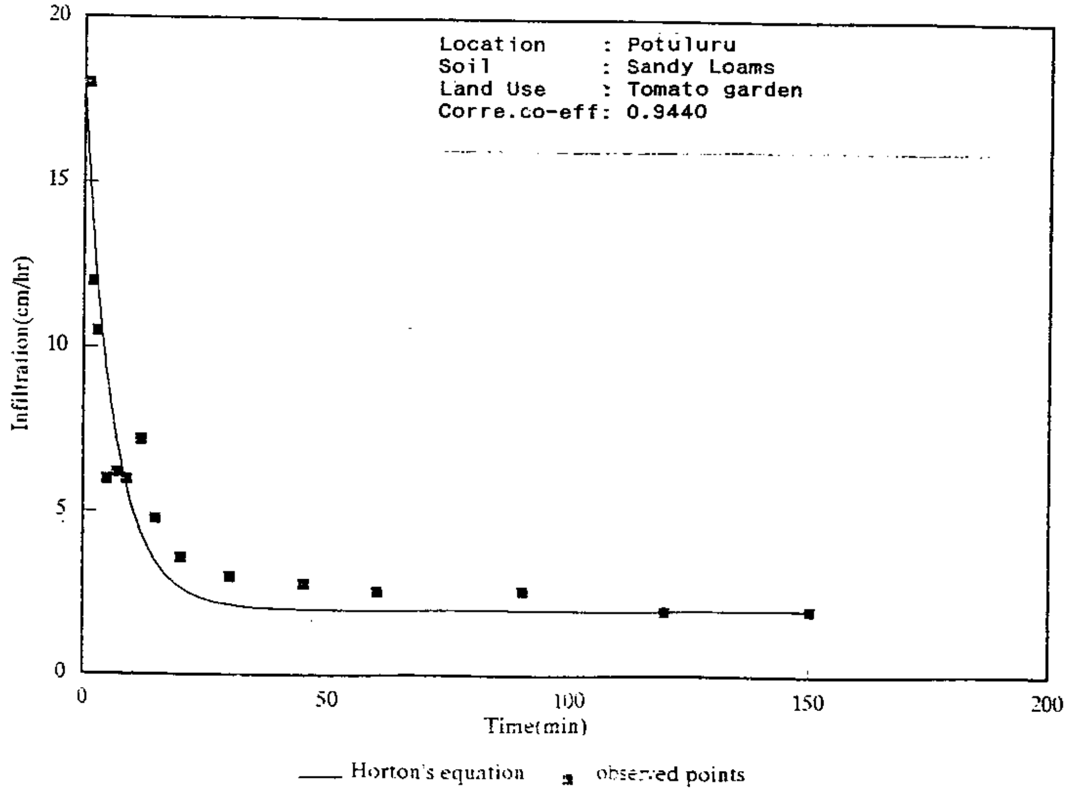

FIG. 27 HORTON'S INFILTRATION RATE CURVE

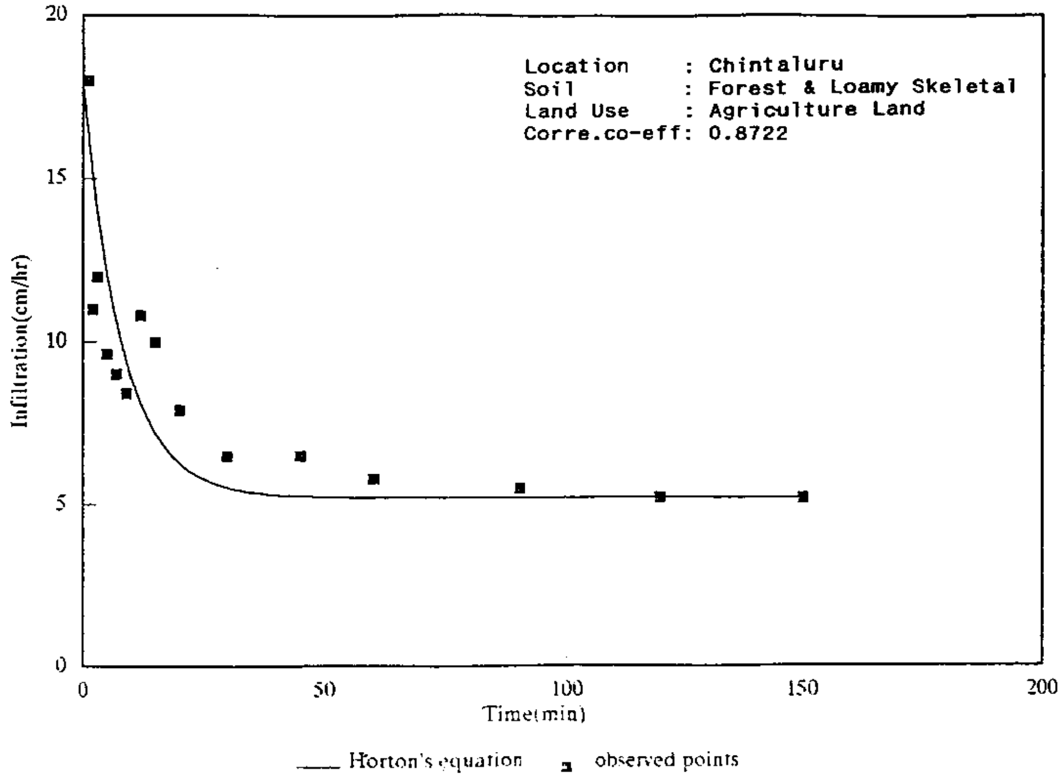

FIG. 28 HORTON'S INFILTRATION RATE CURVE

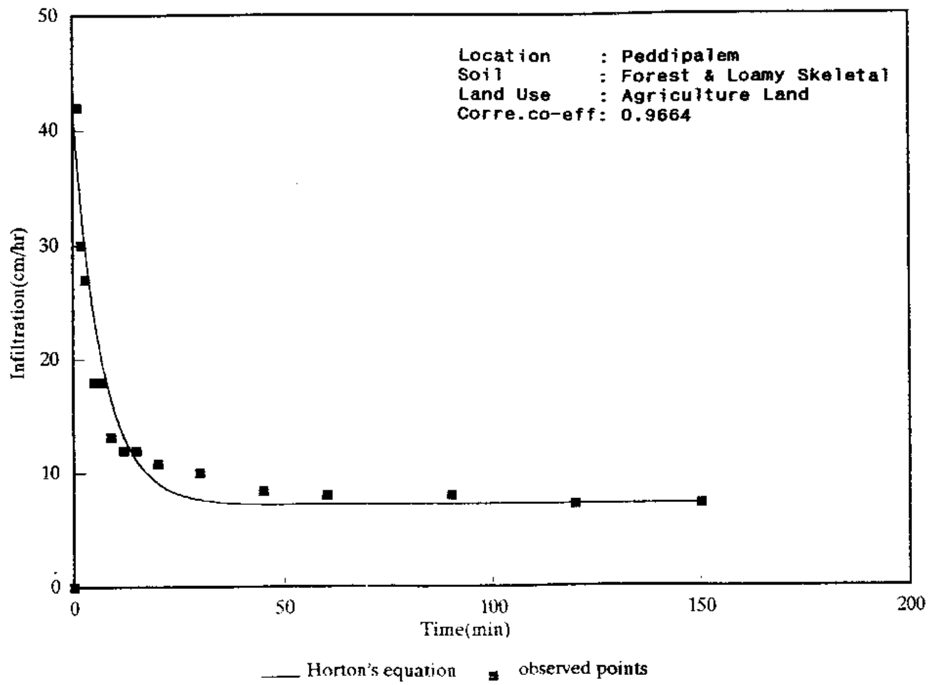

FIG. 29 HORTON'S INFILTRATION RATE CURVE

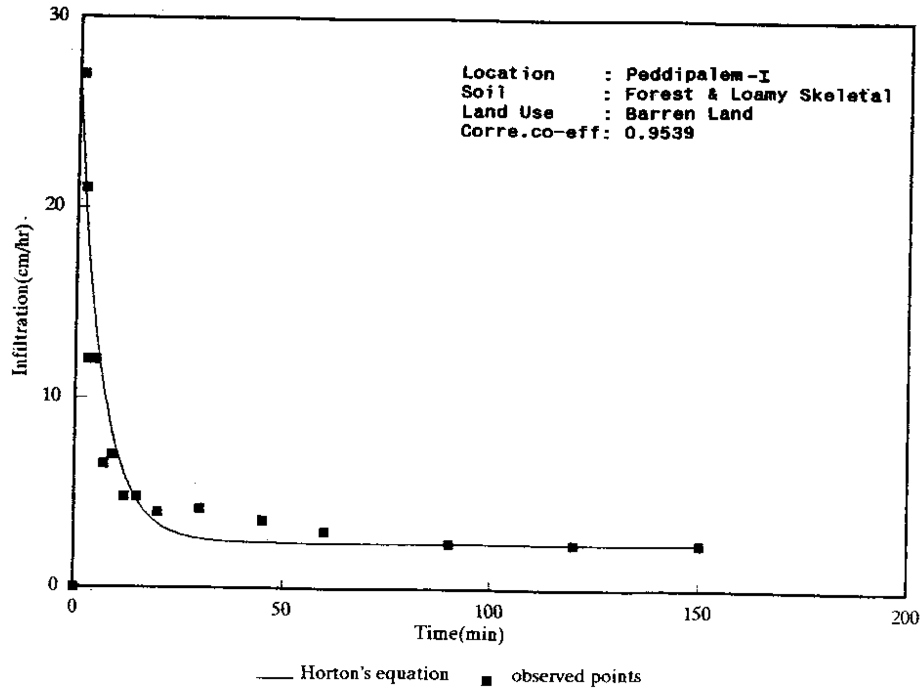

FIG. 30 HORTON'S INFILTRATION RATE CURVE

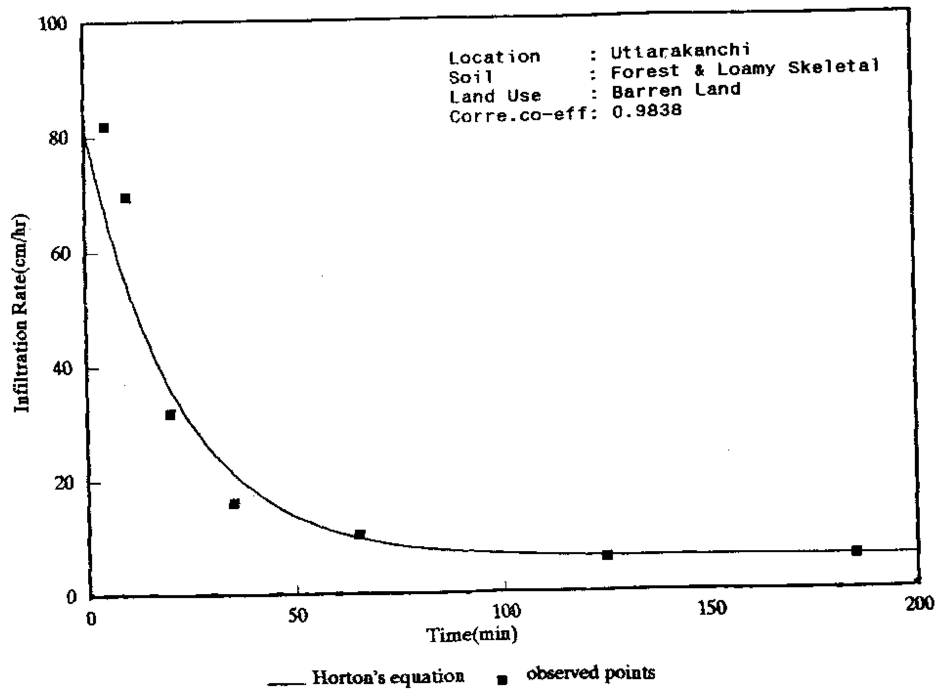

FIG. 31 HORTON'S INFILTRATION RATE CURVE

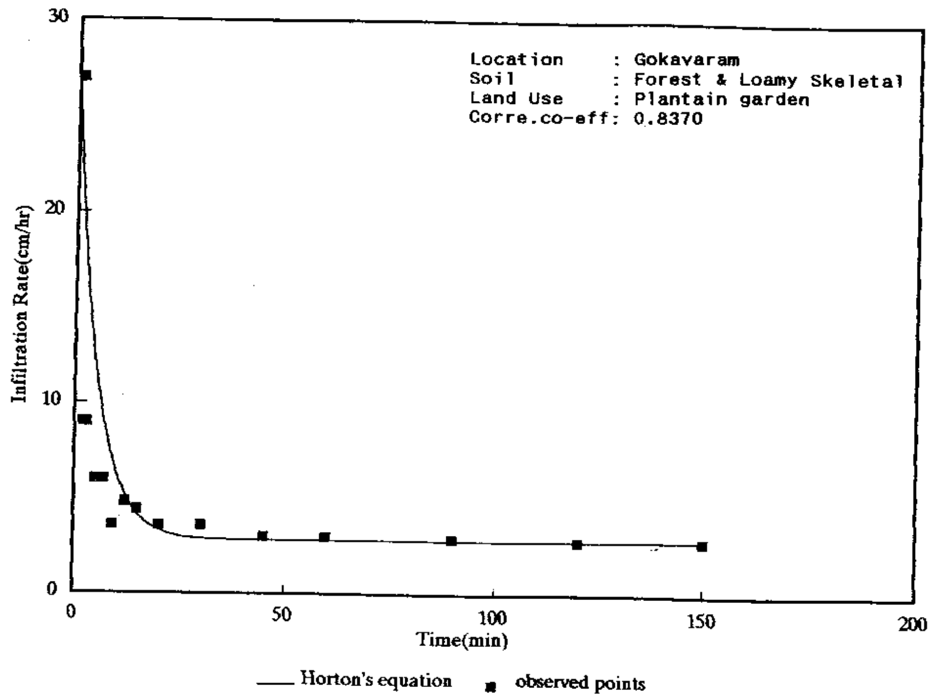

FIG. 32 HORTON'S INFILTRATION RATE CURVE

Table 1 Results of Infiltration tests in the Suddagedda basin

S.No.	Soil type	Land use.	Location	Infiltration rate Initial (Cm/hr)	Final (Cm/hr)	Average (cm/hr)	Horton's eqution	Correlation Co-efficient
1.	Clay loams to clay	Agriculture land	Simhadripuram	24.00	0.60	1.72	$f = 0.60+23.40*e^{-0.1510t}$	0.9653
2.	- do -	- do -	Chendurti	9.00	0.40	0.83	$f = 0.40+ 8.60*e^{-0.1845t}$	0.9324
3.	- do -	- do -	Rachapalli	6.00	0.40	0.85	$f = 0.40+ 5.60*e^{-0.1510t}$	0.9820
4.	- do -	- do -	Tathiparthi-I	30.00	0.40	1.79	$f = 0.40+29.60*e^{-0.1537t}$	0.8746
5.	- do -	- do -	Tathiparthi	18.00	0.80	1.74	$f = 0.80+17.20*e^{-0.1675t}$	0.9334
6.	- do -	- do -	Gollaprolu	12.00	1.20	1.63	$f = 1.20+10.80*e^{-0.1816t}$	0.9149
7.	- do -	- do -	Chebrolu	30.00	1.20	2.37	$f = 1.20+28.80*e^{-0.1802t}$	0.9397
8.	- do -	- do -	Prattipadu	18.00	0.40	1.18	$f = 0.40+17.60*e^{-0.1641t}$	0.9461
9.	- do -	- do -	T.Rayavaram	4.50	0.20	0.44	$f = 0.20+ 4.30*e^{-0.1006t}$	0.9639
10.	- do -	Grass land	Prattipadu-I	24.00	1.00	1.93	$f = 1.00+23.00*e^{-0.1824t}$	0.9611
11.	- do -	- do -	Kodavali	18.00	0.60	1.29	$f = 0.60+17.40*e^{-0.1838t}$	0.9809
12.	- do -	- do -	Dontamuru	36.00	6.00	7.22	$f = 6.00+30.00*e^{-0.1512t}$	0.9298
13.	- do -	- do -	Chebrolu-I	18.00	1.60	2.06	$f = 1.60+16.40*e^{-0.3312t}$	0.9532
14.	- do -	- do -	Gollaprolu-I	18.00	0.80	1.25	$f = 0.80+17.20*e^{-0.2986t}$	0.9690
15.	- do -	Plantain garden	Kodavali-I	25.90	4.10	4.58	$f = 4.10+21.50*e^{-0.2611t}$	0.9521
16.	sandy loams	Grass land	Pedasankarlapudi	12.00	0.35	0.89	$f = 0.35+11.65*e^{-0.1238t}$	0.9770
17.	- do -	Barren land	Dharmavaram	36.00	2.00	3.79	$f = 2.00+34.00*e^{-0.0908t}$	0.9511
18.	- do -	Mango garden	Vakapalli	27.00	2.20	3.96	$f = 2.20+24.80*e^{-0.0798t}$	0.9865
19.	- do -	Agriculture land	Chinasankarlapudi	12.00	1.20	1.59	$f = 1.20+10.80*e^{-0.2082t}$	0.9962
20.	- do -	- do -	Sarabhavaram	12.00	1.80	2.13	$f = 1.80+10.20*e^{-0.2397t}$	0.9770
21.	- do -	- do -	Omangi	36.00	4.40	6.51	$f = 4.40+31.60*e^{-0.1067t}$	0.9250
22.	- do -	Grass land	Chinasankarlapudi-I	56.00	8.00	9.91	$f = 8.00+48.00*e^{-0.1892t}$	0.9555
23.	- do -	Tomato garden	Potuluru	18.00	2.00	2.74	$f = 2.00+16.00*e^{-0.1592t}$	0.9440
24.	Forest & loamy skeletal	Agriculture land	Chintaluru	18.00	5.20	5.97	$f = 5.20+12.80*e^{-0.1230t}$	0.8722
25.	- do -	- do -	Peddipalem	42.00	7.20	8.97	$f = 7.20+34.80*e^{-0.1449t}$	0.9664
26.	- do -	Barren Land	Peddipalem-I	27.00	2.40	3.53	$f = 2.40+24.60*e^{-0.1602t}$	0.9539
27.	- do -	- do -	Uttarkanchi	82.00	5.90	13.42	$f = 5.90+76.10*e^{-0.0459t}$	0.9838
28.	- do -	Plantain Garden	Gokavaram	27.00	2.80	3.73	$f = 2.80+24.20*e^{-0.1942t}$	0.8370

Forest and Loamy skeletal soil

This type of soil occurs on upstream parts of the basin. Total five experiments have been conducted in this classification mainly because, the region is inaccessible due to poor road network. The initial infiltration rate varies between 18.00 cm/hr to 82 cm/hr. Similarly the final infiltration rate varies between 2.40 cm/hr to 7.20 cm/hr. The average infiltration rate (obtained from Horton's equation) varies between 3.73 cm/hr to 13.42 cm/hr. Finally the average initial infiltration, average final infiltration and average infiltration rates are calculated as 39.2 cm/hr, 4.7 cm/hr and 7.12 cm/hr respectively.

The comparison of average infiltration rates in various soil types are shown in Table 2.

Table 2 Comparison of initial, final and average infiltration rates in various soil types

Soil Type	Average initial infiltration rate(cm/hr)	Average final infiltration rate(cm/hr)	Average of average infiltration rate(cm/hr) obtained from Horton's equation
clay loams to clay	19.42	1.31	2.05
sandy loams	26.12	2.74	3.94
forest&loamy skeletal	39.20	4.70	7.12

The above table shows that the average infiltration rate is low in clay loams to clay and high in forest & loamy skeletal soil. Similar pattern had also been observed in average initial infiltration rate and final infiltration rate.

According to landuse classification the average infiltration rate calculated for each landusewise for agriculture, grass land, Barren Land, Plantain garden, Tomato garden and Mango garden are 2.50 cm/hr, 3.49, 6.9, 4.15, 2.74 and 3.96 cm/hr respectively (Table 1). The highest average infiltration is obtained in Barren Land and lowest in agricultural land.

Spatial distribution of average infiltration rates

Out of 28 experiments, sixteen locations distributed all over the basin have been considered to prepare a map showing the spatial distribution of average infiltration rate in the basin. The location of these experiments and average infiltration rate contours are shown in Fig. 33. The average infiltration rate from each experiment is obtained from Horton's equation. The variation of average infiltration rate in the basin is between 0.5 cm/hr to 13 cm/hr.

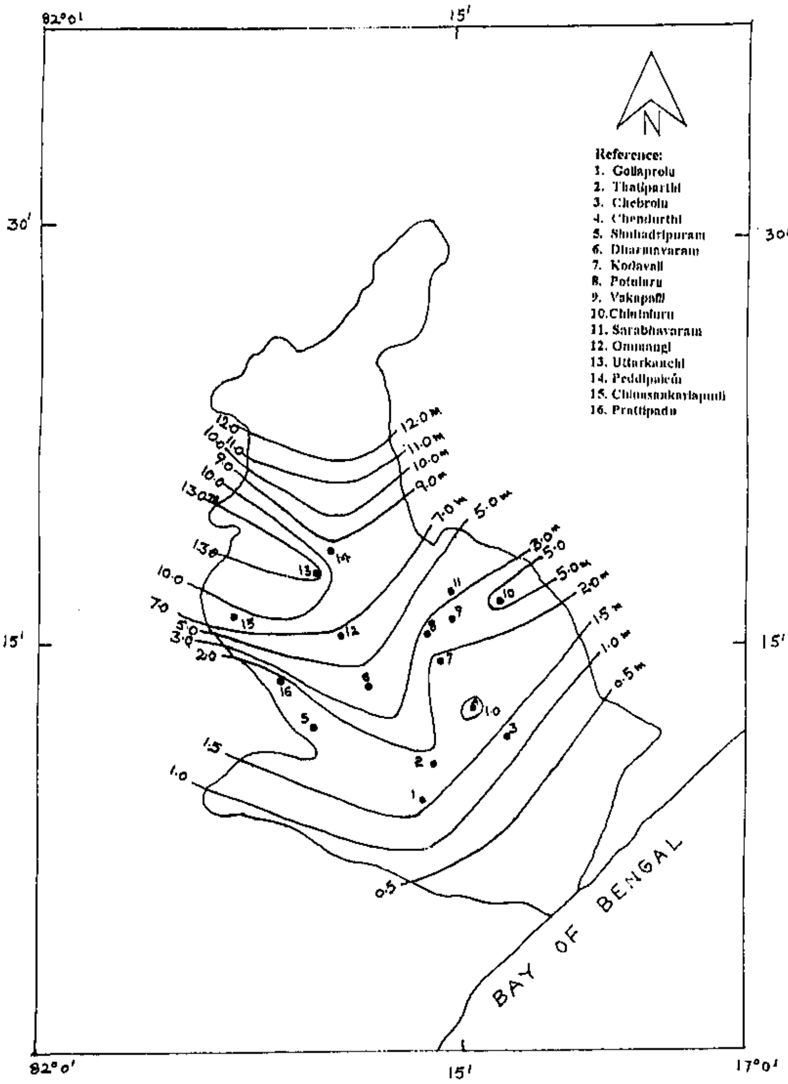

Fig. 33 Average Infiltration rate contours in the Suddagedda basin

6.0 CONCLUSIONS

Total 28 tests using double ring infiltrometer have been conducted in the Suddagedda basin to understand the infiltration characteristics of the basin.

1) Suddagedda basin has been broadly divided into mainly three soil types. They are clay loams to clay, sandy loams and forest & loamy skeletal

2) Using the data obtained at each infiltration test the Horton's equation is successfully fitted (i.e. correlation coefficient varies between 0.83 to 0.99).

3) The average infiltration rate obtained by Horton's equation is more in Forest and loamy skeletal (7.124 cm/hr) and low in clay loams to clay (2.05 cm/hr).

4) The average initial and final infiltration rates are more in Forest and loamy skeletal (39.2 cm/hr and 4.7 cm/hr) and less in clay loams to clay (19.42 cm/hr and 1.31 cm/hr).

5) According to landuse classification the highest average infiltration rate was found in Barrenland (6.9 cm/hr) and lowest in Agricultural land (2.50 cm/hr).

6) The spatial distribution of average infiltrate rate map of Suddagedda basin had been prepared. The variation of average infiltration rate in the basin is between 13.42 cm/hr to 0.44 cm/hr.

REFERENCES

Beaver, R.D., Hartman, J.P., and Wanielista, M.P. 1977. "Infiltration and Stormwater Retention/Detention Ponds", Stormwater Retention/Detention Basin Seminar, Y.A.Yousel. Ed., Florida Technological University, Orando, Fl.

Horton, R.E. 1939, " An approach toward a physical interpretation of Infiltration capacity", transactions of the Americal Geophysics union, 20: 693-711.

Horton, R.E. 1940, "An approach towards a physical interpretation of infiltration capacity", proceedings of soil science society of America, 5: 399-317.

Omkar and Patwari.B, 1992. " Infiltration studies in Jammu region, NIH, Roorkee report, TR-163.

Rawat, J.S, Purandara, B.K and Chandhrakumar, S .1992. " Infiltration studies in the Malaprabha and Ghataprаba catchments, NIH, Roorkee report, CS-105.

SGWD, 1993 "Water balance studies in Suddagedda basin (Part-I) - Status of network, data availability and instrumentation.

Soni, P., Naithani, S., and Matur, H.N, 1985. " Infiltration studies under different vegetation cover" Indian J. of Forestery, Vol 8(3), pp 170-173.

Soni, P and singh, S.R, 1988." Average infiltration from cylinder infiltrometer test" Indian Soc. of Agri. Engineers, 24th annual convenction held at PKV, Akola(India).

Toebes, C. and Ouryvaev, V.(eds), 1970. " Representative and experimental basins". An International guide for research and practice, UNESCO.

Wanielista, M.P. 1990. " Hydrology and water quantity control". John Wiley and Sons, New York, N.Y

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