

Preliminary Study of the Variation of Soil Moisture

by

R. GOPALAKRISHNAN, B. Sc. (Ag.),
Meteorology Assistant, Pattambi

and

C. BALASUBRAMANIAN, B. A., B. Sc. (Ag.),
Agricultural Meteorologist, Coimbatore

Agricultural Research Station, Pattambi, South Malabar, Madras

With a view to study the variation in soil moisture, soil samples from surface to 3", 6" to 12", 12" to 18" and from 18" to 24" depths are being taken weekly by means of a soil auger set from the observatory area at the Agricultural Research Station, Pattambi from 15—9—1950 onwards and the moisture percentages at different depths were determined in duplicate by the method of weighing.

The observatory area which itself was a single crop paddy land is situated in the midst of single crop paddy fields and is a flat ground of half an acre. The soil of the observatory in common with the rest of the soil of Malabar is red loam of lateritic origin and is subject to constant depletion of finer fraction of the soil and soluble plant foods in the torrential rains during the South West Monsoon period when 60" to 80" of rain are received within 2 months, June and July. The mechanical analysis of the soil of single crop paddy lands on which the observatory is situated is given below:

Clay	32.78%
Silt	11.79%
Fine silt	12.90%
Coarse sand	42.53%

The soil moisture data gathered from a total number of 140 soil moisture estimations carried out at regular weekly intervals during the period 15—9—1950 to 26—6—1953 were analysed statistically in the following manner:—

(a) The data collected during the whole period, that is, from 15—9—1950 to 26—6—1953.

(b) The whole period was divided into three seasons namely, Hot weather period (February to June) South West Monsoon (June to September) and North-East Monsoon period (September to January) and the data gathered during these three different periods were analysed separately.

(c) The data pertaining to the different months of the calendar year.

The summary of results of the above analyses are given below :—

*Summary of results for the whole Period
(15—9—1950 to 26—6—1953)*

\ Particulars	DEPTHS					G. M.	"Z" Test Satisfied or not	C. D. P. 0.05
	3" (A)	6" (B)	12" (C)	18" (D)	24" (E)			
Moisture percentage	9.40	11.02	12.22	13.20	13.41	11.85	Yes, both for depths and dates	4.03
Percentage on general mean	79.0	93.0	103.2	111.4	113.1	100		

Conclusion : E D C B A

4. In the North-East Monsoon period the moisture percentage increases as the depth increases; but the variation in soil moisture between 24' and 18" is not significant.

5. From the month-war analyses the following conclusions are drawn :

(a) In all the months except, in the months when the South-West Monsoon is active (June, July and August) the moisture percentage generally increases as the depth increases.

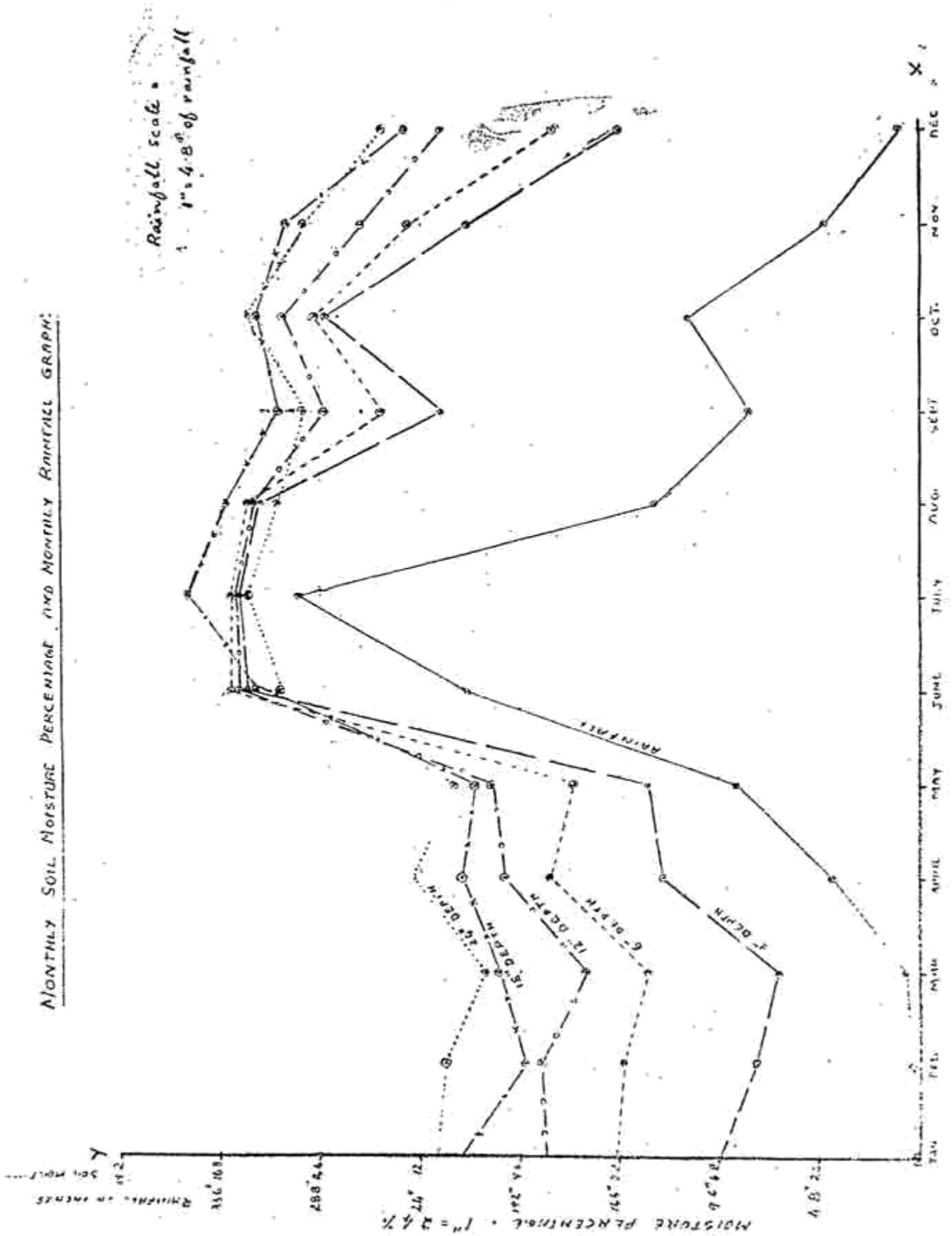
(b) In the months of June and July the soil moisture status at different depths is the same though it varies at different dates during these months.

(c) In the month of August the soil moisture status is same at all depths and also on different dates.

(d) The differences in soil moisture percentages are not significant among some depths during certain months as shown in the table given below :

A. No.	Depths	Months in which the variations are not significant
1.	24" and 18"	In all the months except in the month of February.
2.	18" and 12"	February, April, May, September, October and December.
3.	12" and 6"	April, September, October and November.
4.	6" and 3"	September and October.
5.	24", 18" and 12"	May, September and October.
6.	12", 6" and 3"	October.

MONTHLY SOIL MOISTURE PERCENTAGE AND MONTHLY RAINFALL GRAPH:



6. The soil moisture at different depths is generally at the lowest in the month of March and is at the highest in the month of July.

7. From the month of May onwards there is a tendency for the soil moisture at different depths to go in line with the trend of the rainfall. That is the soil moisture increases progressively from the month of May upto the month of July (the peak of the South-West Monsoon) and decreases from the month of July upto the month of October (the peak of the North-East Monsoon) and again it decreases thereafter (vide graph).

Acknowledgment: The authors are gratefully indebted to Sri P. A. Venkateswara Ayyar, Agronomist and Professor of Agriculture for his invaluable guidance in the preparation of this note and to the Assistant Paddy Specialist, Pattambi for all the facilities given for the collection of the soil moisture data forming the basic material for this paper.

2. Summary of results for Hot Weather Period.

Particulars	DEPTHS					G. M.	"Z" Test Satisfied or not	C. D. P. 0.05
	3" (A)	6" (B)	12" (C)	18" (D)	24" (E)			
Moisture percentage	5.43	8.06	9.59	10.49	11.43	9.00	Yes, both for depths and dates	7.23
Percentage on general mean	60.3	89.5	106.6	116.6	127.0	100.0		

Conclusion: E, D, C, B, A

3. Summary of results for the South West Monsoon Period.

Particulars	DEPTHS					G. M.	"Z" Test Satisfied or not	C. D. P. 0.05
	3" (A)	6" (B)	12" (C)	18" (D)	24" (E)			
Moisture percentage	14.95	15.58	15.82	16.44	15.61	15.68	Yes, both for depths and dates	5.44
Percentage on general mean	95.37	99.33	100.90	104.95	99.55	100		

Conclusion: D C E B C

4. Summary of results for the North East Monsoon Period.

Particulars	DEPTHS					G. M.	"Z" Test Satisfied or not	C. D. P. 0.05
	3" (A)	6" (B)	12" (C)	18" (D)	24" (E)			
Moisture percentage	9.63	10.93	12.45	13.76	13.92	12.14	"Z" Test for depths and dates	6.34
Percentage on general mean	79.36	90.07	102.54	113.35	114.68	100		

Conclusion: E D C B A

Summary of Results Month - War

Month	Soil Moisture Percentage							Percentage on General Mean				General Mean	"Z" Test Satisfied or not	C. D. P. 0-05	Summary of results
	3"	6"	12"	18"	24"	3"	6"	12"	18"	24"					
January	4.93	7.34	9.04	11.09	11.55	50.0	83.5	103.0	120.0	131.5	8.79	Yes.	Both for depths & dates	9.56	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>
February	3.91	7.07	9.06	9.54	11.36	47.8	86.4	110.1	116.7	139.0	8.19	do.	do.	17.39	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>
March	3.39	6.52	7.93	10.05	10.35	44.3	85.1	104.2	131.2	135.2	7.66	do.	do.	16.04	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>
April	6.13	8.87	9.97	10.99	12.17	63.7	92.2	103.6	114.1	126.4	9.63	do.	do.	15.81	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>
May	6.45	8.33	10.25	10.67	11.23	68.3	88.2	108.5	113.3	119.0	9.39	do.	do.	18.66	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>
June	16.19	16.62	16.28	15.97	15.42	100.5	103.3	101.2	99.2	95.8	16.10	Satisfied only for dates		8.13	
July	16.40	16.55	16.45	17.59	16.17	98.6	99.6	98.9	105.8	97.2	16.63	Satisfied only for dates		9.04	
August	15.91	16.24	16.11	16.69	15.54	98.8	100.9	100.1	103.7	96.5	16.10	Not Satisfied both for depths & dates			
September	11.50	12.91	14.30	15.39	14.69	83.6	93.9	103.9	111.9	106.7	13.76	Yes.	Both for depths & dates	11.99	<u>D</u> <u>E</u> <u>C</u> <u>B</u> <u>A</u>
October	14.28	14.45	15.27	15.94	16.17	93.7	94.9	100.7	104.6	106.1	15.22	Yes.	Both for depths & dates	7.29	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>
November	10.92	12.30	13.44	15.15	14.89	81.7	92.2	100.8	113.6	111.7	13.44	Yes.	Both for depths & dates	9.48	<u>D</u> <u>E</u> <u>C</u> <u>B</u> <u>A</u>
December	7.24	8.77	11.45	12.28	12.88	68.8	83.3	108.8	116.7	122.4	10.52	Yes.	Both for depths & dates	10.45	<u>E</u> <u>D</u> <u>C</u> <u>B</u> <u>A</u>

The following conclusions are drawn from the above results:

1. During the year there are marked variations in the soil moisture percentage at different depths, the moisture contents increasing as the depth increases. However the difference between the soil moisture percentage at 18" and 24" is not significant.
2. In the Hot Weather period (February to June) the moisture percentage increases as the depth increases. The variations of soil moisture at each depth are significant.
3. During the South West Monsoon period the moisture percentage at 18" depth is the highest followed by 12", 24", 6" and 3" depths. But the difference in soil moisture between 18" and 12" and the differences among the three depths 24", 6", and 3" are not significant.