HYDROLOGY

PRECIPITATION   TRANSPIRATION   EVAPORATION

INFILTRATION   SURFACE RUNOFF

SPRING

GROUNDWATERTABLE

LAKE   SWAMP   RIVER   OCEAN
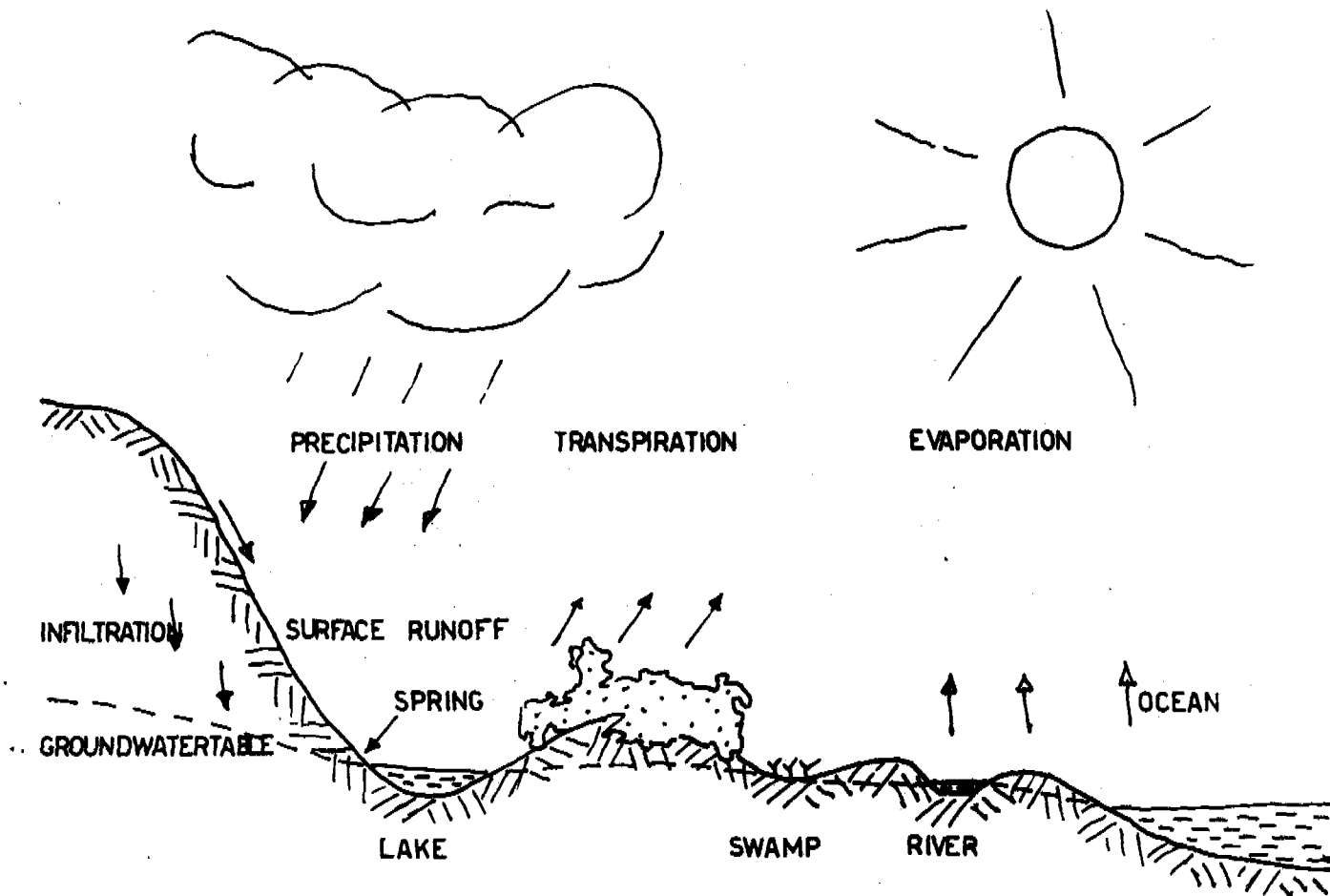
MINISTRY OF AGRICULTURE

COMMUNITY DEVELOPMENT DEPARTMENT

UNITED REPUBLIQUE CAMEROON

SWISS ASSOCIATION FOR TECHNICAL

ASSISTANCE

BUILDING TRAINING CENTRE KUMBA

HYDROLOGY

CONTENTS

DRAINAGE IN CAMEROON

Mt (460m.)
▽ 6,55 m.
BOMANA
SANJE

30 m.
▽
9.75 m.

● IDENAU
500 m
▽
10.19 m.

9 m.
8 m.
7 m.
6 m.
5 m.
4 m.
3 m.
2 m.

2.15 m
▽
FAKO
(4050)

(2,900 m.
▽ 2.90 m.

2.00 m.
▽
(3200 m.)

10 m.

▽
11.00 m.

(2,420 m.
▽ 3.7 m.

upper limit of the forest

(1,000 m.)
▽ 9.15 m.

Scale 1/100,000

1. HYDROLOGY

1. DEFINITION AND HYDROLOGIC CYCLE

Hydrology is the science of distribution and behaviour of water in nature. Hydrology is a part of climatology. The cycle of water or Hydrologic Cycle is without beginning or end and consists of the following:

- Precipitation: All water from the atmosphere deposited on the surface of the earth as either rain, snow, hail or mist.
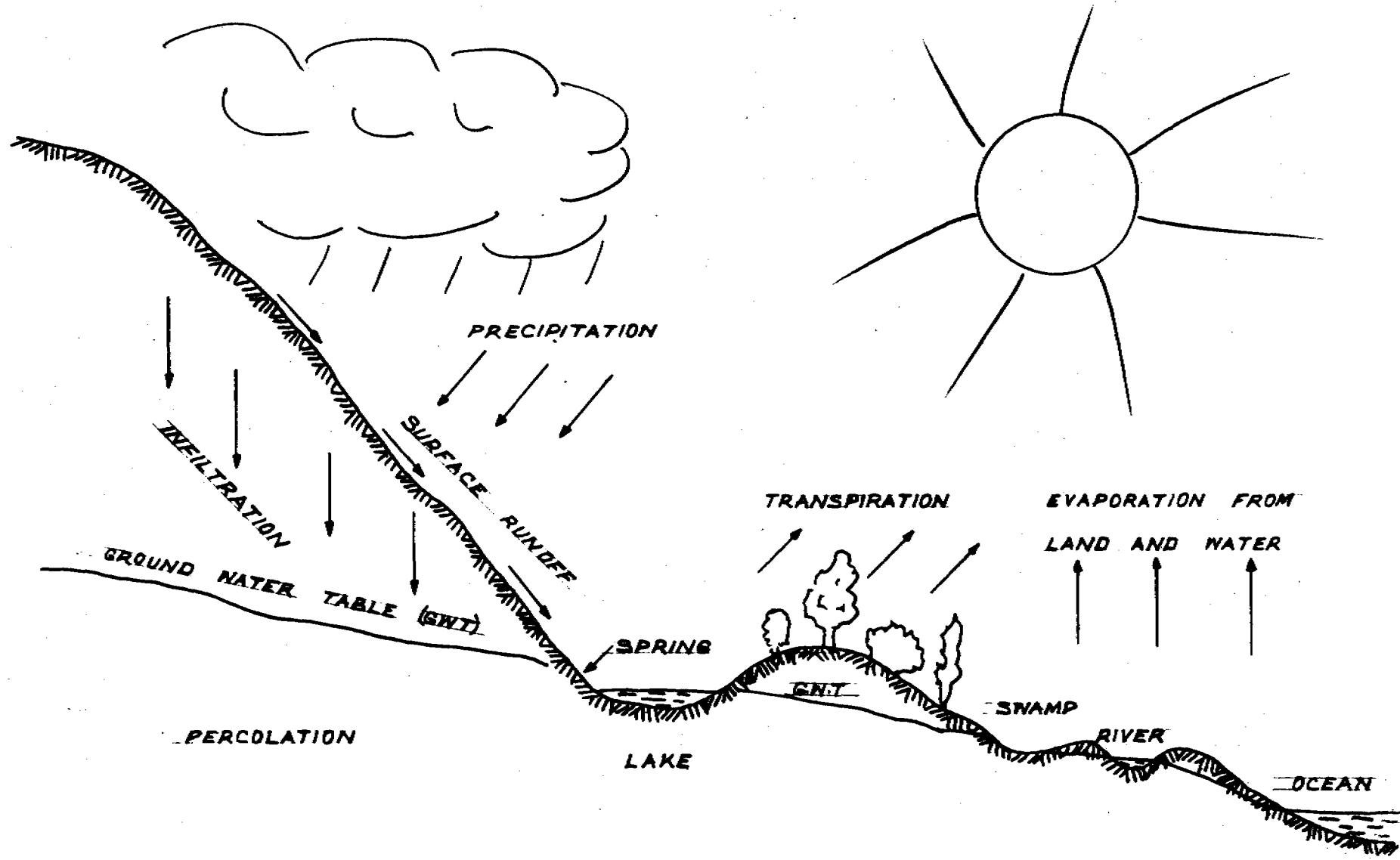
- Surface Runoff: The water which is derived directly from precipitation and passes over ground into water courses is known as Surface Runoff. The Surface Runoff then consists of the precipitation less the losses from infiltration and evaporation.

- Evaporation, Transpiration: Combined loss of water from land and water-surface by Evaporation and plant Transpiration.

- Percolation: The term percolation discribes the passage of water into, through and out of the ground. The term infiltration is frequently used to describe the entrance of water into the ground and its vertical movement down to the ground watertable, while percolation or ground waterflow is applied to the movement of water after it has reached the watertable.

PRECIPITATION

INFILTRATION

SURFACE RUNOFF

TRANSPIRATION

EVAPORATION FROM LAND AND WATER

GROUND WATER TABLE (GWT)

SPRING

G.W.T

SWAMP

PERCOLATION

LAKE

RIVER

OCEAN

HYDROLOGIC CYCLE

2. CLIMATIC PATTERN

The main features of the climate are the 4 - 5 months long
dry season from November to March and the corresponding
rainy season of 7 - 8 months.

Notes on the climatic characteristics of the various areas are
based on inadequate records in terms of duration and number
of stations. Nevertheless, an idea of the main climatic
zones can be found considering some basic factors:

- Throughout most of West-Africa, the rainfall and the
  humidity decrease with increasing distance from the coast,
  but in South-West and North-West Province this pattern
  is sharply modified by the topography.

- The main rain-bearing winds come from South West. Wherever
  these are interrupted by high land, heavy precipitations
  result over all South West facing slopes with complementary
  rain shadows in the N.E. For example, Dibundcha on the
  South West side of the Mount Cameroon averages
  10.4 m of rain per annum, wheras Mpundu at the northern
  side receives only 1.5 m p.a. Similarly Fontem, at the
  South West of the high plateau averages 4.3 m compared to
  Ndop with 1.6 m p.a.

2.1. QUANTITY OF RAINFALL

Rainfall quantities can be mapped with Isohyetes, i.e. all
points of the same amount of annual rainfall are linked and
the resulting lines give us an idea of the repartition of the
rainfall in a region. (see 1.2.4., Fig. 2 + 3 + 4.)

2.2 VARIATION OF RAINFALL

The rainfall varies greatly throughout the year and from one
year to the other as well as from one station to another
(see map annual rainfall). The monthly variations have
been analysed by Brown and Clarkson for the Bamenda Station
records 1923 - 1953 and the results shown in Fig. 5 + 6.
In the diagram, the upper and the lower ends of the monthly
pillar show the greatest and least rainfall recorded during
this period. In four out of five years the monthly rainfall
may be expected within the dotted lines. The black line
across indicates the arithmetic means of 30 years of records.

2.3. INTENSITY OF RAINFALL

The intensity of rainfall tells us how much rain falls within
a certain period. (10', 15', 30', 1^h, 24^h.)
Records of intensity are essential data for the calculations
involved in designing bridges, culverts, dams and soil
conservation earthworks.
(see Fig. 7)

2.4. TABLES OF MONTHLY RAINFALL

	J	F	M	A	M	J	J	A	S	O	N	D

Bamenda meteo station

	J	F	M	A	M	J	J	A	S	O	N	D
1965	3	88	64	221	127	381	497	486	361	183	-	24
1966	25	-	131	301	291	131	463	408	480	170	163	-
1967	1	47	100	182	100	387	392	352	591	355	36	5
1968	55	50	302	223	154	456	428	395	366	145	140	1
1969	-	19	234	151	214	309	546	569				

Tole Tea Estate

	J	F	M	A	M	J	J	A	S	O	N	D
1965	46	61	90	199	186	266	1144	1506	410	342	39	21
1966	40	-	108	103	54	123	459	910	290	219	80	4
1967	-	47	215	141	162	236	676	835	441	155	69	10
1968	25	1	89	200	167	620	1450	750	570	166	52	12

Acha Tugi Presbyterian Hospital

	J	F	M	A	M	J	J	A	S	O	N	D
1966	-	-	133	401	371	326	511	353	441	307	112	-
1967	12	40	100	203	98	222	370	357	380	360	55	19
1968	33	45	170	145	246	232	297	227	389	194	57	12
1969	-	63	308	175	295	353	378					

Wum Agric. Farm

	J	F	M	A	M	J	J	A	S	O	N	D
1968	20	65	169	262	378	453	406	446	497	356	102	-
1969	-	27	161	274	391	430						

Ndu Tea Estate

	J	F	M	A	M	J	J	A	S	O	N	D
1969	-	36	115	138	150	146	272	372				

Idenau 10556 mm

	J	F	M	A	M	J	J	A	S	O	N	D
1967	11	212	288	518	547	1952	1817	1396	1490	1513	574	238

Bota 4226 mm

	J	F	M	A	M	J	J	A	S	O	N	D
1967	-	23	161	91	177	692	1361	930	383	181	193	34

Meanja 1650 mm

	J	F	M	A	M	J	J	A	S	O	N	D
1967	-	47	140	54	54	234	293	315	170	128	191	24

Kumbo Baptist Hospital Nso 1957 - 1966

	J	F	M	A	M	J	J	A	S	O	N	D
min.	-	-	38	87	118	79	186	126	196	118	10	-
Max.	33	87	216	295	395	266	466	428	454	380	208	136
av.	9	13	116	176	196	188	310	270	316	224	76	16

Monthly Rainfall

Year 1967   Idenau ⸺ ⸺ ⸺ ⸺ Tole Tea ⸺⸺⸺

                 Bota ⸺.⸺.⸺   Meanja ⸺o⸺o⸺
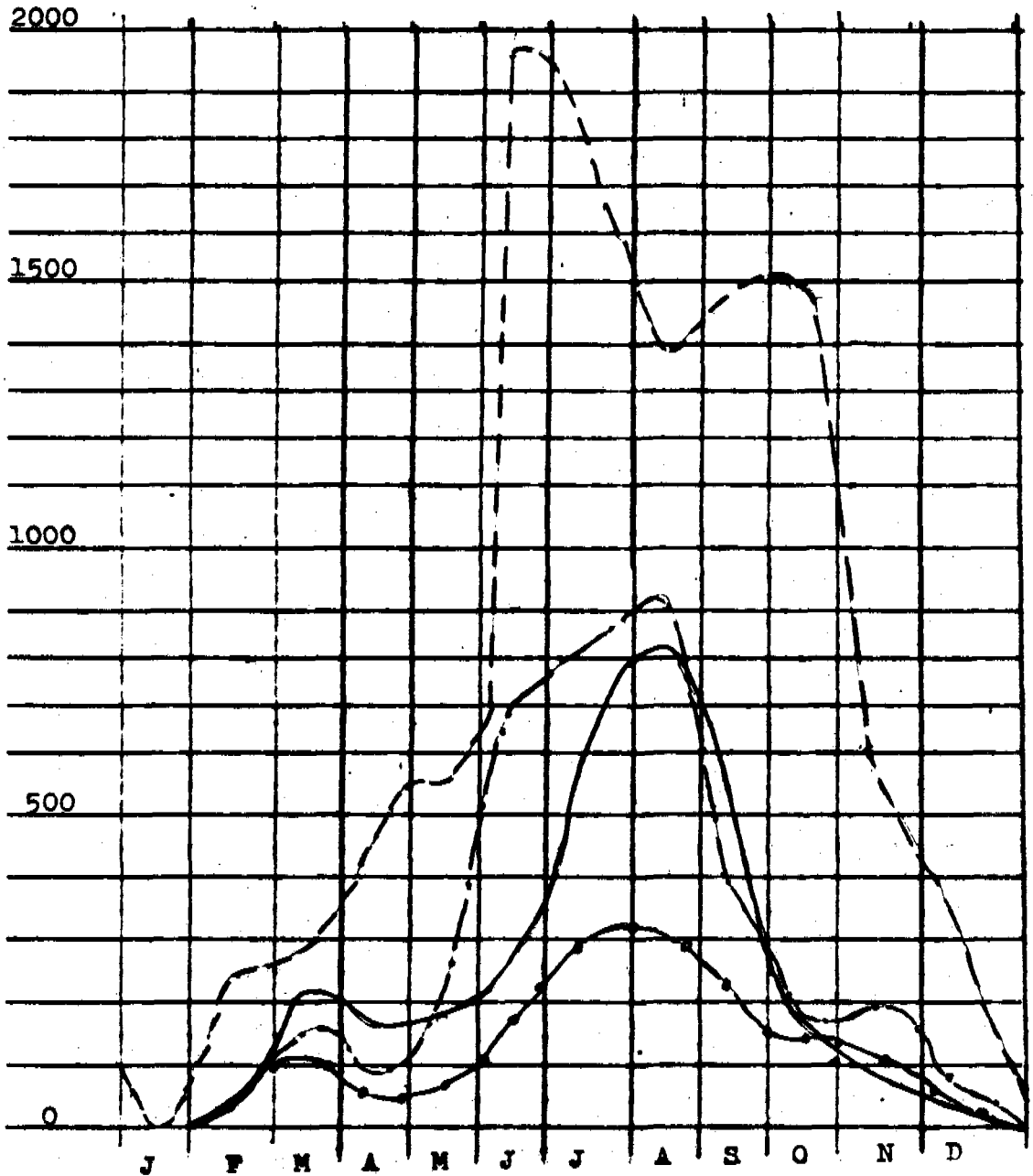
Monthly Rainfall

Year 1968   Bamenda ————————————

                       Wum Agric.— — — —

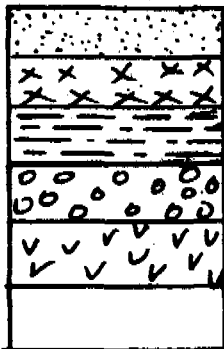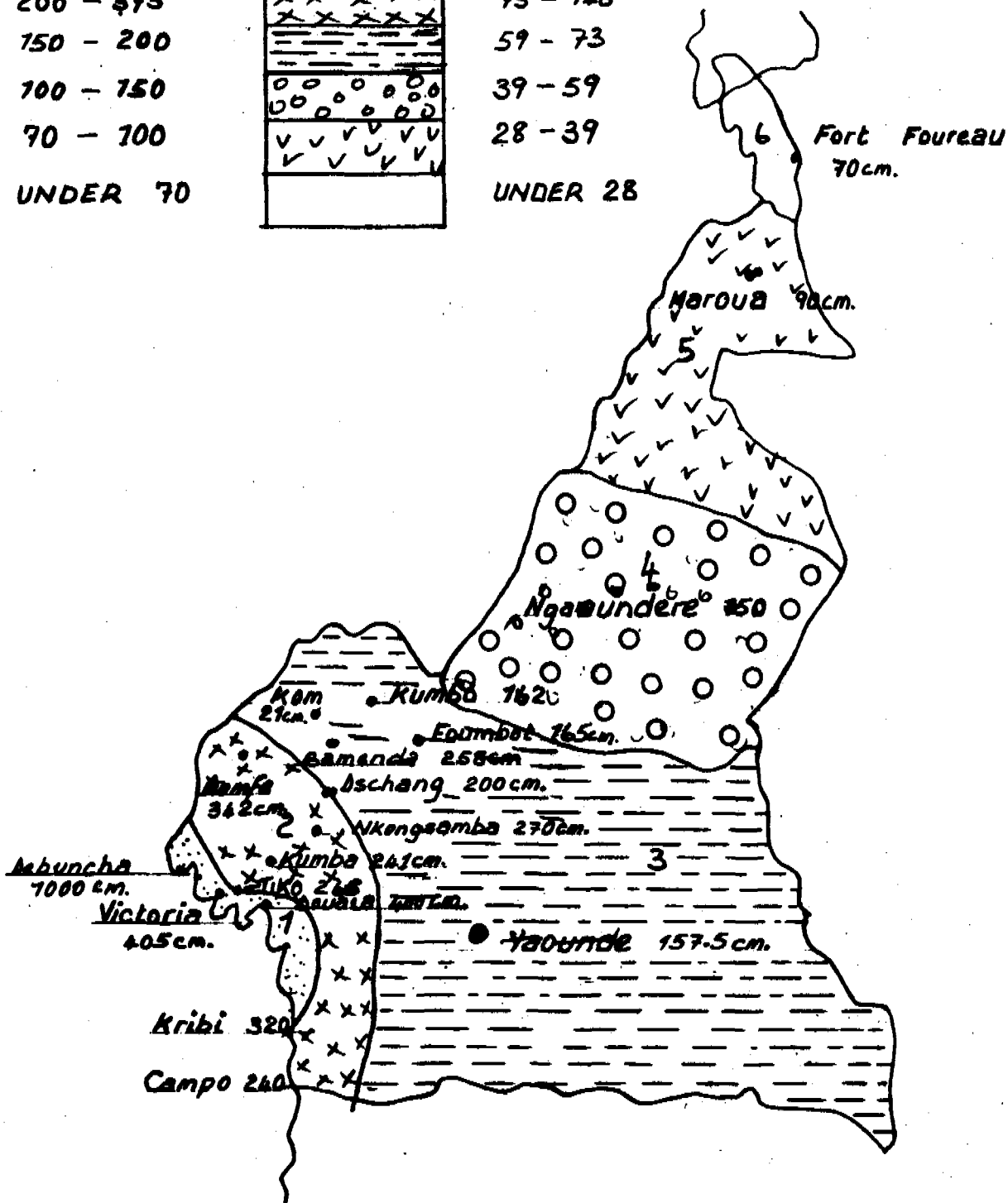   Acha Hospital—.—.——.——

Intensity of Rainfall
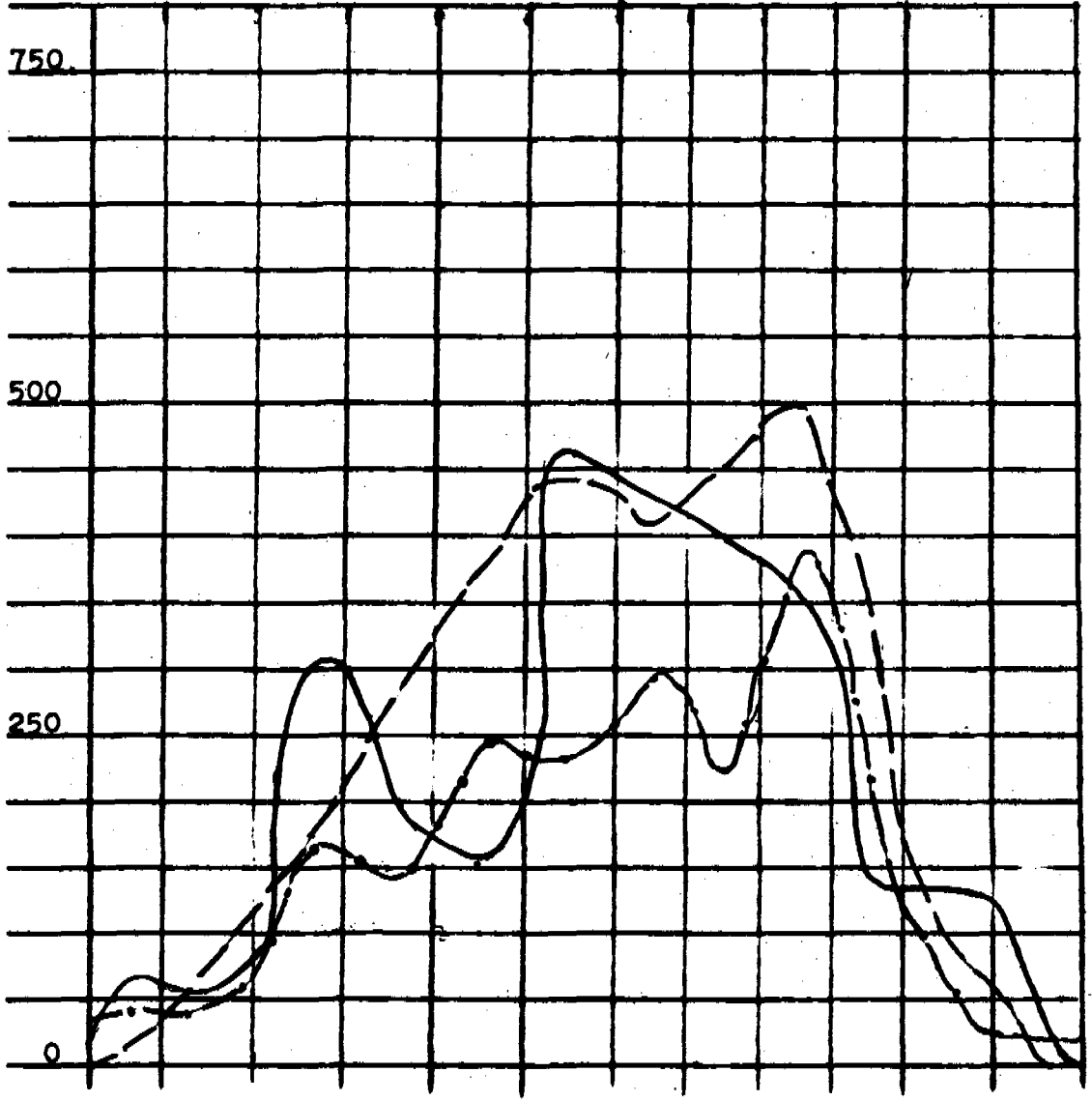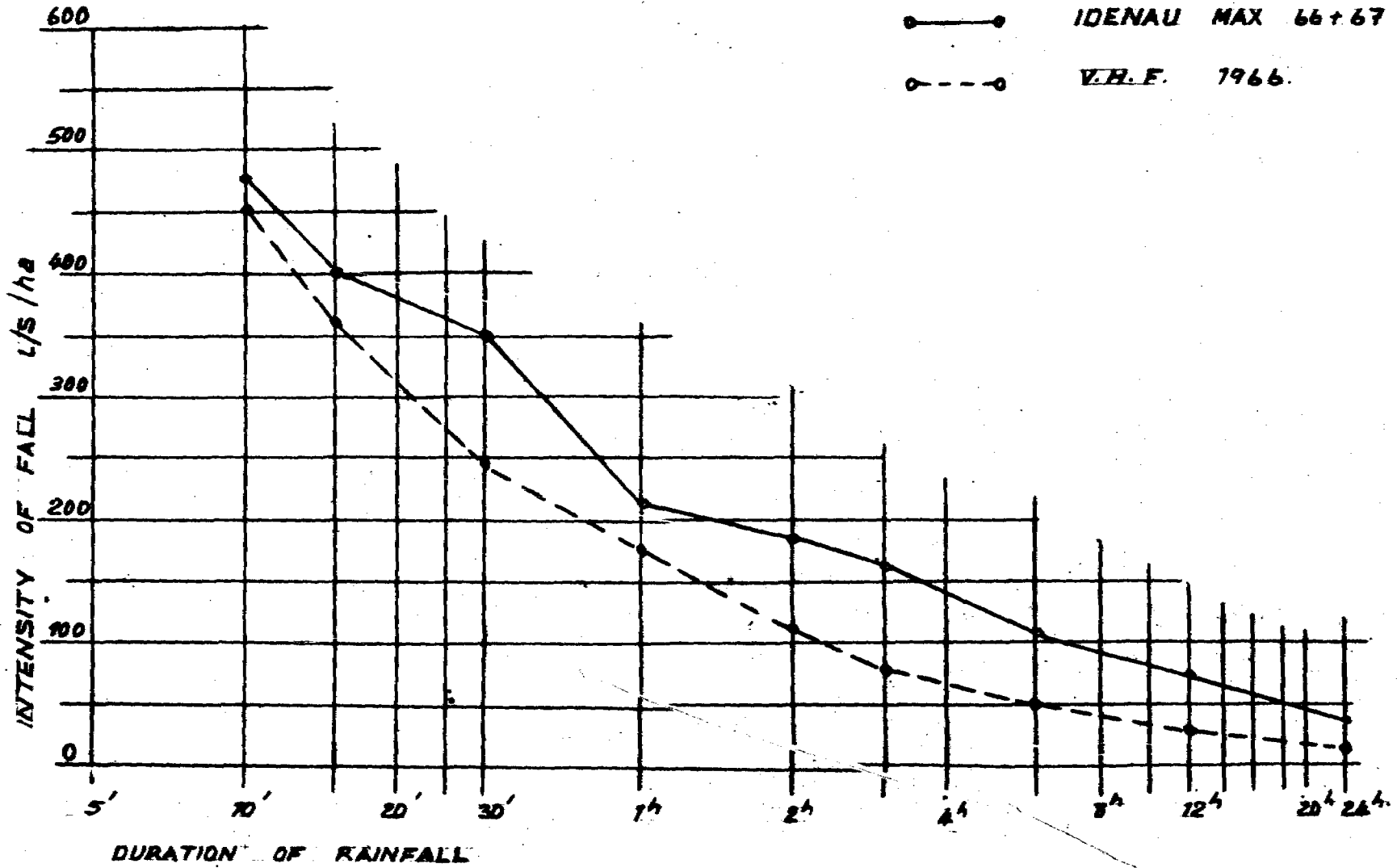
CAMEROUN, Distribution of Annual Rainfall

CM.
OVER 375
200 - 375
150 - 200
100 - 150
70 - 100

UNDER 70

INCHES
148
73 - 148
59 - 73
39 - 59
28 - 39

UNDER 28

Fort Foureau
70cm.

Maroua 90cm.

5

4

Ngaoundere 150

Kom 21cm.
Kumbo 162

Eoumbot 165cm.
Bamenda 258cm.
Bschang 200cm.
Nkongsamba 270cm.
Kumba 241cm.

Bafo 342cm.

Mbuncha 1000 cm.
Tiko 246
Douala 367cm.

3

Victoria 405cm.

1

Yaounde 157.5 cm.

Kribi 320
Campo 240

VARIATION OF RAINFALL AT BAMENDA STATION

MONTHLY VARIATION OF RAINFALL 1923 - 1957
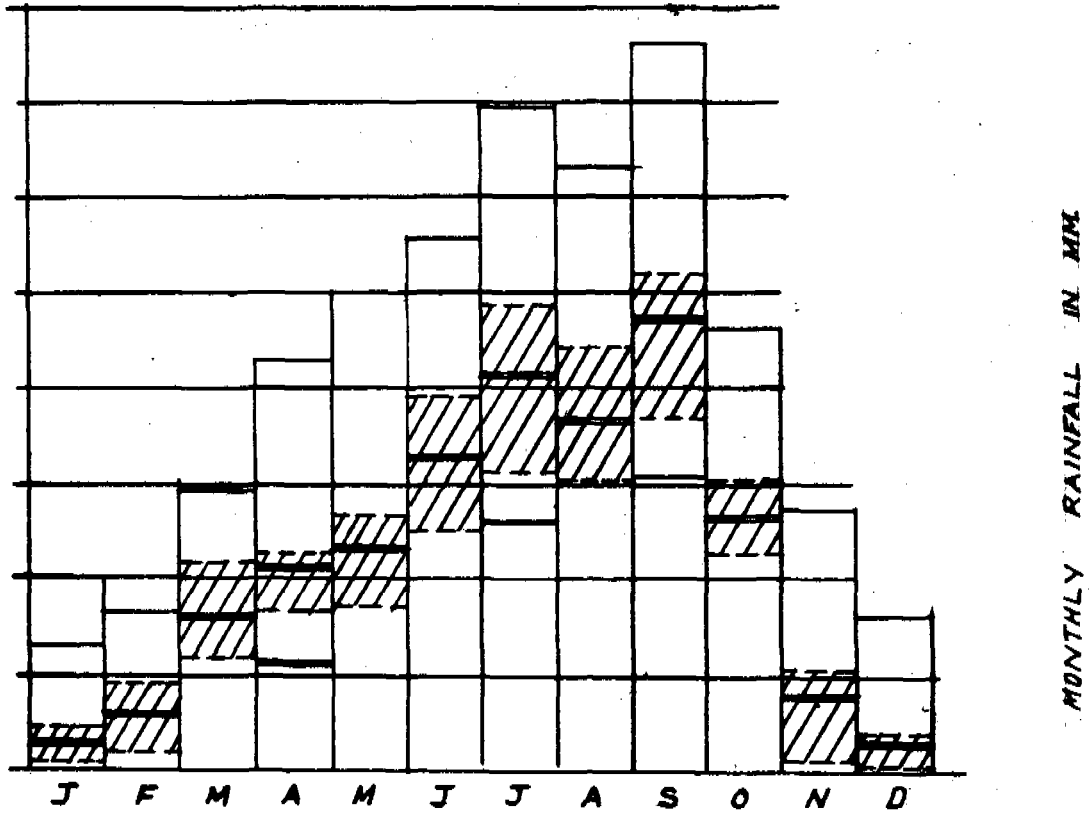
Annual Variation of rainfall 1920 - 1970
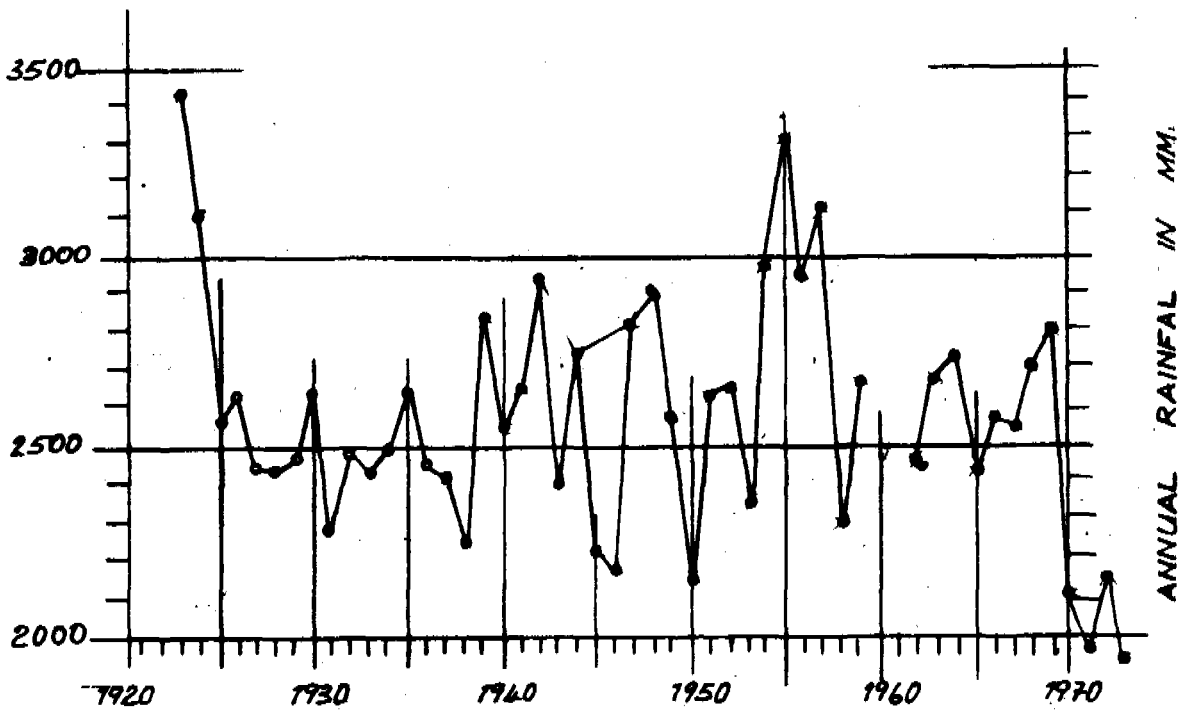
3. RAINFALL, RUN OFF AND INFILTRATION

The quantity of water running from an area into streams and finally to the sea is not the same as the rainfall.

The quantity of rainfall will be shared into:

- direct evaporation
- transpiration through vegetation
- infiltration
- run off

3.1 INFILTRATED WATER

Infiltrated water forms the ground water and through its natural filtration it cn be used directly as drinking water (as far as protective measurements for catchments are adopted.)

The characteristics of the yield of a spring depend on the type of soil and subsoil. From rocky areas the quantity of water will directly depend upon the rainfall. Surface springs will also dry up shortly after the rainy season and supply again after the first rains.

Springs from deep lateritic covers or from far distant catchment arecs are more regular but their lowest supply quantity does not correspond with the lowest rainfall.

3.2. RUN OFF

Similar characteristics can be found in streams. Rocky areas provide flood and low w ter according to the rains. Lateritic or otherwise porous and water-helding soils supply the streams with underground water and the quantity may still decrease after the first rains.

4. DRAINAGE IN CAMEROON

The principal Cameroon watershed begins in the Rumpi Mountains north of Kumba and continues through Kupe, Manenguba, Bambutu, Bamenda Banyo and Ngoundere to Ubangi-Shari across the frontier. It is the main source of the country's rivers, which flow in four main directions: North into lake Chad, North-west into River Benue (Niger), South-west into Gulf of Guinea and South-east into Kadei, a tributary of River Congo. These correspond nearly to the five main drainage basins: Chad Basin, Benue Basin (Niger), Sanaga Basin, Congo Basin and Basin of Coast Rivers.