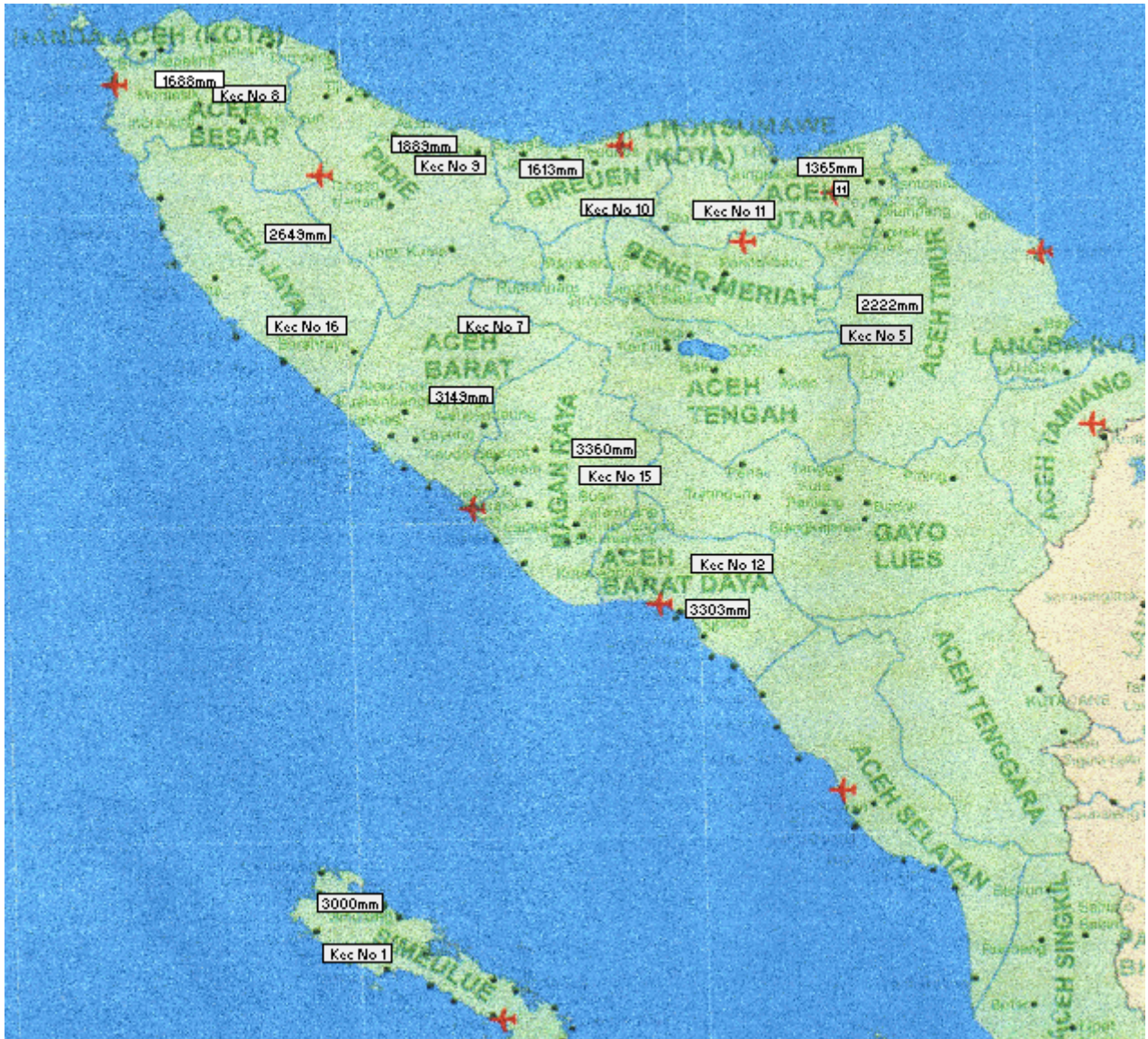


ETESP Background Paper

ANNUAL & MONTHLY RAINFALL



October 2005
(Update of December 2005)

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ANNUAL & MONTHLY RAINFALL

1. Introduction

For the ETESP, Agriculture Component Inception Report the only rainfall data available were those quoted in Table 4.1 which contained monthly data for the year 1999 plus long term totals. The data sets were not all complete for all months or for all Kabupaten and a few “gaps” existed.

Accordingly, to try and establish a more complete data set, until such time as full meteorological data sets can hopefully be obtained, the data were manipulated to give monthly rainfall data based on the long term “total” rainfall for each Kabupaten. The hope being that by using the long term data the information just might be more reliable – but this cannot be guaranteed.

Also, in the Inception Report it was stated that rainfall was greater on the west coast than on the east – this statement, though basically accurate, did not supply much useful information. Accordingly the available data was again manipulated to try and establish “rainfall” zones which might prove useful in planning rehabilitation processes.

2. Monthly and Annual Rainfall

The original 1999 data plus the “manipulated” data sets are shown as Table 1.

Table 1(a) Monthly Rainfall Data - 1999

Kabupaten Code	8	16	7	15	12	1	9	10	11	5
Kabupaten Name										
Month	Aceh Besar	Aceh Jaya	Aceh Barat	Nagan Raya	Aceh Barat Daya	Simeulue	Pidie	Bireuen	Aceh Utara	Aceh Timur
	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>
Jan	72	242	242	384	216	40	195	195	330	246
Feb	139	180	94	159	313	75	327	97	91	387
March	114	240	299	299	254	55	126	122	85	497
April	78	140	215	286	138	65	163	123	38	170
May	74	87	307	221	280	121	85	130	-	166
June	34	61	33	33	155	70	57	69	7	129
July	51	155	147	147	206	107	30	76	-	211
Aug	92	314	314	291	185	186	123	70	-	270
Sept	107	202	202	202	488	110	333	99	-	287
Oct	41	416	416	416	210	141	140	171	-	285
Nov	83	273	273	273	98	135	98	204	-	-
Dec	173	268	268	279	231	139	129	224	-	396
Total 1999	1057	2578	2809	2990	2774	1244	1807	1541	1318	3044
Long Term Total	1668	2649	3149	3360	3303	1127	1889	1613	ND	2222

Source: ETESP Inception report October 2005
From Land Rehabilitation and Environment Sub-Section

Recent local advice is that the figure for Simeulue should be about 3,000 and not the above quoted 1127 or 1244mm.

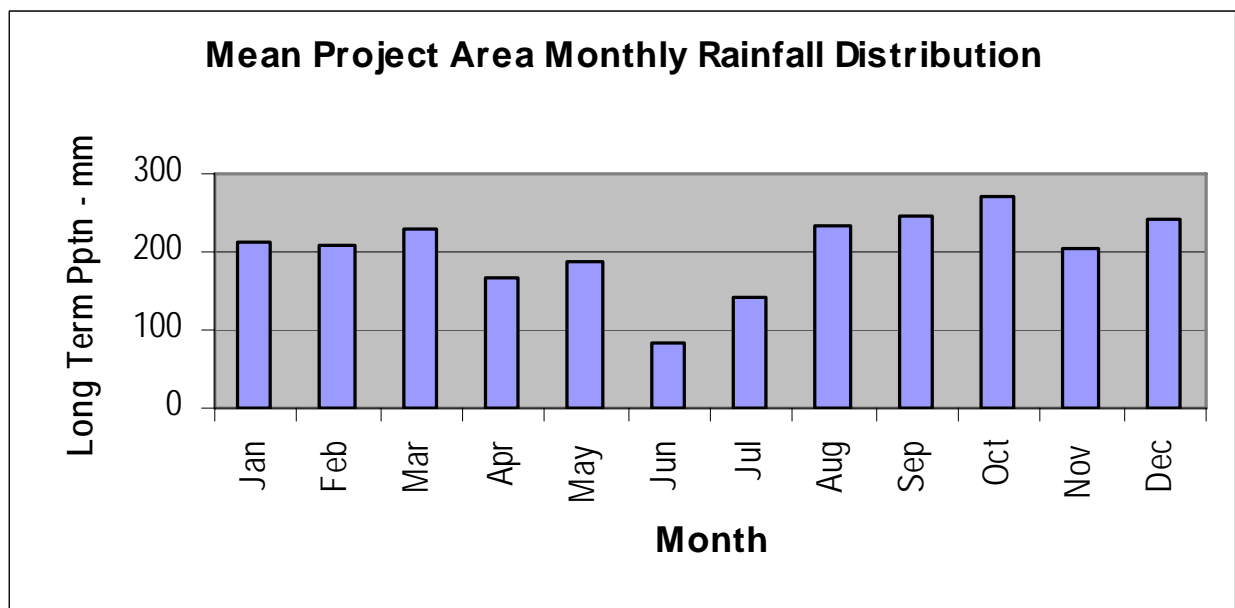
Table 1(b) Monthly Rainfall Data Based on Long Term Data

Code Name	8		16		7		15		12		1		9		10		11		5		Overall		
Month	Aceh Besar Monthly as % of annual		Aceh Jaya Monthly as % of annual		Aceh Barat Monthly as % of annual		Nagan Raya Monthly as % of annual		Aceh Barat Daya Monthly as % of annual		Simeulue Monthly as % of annual		Pidie Monthly as % of annual		Bireuen Monthly as % of annual		Aceh Utara Monthly as % of annual		Aceh Timur Monthly as % of annual		Monthly as % of annual Overall monthly average long		
	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	%	mm	
Jan	114	7	249	9	271	9	432	13	257	8	96	3	204	11	199	12	123	9	180	8	10	212	
Feb	219	13	185	7	105	3	179	5	373	11	181	6	342	18	99	6	126	9	282	13	9	209	
Mar	180	11	247	9	335	11	336	10	302	9	133	4	132	7	125	8	129	9	363	16	9	228	
Apr	123	7	144	5	241	8	321	10	164	5	157	5	170	9	126	8	96	7	124	6	7	167	
May	117	7	89	3	344	11	248	7	333	10	292	10	89	5	133	8	101	7	121	5	7	187	
Jun	54	3	63	2	37	1	37	1	185	6	169	6	60	3	70	4	55	4	94	4	3	82	
Jul	80	5	159	6	165	5	165	5	245	7	258	9	31	2	78	5	76	6	154	7	6	141	
Aug	145	9	323	12	352	11	327	10	220	7	449	15	129	7	71	4	127	9	197	9	9	234	
Sep	169	10	208	8	226	7	227	7	581	18	265	9	348	18	101	6	140	10	209	9	10	248	
Oct	65	4	427	16	466	15	467	14	250	8	340	11	146	8	175	11	145	11	208	9	11	269	
Nov	131	8	281	11	306	10	307	9	117	4	326	11	103	5	208	13	107	8	146	7	8	203	
Dec	273	16	275	10	300	10	314	9	275	8	335	11	135	7	229	14	141	10	143	6	11	242	
Total - LT	1668		2649		3149		3360		3303		3000		1889		1613		1365		2222		Avrg		2422
Check	1668		2649		3149		3360		3303		3000		1889		1613		1365		2222		Avrg		2422

Source: Developed by manipulating data of 1999 rainfall to get % of 1999 per month then applying percentages to Long Term Total Rainfall
 Total for Bireuen changed from 1100+ to 3000mm on local advice

The full spreadsheet showing the percentages per month etc is shown as Appendix 1 and rainfall distributions graphs (block diagrams) are shown in Appendix B. The overall rainfall distribution for the project area, for which data are held, is shown in Figure 1.

Figure 1 Rainfall Distribution – monthly, average for project area



3. Rainfall Zones

For planning soil reclamation and, later, agricultural inputs, it is very helpful – perhaps necessary – to have as much climatic data, including isohyets mapping information as possible. No such information was immediately available hence the existing rainfall data has been manipulated with the following outputs.

- A table showing rainfall zones
- A diagram showing rainfall in the various Kabupaten, and
- A simple map showing the location of these zones

Table 2 Rainfall Zones based on Long Term Precipitation

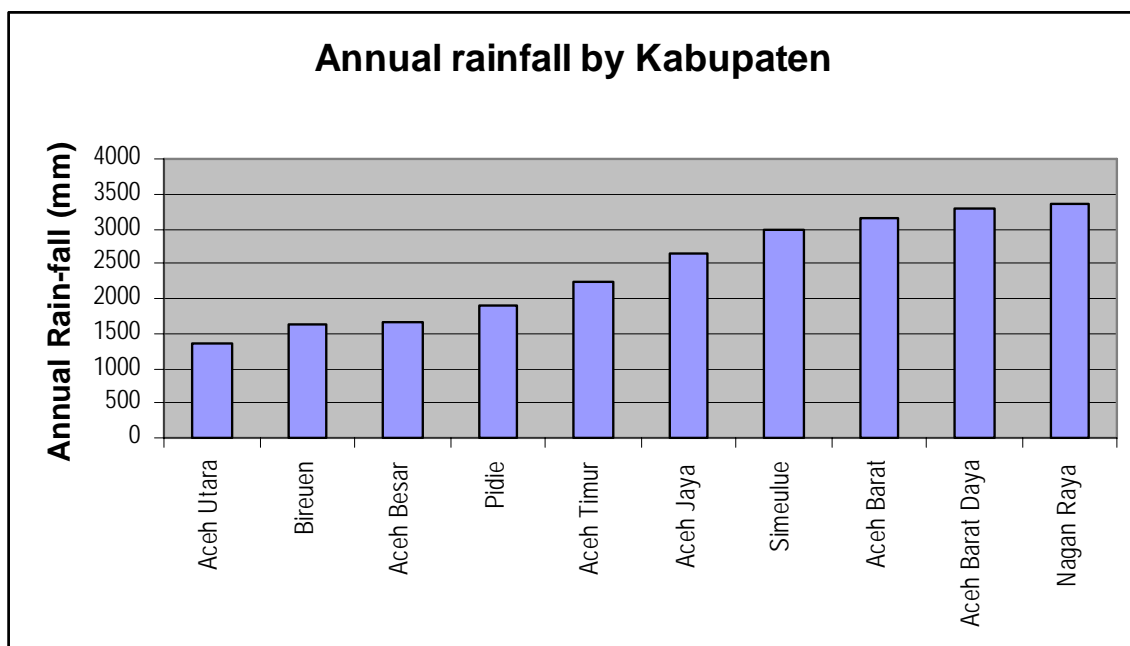
District No	Name	Location	Annual long term Pptn (mm)	Pptn in 1999	1999 as % of average
11	Aceh Utara	N	1365	1318	97
		Average	1365	1318	97
10	Bireuen	N	1613	1541	96
8	Aceh Besar	N	1668	1057	63
9	Pidie	N	1889	1807	96
		Average	1723	1468	85
5	Aceh Timur	E	2222	3044	137
16	Aceh Jaya	W	2649	2578	97
		Average	2436	2811	117
1	Simeulue	W	3000	ND	ND
7	Aceh Barat	W	3149	2809	89
12	Aceh Barat Daya	W	3303	2774	84
15	Nagan Raya	W	3360	2990	89
		Average	3203	2858	87

It can be seen in Table 2 that groupings based on latitude and or geographical position do show variations with:

- The lowest rainfall, less than 1500mm, in Aceh Utara which is at the eastern end of the N coast
- Average of around 1700mm found along the N coast
- Average of around 2400mm in the band with Aceh Jaya in the W and Aceh Timur in the E and at about the same latitude
- The lower west coast, including the island of Simeulue, having the highest – overall average of over 3200mm

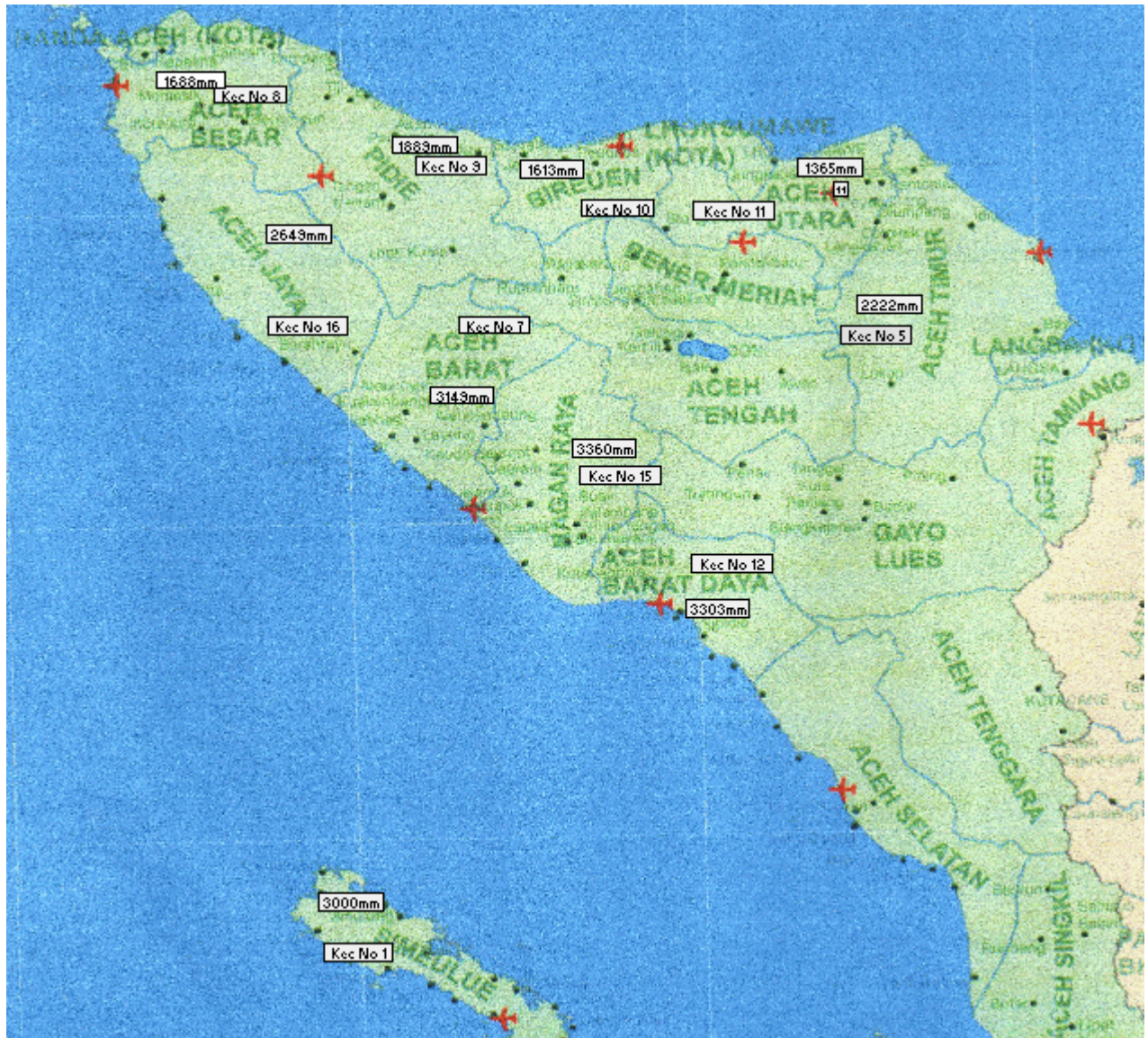
With slightly more data and knowledge of actual rainfall stations it would be possible to draw crude isohyets; this has not been attempted by ETESP.

Figure 2 Long Term Precipitation by District (Kabupaten)



It appears that rainfall decreases as one comes north and the pattern appear to be governed by latitude (how far north) and not location on the north or west coast. What has, in most previous reports, been referred to as the east coast is, in fact, largely a north coast! Only Aceh Timur should really be considered as lying on the east coast.

Figure 3 Districts (Kabupaten) in the Study and Long Term Precipitation



The original data as manipulated and used for the ETESP inception report has been found to be incorrect for Simeulue; long term annual rainfall was given as just over 1,000mm per annum when it should be about 3,000mm – this information being supplied by local Dinas staff from the area.

However, the lower figure should not be totally cast aside as it is possible that the data came from a rainfall station that is in a rain shadow – but for planning purposes the higher, 3000mm, figure should be used.

4. Use of Rainfall Data

The monthly rainfall data have already been built into one of the main “reclamation” tools which is an MS Excel spreadsheet ([Leaching Water Requirements.XLS](#)) for calculating the depth (mm) and volume (cubic metres per hectare) required to leach soils of various textural class with salinised horizons of various depths.

APPENDIX 1 Original Data Manipulation Spreadsheet

Kabupaten Monthly Precipitation from Long Term Annual Rainfall																						
Code	8		16		7		15		12		1		9		10		11		5		Overall	
Name	Aceh Besar		Aceh Jaya		Aceh Barat		Nagan Raya		Aceh Barat Daya		Simeulue		Pidie		Bireuen		Aceh Utara		Aceh Timur		Overall	
Month	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	
Jan	114	7	249	9	271	9	432	13	257	8	36	3	204	11	199	12	123	9	180	8	10	206
Feb	219	13	185	7	105	3	179	5	373	11	68	6	342	18	99	6	126	9	282	13	9	198
Mar	180	11	247	9	335	11	336	10	302	9	50	4	132	7	125	8	129	9	363	16	9	220
Apr	123	7	144	5	241	8	321	10	164	5	59	5	170	9	126	8	96	7	124	6	7	157
May	117	7	89	3	344	11	248	7	333	10	110	10	89	5	133	8	101	7	121	5	7	169
Jun	54	3	63	2	37	1	37	1	185	6	63	6	60	3	70	4	55	4	94	4	3	72
Jul	80	5	159	6	165	5	165	5	245	7	97	9	31	2	78	5	76	6	154	7	6	125
Aug	145	9	323	12	352	11	327	10	220	7	169	15	129	7	71	4	127	9	197	9	9	206
Sep	169	10	208	8	226	7	227	7	581	18	100	9	348	18	101	6	140	10	209	9	10	231
Oct	65	4	427	16	466	15	467	14	250	8	128	11	146	8	175	11	145	11	208	9	11	248
Nov	131	8	281	11	306	10	307	9	117	4	122	11	103	5	208	13	107	8	146	7	8	183
Dec	273	16	275	10	300	10	314	9	275	8	126	11	135	7	229	14	141	10	143	6	11	221
Total - LT	1668		2649		3149		3360		3303		1127		1889		1613		1365		2222		Avg	2235
Check	1668		2649		3149		3360		3303		1127		1889		1613		1365		2222		Avg	2235

LT = Long Term data source

This sheet shows Simeulue as having an annual rainfall of about 1130mm

The above is extracted from the MS Excel spreadsheet [Kabupaten Precipitation.XLS](#) and can be supplied on request.

Appendix 2 Updated Data Manipulation Spreadsheet

Code Name	8		16		7		15		12		1		9		10		11		5		Overall	
Month	Aceh Besar Monthly as % of annual		Aceh Jaya Monthly as % of annual		Aceh Barat Monthly as % of annual		Nagan Raya Monthly as % of annual		Aceh Barat Daya Monthly as % of annual		Simeulue Monthly as % of annual		Pidie Monthly as % of annual		Bireuen Monthly as % of annual		Aceh Utara Monthly as % of annual		Aceh Timur Monthly as % of annual		Monthly as % of annual Overall monthly average long	
	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	mm	%	%	mm
Jan	114	7	249	9	271	9	432	13	257	8	96	3	204	11	199	12	123	9	180	8	10	212
Feb	219	13	185	7	105	3	179	5	373	11	181	6	342	18	99	6	126	9	282	13	9	209
Mar	180	11	247	9	335	11	336	10	302	9	133	4	132	7	125	8	129	9	363	16	9	228
Apr	123	7	144	5	241	8	321	10	164	5	157	5	170	9	126	8	96	7	124	6	7	167
May	117	7	89	3	344	11	248	7	333	10	292	10	89	5	133	8	101	7	121	5	7	187
Jun	54	3	63	2	37	1	37	1	185	6	169	6	60	3	70	4	55	4	94	4	3	82
Jul	80	5	159	6	165	5	165	5	245	7	258	9	31	2	78	5	76	6	154	7	6	141
Aug	145	9	323	12	352	11	327	10	220	7	449	15	129	7	71	4	127	9	197	9	9	234
Sep	169	10	208	8	226	7	227	7	581	18	265	9	348	18	101	6	140	10	209	9	10	248
Oct	65	4	427	16	466	15	467	14	250	8	340	11	146	8	175	11	145	11	208	9	11	269
Nov	131	8	281	11	306	10	307	9	117	4	326	11	103	5	208	13	107	8	146	7	8	203
Dec	273	16	275	10	300	10	314	9	275	8	335	11	135	7	229	14	141	10	143	6	11	242
Total - LT	1668		2649		3149		3360		3303		3000		1889		1613		1365		2222		Avg	2422
Check	1668		2649		3149		3360		3303		3000		1889		1613		1365		2222		Avg	2422

Original figure suspect and replaced with 3,000mm on local advice

LT = Long Term data source

APPENDIX B RAINFALL DISTRIBUTION DIAGRAMS

