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Cyclone Damage to Coconut Plantations

(Report on Survey conducted by C.R.I.)

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INTRODUCTION

1. Objectives of Survey :

The survey was intended to obtain information on the extent of damage to coconut plantations in Chilaw district caused by the cyclone of October, 1967.

The information gathered was directed mainly towards two specific aspects—namely:

(i) To estimate the number of palms damaged and the degree of such damage as a result of the cyclone.

(ii) To estimate the number of surviving palms facing the immediate threat of destruction by Red Weevil which are likely to find ready breeding places in trunks of palms that have succumbed to the cyclone and have not been properly disposed of.

2. Design of Survey

In the absence of a framework of coconut holdings in Chilaw district from which to draw a random sample and due to the fact that the urgency of the information required did not permit the preparation of an ad-hoc framework, there was no alternative but to consider a whole village as the ultimate sampling unit. Thus whatever village was included in the sample was fully enumerated.

Chilaw district consists of eight palatas or pattus and these constituted blocks (or strata) from each of which a certain number of villages were selected at random making use of the published village lists. Thus the survey design adhered to what is technically termed a "Stratified random sample". The sampling fraction was not constant and therefore this did not constitute a self-weighting design. This feature of a varying sampling fraction was deliberately introducted to attain higher precision of the estimate taking advantage of our knowledge of conditions in the district.

The number of villages selected from each stratum is given in Table 1 :

TABLE I

No. of villages selected in each stratum

Stratum	Total No. of Villages	No. of Villages surveyed	Sampling Fraction %
Meda Palata	30	7	23·3
Yatakalan Pattuwa	36	9	25·0
Kammal Pattuwa	25	5	20·0
Othara Palata	43	10	23·3
TOTAL—Pitigal Korale South	134	31	23·1
Munneswaram Pattu South	70	24	34·3
Yagam Pattuwa	50	17	34·0
Anaivillundan Pattuwa	70	20	28·6
Munneswaram Pattu North	17	5	29·4
TOTAL—Pitigal Korale North	207	66	31·9
TOTAL—Chilaw District	341	97	28·4

As evident from Table I, the sample consisted of 97 villages out of a total of 341 villages in Chilaw District, amounting to an overall sampling fraction of 28%

Due to the fact that in Pitigal Korale North, the villages wereexpected to vary in respect of acreage and number of palms more than in Pitigal Korale South, greater weightage was given to Pitigal Korale North. Accordingly 32% of the villages were surveyed in Pitigal Korale North as against 23% from Pitigal Korale South.

When planning this survey, it was expected that the estimate of total acreage and total number of palms in Chilaw District obtainable from this survey would not carry a high precision. This arises from our decision (unavoidable though it was) to reckon the village as the ultimate sampling unit and the fact that villages vary appreciably in respect of total acreage and total plant stand. But the estimation of total acreage and total number of palms in Chilaw District was never the intention of the survey. The survey was intended to give an estimate of the number of palms affected as a proportion of the plant stand. We were confident that this ratio estimate is obtainable with very high precision. Accordingly the intended method of estimation of the number of palms affected was by means of the product between the ratio estimate obtained from this survey and the estimate of the number of palms for Chilaw District obtained in the F.A.O. Pilot Survey of 1963.

The estimate of the total number of palms obtained from this survey is now available (Table 2) :

TABLE 2

Comparative estimates of total number of palms in Chilaw District

Holding Size	Estimated total No. of palms	
	FAO Pilot Survey 1963	Present Survey
Small Holdings (less than 20 acres)	3731,000	3425,000
Estates (20 acres and above	3736,000	3047,000
Chilaw District	7467,000	6472,000

It is evident from the above, that the two estimates do not differ much. The present estimate is lower both for the small holdings and the estate sectors. However both these estimates of the total number of palms are from sample surveys and therefore carry an inherent error. It was therefore decided by us to deviate from the original intention and use the estimate of total number of palms obtained from this present survey. Thereby, if and when we err, we do so on the side of modesty. Thus any estimate of the extent of damage to coconut palms reported herein is (if at all) an under-estimate.

3. Definitions and Concepts :

(*a*) *Affected palms* :

Palms affected by the cyclone have been classified under three categories with regard to the degree of damage. These are—

(i) Fallen Palms—These are palms that have been completely uprooted and have no chances of being replanted.

(ii) Slanting palms—These are palms that are leaning appreciably and may not survive another minor gale quite apart from a cyclone. These have to be straightened out and coupled to another tree by a wire.

(iii) Partially damaged palms—These are palms with drooping bunches and broken branches. In most of these palms, younger bunches and inflorences have suffered loss of immature nuts and buttons. These may be expected to yield poorly for a couple or more of future crops.

(*b*) *Age classification of palms* :

Affected palms in each of the above categories are classified under five economically meaningful age groups. These are—

(1) Very young seedlings (1-4 years).
(2) Palms at point of bearing.
(3) Young bearing palms (upto 25 years).
(4) Mature bearing palms (25-50 years).
and (5) Old bearing palms (over 50 years).

In the statistics provided on the findings of the survey, the above five age classifications are given only for Chilaw District as a whole but in the break up of the statistics by holdings size and areas, only two broad age groups are shown in order to avoid bulky tables. These groups are—

(1) Non bearing palms and
(2) Bearing palms.

(*c*) *Palms susceptible to Red Weevil attack* :

In this survey, palms under 15 years of age were considered palms normally facing the danger of Red Weevil attack. Of these palms, those with bulgy stems and those with cracks on stems were considered highly susceptible. In presenting the estimate of palms facing the danger of Red Weevil attack, the palms numbers are shown under two cattogeries viz. high susceptible palms and other young palms which too may be attacked.

FINDINGS OF SURVEY

1. Damage to Coconut Palms:

(*a*) *Chilaw District as a whole*:

The proportion and the number of palms affected (in Chilaw District as a whole) classified according to degree of damage and age of palms are shown in Table 3 (*a*) and 3 (*b*) respectively.

TABLE 3

(*a*)—Proportion (%) of Coconut Palms Affected in Chilaw District by Age Group and Degree of Damage

Degree of Damage	(%) Proportion of palms affected					All ages of palms
	Young Seedlings	Palms point of bearing	Young bearing palms	Mature bearing palms	Old bearing palms	
(*a*) Fallen	0·36	0·18	0·85	2·75	2·02	6·16
(*b*) Slanting	0·57	0·31	0·91	2·19	0·66	4·64
(*c*) Partially damaged	0·83	0·37	1·62	2·27	1·29	6·38
All degrees of damage	1·76	0·86	3·38	7·21	3·97	17·18

TABLE 3

(*b*)—Number of Palms Affected in Chilaw District

Degree of Damage	Number of palms affected					
	Young Seedlings	No. of palms at at point of bearing	Young bearing palms	Mature bearing palms	Old bearing palms	All ages of palms
(*a*) Fallen	23416	11750	54690	177918	130688	398462
(*b*) Slanting	37194	19900	58843	141775	42639	300351
(*c*) Partially damaged	53568	24240	104867	147208	83187	413070
All degrees of damage	114178	55890	218400	466901	256514	1111883

CYCLONE DAMAGE
LUNUWILA/BANDIRIPPUWA AREA

Out of an estimated total of 6.5 million palms in Chilaw District, a proportion of 17% or about 1.1 million palms of all age groups have been affected to some degree or other by the cyclone.

The total number of palms fallen is about 4 lakhs constituting about 6% of the total plant stand in Chilaw District. Of these about 3.5 lakhs were bearing palms, 11750 palms were at point of bearing and 23416 palms were young seedlings.

There are nearly 3 lakhs of palms slanting perilously. These may succumb to even a minor gale and may be lost to the Chilaw District coconut plantations if not attended to early. Of these about 2.5 lakhs are bearing palms, 19900 palms are at point of bearing and 37194 are young seedlings.

In addition to above, there are a further 4 lakhs of palms whose crowns are partially damaged, with drooping mature bunches and younger bunches having suffered severe immature nutfall. Of these nearly 3.5 lakhs are bearing palms. The yield of a number of future picks of these palms will be lowered appreciably and the economic loss to the plantations on this score can be sizeable.

(*b*) *Small holdings vs. estate sector*:

The proportion and number of palms affected in the small holdings and estates sector are given in Tables 4(*a*) and 4(*b*) respectively.

TABLE 4

(*a*)—Proportion (%) of palms affected in the small holdings and estates sector.

Degree of Damage	Small Holdings less than 20 acres			Estates 20 acres and over			Chilaw District		
	Non Bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
(*a*) Fallen	0.82	7.48	8.30	0.23	3.51	3.74	0.54	5.62	6.16
(*b*) Slanting	1.25	4.78	6.03	0.46	2.61	3.07	0.88	3.76	4.64
(*c*) Partially damaged	1.70	5.97	7.67	0.64	4.29	4.93	1.20	5.18	6.38
All degrees of damage	3.77	18.23	22.00	.33	10.41	11.74	2.62	14.56	17.18

TABLE 4

(*b*)—Number of palms affected in the small-holdings and estate sector.

Degree of Damage	*Small Holdings less than 20 acres*			*Estates 20 acres and over*			*Chilaw District*		
	Non bearing palms	*Bearing palms*	*All ages*	*Non bearing palms*	*Bearing palms*	*All ages*	*Non bearing palms*	*Bearing palms*	*All ages*
(*a*) Fallen	28023	256197	284220	7143	107099	114242	35166	363296	398462
(*b*) Slanting	42953	163657	206610	14141	79600	93741	57094	243257	300351
(*c*) Partially damaged	58300	204453	262753	19508	130809	150317	77808	335262	413070
All degrees of damage	129276	624307	753583	40792	317508	358300	170068	941815	1111883

The number of palms affected in the small holdings and estates sector as shown in Table 4(*b*) are self explanatory. However these do not indicate the intensity of damage in the two sectors. Table 4(*a*) which gives the percentage of palms affected indicate the intensity. It is evident therefrom that the small holdings sector is badly affected amounting to 22% as against about 12% in the estates sector.

(*c*) *Pitigal Korale South vs. Pitigal Korale North* :

The proportion and the number of palms affected in Pitigal Korale South and Pitigal Korale North are shown in Table 5(*a*) and 5(*b*) respectively.

TABLE 5

(*a*)—Proportion (%) of palms affected in P. K. South and P. K. North

Degree of Damage	*Pitigal Korale North*			*Pitigal Korale South*			*Chilaw District*		
	Non bearing palms	*Bearing palms*	*All ages*	*Non bearing palms*	*Bearing palms*	*All ages*	*Non bearing palms*	*Bearing palms*	*All ages*
(*a*) Fallen	0.71	4.07	4.78	0.32	7.64	7.96	0.54	5.62	6.16
(*b*) Slanting	0.98	2.38	3.36	0.75	5.58	6.33	0.88	3.76	4.64
(*c*) Partially damaged	1.60	4.19	5.79	0.68	6.48	7.11	1.20	5.18	6.38
All degrees of damage	3.29	10.64	13.93	1.70	19.70	21.40	2.62	14.56	17.18

TABLE 5

(*b*)—Number of palms affected in P. K. South and P. K. North

Degree of Damage	*P. K. North*			*P. K. South*			*Chilaw District*		
	Non bearing palms	*Bearing palms*	*All ages*	*Non bearing palms*	*Bearing palms*	*All ages*	*Non bearing palms*	*Bearing palms*	*All ages*
(*a*) Fallen	26115	149925	176040	9051	213371	222422	35166	363296	398462
(*b*) Slanting	36139	87446	123585	20955	155811	176766	57094	243257	300351
(*c*) Partially damaged	58888	154225	213113	18920	181037	199957	77808	335262	413070
All degrees of damage	121142	391596	512738	48926	550219	599145	170068	941815	1111883

The number of palms affected as shown in Table 5(*b*) do not indicate the intensity of damage or the severity of the Cyclone in the two areas Pitigal Korale North and Pitigal Korale South. The intensity of damage is indicated in Table 5(*a*). It is evident that P.K. South has suffered more damage than P.K. North—the rate of damage being 21% and 14% respectively for the two areas.

(*d*) *Damage to coconut plantations in the sub-divisions of Pitigal Korale South and Pitigal Korale North.*

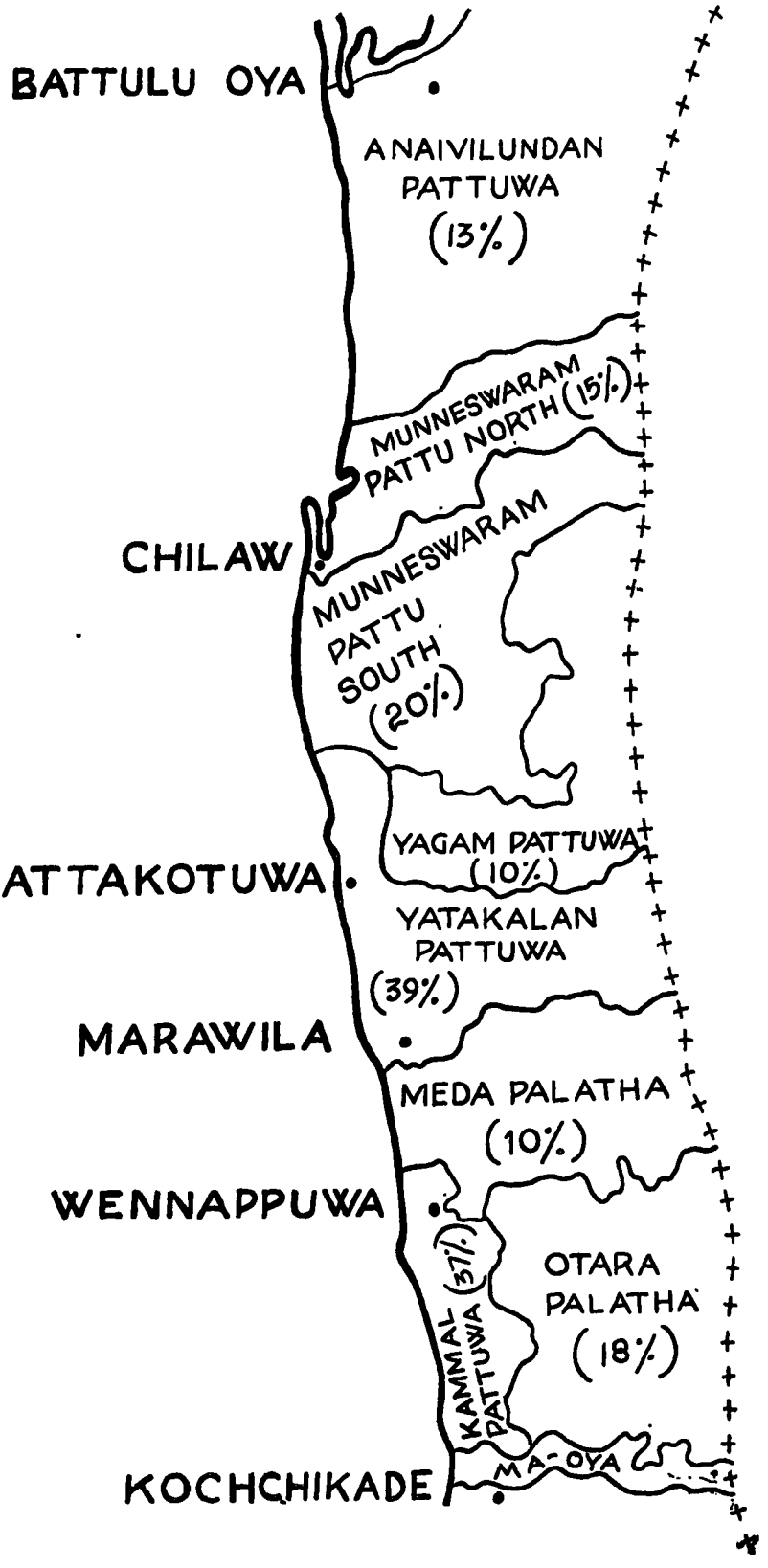
BATTULU OYA
ANAIVILUNDAN PATTUWA (13%)
MUNNESWARAM PATTU NORTH (15%)
CHILAW
MUNNESWARAM PATTU SOUTH (20%)
YAGAM PATTUWA (10%)
MATTAKOTUWA
YATAKALAN PATTUWA (39%)
MARAWILA
MEDA PALATHA (10%)
WENNAPPUWA
KAMMAL PATTUWA (37%)
OTARA PALATHA (18%)
MA-OYA
KOCHCHIKADE

TABLE 6

No. of palms affected in the sub-divisions of P. K. North and P. K. South

Area	No. of palms affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Meda Palata						
(*a*) Fallen	2674	41598	44272	0.35	5.39	5.74
(*b*) Slanting	1876	14628	16504	0.24	1.90	2.14
(*c*) Partially damaged	2995	11984	14979	0.39	1.55	1.94
All degrees of damage	7545	68210	75755	0.98	8.84	9.82

Area	No. of palms affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Yatakalan Pattuwa						
(*a*) Fallen	1880	40176	42056	0.48	10.22	10.70
(*b*) Slanting	5720	45576	51296	1.45	11.59	13.04
(*c*) Partially damaged	6260	54560	60820	1.59	13.88	15.47
All degrees of damage	13860	140312	154172	3.52	35.69	39.21

Area	No. of palms affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Kammal Pattuwa						
(*a*) Fallen	2510	53845	56355	0.62	13.33	13.95
(*b*) Slanting	6870	42725	49595	1.70	10.58	12.28
(*c*) Partially damaged	4625	40645	45270	1.15	10.06	11.21
All degrees of damage	14005	137215	151220	3.47	33.97	37.44

Area	No. of palms affected			%palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Otara Palata						
(*a*) Fallen	1987	77752	79739	0.16	6.36	6.52
(*b*) Slanting	6489	52882	59371	0.53	4.32	4.85
(*c*) Partially damaged	5040	73848	78888	0.41	6.04	6.45
All degrees of damage	13516	204482	217998	1.10	16.72	17.82

Area	No. of palms affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Munneswaram Pattu South						
(*a*) Fallen	4544	51295	55839	0.65	7.32	7.97
(*b*) Slanting	10683	17680	28363	1.52	2.52	4.04
(*c*) Partially damaged	12200	44063	56263	1.74	6.29	8.03
All degrees of damage	27427	113038	140465	3.91	16.13	20.04

Area	No. of plams affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Yagam Pattuwa						
(*a*) Fallen	2397	35960	38357	0.24	3.61	3.85
(*b*) Slanting	3833	10390	14223	0.39	1.04	1.43
(*c*) Partially damaged	5630	38115	43745	0.57	3.83	4.40
All degrees of damage	11860	84465	96325	1.20	8.48	9.68

Area	No. of palms affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Anaivillundan Pattuwa						
(*a*) Fallen	18691	28076	46767	1.34	2.01	3.35
(*b*) Slanting	20930	12789	33719	1.50	0.92	2.42
(*c*) Partially damaged	39450	65543	104993	2.83	4.70	7.53
All degrees of damage	79071	106408	185479	5.67	7.63	13.30

Area	No. of palms affected			% palms affected		
	Non bearing palms	Bearing palms	All ages	Non bearing palms	Bearing palms	All ages
Munneswaram Pattu North						
(*a*) Fallen	483	34594	35077	0.08	5.87	5.95
(*b*) Slanting	693	46587	47280	0.12	7.90	8.02
(*c*) Partially damaged	1608	6504	8112	0.27	1.10	1.37
All degrees of damage	2784	87685	90469	0.47	14.87	15.34

It was pointed out earlier that the severity of attack by the the Cyclone was felt more in Pitigal Korale South than in Pitigal Korale North—the number of palms of all ages affected to some degree or other as a proportion of the total plant stand in the areas being 21% and 14% respectively.

Within Pitigal Korale South, Yatakalan Pattuwa and Kammal Pattuwa are very badly affected—being 39% and 37%. Meda Palata is least affected —being only 10%. The proportion of palms affected in Otara Palata is 18%. Within Pitigal Korale North, Munneswaram Pattu South is worst affected (being 20%) and Munneswaram Pattu North is second worst—being 15%. Yagam Pattuwa is the least affected—being 10%. Yagam Palata and Meda Palata are least affected as they are situated further inland.

In order to help readers who are not acquainted with the geographical location of these different Palatas and Pattus, a map of Chilaw District (Fig. 1) is annexed showing the severity of attack in these sub-divisions.

2. Potential Danger from Red Weevil

The earlier section of this report detailed out the damage already incurred by the coconut plantations as a result of the cyclone.

The palms that have survived the cyclone are facing the further danger of being destroyed by Red Weevil. The likelihood of a Red Weevil outbreak is very great due to the fact that the crowns of palms fallen as a result of the cyclone (if not properly disposed of) can serve as ideal breeding ground for Red Weevil. There is the immediate danger of all young palms within the vicinity of 200 yards and to a lesser extent within 400 yards of these fallen palms, being destroyed. This survey made a count of all young palms within these distances from fallen palms. Although we restricted our count of young palms to those within 400 yards of fallen palms, it goes without saying that if the feared outbreak of Red Weevil assumes large proportions, young palms much further than these distances are liable to be ruined. Therefore the statistics provided in this report on the probable number of young palms facing the danger of destruction through Red Weevil attack, have to be considered as the bare minimum.

(*a*) *Chilaw District as a whole* :

The number of young palms in Chilaw District facing destruction by Red Weevil is given in Table 7.

(*b*) *Small Holdings vs. Estates Sector* :

The position in the small holdings and estates sector is shown in Table 8.

TABLE 7

Number of young palms facing danger from Red Weevil

Distance from fallen palms	*Number of palms*		
	Highly susceptible	*Less susceptible*	*All Young palms*
Within 200 yds.	301292	259637	560929
Between 200 and 400 yards	87787	62948	150735
Within 400 yds.	389079	322585	711664

About 7 lakhs of young palms in Chilaw District are likely to be destroyed by Red Weevil, of which about 4 lakhs are highly susceptible.

TABLE 8

No. of young palms facing danger from Red Weevil in the small-holdings and estate sectors

Sectors	*Number of young palms within 400 yards*		
	Highly susceptible	*Less susceptible*	*All Young palms*
Small Holdings Less than 20 acres	222339	229335	451674
Estates 20 acres and above	166740	93250	259990
Chilaw District	389079	322585	711664

In the small-holdings sector, about 4.5 lakhs of young palms are liable to be destroyed and in the estates sector about 2.6 lakhs of young palms.

(*c*) *Sub-divisions of Chilaw District* :

The number of young palms liable to be destroyed in the different sub-divisions of Chilaw District are showin in Table 9, and are self explanatory.

TABLE 9

Number of young palms facing danger from Red Weevil in the sub-divisions of Chilaw District.

Sub-division	*Number of young palms within 400 yards*		
	Highly susceptible	*Less susceptible*	*All young palms*
Meda Palata	29815	28654	58469
Yatakalan Pattu	30836	37704	68540
Kammal Pattuwa	42430	18520	60950
Otara Palata	96243	72171	168414
Pitigal Korale South	199324	157049	356373
Munneswaram Pattu South	30753	43516	74269
Yagam Pattu	25594	28235	53829
Anaivillundan Pattu	54940	83966	138906
Munneswaram Pattu North	78468	9819	88287
Pitigal Korale North	189755	165536	355291
Chilaw District	389079	322585	711664

3. Summary

Out of an estimated total of 6.5 million palms in Chilaw District, a proportion of 17% or 1.1 million palms of all ages have been affected to some degree or other by the cyclone.

The total number of palms fallen is about 4 lakhs constituting about 6% of the total palm stand in Chilaw District. Of these over 3.5 lakhs were bearing palms, 11750 palms were at point of bearing and 23416 were young seedlings.

There are nearly 3 lakhs of palms slanting perilously facing the danger of being uprooted by even a minor gale. Of these 2.5 lakhs are bearing palms.

In addition, there are a further 3.5 lakhs of bearing palms with crowns damaged, drooping bunches, and having suffered serious immature nutfall.

The cyclone had been more severe on small-holdings than estates (22% & 12% respectively).

Pitigal Korale South has been affected more than Pitigal Korale North (21% and 14% respectively). The coastal area is more affected than areas further inland.

About 7 lakhs of surviving young palms are facing the threat of destruction by Red Weevil if immediate steps are not taken to dispose of crowns of fallen palms which are ideal breeding ground for Red Weevil.

ACKNOWLEDGEMENTS

We are deeply indebted to Mr. C. A. Wickremasuriya, Chief Advisory Officer of the Coconut Research Institute, whose unreserved co-operation by way of Staff, funds and moral support, made it possible for us to carry out this survey in such a short period and successfully.

All the field work and field supervision were carried out by the Advisory Field Officers. We are grateful to them for their remarkable effort in the field, having had to work under very trying conditions.

Our sincere thanks are due to the Grama Sevakas of Chilaw District, who helped the field officers to locate holdings and village boundaries etc.

The co-operation received from the officers of the Division of Biometrics, C.R.I. in the planning stage of the survey, in the statistical analysis of data and also in the preparation of this report is gratefully acknowledged.