Field Data Retrieval by Clip Cards and its Practical Implications

E. A. ROSENQUIST, J. F. McEWEN AND R. SHEPHERD

Harrisons Fleming Advisory Services Limited, Kuala Lumpur, Malaysia

Abstract in Bahasa Malaysia

Maklumat yang berharga boleh diperolehi dengan menganalisa rekod-rekod yang dibuat di ladang. Bagaimanapun, banyak ladang tidak menyimpan rekod-rekod luar individu dan dengan itu susah hendak dianalisa data yang ditaksir oleh ladang-ladang lain oleh kerana amalan merekod dan format maklumat yang dibentangkan dalam buku-buku rekod ladang tidak sama.

Kertas ini membincangkan cara-cara merekod yang dipiawaikan dan menjelaskan tentang sejenis kad ketip yang mudah dan murah dan sesuai untuk mendapat balik data ladang. Kad ketip yang dijelaskan ini dibentuk untuk memasukkan sekurang-sekurang-nya sepuluh tahun data mengenai pertumbuhan, perolehan, keadaan zat makanan pokok, baja yang dibubuh, serangan penyakit, kualiti pokok dan lain-lain maklumat yang menarik perhatian. Kerja menyusun kad-kad ini mengikut ladang, tahun penanaman, jenis benih, cara penanaman, siri tanah dll. yang dibuat dengan tenaga manusia dapat dimudahkan lagi dengan mengetipkan lubang-lubang yang berkenaan di garisan tepi.

Abstract

Valuable information can be obtained by analysis of estate field records. However, many estates do not maintain individual field records and analysis of data assessed by other estates is difficult on account of non-standardisation of both recording practices and the format of information presentation in field history books.

This paper discusses standardised recording procedures and describes a simple, inexpensive clip card suitable for retrieval of field data. The clip card described is designed to include at least ten years' data on growth, yield, nutritional status of trees, fertilisers applied, disease incidence, quality of stands and other information of historical interest. Manual sorting of cards according to estate, year of planting, identity of planting material, planting method, soil series, etc. is greatly facilitated by clipping the appropriate marginal hole.

Much information of immediate and historical value is recorded during the life of a rubber planting. Various methods of recording field data are in use, but each method has certain limitations and retrieval of data for detailed study is usually difficult.

It is desirable that standard recording procedures are adopted and data are stored in a manner which facilitates their retrieval. The clip card information retrieval system is designed to include a wealth of field data of practical value in monitoring field performance and covering several years. Analysis of data from large numbers of fields would also yield very useful information on the influences of various ecological factors and management practices on tree performance.

PRESENT METHODS OF RECORDING FIELD DATA

The day-to-day history of a field is normally recorded in a series of diaries and notebooks which are maintained by staff members directly responsible for field work. Data are often recorded in a rather haphazard way; as a consequence, essential data may be missing and preparation of summaries can be time consuming.

Field records may also be summarised in estate progress reports (usually monthly) or in periodic inspection reports (usually every six months). As progress and inspection reports are produced primarily for the immediate information of the management, it is quite difficult to abstract from such reports detailed information relating to a particular field over several years.

More permanent records in respect of individual fields may be maintained in a special field history book in which one or more pages are allocated for each field. These books are usually retained on the estate and are referred to from time to time to seek answers to specific queries raised by the management or advisors. In some cases, the field history book is well designed and provides a comprehensive history of individual fields. However, the detail and format of data recording undertaken by estates differ significantly and common shortcomings are as follows:

- Only one copy is maintained.
- Production of duplicates by photocopying the estate copy may be difficult.
- The recording format may be incomplete.
- The format of data presentation may be such that their appraisal is difficult.
- Different units of measurement may be used on different estates, this complicates pooling of data in statistical surveys.
- The records book may cover only a very limited number of years.

- The detail and accuracy of data recorded depend to a considerable extent on the enthusiasm and reliability of personnel responsible for maintaining the book.

- Problem areas cannot readily be identified and isolated.

In view of the lack of standardisation of field history books, it is exceedingly difficult to conduct comprehensive statistical surveys which would supplement data obtained in trials. For instance, commercial surveys to study the growth and yield performances of a particular planting material on different soils would be very time consuming and may not be possible if incomplete data are recorded.

DATA RETRIEVAL CLIP CARD

The data retrieval clip card illustrated in *Appendix 1* has been designed taking into account the shortcomings of existing field history books. It presents in a concise format all important data of immediate and historical value in a manner that facilitates their appraisal (especially in relation to fertiliser and tapping policies) and preparation of abstracts or summaries of data. Cost data are not included in the card as its capacity is limited; moreover, both labour and material costs change with time and vary from one estate to another. The cards do not therefore entirely replace field history books.

As it is highly desirable that standardised sampling and recording methods are adopted, these are defined in considerable detail in *Appendix 2*.

Basic Description and Method of Use

Clip cards are used for many purposes. Typical uses include:

- Records of medical histories of individual patients in hospitals

- Vehicle maintenance records in garages

- Recording literature abstracts in libraries

- Research surveys in agriculture and other disciplines.

The simplest clip card has a series of holes close to its margin, each hole being allotted to a specific piece of information. The holes can be clipped by use of a small punch and cards can be sorted into groups by inserting a needle through a specific hole in a stack of cards. Being cards only, a hand punch and sorting needle are required, the clip card system is cheap to install and requires limited skill in its operation. One or two thousand cards can be handled without too much difficulty, but if larger numbers are involved the best approach would be

to transfer the data from the cards to a computer. The format of the proposed cards is suitable for this purpose and even if summaries are done by computer the cards would still be consulted when evaluating fertiliser and tapping policies.

The recommended card measures 286 × 209 mm and fits conveniently into an A4 photocopier. The print is blue and does not appear too strong on photocopies. The field data are entered in black and show up more boldly. The top left hand corner of each card has been cut away to facilitate correct orientation of cards within stacks.

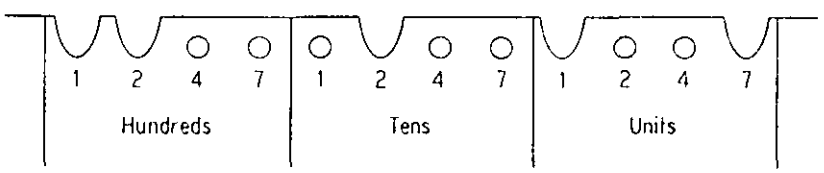
The cards have been printed on 300 gsm glory board which stands up well to repeated handling and sorting, provided reasonable care is taken. They must not be bent or stored at an angle as sorting might then become impossible and they should be kept in a dry atmosphere in horizontal or vertical stacks.

With due regard to the anticipated amount of handling and volume of data recorded, it was decided to restrict the life of a card to twelve years, which would necessitate three cards over the life of a field. If the period was extended, the card would have to be enlarged or data omitted and difficulty would be experienced in sorting cards in later years.

It is recommended that cards of two colours be printed. One colour would be used for recording data in respect of field management units (ideally one cultivar planted in one soil in one year) for which yield and other records are available. The contrasting second colour is used for sub-units which are created only for the purpose of foliar sampling and fertiliser application. Data which refer to the entire field management unit as a whole should not be entered on the sub-unit cards. This facilitates the calculation of accurate weighted average values when data are analysed.

Certain data are allocated code numbers to enable their sorting by clipping. If this is done, a code reference list should be prepared and filed.

The '1 2 4 7' coding system is adopted as it enables sorting of all numbers upto 9 by placing the needle through only one or two holes. Thus, the number '3' is entered by clipping holes '1' and '2' and '5' is entered by clipping '4' and '1'. A '1 2 4 7' block is provided for units, tens, hundreds, etc. so that the number 328 would be clipped as illustrated below:



To select the card with number 328 from the stack, one or more needles could be used. If two needles are used, they would be placed in the '1' and '7' units holes and the cards which fall would be re-sorted by inserting one needle in the '2' tens hole; finally, by placing needles in the '1' and '2' hundreds holes of the fallen cards, only cards with the number 328 will drop out.

By using the technique of back sorting a stack of cards can readily be rearranged in numerical order. This is done by inserting the needle successively through the '1', '2', '4' and '7' of the units, tens and hundreds blocks and each time placing the fallen cards at the back of the stack before re-sorting.

An operator can be trained to handle the cards in only an hour or so and clipping new cards can be speeded up if the holes to be clipped are firstly marked in pencil. Pre-marking of holes to be clipped is also desirable for checking purposes.

Layout and Coding

Constant factors. Factors such as estate, division, field number, year of planting, soil type, topography, cultivar, original spacing, etc., do not alter during the life of a planting and data are entered along the edges of the card in the boxes provided. One card is opened for each leaf sampling unit and the data identifying the unit are entered along the top of the card. The right hand side of the card is used to record information on nursery practices and the method of planting. The left hand side is used for data relating to soils, topography, method of clearing and information on cover crops. The base of the card is used for recording information at fixed times after planting (*e.g.* stand density at opening for tapping).

These entries are necessarily very brief as there is insufficient room for more detailed information. In retrospect, the data actually recorded on the clip cards provide a reasonably adequate account of the early history of the field. Reference could be made to field history books for further information.

The cards can readily be sorted into groups, according to specific data. Thus, if one wishes to study the performance of clone PB 86 on different soils, all cards relating to PB 86 are sorted out and are then grouped by soil series and then arranged in year of planting order within each soil series.

Variable factors. Factors which may change with time are recorded in the body of the card. The upper half of the card front is devoted to tapping aspects and field observations on diseases, ground covers, quality of canopies, extent of wind damage, etc. in successive years. The lower half of the card deals with nutritional data, girthing rates and fertilisers actually applied in each year. The reverse of the card can accommodate records over an eighteen-year period and provides additional information of value in interpreting yield responses, and space is available for a sketch plan of the field/sampling unit.

Sorting of cards according to specific variable factors must be done visually. Such sorting would be necessary for studies of the influence of nutritional status of trees on yield performance. Provided that entry of data has been standardised, detailed analyses for both constant and variable factors can be undertaken by computer. However, data on the cards will have to be translated on to special cards or tapes for feeding into the computer. The use of standard computer programmes will enable pooling and study of a vast amount of information gathered in respect of tree performance in different environmental circumstances and in relation to management practices.

ORGANISATION OF ROUTINE DATA RECORDING

It is recognised that data collected in commercial plantings are usually less accurate than data from research experiments where considerable care is taken to ensure comparisons are statistically valid and data are recorded to the required precision. However, the volume of data obtained in commercial plantings is much greater and this to some extent compensates for its reduced accuracy. Nevertheless, it is obviously desirable to ensure that the commercial data are as accurate as possible. To achieve this objective, careful planning and organisation of recording are essential.

A procedure which has proved successful where the estate is associated with a research centre involves entering data on duplicate cards for each master or subsidiary unit, one copy being retained by the estate and the other by the research centre. The estate is responsible for entering on its card, data originating there *e.g.* yield records, fertiliser applications, etc., and the research centre enters nutritional data and observations made by its specialist staff members. Once a year the data are transferred from the one card to the other so that both are kept up-to-date. The inter-card transfer of data could be made during the course of visits by research centre staff to the estate. The use of duplicate cards reduces the risk of records being lost due to fire, floods, etc., and minimises the need for correspondence in connection with field records.

In view of the importance of accurate collation of records, it is desirable that each estate (or group of estates) establishes a records/statistics section under the immediate charge of a staff member whose figure-work is sound and who can be expected to query anomalous figures. The necessary records on the estate are usually available in field history books, progress and inspection reports, and in tapping statistics returns.

Data to be entered by the research centre can be conveniently recorded at the time of leaf sampling, and analytical results should be available a month or two later so that fertiliser recommendations can be drafted well before the next wintering season when fertiliser application in mature plantings is due. The target should be to have cards up-to-date by about October in the northern hemisphere

and by April in the southern hemisphere. An analysis of the year's records should then be carried out so that trends in yield, incidence of dry panels, nutritional levels, etc., are summarised before the fertiliser recommendations are drafted.

In practice, it has been found useful if data on the cards are examined jointly by research and estate staff members at the time of drafting fertiliser recommendations. This enhances rapport and with their detailed knowledge of fields, the estate staff can often explain apparently anomalous figures and assist research personnel in other ways.

It is appreciated that initial entries of data on the card will involve a great deal of work, especially where field history books are of little assistance and it is necessary to search for records. However, certain information (*e.g.* nursery practices) from fields which have been tapped for several years is less vital and may be omitted from the card. For existing plantings, every effort should be made to enter as much information as can be obtained on the performance of trees and events over the past five years at least. Where there is doubt concerning the accuracy of a figure or observation, the record should be made in pencil rather than in ink. The importance of entering data on cards at the earliest opportunity is stressed.

APPLICATION OF DATA ANALYSIS

The following examples indicate how information of practical value can be obtained by analysis of data recorded on clip cards.

- *Cultivar* versus *soil series studies.* The cards can be sorted by needles into cultivar/soil series groups and the average nutrient levels of individual cultivars on each soil series computed. Two-way tables of such a study by Rosenquist are presented in *Table 1.* A statistical analysis of the average figures is possible so that the significance of differences in nutrient levels of cultivars growing in each soil series may be established. A knowledge of these differences is essential when formulating fertiliser policy. Such a study could be repeated after each foliar survey. Over the years, the differences in nutritional levels between soil series should diminish if due weight is given to foliar analysis data when formulating fertiliser policies. Similar two-way tables could be constructed to compare growth and yield performances of individual cultivars on different soils which will indicate which cultivar is best suited to a particular soil.

- *Cultivar* versus *age studies.* Clip cards could be sorted manually so that changes in growth rate, yield and nutritional status of individual cultivars may be monitored. It has been found that the magnesium content of

TABLE 1. ANALYSES OF DATA RECORDED ON CLIP CARDS – SHADE LEAVES FROM MATURE RUBBER (JUNE – SEPTEMBER 1961)

Soil series	Clone								Total/Mean
	GI 1	PB 86	Tjir 1	PB 25	RRIM 501	Pil. B84	Misc.	Seedling Ch. E	
	Number of units sampled								Total
Malacca	11	70	32	13	17	10	38	21	212
Batu Anam	6	35	16	8	10	9	13	16	113
Seremban	6	30	20	9	9	8	22	11	115
Rengam	10	38	20	5	8	4	20	29	134
Total	33	173	88	35	44	31	93	77	574
	Nitrogen (% on dry matter)								Mean
Malacca	3.95	3.37	3.31	3.53	3.30	3.50	3.46	3.45	3.48
Batu Anam	3.81	3.38	3.41	3.49	3.33	3.42	3.34	3.43	3.45
Seremban	4.01	3.49	3.36	3.58	3.32	3.61	3.53	3.59	3.56
Rengam	3.88	3.57	3.55	3.71	3.38	4.02	3.54	3.50	3.64
Mean	3.91	3.45	3.41	3.58	3.33	3.64	3.47	3.49	3.53
	SE 0.095			MSD Clones (5%) 0.14			MSD Soils (5%) 0.10		
	Phosphorus (% on dry matter)								Mean
Malacca	0.242	0.256	0.229	0.283	0.203	0.229	0.220	0.246	0.238
Batu Anam	0.237	0.257	0.236	0.271	0.198	0.214	0.215	0.247	0.234
Seremban	0.245	0.254	0.224	0.271	0.201	0.216	0.211	0.238	0.232
Rengam	0.260	0.262	0.232	0.294	0.205	0.240	0.216	0.230	0.242
Mean	0.246	0.257	0.230	0.280	0.202	0.225	0.215	0.240	0.237
	SE 0.0068			MSD Clones (5%) 0.010			MSD Soils (5%) 0.007		
	Potash (% on dry matter)								Mean
Malacca	1.48	1.54	1.23	1.46	1.17	1.13	1.25	1.12	1.30
Batu Anam	1.42	1.45	1.20	1.44	1.14	1.18	1.25	1.13	1.28
Seremban	1.53	1.76	1.40	1.55	1.34	1.32	1.34	1.28	1.44
Rengam	1.19	1.38	1.00	1.22	1.20	1.05	1.09	1.10	1.15
Mean	1.40	1.53	1.21	1.42	1.21	1.17	1.23	1.16	1.29
	SE 0.059			MSD Clones (5%) 0.09			MSD Soils (5%) 0.06		
	Magnesium (% on dry matter)								Mean
Malacca	0.414	0.310	0.276	0.264	0.320	0.311	0.322	0.337	0.320
Batu Anam	0.393	0.306	0.262	0.228	0.308	0.289	0.334	0.309	0.304
Seremban	0.302	0.285	0.234	0.232	0.277	0.274	0.285	0.300	0.274
Rengam	0.338	0.284	0.258	0.238	0.282	0.275	0.298	0.316	0.286
Mean	0.362	0.296	0.258	0.240	0.297	0.287	0.310	0.315	0.296

rubber foliage increases progressively during the immature phase, remains constant for a period and then declines. The effect of age on nutritional status has also been shown to be very marked in the case of oil palms.

- *Covers policy, rootstock and density studies.* Cards can be sorted according to the persistence of legumes, type of rootstock and stand density to determine their effects on growth, yield and nutritional status of foliage.

- *Growth/yield groupings and nutrient levels.* In national surveys, large numbers of cards may be sorted for certain cultivars growing on a particular soil series. For instance, there may be one hundred cards relating to PB 86 on Rengam series soils. These can be arranged into five groups according to yield, with 20% best yielding fields in *Group 5* and 20% poorest yielding fields in *Group 1* and the other fields equally distributed in the remaining groups according to their yield. The average nutritional levels within each group can be calculated and a progressive decline in potassium content from a high level in *Group 5* to a low level in *Group 1* will indicate a positive correlation between yield and potassium content. The existence of a positive correlation is not proof that potassium deficiency is limiting yield, but it does indicate the need to investigate this possibility. Studies of performance groupings in this way have provided some most useful information about oil palms in Indonesia where there is a large volume of data from commercial plantings but a limited amount from research experiments. Comparable studies in rubber are likely to be equally useful.

CONCLUSION

The use of the data retrieval clip card is cheap and simple. Provided care is taken to obtain accurate data in a standard format, the cards can be used to retrieve data on many subjects. An analysis of this data can give information of practical importance. The data may merely support data from research experiments but it may also draw attention to subjects of future research.

By drawing together data from the estate and annual foliar surveys, the card is of great assistance when formulating fertiliser or tapping policies.

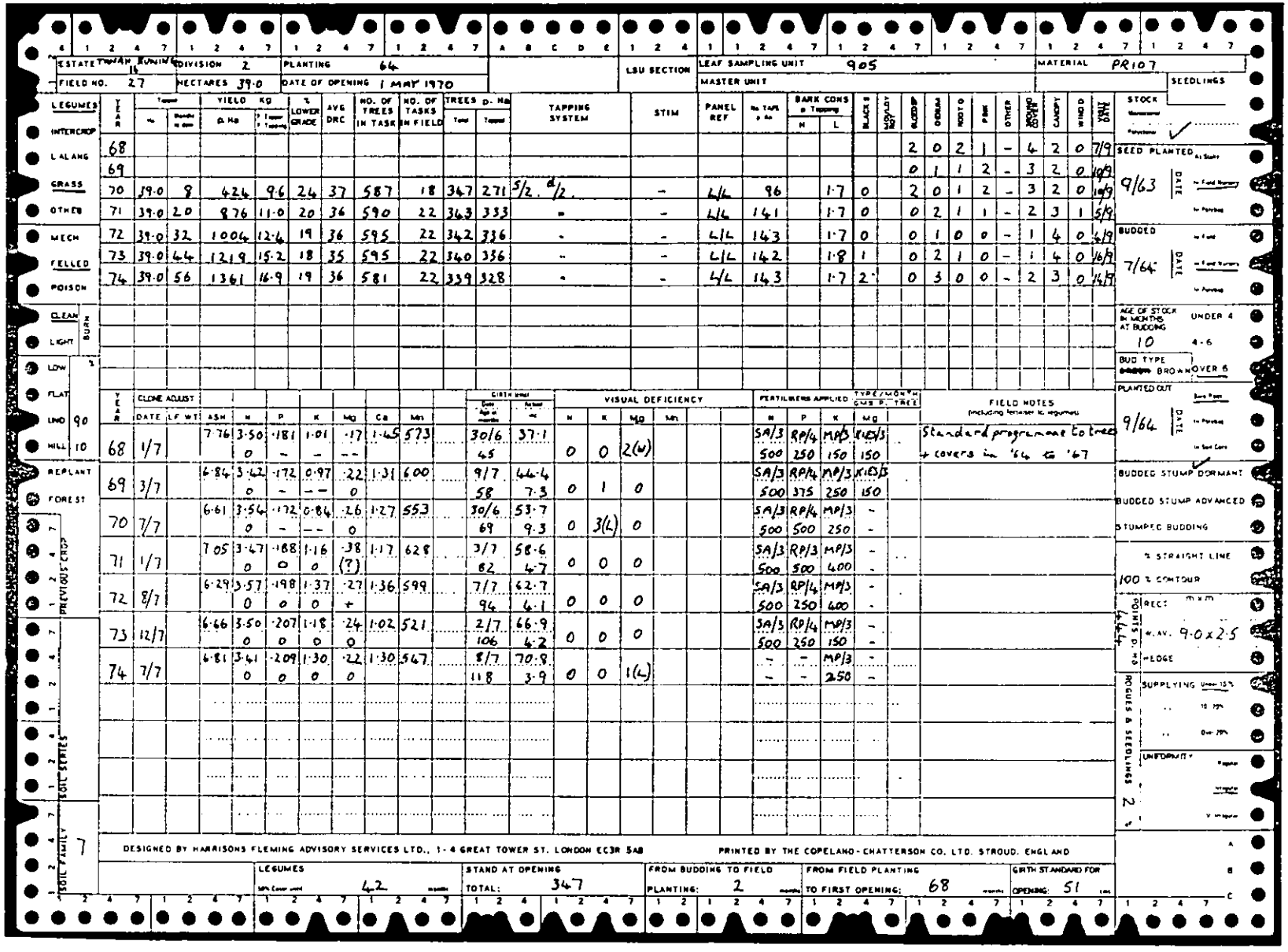
Finally, the card collects data in a format suitable for processing by computer. The widespread use of the clip card system both in Malaysia and in other countries and a central computer analysis of the data obtained will be of great value to the natural rubber industry.

REFERENCE

1. ROSENQUIST, E. A. (1964) Soils and the fertilisation of rubber and oil palm. *J. trop. Geogr.*, **18**, 148.

APPENDIX 1

DATA RETRIEVAL CLIP CARD — FRONT OF CARD



ESTATE TUNAH RUNIM 16 | DIVISION 2 | PLANTING 64 | LSU SECTION | LEAF SAMPLING UNIT 905 | MATERIAL PR107

FIELD NO. 27 | HECTARES 39·0 | DATE OF OPENING 1 MAY 1970 | MASTER UNIT | SEEDLINGS

YEAR	Topped: No.	Topped: Density p. Ha	YIELD KG p. Ha	YIELD KG % Lower Grade	AVG DRC	NO. OF TREES IN TASK	NO. OF TASKS IN FIELD	TREES p. Ha: Total	TREES p. Ha: Topped	TAPPING SYSTEM	STIM	PANEL REF	No. Taps p. Ha	BARK CONS p. Tapping: N	BARK CONS p. Tapping: L	BLACK S	HOLIDAY	BLIGHT	MEDIUM	ROOT D	FIRE	OTHER	DROUGHT	CANOPY	WIND	TOTAL
68																		2	0	2	1	–	4	2	0	7/9
69																		0	1	1	2	–	3	2	0	10/9
70	39·0	8	424	9·6	24	37	587	18	347	271	5/2 d/2	–	4/4	96		1·7	0	2	0	1	2	–	3	2	0	10/9
71	39·0	20	876	11·0	20	36	590	22	343	333	"	–	4/4	141		1·7	0	0	2	1	1	–	2	3	1	5/9
72	39·0	32	1004	12·4	19	36	595	22	342	336	"	–	4/4	143		1·7	0	0	1	0	0	–	1	4	0	6/9
73	39·0	44	1219	15·2	18	35	595	22	340	336	"	–	4/4	142		1·8	1	0	2	1	0	–	1	4	0	8/9
74	39·0	56	1361	16·9	19	36	581	22	339	328	"	–	4/4	143		1·7	2	0	3	0	0	–	2	3	0	10/9

LEGUMES: INTERCROP / LALANG / GRASS / OTHER — MECH / FELLED / POISON — CLEAN / LIGHT BURN — LOW / FLAT / UND 90 / HILL 10 %

YEAR	CLONE ADJUST: DATE	LF WT	ASH	N	P	K	Mg	Ca	Mn	GIRTH (mm): Expected (Age at months)	GIRTH (mm): Actual	VISUAL DEFICIENCY: N	K	Mg	Mn	FERTILISERS APPLIED: N	P	K	TYPE/MONTH CWS P. TREE: Mg	FIELD NOTES (including fertiliser kg. applied)
68	1/7		7·76	3·50	·181	1·01	·17	1·45	573	30/6	37·1					SA/3	RP/4	MP/3	K1E/3	Standard programme to tree
				0	–	–	– –			45		0	0	2(W)		500	250	150	150	+ covers in '64 & '67
69	3/7		6·84	3·62	·172	0·97	·22	1·31	600	9/7	44·4					SA/3	RP/4	MP/3	K1E/3	
				0	–	– –	0			58	7·3	0	1	0		500	375	250	150	
70	7/7		6·61	3·54	·172	0·84	·26	1·27	553	30/6	53·7					SA/3	RP/4	MP/3	–	
				0	–	– –	0			69	9·3	0	3(L)	0		500	500	250	–	
71	1/7		7·05	3·47	·188	1·16	·38	1·17	628	3/7	58·6					SA/3	RP/3	MP/3	–	
				0	0	0	(?)			82	4·7	0	0	0		500	500	400	–	
72	8/7		6·29	3·57	·198	1·37	·27	1·36	599	7/7	62·7					SA/3	RP/4	MP/3	–	
				0	0	0	+			94	4·1	0	0	0		500	250	400	–	
73	12/7		6·66	3·50	·207	1·18	·24	1·02	521	2/7	66·9					SA/3	RP/4	MP/3	–	
				0	0	0	0			106	4·2	0	0	0		500	250	150	–	
74	7/7		6·81	3·41	·209	1·30	·22	1·30	547	8/7	70·8					–	–	MP/3	–	
				0	0	0	0			118	3·9	0	0	1(L)		–	–	250	–	

PREVIOUS CROP: 1 Replant, 2 Forest, 3, 4, 5, 6, 7

SOIL SERIES

SOIL FAMILY 7

STOCK: Monoclonal / Polyclonal ✓

SEED PLANTED: 9/63 (DATE)

BUDDED: 7/64 (DATE)

AGE OF STOCK IN MONTHS AT BUDDING: 10 — UNDER 4 / 4-6 / OVER 6

BUD TYPE: BROWN

PLANTED OUT: 9/64 (DATE)

BUDDED STUMP DORMANT ✓

BUDDED STUMP ADVANCED

STUMPED BUDDING

% STRAIGHT LINE

100 % CONTOUR

POINTS O.N.: RECT: m x m; M.AV. 9·0 x 2·5; HEDGE

HOUSES & SEEDLINGS 2 %: SUPPLYING Under 15 % / 15 - 25 % / Over 25 %; UNIFORMITY A Regular / B Irregular / C Very irregular

LEGUMES: 50% Cover used 42 months

STAND AT OPENING: TOTAL: 347

FROM BUDDING TO FIELD PLANTING: 2 months

FROM FIELD PLANTING TO FIRST OPENING: 68 months

GIRTH STANDARD FOR OPENING: 51 cm

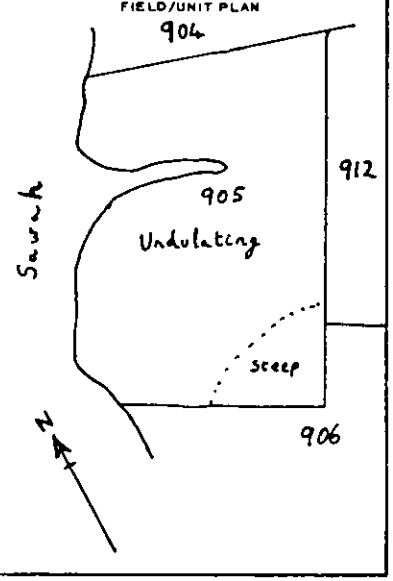
DESIGNED BY HARRISONS FLEMING ADVISORY SERVICES LTD., 1-4 GREAT TOWER ST. LONDON EC3R 5AB — PRINTED BY THE COPELAND-CHATTERSON CO. LTD. STROUD. ENGLAND

APPENDIX 1

DATA RETRIEVAL CLIP CARD — REVERSE OF CARD

MONTH AND YEAR	YIELD Kg/Ha p. an	LOW LEVEL PANEL						HIGH LEVEL PANEL						TAPPING/STIMULATION NOTES	GENERAL
		PANEL	HT. OF CUT cms	BARK CONS. p. an cms	BARK THICKNESS BELOW CUT mm	BARK THICKNESS 3 YR mm	% DRY CUTS	PANEL	HT. OF CUT cms	BARK CONS. p. an cms	BARK THICKNESS BELOW CUT mm	BARK THICKNESS 3 YR mm	% DRY CUTS		
6/70	424	A B / A(V)	145		8·7		0							Ise Opening 1 may 1970	'64. 17% planting losses due to insufficienc rain, 75 mms in October. Field supplied 11/64
7/71	876		121	24	8·9		0								7/67 Ise thinning to 400 p. Ha
7/72	1004		97	24	9·5		0								7/69 2nd thinning to 350 p. Ha
7/73	1219		71	26	9·5	5·7	0								9/73 Erosion noted in S.E. part, terraces to be repaired
7/74	1361		46	25	9·6	5·8	2								1/74 Terraces repaired.

FIELD/UNIT PLAN



APPENDIX 2

EXPLANATORY NOTES ON ENTERING INFORMATION ON THE CLIP CARD

CONSTANT FACTORS

Top of Card

Estate: Estate name and an allotted code number in brackets: code number is clipped.

Division: Division number or name and an allotted code number: the number is clipped.

The card has been designed in conjunction with various systems of field/block numbering which are in use. Two alternative systems are considered.

Top of Card – System A

The preferred system is that the field number should indicate the year of planting. Thus a field planted in 1958 will be numbered *58*. If more than one field is planted in one year, fields would be differentiated by alphabets *e.g. 58A, 58B, 58C,* etc. Using this system of field numbering the procedure is as follows:

Planting: Enter the field number and letter – *e.g. 58A* and clip.

Hectares: Enter the field area in hectares to one decimal place.

LSU section: If the area of the field is too large to be considered as a single leaf sampling unit it may be divided into sections for the purpose of leaf sampling. The LSU section number is entered and clipped. The approximate area of the LSU section should be entered in this box.

Using this system, the field number and leaf sampling unit number boxes need not be used.

Top of Card – System B

Planting: Enter the last two figures of the year of planting *e.g. 58* and clip.

Field number: Enter the field number.

Leaf sampling unit: Every field is allotted a leaf sampling unit number. Within each division, the fields should be arranged in order of year of planting (oldest first). Each division is then allotted a block of (say) one hundred numbers and the fields are allotted numbers in sequence. Future plantings are allotted higher numbers within the block of numbers allotted to the division. On reaching the highest number, the fields with the lower numbers will have been replanted so that these numbers can be re-used. The LSU number is clipped.

LSU section: As in *System A*.

Using *System B*, the alphabets are not used.

Master unit: As plantings become older, the management may decide to amalgamate two or more fields for the purpose of yield recording, etc. If this is done one of the cards on which this data will be entered is regarded as the master unit and this number is entered on all the cards relating to fields which have been amalgamated.

Material: Enter identity of the cultivar(s) planted. Each of the principal commercial cultivars is allotted a numerical code number. Less important cultivars are grouped together under a code number. The cultivar code number is clipped. If three-part-trees are involved the code number of the crown is used.

Right Hand Side of Card

Seedlings: Clip only if clonal seedlings not intended for budgrafting are planted.

Stock: Enter the type of rootstock used against the words, mono-clonal – polyclonal and clip appropriately.

Seed planted: Enter date of planting seed and clip where the seed is planted.

Budded: Enter date of budding and clip where the budding takes place.

Age of stock: Enter age of stock in months at budding and clip appropriate hole.

Bud type:	Delete type not used.
Planted out:	Enter date of planting out and clip the appropriate planting method. Stage of development at planting out – Clip 'Budded stump dormant', 'Budded stump advanced' or 'Stumped budding' as appropriate. (Buds which are just bursting should be treated as 'dormant' for this purpose.)
Lining:	Enter the percentage of the area planted in straight lines and on the contour. Clip where this exceeds 30%.
Planting system:	Considered 'rectangular' if distance between planting rows is less than 7 m, 'avenue' if distance is 7 – 12 m and 'hedge' if distance exceeds 12 metres. Enter actual spacing on appropriate line and clip accordingly. Enter number of planting points per hectare.
Supplying:	A 'supply' is defined as a plant supplied more than three months after the original planting is completed. Estimate and enter the percentage of supplied plants on the appropriate line at the time of opening. Clip accordingly.
Rogues and seedlings:	In budgrafting areas, estimate and enter the percentage of rogue clones and seedlings (including stock shoots) at the time of opening. If rogues and seedlings exceed 10% of the stand, the unit should be designated 'mixed' and records cannot be accepted as representative of the dominant clone.
Uniformity:	Estimate and clip the uniformity at the time of opening. At present this is based on visual assessment but it is hoped to introduce a system based on the coefficient of variation of girth.
A. B. C:	This box is reserved for recording special methods. *'A'* may be used for three-part-trees – a space is available below the word 'material' at the top of the card for recording the trunk clone. *'B'* may be used to identify areas in which 100% of the original planting consisted of two budded stumps per point. *'C'* is reserved for other special methods which may be developed.

Left Hand Side of Card

Ground cover:	Underline each type of vegetation which covered more than 20% of the land surface at any time during immaturity

and clip accordingly. Further observations should be recorded under 'Field notes' against the appropriate year.

Clearing method: Clip to indicate whether the previous stand was cleared manually, mechanically or by poisoning and disintegration *in situ*. Further details should be recorded under 'General' on the reverse of the card.

Burn: If the previous vegetation was burned after felling circle the word 'Burn' and clip 'Clean' if all heavy timber was burned or 'Light' if heavy timber was left on the ground.

Topography: Indicate the percentage of the land surface which is low-lying (inadequately drained), flat (average slopes under 3%), undulating (3% to 16%) and hilly (over 16%). Clip wherever the percentage of the land surface in one topographical group exceeds 30%.

Previous crop: If previous crop was rubber, circle word 'Replant' and clip; if area was previously heavy forest, circle word 'Forest' and clip; if neither of these, enter the previous crop and code index number using the following code.

1. Oil palm/coconut
2. Agave
3. Abaca/bananas
4. Ladang/food farm (including tapioca)
5. Lalang or other tall grasses
6. Belukar/secondary forest
7. Cocoa
8. Sawah/rice field

(9 – 14) Unallocated. Clip appropriate number.

Soil family: Enter soil family and code index number using the following code:

Lowland soils	Upland soils
1. Alluvial	7. Brown/chocolate podsols
2. Organosols	8. Yellowish brown podsols
3. Regosols	9. Reddish yellow podsols
4. Grey hydromorphic (0 – 20 cm)	10. Yellow podsols
5. Grey hydromorphic (20 – 80 cm)	11. Latosols (volcanic origin)
6. Grey hydromorphic (>80 cm)	12. Latosols (granitic origin)
	13. Latosols (others)

14. Miscellaneous (not listed above)

Soil series: Enter soil series as defined by the appropriate national authority. These should be allotted index numbers on a national basis and the number clipped.

Bottom of Card

Blank box: A blank box is provided at the left hand side on the bottom of the card (ninety-nine numbers). This may be used for recording locally important data not considered elsewhere on the card.

Legumes: Enter the number of months from sowing that legumes constituted more than 50% of the ground cover and clip.

Stand at opening: Enter the total stand per hectare at the time of opening. Clip to the nearest ten (*i.e.* for 347 trees per hectare, clip 35).

Budding to field planting: Enter and clip the number of months if budding is done prior to field planting.

Field planting to first opening: Enter and clip number of months ignoring time to budding if this is after field planting.

Girth standard for opening: Enter and clip the girth standard for opening (cm).

The foregoing are constant factors associated with field identification and definition of circumstances within fields from prior to planting and upto the time when tapping commences.

VARIABLE FACTORS

The variable factors considered below are entered annually in the boxes provided. The data should be entered in pencil if there is any uncertainty as to their accuracy. All other entries should be made with a black ballpoint pen.

Certain data, particularly yield records, may only be available for the field as a whole – *i.e.* separate records may not be available for each LSU Section. *Such data should be entered on one card only.* The data should be entered on the LSU Section 1 card and these cards should be of a different colour to the cards used for LSU sections with higher numbers. This facilitates the selection of these cards for the purpose of entering and analysing data.

Front of Card – Upper Panel

Year:	Enter the last two digits of the year to which the data refer. Preferably this should relate to the calendar year rather than financial year.
Tapped:	Enter hectares (to one decimal point) actually tapped. Also enter the number of months *from the commencement of tapping* to the end of the reference year.
Yield per hectare:	Calculated by dividing the total year's yield by area tapped.
Yield per tapper per tapping:	Calculated by dividing the total year's yield by the number of man-days of tapping carried out in the field – in kilogram to one decimal place. Vacant tasks are not included but extra tappings are included as extra man-days.
% Lower grades:	Record the percentage of total dry rubber crop collected in the form of field coagula.
Avg. DRC:	If possible, record the average dry rubber content of latex over the year to the nearest one percent. This figure may be calculated by expressing the total year's dry rubber yield from latex as a percentage of the recorded latex weight; alternatively if accurate figures are available, by calculating the mean of the monthly averages.
No. of trees in task:	Record average number in the area.
No. of tasks in field:	Record the total number of tasks within the area.
Tapping system:	Use the international tapping notation. If a complex system is in use it should be described in long hand and as a formula under 'Tapping notes' on the reverse of the card. Date of tapping system changes should be recorded.
Stimulation:	Indicate the stimulation policy.

e.g. E10% × 4B: Four applications of 10% Ethrel on scraped bark.

E2½% × 8P: Eight applications of 2½% Ethrel on the panel.

Panel reference: Indicate only L–Low, H–High or H/L–High/Low as full details are given on the reverse of the card.

No. of tappings per annum: Record the number of tappings in the field. Include late and recovery tappings, do not include wash-outs if fewer than 20% of the trees were tapped.

Bark consumption per tapping: Enter in millimeters (to one decimal place) the average bark consumed per tapping over the twelve-month period. Recording is facilitated if at the end of each year the normal monthly spot mark is replaced by a distinctive mark.

The foregoing variable data will normally be obtained from estate records. The following data will normally be recorded by research staff or by specially trained recorders.

Various diseases: Allocate scores as follows:

0 – Nil	
1 – Very mild infection	Probably no significant effect on yield
2 – Mild infection	
3 – Moderate infection	Increasingly adverse effect on yield
4 – Severe infection	
5 – Very severe infection	

Ground cover
Canopy
Wind damage: Allocate scores as follows (but these scores do not necessarily reflect merit):

0 – Nil	3 – Moderate
1 – Very light	4 – Dense or heavy
2 – Light	5 – Very dense or very heavy

Note:- In respect of diseases and the above scores there is need for further elaboration of standards for the guidance of personnel responsible for recording.

In appropriate cases the following abbreviations may be used L–Localised, W–Widespread; and in the case of wind damage R–Recent, P–Previous.

Visit date: Record exact date of visit at which the above data were recorded (*e.g.* 2/7 denotes 2 July).

Front of Card – Lower Panel

Year: Enter last two figures of year.

Clone adjustment: Enter appropriate corrections for clone above nutrient indicated where necessary.

Date: Record date of *collection* of foliar samples for analysis.

Leaf weight: Record average wet weight of central leaflets sampled in grams. This should be recorded at time of sample preparation for despatch.

Nutrient content: In each box *above* the dotted line enter the nutritional data as recorded by the analytical laboratory. *Below* the dotted line enter the 'classified data' in the format +++, ++, +, 0, −, −−, −−−. This classification involves adjusting the laboratory data in respect of the clone, leaf physiological age, and other factors before comparison with the critical level. Methods of adjustment are still evolving and no standard procedure is proposed at this stage.

Girth (cm): There are four sub-compartments in each girth box. These are used for recording: date (day/month), age in months from planting (or budding if budded in the field), actual average girth and girth increment in the preceeding twelve months. Girth records may be obtained from estate records or by recording the girth of trees used for leaf sampling.

Visual deficiency: Symptoms should normally be noted at the time of leaf sampling. Score on a 0 – 5 points system (0 = Nil, 5 = Very severe) and indicate in brackets whether localised (L) or widespread (W).

Fertiliser applied: Enter type and month(s) of application in the upper box (*e.g.* MP4 – for muriate of potash applied in April) and rate of application in grams per tree in the lower box. If several applications are made enter the number (*e.g.* 3 × 100 for three applications of 100 g).

Field notes: These must include a note of fertilisers applied to covers and notes on any other relevant data such as significant pest, fire or flood damage, etc. As soon as the replanting of the field is envisaged in the long term replanting programme this should be recorded (R79 = scheduled for replanting in 1979). This will affect tapping, stimulation and fertiliser policy.

Reverse of Card

On the right of the reverse of the card two large boxes are provided. The upper box is intended for any general comments such as a detailed description of clearing methods or to give an explanation of reasons leading to tapping/stimulation policy changes.

The lower box is for a sketch of the field/unit plan. An outline of the field should be drawn showing major features such as streams and roads and perhaps the numbers of adjacent fields. The boundaries of the leaf sampling unit sections should be marked and the section numbers entered. Wherever possible section boundaries should follow permanent major features.

The two boxes described above need only be completed on the field master card (*i.e.* LSU Section No. 1 card).

The remainder of the reverse of the card is devoted mainly to a record of the tapping history as follows:

Month/Year: This refers to the month and year when the various field measurements were recorded.

Yield: Enter annual yield per hectare (preferrably calendar years). If more than one tapping system was used during the year yields should, if possible, be recorded separately for each system and the number of months shown in brackets. The systems used should be entered under 'Tapping/stimulation notes'.

e.g.	Yield kg/ha p. an	Tapping/stimulation notes
	684 (6m)	S/2 d/3 (6m)
	925 (6m)	S/2 d/2 (6m)
	1609	

Panel: Pending the general acceptance of a standard international system of panel reference notation the following is proposed:

For $\frac{1}{2}$ spiral cuts the panels are referred to as A – B.
For $\frac{1}{3}$ or $\frac{2}{3}$ spiral cuts the panels are referred to as ABC.
For $\frac{1}{4}$ or $\frac{3}{4}$ spiral cuts the panels are referred to as ABCD.

Whenever the number of panels is changed the appropriate 2, 3 or 4 letters should be entered in the top of the panel box.

– Virgin bark (V), first renewal (1R), second renewal (2R)

– Conventional downward tapping ↓, upward tapping ↑

Example $\frac{\text{ABC}}{\text{B (1R).C(V)}}$

The above indicates that the tree has been divided into three panels (ABC) and is currently being tapped on a $\frac{2}{3}$ spiral with the upper $\frac{1}{3}$ of the cut on first renewal and the lower $\frac{1}{3}$ on virgin bark.

Height of cut: Record (cm) the distance from ground level (seedlings) or stock/scion union (budgrafts) to the lowest point of the tapping cut.

Bark consumption per annum: Record (cm) the average bark consumption in the preceeding twelve months.

Bark thickness: Record the average thickness of bark (millimetre to nearest 0.5 mm) at 10 cm below tapping cut (or above if upward tapping) and renewed bark of three years old.

% Dry cuts: Record at the end of the year the percentage of total cuts within the field which at that time failed to yield latex over $\frac{1}{4}$ of the tapping cut length.

Low level panel/ high level panel: Records from low level panels are entered separately from high level panels under the appropriate headings.

When a high level panel becomes a low level panel a line should be drawn under the last entries with an arrow indicating that the next year's entry is recorded under 'Low level panel'.

Tapping/stimulation notes: Record tapping and stimulation systems used during the year using international notation symbols. In some cases a brief explanation of the system in long hand may be needed.

Sources of Data

The data originate from two principle sources:

- The estate
- The associated research organisation.

The organisation required for the collection of data will depend on the system of data recording at present in use. In some cases virtually all the data will be immediately available but in other cases it may be necessary to set up a new organisation for this purpose.

The opening of the cards and the entry of the fixed data in the first year inevitably involves a great deal of work and careful planning. In subsequent years much data can be collected at the time of leaf sampling. The trees from which leaf samples are collected are representative of the area. Much data may be recorded from measurements on these trees each year. The number of trees involved is usually large enough to give average figures of sufficient precision for practical purposes. Special forms have been designed for recording data from leaf-sampled trees and the calculation of average figures.

SESSION DISCUSSION

Reduced Immaturity Period of Hevea brasiliensis

ENCIK SHAHABUDIN SHAFIE (Malaysia)

During the first few years after planting, the crown would be growing at a much faster rate than the roots in the absence of a strong primary tap root. Could such trees be more prone to wind damage?

Would you recommend growing stumped buddings on hillside or in wind prone areas?

DR G. HARIDAS

The absence of a very strong tap root has already been discussed in the first paper on this subject. Instead of one tap root there is a multiple tap root system. I therefore do not envisage wind damage being a problem. Planting of stumped buddings on hilly slopes will certainly depend on the type of soil and steepness of slope, and thus a general recommendation cannot be made.

MR A.G. AWCOCK (Malaysia)

I have three questions. First, generally, estates tend to use the same size for nurseries for stumped buddings. If one has to use this method for replanting, do the authors consider it desirable or necessary to broadcast NPKMg to replace nutrients taken up in previous years?

Second, given suitable soils within boundaries of estates, do you consider it necessary to site nurseries for future replants within a central location of each replant to minimise transportation shock? This would assume a planned replanting set up adhered to at least three years ahead.

Third, on page 8 the authors mention severe stem bending of polybag plants which had to be roped. How many plants in each trial had to be roped and do you consider this problem likely to arise in future or was this brought on by lack of rainfall, weather, or any other factors?

DR G. HARIDAS

Certainly any form of nutrients that were removed by the previous crop in a nursery would have to be replaced. This would be especially so with N and K, as a considerable amount of N and K are taken up.

Siting of nursery in a central location should be a basic consideration in any enterprise of this sort. It is certainly desirable to have it as near as possible to the area of replanting to minimise the shock effect of handling and transportation.

The percentage of tree bending happened on only one trial where polybags were planted. It was less than 10%. The cause for this was a lightning which hit a patch of trees and created an open space which led to the trees bending.

MR TAN HONG TON (Malaysia)

Mulching to ensure transplanting success of stumped buddings is an old practice. Mulching to enhance girth increment is indeed rather new. For the first curve, mulching is done only once, immediately after planting. How many times do you have to mulch during the ten-month period to obtain a full effect of mulching?

Mulching on a large scale would be very difficult because of the scarcity of mulch material. Transport of mulch material is also very expensive. Could you please advise us on how to tackle this problem? Does mulching not encourage insect damage to the young plants?

DR G. HARIDAS

We used lalang mulch only once. It lasts about eight months or so. Costs are reasonable. Growth advantages obtained are on account of profuse feeder root growth and higher uptake of nutrients due to the higher soil moisture content under the mulch. Residual effects of mulch are also seen.

Cost for transport of mulch will be high if you have to cart it for long distances. We have had no experience on transportation over long distances and therefore cannot make suitable comments.

We are yet to experience problems from insects or pests resulting from mulching.

DR P.R. WYCHERLEY (Australia)

When we saw the experiment at Sungei Buloh yesterday, it seemed that some of the rows of trees of the same treatment were uneven. One of the objects of these techniques is to obtain uniformity. Have coefficients of variation within treatments been calculated or other tests for uniformity been applied?

Stumped buddings are particularly susceptible to drought. The RRIM Annual Reports for 1953 and 1954 mention improved success in transplanting large budded stumps by enclosing them in alkathene tubes, wrapping with newspaper or by painting with a polymethyl methacrylate latex. Further exploration of the last was discontinued because of the cost. Recently Yeoh and Tan reported a natural rubber latex formulation for the control of pink disease. Have any NR latex formulations, with or without white colouring incorporated, been tried for these applications and compared for cost and effectiveness with whitewash?

DR G. HARIDAS
The unevenness of trees could be attributed to the girth size at selection before planting out. We are yet to work out coefficient of variation and perhaps it is best done in experiment SE 29/3.
NR formulations have not been tried. Until such time we cannot make any useful inferences on this or provide any information pertaining to costs or its effectiveness compared to whitewash.

DR S.L. NEOH (Malaysia)
Would the 'Soil Core' method help to lessen the transplanting shock of very large stumped buddings?

DR G. HARIDAS
The shock may still be there, but not as severe because of the lump of soil that is there. However, I do not know of any equipment that can be used.

DR H.G. RAJ (Malaysia)
What are the long-term effects on cumulative yields and the economic life of the tree arising from reduced immaturity period?

DR G. HARIDAS
We do not know this. It has to be assessed as we go along.

Possible Utilisation of Rubber Factory Effluent on Cropland

DR H.G. RAJ (Malaysia)
I think effluent stinks and it is inhibitive to human beings! Have you done any work to deodorise the effluent before application?

MR D.J. BARRY
Effluent is noxious but valuable! There is a blending system which is larger than that shown on the slides. Some reduction in BOD takes place and the effluent is less 'smelly' on the way out of the bulking system than before its treatment.

MR E. PUSHPARAJAH
Does sprinkler irrigation using serum, *i.e.* factory wastes, cause quicker damage to the sprinkler system, and is there any damage to the pasture? I ask this question because I understand that Uniroyal' Plantations have successfully grown napier grass using skim serum. The effluent is applied using a trailer. Such applications are made only once in forty-five days, *i.e.* after each harvesting. If Mr Zeid is here he would possibly be able to comment on this. Incidentally, the continuous air pollution is absent in this method. Has Chemara tried this method of application?

MESSRS D.J. BARRY AND K.R. PILLAI
Depending on the rate of application (below 1/10 in. rain equivalent per application of skim), no sprinkler damage has been observed. There is occasional blockage of the nozzle.
To your second question, our answer is that we have not attempted this method.

Field Data Retrieval by Clip Cards and Its Practical Implications

DR J.W. BLENCOWE (Thailand)
I have some comments on the last paper. These are:
One, it is relatively cheaper to buy plain clip cards and print them locally to company requirements.
Two,if a new system is being set up, wait until at least several hundred cards have been accumulated before starting to clip them. By this time it will be easier to spot any possible snags or inconsistencies in the sorting system.
Three, in my own card collection, thirty-year-old cards are still serviceable.

MR E.A. ROSENQUIST
I agree that printing the cards locally is cheaper than having them printed in England.
The reason for suggesting duplicate cards, despite their serviceability, is that we like to enter into our cards field observations even in the field. This exposes the card to moisture and dirt and shortens its life. We therefore recommend the use of a duplicate, one copy being used for field work and the other for punching and analysis.

MR KAW HUN WOON
What is the cost of printing, say, 3000 of the specially prepared cards?

MR E.A. ROSENQUIST
The cost of printing them locally is not known. In England it would cost about 3 N.P. per card.