AA RESEARCH NEWS

January'95

EDITORIAL

One of the most difficult and crucial decisions, a planter must make every time he decides to plant, is the choice of planting material. A correct choice will reward him amply throughout the economic life-span of the planting while a bad choice could ruin him.

The importance of choosing the correct planting material cannot be overemphasized. The issue is elaborated in our theme article As You Sow So Shall You Reap by our plant breeder, Dr. Soh Aik Chin.

Another area that is of great concern to the planters is the safe use of pesticides. The required precautions as suggested by CCM Bioscience are reproduced on page 6.

OOI, L.H.

CONTENTS

ERRATA

We regret the following errors made in our January 1994 issue :-

"Page 5 under AMP Plantation and captioned under Plate 7". The material had been wrongly identified as Agromac clone AGK34 and AGK19. All references to Agromac clones were incorrect and should be deleted.

As You Sow So Shall You Reap

Many of us are familiar with the above age-old saying. Although it means that one must accept the consequences of one's actions, this analogical reference to seeds underscored the importance of planting materials in traditional farming societies . The importance of planting materials is still very relevant to modern farming or plantation systems.

Ancient man who evolved from being a food gatherer or hunter to a farmer by choosing and saving the best seeds from the wild was perhaps the first plant breeder. As civilization progressed, traditional crop varieties were developed by farmers, by conscious and unconscious selection, by selecting the best seeds from the best plants. This method of varietal development has been superceded in modern times using scientifically based breeding and genetic improvement methods by plant breeders. Progress and achievements made in the last 50 years have exceeded many-fold achievements made in the last 2000 years. Tables 1-4 and Figure 1 illustrate the yield improvement contributions made by introductions of new varieties for some major crops.

Table 1: Total rice area, coverage of modern varieties and increase in rice production in selected Asian countries, 1967-93

	Total area planted to rice 1992 (million ha)	Percentage area planted to modern varieties	Rice production (million tons) 1967-69	1991-93	Percent increase in production
China	32.4	100	97.6	185.3	90
India	42.0	66	58.9	110.8	88
Indonesia	10.6	77	18.2	46.7	157
Bangladesh	10.1	51	17.2	27.3	59
Vietnam	6.7	80	8.8	21.0	138
Thailand	9.5	68	12.4	18.6	50
Myanmar	4.7	50	7.9	14.5	84
Japan	2.1	100	18.6	11.7	-37
Brazil	4.7	23	6.6	9.8	48
Philippines	3.2	94	4.8	9.4	96
USA	1.3	100	4.3	7.6	77
South Korea	1.2	100	5.0	7.0	40
Egypt	0.5	100	2.5	3.7	48

Source: FAO, Agrostat database and IRRI, Rice Almanac, 1993-95

Table 2: Breeding progress in oil palm. (Adapted from: Lee and Yeow, 1985 and Lee et al., 1990)

Period	Variety	Oil Yield	Bunch Yield	Bunch No.	Bunch Wt.	Oil/ Bunch
		t/ha	t/ha/yr	no./p/yr	kg	%
1930's	Elmina D	3.7	21.3	12.6	11.5	17.2
1960's	UR.D(improved)	5.0	26.9	16.0	11.4	18.4
1960's and 1970's	D(UR.3rd gen.) x P(AVROS1st gen.)	7.8	30.9			25.2
	D (UR.4th gen.) x P(AVROS.1st gen.)	8.3	31.0			26.8
1960's and 1970	D(UR) x P(AVROS 1st gen.)	8.2	34.3			23.9
	D (UP) x P(AVROS 2nd gen.)*	7.7	31.5			24.3

N.B. D = dura P = pisifera UR. = Ulu Remis Gen = generation
* = unselected pisifera

Table 3 : Progress of yield improvements in the RRIM breeding programme; yields (kg/ha/yr) of successive phases. From: Tan (1987) quoted by Simmonds (1989)

Period of Yield	Stage, advancement under index and material					
	Early (0)	1920's (1)	Phase I 1928-31 (2)	Phase II 1937-41 (2)	Phase III 1947-58 (2.5)	Phase IV 1959-65 (3)
1-5 yr	450	1000	1300	1550	1750	1650
6-10 yr	650	1350	1550	2450	2500	2350

Table 4: Genetic improvement in cocoa yield. (From: Ooi et al. 1989)

Hybrid group	Period released	Planted	Yield Record	Yield as % of PA7 x NA32			PA7 x NA32 yield kg/ha/yr	
				Trial[2] mean	Top 5 hybrids	Best hybrid	Whole trial duration	1979-1981
Series I[1]	1960s	1964/65	1966 to 1981	93 (1874)[3]	97 (1960)	104 (2099)	2016	2615
Series II	1970s	1970	1973 to 1981	123 (1672)	150 (2034)	178 (2415)	1358	1361
Series III	1980s	1974	1976 to 1981	114 (881)	150 (1160)	162 (1253)	740	969

Note: 1) For Series Ib and excluding Amelonado.
2) Excluding PA7 x NA32 control.
3) Figures in brackets are yield in kg/ha/yr

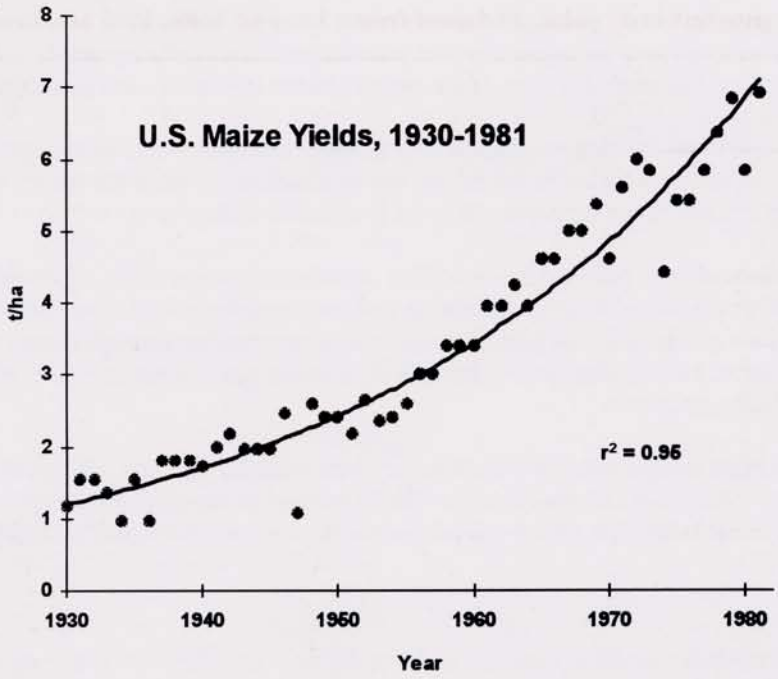


Fig. 1: U.S. maize grain yields from 1930 to 1981. Each point represents the mean yield for the indicated year. Regression calculated on the basis of 1930 to 1980 data using the second degree polynomial $Y = a + bX + cX^2$. r^2 coefficient of determination. (Date obtained from various volumes of USDA's Agricultural Statistics, U.S. Government Printing Office, Washington, D.C.)

Planting materials have been responsible for the rise and fall of communities , nations and industries. Famine caused by an epidemic blight on a popularly planted variety of potato led to the mass emigration of Irish people to the United States in the 19th century. The release of the miracle varieties of rice,maize and wheat in the Green Revolution years (1960's and 1970's) helped to stave off mass starvation and revolutions in many parts of Asia, Africa and Latin America. At home, lest we forget, rubber and oil palm helped to build up our country, Malaysia, to what it is today.

With the above in mind, planters as consumers of planting materials should be very discriminating in their choice as what they plant will be their cash cows for the next 20 to 30 years. What should we look for in our choice of planting materials?

Source

There are a number of seed/ planting material suppliers , both governmental and private. Choice of source is of primary importance as associated with each source is the type or pedigree of seeds produced which is indicative of the genetic potential or capability of the material, the breeding and research support and continuity and the quality of the seeds produced. Company reputation, personal experience and research come into play here. It is always advisable to buy at source than through intermediaries as bad expriences with illegitimate seeds have arisen from time to time.

Propagation Material

Propagation material may be in the form of open -pollinated seeds, hybrid seeds and clones and it is important to distinguish between them as they have genetically different characteristics.

Rubber planting materials are mainly in the form of clones with some polycross or polyclonal seeds. Clones are identical copies of a particular selected plant and are thus genetically and phenotypically (visually) very uniform.They are capable of high yields and quality but are also vulnerable to serious crop loss if susceptible to any particular disease or pest attack or environmental stress.

Polyclonal seeds are mixed hybrid seeds obtained by open or natural pollination in isolated seed gardens planted with superior parents. The plantings are thus more genetically or genotypically and phenotypically variable. They are generally not as superior yielding as clones but are better buffered against disease, pest and abiotic stresses.

Hybrids are made in oil palm by hand - pollination and in cocoa by open - pollination in isolated seed gardens and by hand-pollination. Hybrids are also genotypically and phenotypically uniform especially if the parents are inbreds. In commercial plantings, however, the hybrids are mixed and are essentially like polycross seeds.

The difference between open - pollination in isolated seed gardens and hand - pollination is that the level of illegitimate pollinations is expected to be higher in the former unless mistakes are made for hand - pollination. The price of seed is understandably lower in the former as the latter is a skillful and tedious job.

High levels of illegitimates have been reported for cocoa seed garden hybrids and dura contaminants in commercial DxP plantings. In both cases the power of insect pollinators had been underestimated in seed garden designs and controlled - pollination protocols earlier. With the breakthrough in cloning oil palms through tissue culture (oil palm has no natural means of vegetative propagation) clones and clonal (mono or poly) seeds will serve as alternatives to mixed hybrid seeds as the planting materials.

Understandably everyone will always want to plant the very best material and this will invariably end up in planting large hectarages with monoclones or monohybrids. This is not a good agronomic practice as it may predispose the plantings to serious losses by disease epidemics, pest outbreaks and environmental hazards if susceptible.

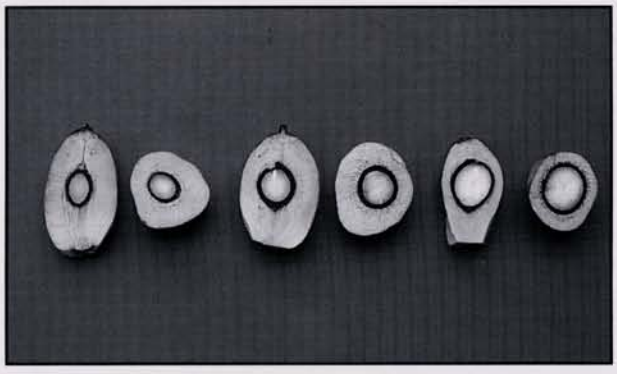
Yield Potential

Undoubtedly, buyers will be most concerned about the yielding ability of the materials. However, when enquiring about the yielding potential of a material from a particular supplier, one should ask for figures for growing conditions similar to those for the intended planting. Suppliers usually quote figures for the best growing conditions although it is known that different planting materials can yield differently in different environments.

Although this genotype (material) x environment interaction phenomenon is less serious in oil palm in Malaysia, nevertheless, materials having high bunch numbers tend to do better under sub-optimal conditions than materials with large bunches. Due to diseases and wind damage predisposition, genotype x environment interactions are more important in cocoa and rubber.

Crop Quality

In oil palm, although yield is measured as fresh fruit bunch yield (FFB) it is the oil that is the economic product. Hence materials with high oil content (extraction) in the bunches are preferred. Similarly, in rubber it is not only the latex yield but also the dry rubber content which are important and in cocoa not only the pod yield but also the dry bean weight. Other quality considerations include more unsaturated oil and carotene content in oil palm, hypoallergenicity in rubber and butterfat content in cocoa.



Oil Palm fruit characteristics (L-R)

1. Thick mesocarp ---> high palm oil yield
2. Average mesocarp and kernel ---> average palm oil and palm kernel oil yield
3. Average mesocarp, big kernel ---> high kernel oil yield

Complementary Products/Byproducts

In oil palm, kernel yield features intrinsically in the revenue accrued for the plantation while in rubber, timber is becoming an important source of additional income. Oil palm planting materials with different kernel content and rubber clones with good timber yield and quality are available. Depending on one's disposition or inclination, one could choose the planting material which meets one's preferred combination of traits.

PB355 a potential rubber cum timber clone

Resistance to pest , disease and abiotic stress

Planters will always have to be on guard against pest and disease outbreaks, prolonged drought and floods and mineral toxicity/deficiency which can result in significant profit lost or worse, total crop loss. Resistant varieties offer the cheapest form of protection. For oil palm in West Africa and Latin America with the endemic serious diseases e.g. *fusarium wilt, lethal bud rot* , the quest of resistant varieties is a primary breeding concern. In Malaysia the only serious malady of concern is *Ganoderma basal stem rot* of which plant resistance is actively being sought currently. *Crown disease* occurs commonly in young oil palms although generally with low incidence , transient expression and little effect on overall yield. Some materials are more prone than others. In rubber, clonal differences in susceptibility to leaf diseases, *brown bast* or tree dryness and wind damage are very apparent. Pest and disease control expenditure constitutes a large proportion of cocoa production cost. Resistant materials are thus invaluable and resistant clones are available for *vascular streak dieback* disease and being sought after for *cocoa pod borer* and *Phytophthora pod rot.*

PBC 123, a VSD resistant cocoa clone

A high yielding short palm with less spiky bunches

Secondary traits

So far we have dealt with primary traits or characteristics that relates directly to yield and profit. Secondary traits help indirectly in increasing yield and profit. Short palms bearing less spiky bunches on longer stalks will facilitate harvesting. Narrow leaf petioles will also facilitate pruning. In rubber, thicker girth and long trunk with self pruning of lateral branches characteristics will increase latex and timber yield.

It will indeed be a daunting task to select a particular desirable planting material with so many considerations to take into account. Also when selecting one desirable character one may have to compromise on another. For example a long stemmed rubber clone may be more prone to wind damage and oil palm bunches on long stalks tend to be small. It must be remembered that there is no such thing as a super variety i.e. a variety which possesses all the best attributes. Although breeders strive to achieve it, they have to compromise with biological constraints to only produce good or improved varieties which possess many of the desirable atttributes. It is up to the planter or farmer to pick the variety which can best fits his needs, limiting his considerations to a few important attributes. To help him in his choice, he can also construct a simple economic index (I) which weights each trait according to its relative economic importance:

$I = a_1x_1 + a_2 x_2 + \ldots\ldots,$ where x_1= trait 1 e.g. oil yield in t/ha, a_1= relative economic value of trait 1
x_2= trait 2 e.g. kernel oil yield in t/ha, a_2= relative economic value of trait 2

Palm oil is currently selling at RM1450 while palm kernel oil is at RM1350. If the relative economic value of palm oil is assigned, a_1=1 then a_2=1350 /1450=0.93. One then selects the varieties based on their relative I values (higher preferred). In this case, varieties with relatively higher palm oil yield than palm kernel oil yield are favoured. Relative economic values can be derived in a number of ways, depending on one's perception of price trends over time. Likewise one could include other important traits into the index

Lastly, there is another aspect of planting material selection. When the traditional farmer saves the best seeds he not only ensures that he has picked the best genotype but also the most vigorous seeds to ensure good and uniform germination for his next crop. He then rogues out the genetically and developmentally handicapped seedlings. He is then poised to reap a good harvest from what he has sown, environmental uncertainties notwithstanding. This tradition should be permanently planted in us !

A.C.SOH

SAFE USE OF FURADAN AND PESTICIDES

A) THE DO'S OF FURADAN APPLICATION

1. As FURADAN is a granular product, application is by hand (use rubber gloves). Avoid any entry of the granules into the gloves. Any sign of coloration on the hand or skin indicates exposure and contamination and should be washed immediately with plenty of soap and water. Precautions should be taken to avoid skin contact.

2. Use long sleeved shirt and long pants.

3. Use a long handled ladle (not a domestic spoon) to apply (eg. a one foot long wooden handle to a milk tin).

4. In windy conditions or when FURADAN granules get "dusty", use mask to prevent inhalation.

5. Wash hands thoroughly before eating and drinking.

6. Wash body (bathe) well after work. Launder clothes regularly (everyday).

7. Stop work immediately if untoward effects are encountered during use. Such effects are headaches/ giddiness, sweating and/or salivation,weakness of legs, vomitting, narrowed visual fields.

8. Seek medical attention immediately.

9. Remove worker from application work (exposure).

10. Arrange through usual medical channels for Cholinesterase estimation.

B) SAFETY PRECAUTIONS IN PESTICIDE USE

1. Know the chemicals you are using; not just its intended properties but also the unintended unwanted toxic side effects.

2. Such information is on the label. Read the label carefully. Any further information or clarification is readily available on request from CCM. A team of expert technical officers, including doctors, are at your service.

3. Ensure label instructions are implemented and followed meticulously. There are NO SHORT CUTS OR EASIER WAYS of using pesticides than those already put on labels and product literature. Please do not improvise your own methods.

4. Develop a small team of pesticide application workers. Give them basic training in proper methods of pesticide application and safety. Make use of the same team for all pesticide application work. If this is not possible, train one mandore or team leader to be at all times in supervision control, during pesticide application to ensure that the correct things are done.

   Ensure the persons involved are regularly examined by your VMO.

5. Try to avoid casual labour, especially young underage (below 18 years old) persons in pesticide application, as they are prone to be frivolous and careless.

6. AVOID SKIN CONTACT al all cost with ALL PESTICIDES. ALL PESTICIDES are hazardous. Care has to be taken when applying them.

   Any skin contamination that may occur must be washed immediately.

7. Use protective equipment and clothing as appropriate to the pesticide you are using. It is cheaper than you think; and it will pay substantial dividends. Such equipment may include masks, gloves, long sleeved shirts, long pants, boots and aprons.

   Work clothing must be laundered regularly. Segregate them from other clothings.

8. Implement and enforce as high a degree of personal hygiene as possible. This is particularly so, before eating, drinking or smoking during rest breaks.

9. BE ALWAYS PREPARED FOR AN EMERGENCY by having a CONTIGENCY FIRST AID plan. For maximum benefit, keep your Hospital Assistant and your VMO informed of the pesticides you use. They will have to be familiar with appropriate First Aid and treatment procedure. Have in your clinic, appropriate antidotes, emetics, absorbents etc. Such items should include atropine, syrup of ipechac, Fullers Earth etc. An emergency is not the time to run around to find treatment materials.

10. EVERY PERSON involved in pesticide manage ment and application must be made aware of the above 'rules'. These include the manager assistants, conductors, mandores/contractors and not the least, the workers themselves.

SHAHARUDDIN BIN SHARIFF
Registration & Stewardship Manager
CCM Bioscience

DANUM VALLEY

The Danum Valley Conservation Area which was set up in 1981 covers approximately 438 km² of undisturbed and logged lowland rainforests. The Field Research Centre is sited amidst this vast forest reserve. It is located 85 km west of Lahad Datu on the banks of Segama River. This Research Centre is run by the Sabah Foundation with a management committee comprising representatives from the various institutions and government departments in Sabah. The research centre is part of a programme initiated in 1984 as a collaborative venture between the Sabah Foundation and the Royal Society, London with scientific aims such as the study of ecological processes and evolutionary mechanisms that maintain the rainforest. It is also intended to provide training opportunities to Sabahans in ecology and forestry as well as providing an assessment on the impact of logging.

For those interested in environment education, the Centre's Sabah Nature Club has a 7-day Nature Orientation courses for school children while for those interested in wilderness recreation, the centre offers accommodation facilities for up to 40 visitors.

Four AAR agronomists and two others visited the Field Research Centre on 15th January, 1994 and were given an educational tour by the Resident Research Officer, Ms. Yap S.W. Our objectives of the visit were to discuss:

1) the latest work on reafforestation and plantation forestry at Danum Valley,
2) potential forest trees for plantation forestry,
3) hydrology in forest
4) nutrient cycling in forest, and
5) soil erosion in forest.

The visitors were shown some of the research projects conducted at the centre. One of them was the propagation technique by vegetative means such as tissue culture. According to Ms. Yap, the Sabah Foundation plans to replant the logged forest with indigenous dipterocarp seedlings. However, these dipterocarp trees flower and seed very rarely. With vegetative propagation, the scientists hope to come up with solutions to the perennial problems of shortage of materials.

The centre has also set up an industrial scale nursery using forest top soil and modern horticulture techniques to hasten and improve the growing capacity of the dipterocarp seedlings. These tiny saplings are sourced from the forest floor itself with great difficulty. There were approximately 300,000 plants of dipterocarp species in the nursery. They were *Drybalanops lanceolata* (kapor), *Shorea parvifolia* (seraya punai) and *Parashorea malaononan* (urat mata daun licin). When the seedlings are ready, they are taken to the logged area and planted in a grid manner.

It was heartening to learn that run-off losses in the forest were similar to mature oil palm plantations. The research work on reafforestation and plantation forestry is still at an infancy stage compared to plantation crops.

The visitors also explored some of the nature trails which were most fascinating. Within a short span on one of the well marked trails, we were able to see many species of plants, trees and rare wild orchids. It was reported that a hectare of tropical rainforest contains an average of 86 plant species.

One of the most exhilarating experiences was the ascent to the recently built 40m canopy viewing tree platform on a giant *Shorea*. Mr. Cheong Kam Swee, Planting Advisor of Taiko Plantations Sdn. Bhd., led the way and showed what great determination and single-mindedness can do to overcome obstacles and perhaps "fear". He was followed by Mr. Chiu Sheng Bin, Agronomist of Hevea Palm. Four AAR agronomists also made the climb. Although we had to scale and shiver up 126 steps vertically, the exhaustive climb was most rewarding as the view from the platform was very panoramic and ethereal. However, we were unable to catch a glimpse of the wild animals (wonder whether they were observing us instead!) but managed to see some of the bird species.

The ladder and platform was built for the foolhardy by people with an unusual sense of humour. For example, along the way up there were messages to encourage or was it to discourage a climber such as:

a) Are you feeling numb and weak?
b) Have you bought insurance?
c) Have you written your will?

Well, we managed it and survived to relate our experiences and encourage you and your family to attempt it too.

Last but not least, we also visited the proposed "Borneo Rainforest Lodge" situated 10 km from the Research Centre. The lodge was being planned for ecotourism and due to be opened in 1995.

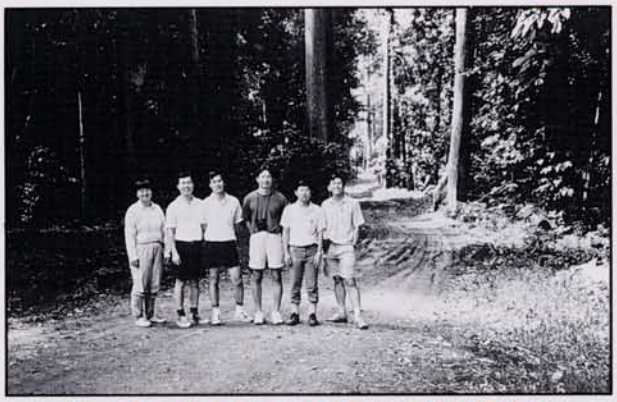
For those who are interested to visit the Danum Valley Field Centre, advance booking can be made either at Innoprise Corporation Sdn. Bhd. office at Kota Kinabalu. (Tel. No. 088-243245) or through the Regional Office in Lahad Datu (Tel. No. 089-81092).

Acknowledgements

We would like to thank Miss Yap Sau Wai and Danum Valley Field Center for their kind hospitality.

TEO,C.B.

DANUM VALLEY



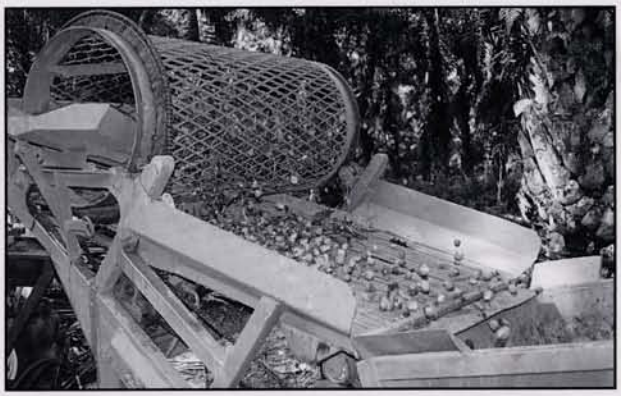
The brave visitors who "conquered" the 40m high giant *Shorea*

On top of the world - 40m high giant *Shorea*

TRASH REMOVAL IN OIL PALM LOOSE FRUITS

Collection of oil palm loose fruits is a tedious and time consuming process often carried in an unsatisfactory manner. It is not uncommon to find a lot of trash in the loose fruits sent to the palm oil mill. Trash is a major cause of machinery tear and wear which could cost RM1 million a year in a palm oil mill. In addition, trash also absorbs valuable palm oil during milling thereby lowering OER. It is therefore desirable to reduce or eliminate the trash. Many devices had been developed to remove the trash with varying degree of success. A promising prototype device developed by Pamol is illustrated in the following two photographs :-

Loose fruits minus the trash being loaded directly into a waiting lorry on Mamor Estate



Paimols' prototype trash removal device powered by mini-tractor

OOI, L.H.

SOCIAL AND PERSONAL

Congratulations to :

* Mr. Subramaniam s/o Velu on the birth of his daughter Mohaneswari on 20/5/94.
* Mr. Bacho A. Sappe on the birth of his daughter on 1/5/94.
* Mr. Sandrasegaran s/o Veerapan on the birth of his daughter Chandralekha Segar on 8/7/94.
* En. Samsudin Salleh on the birth of his son Muhammad Amsyar Syahmi on 13/10/94.
* En. Denney Kassim on the birth of his daughter Nur Dania Denney on 21/2/94.

LOO, LILY