October 2003
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AA RESEARCH NEWS

Inside this issue:

E D I T O R I A L

The oil palm is one of the most versatile oil crops grown in the tropical world. Besides palm oil and palm kernel oil, the oil palm industry also generates a large number of byproducts with well established uses. Palm kernel cake for instance is an established animal feed; the fibre and shells are burned as fuel in boilers to raise steam and the residual ash is used for surfacing estate roads. Bunch ash is a valuable source of potash while the pruned fronds and to a lesser extent, trunks and stumps are recycled in the field as organic matter. Empty fruit bunches (EFB) another byproduct, which are produced in large quantities can be both a valuable source of nutrients and organic matter. However, it could be a source of pollution and hotbed for rhinoceros beetle breeding when not well disposed off. Ooi Ling Hoak and his co-authors advocate the return of EFB to the field through a dedicated personnel and appropriate machinery system, the benefits of which are hightlighted in the article.
A topic of much interest of late is the planting of beneficial plants for natural suppression of leaf eating pests in oil palms. Teo Chor Boo`s summary of the use of beneficial plants and their effective radius of control should serve as guidelines on establishment of such plants in the estates.
Our rookie agronomist, Asraf Idrus, has written an advisory note on management of magnesium deficiency as part of his training at AAR. The note should be refreshing to estate personnel in the identification and treatment of the deficiency.
The new AAR substation in Indonesia, established to better serve the expanding hectarage in Indonesia is illustrated in pictorial form.

HAPPY READING!

CWH.

DIRECT APPLICATION OF EMPTY FRUIT BUNCHES (EFB) TO MATURE OIL PALM FIELDS

BY OOI LING HOAK, P. KODIAPPAN AND P. MUTHUKUMARAN

Introduction

Empty fruit bunch or EFB is a valuable source of nutrients and organic matter. Mulching with EFB has been shown to improve vegetative growth and yield of oil palm (Khoo and Chew 1979, Gurmit *et al*. 1981) in both coastal and inland soils. Yield increases of 23% (Gurmit *et al.* 1990) and 75% (Lim and Chan 1990) have been reported. When mulched immediately after planting, the immature period of the palm may also be reduced by several months (Lim and Chan 1990). Chan *et al*. (1993) reported positive interaction between EFB and mineral fertilizer application.

The method of applying EFB in mature oil palm fields described in this article is the result of a joint effort by AAR and the managers of Telok Sengat Estate and Telok Sengat Palm Oil Mill. This method has been successfully implemented on Telok Sengat Estate and all the EFB produced in 2002 (about 20,000t) were fully applied in about 500 ha. of mature fields.

Planning

Availability of EFB

The estate manager should consult the mill manager on the estimated amount of EFB available for the year to facilitate planning. The amount of EFB produced in a palm oil mill may be estimated as follows (Table 1).

Table 1: Estimated EFB production in a palm oil mill (t)

Contributor	FFB	EFB @ 20% of FFB
Own Estates	x	0.2x
Outside crop	y	0.2y
Total	x + y	0.2(x+y)
Monthly (mean)	(x+y)/12	0.2(x+y)/12

Selection and scheduling fields for EFB application

The very bulky nature of EFB and high rates of application required (usually 40t per ha) make EFB application an expensive and demanding task. To minimise the cost and burden of transporting and applying the EFB in the field, the following criteria are suggested when selecting fields for EFB application:

1) Distance from the mill should not exceed 8 km but preferably within 5 km from the mill.
2) Terrain should be gentle to facilitate the application by tractor-trailers.
3) Availability of in-field paths. Where suitable in-field paths are not available, simple paths should be made with a bulldozer where terrain permits.

Based on the foregoing criteria and estimates of EFB availability, an application schedule may be drawn up as follows (Table 2

Table 2: EFB application schedule

Month of application	Field	EFB application (40t/ha)				Ha of non -EFB application
		Hectare		Tons		
		This month	To-date	This month	To-date	
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Total						

In the sections of the fields where EFB cannot be applied due to difficult terrain, substitution with mineral fertilizers is proposed.

Tractor-trailer and tractor-dozer requirements

A dedicated fleet of tractor-trailers working full time for EFB mulching is recommended. Past experience indicates that it is not advisable to use part time transporters (e.g. FFB transporters carrying EFB on their return trips) as the estate usually ends up applying the EFB in a disorganised and unsatisfactory manner. Smooth clearance of EFB from the mill would also be disrupted.

If the travelling distance is less than 8 km one way, a 5-ton tractor-trailer can transport and apply about 20t of EFB per day directly to the field in 1.2t heaps per 4-palm area. Assuming 300 working days a year, output amounts to 6,000t EFB per year. In addition to the tractor-trailer, a tractor fitted with a front dozer (tractor-dozer) is required to spread the EFB heaps evenly in the inter-rows. The output of the tractor-dozer is about 2.5 ha. (equivalent to 100t EFB at application rate of 40t EFB/ha) per day or 750 ha.(30,000t EFB) per year. The number of EFB tractor-trailers and tractor-dozers required can be computed as follows (Table 3).

Table 3: EFB tractor-trailer and tractor-dozer requirement.

Contributor	FFB (t)	EFB (t) @ 20% FFB
Own Estates	x	0.2x
Outside crop	y	0.2y
Total	x + y	0.2(x+y)
No. of EFB tractor-trailer required	**0.2 (x + y)/ 6000**	
No. of tractor-dozer required	**0.2 (x + y)/ 30000**	

A simple rule of thumb is to provide one unit of tractor-trailer per 10t FFB per hour milling capacity and one unit of tractor-dozer per 45t FFB per hour mill. It is important to deploy enough tractor-trailers to evacuate the EFB to avoid build -up at the mill.

EFB trailer with 4 compartments

Fig. 1 shows a modified 5 ton trailer with 4 equal compartments capable of carrying 1.2 t EFB per compartment. Each compartment is unloaded onto the 4 palm area in the inter-rows , fulfilling the application rate of 40 ton/ha EFB.

Personnel requirement

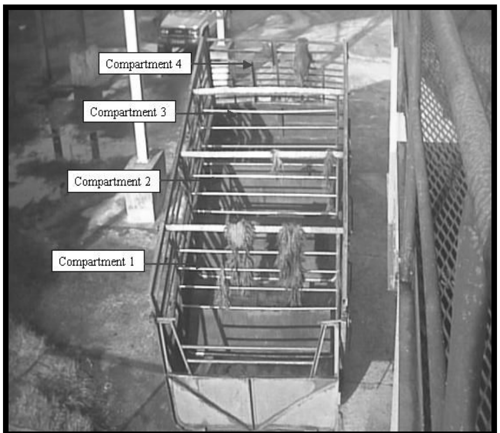


Figure 1: A modified trailer with four equal compartments (1.2t EFB per compartment)

A mandore is required to supervise proper application of EFB. His other duty is to mark out areas where EFB cannot be applied due to difficult terrain or other reasons, whereby mineral fertilisers may be substituted in these "missed out" areas. The manager is to consult his agronomist on the type and quantity of fertiliser to apply in these areas. As aforementioned, this is best done immediately after the EFB application with a one-off application if the areas involved is small.

Evacuation of EFB from the mill for unloading in the field


Figure 2: Determining the tare weight of tractor-trailer

The following procedure is recommended:

Step 1: The empty EFB tractor-trailer is weighed at the mill weighbridge to determine its tare weight. This is illustrated in Figure 2.

Step 2: Loading of EFB at the mill.

Figure 3 illustrates the loading of EFB from the mill EFB hopper to the EFB trailer. This is a very efficient way of handling EFB at the mill.


Figure 3: Loading of EFB at the mill EFB hopper

EFB loading facility may differ between mills and hence different methods of loading EFB.

Step 3: The loaded tractor-trailer is weighed again to determine the weight of EFB as illustrated in Figure 4 .

Figure 4: Determining the weight of EFB

It is important to weigh every load of EFB, keeping proper records after the weighing. This is to enable computation of rate and cost of application and also payment to the EFB transporters.

Application of EFB in the field

Step 1: The EFB tractor-trailer unloads one compartment load of EFB (1.2t) per 4-palm area in the inter-row (Figure 5).

Figure 5: EFB tractor-trailer unloads one compartment load of EFB (1.2t) per 4-palm area in the inter-row

It must be emphasised that EFB from the mill must be applied directly to the interrows without delay. This is because considerable amount of nutrients particularly K, would be lost if the EFB were dumped along the roads and applied later (Table 4). In addition, EFB dumps outside of the interrows are also ideal breeding grounds for rhinoceros beetles. In general, EFB application should be at least ½-1 km away from immature fields in order to avert potential beetle damage to young plants.

Table 4: Release 50 or when 50% of the nutrients have been lost from EFB under field condition (after Caliman *et al.*, 2001)

Nutrient	Release 50 (day)
N	205
P	85
K	25
Mg	115
Note: Almost all the K in EFB is released within 3 months	

Step 2: Spreading of EFB into single layers. As soon as EFB has been applied in an area of more than 2.5 hectares (enough for a day's work by a tractor-dozer), a tractor fitted with a front dozer (tractor-dozer) spreads the EFB heaps evenly in the inter-rows (Figure 6).

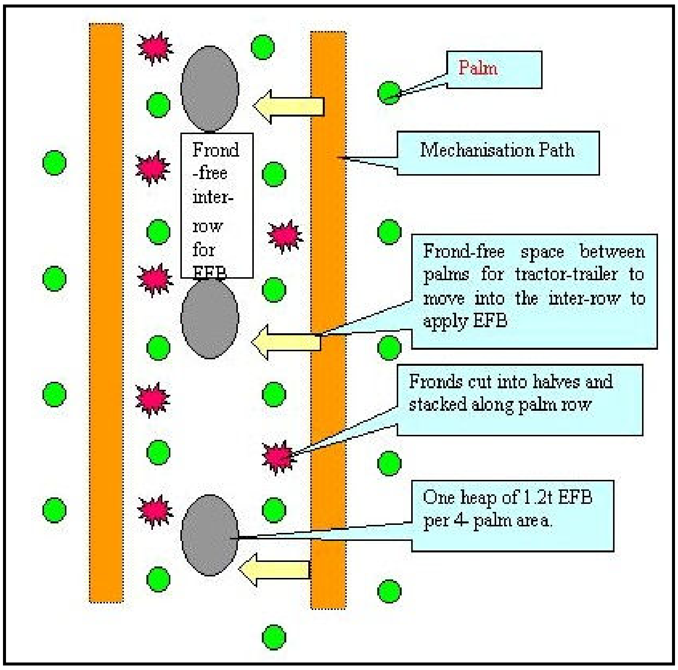
Figure 6: A tractor fitted with a front dozer spreads the EFB heaps evenly in the inter-row

It is necessary to spread the EFB into thin layers (preferably in single layers) in the inter-rows to minimise breeding of *Oryctes rhinoceros* beetles and also to ensure even distribution of nutrients. It is also an effective way of reducing run-off and soil erosion.

Frond stacking

It is advisable to stack the pruned fronds in the following pattern (Figure 7) to facilitate application of EFB and more importantly to reduce tyre punctures caused by improperly stacked fronds.

Figure 7: Recommended frond-stacking pattern to facilitate EFB application



Rate of application

The rate of application mainly depends on the type of soil and palm requirement and should be determined by the agronomist. If EFB is properly applied at 40t/ha, most of the mineral fertilisers can be withdrawn, resulting in considerable savings in the cost of manuring (Table 5).

Table 5: Nutrient content in 40t of EFB (taken from BEASB OPC 8b)

	Nutrients in 40 t EFB (wet)			
	N	P	K	Mg
Kg/ha	105.1	11.7	385.4	17.5
Kg/palm (138 p/ha)	0.76	0.08	2.79	0.13
	Fertilizer equivalent (kg)			
	AS	JRP	MOP	Ks
Kg/ha	500.5	77.5	770.8	107.6
Kg/palm (138 p/ha)	3.63	0.56	5.58	0.78

Cost and benefits

The cost and benefits of applying EFB may vary between estates. An example given in Table 6 shows that the "fertiliser value" of EFB is more than twice the cost of EFB application. Apart from savings in fertiliser, EFB has also been shown to improve vegetative growth and yield.

Table 6: Cost and benefits of applying EFB in Estate A

Item	Cost of applying 40 t EFB per ha (RM)				
	Cost per ton (RM)		Cost per ha		
Tractor-trailer (transport from mill and apply EFB at 1.2t per 4 palms)	5.5		220		
Spreading by tractor-dozer	1.2		48		
Total cost	6.7		268		
Item	Fertiliser value of 40 t EFB per ha				
	AS	RP	MOP	Ks	Total
Fertiliser equivalent (Kg/ha)	501	78	771	108	
Price per ton (RM)	330	280	530	430	
Fertiliser value (RM/ha)	165	22	409	46	642

Conclusion

The benefits of EFB application to palm growth and yield have been well documented. At the same time, considerable savings in the cost of manuring can be achieved if properly applied, and the mineral fertiliser application reduced accordingly. The main constraint faced by the estates is the logistics in handling the large amount of the bulky material. The problem may be overcome if due emphasis and effort are devoted to its utilisation. EFB application should be regarded as a full time task and carried out by a dedicated team of personnel with appropriate and adequate machinery.

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Introducing beneficial plants as part of an Integrated Pest management (IPM) strategy in oil palm plantations

By Teo Chor Boo

Leaf eating caterpillars are major pests of oil palm. Both bagworms and nettle caterpillars cause severe damage by defoliating the palm. Yield decline of up to 40% has been reported after 10-13% defoliation (Wood et al, 1973, quoted by Ho et al, 2003).

Outbreaks of pests damage in oil palm have been linked to the removal of ground vegetation due to excessive herbicide application (Syed et. al. 1976; Tiong, 1979). Under these circumstances, the equilibrium or balance between natural enemies (predators and parasitoids) and pests become more fragile, thus increasing the likelihood of outbreaks. In the oil palm ecosystem, a wide range of weeds and under-storey plants have been identified to harbour and provide food to insects (Tiong, 1982), which account for a large population of natural enemies of the pests. Plant species capable of attracting natural enemies usually produce nectar and their flowers have an open structure which allows easy access to the pollen.

Ho, et al (2003) carried out comprehensive trials, both in the field and in cage experiments to evaluate the efficacy of a range of beneficial plants, which could suppress the population of leaf eating caterpillars (in this case, bagworms). After taking into consideration the practical aspects, ease of establishment and maintenance, he shortlisted three groups of plants species, based on their effectiveness. Cassia cobanensis was found to be the most effective followed by Antigonon leptopus and Turnera subulata. His results showed that in an established dense strip of the above plant species could significantly reduce the pest population up to 60 palms away from these plots.

Euphorbia heterophylla which also gave effective control was not favoured for planting on a large scale due to difficulty in establishment and short life cycle of the plant.

These plants should be planted preferably in hedge rows, comprising 60% Cassia cobanensis, 20% Antigonon leptopus and 20% Turnera subulata, in suitable open areas like road sides and drain edges throughout the field. Other beneficial plants that have already established in the interrows should also not be sprayed out.

Estates with a history of leaf eating caterpillar outbreaks should quickly plant up these beneficial plants. It should however be cautioned that whilst beneficial plants assist in reducing the incidence of pest outbreaks, use of chemicals will still be required in an outbreak situation.

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Antigonon leptopus

Turnera subulata

Cassia cobanensis

Special Advisory Note on Management of Magnesium Deficiency in Mature Oil Palms
By Asraf Mohamad Idrus

Magnesium is the central element in chlorophyll and therefore is essential for photosynthetic efficiency. Insufficient attention given to management of Mg deficiency may result in yield loss of up to 16% (Dubos et al, 1999).

Occurrence

Magnesium deficiency can be found

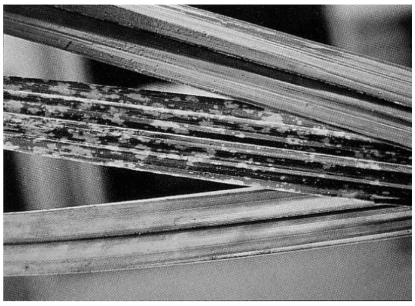
- on sandy soils and/or where topsoil is shallow (e.g. eroded areas on sloping land)
- in very high rainfall areas where the nutrient can be leached out easily.
- where heavy rates of K and N fertilizers have been applied which can inhibit the uptake of Mg by the palm.

Symptoms

For the so called `orange frond` symptoms, the yellowing in Mg deficient palms is due to the progressive loss of chlorophyll. The initial symptoms of deficiency appear as pale discolouration from the pinnae inwards on older fronds exposed to sunlight. As the deficiency progresses the margins of the pinnae may desiccate. Newly emerged or upper ranked fronds do not normally exhibit the deficiency symptoms.

The best identification of magnesium deficiency is the shading effect in which there is an absence of chlorosis (yellowing) on sections of the pinnae shaded from direct sunlight by the upper fronds or pinnae on the upper rank. This shading effect does not occur in other nutrient deficiencies.

Occasionally Mg deficiency may be mistaken for K deficiency especially where the latter is at the severe stage. The picture on the right differentiates between Mg and K deficiency. Unlike Mg deficiency, K deficiency occurs as orange spottings on the pinnae. When held against bright light, the light can transmit through the orange spottings. At the severe stage however, the whole pinnae may turn bright orange- yellow as the orange spots coalesce, giving very similar symptoms as Mg deficiency. In Mg deficiency the orange yellow is generally lighter in colour with the symptoms commencing much earlier.



Treatment

Corrective measures should be carried out quickly to prevent the symptoms from increasing in severity by,

- application of soluble Mg fertilizers such as Kieserite. Ground magnesium limestone may also be applied to build up soil magnesium content and avoid deficiency in the long term. Application from 1.5 - 2.0 kg Kieserite per palm will be required to remedy deficiency. Recovery is fairly slow and the effect of remedial fertilizers may begin only 2-3 months after application. Recovery is seen in more fronds turning to healthy colour after the older deficient fronds have been pruned.

- Annual maintenance dressing should also take into consideration the amount of K and N fertilizers applied so as to minimise their antagonistic action.

Reference

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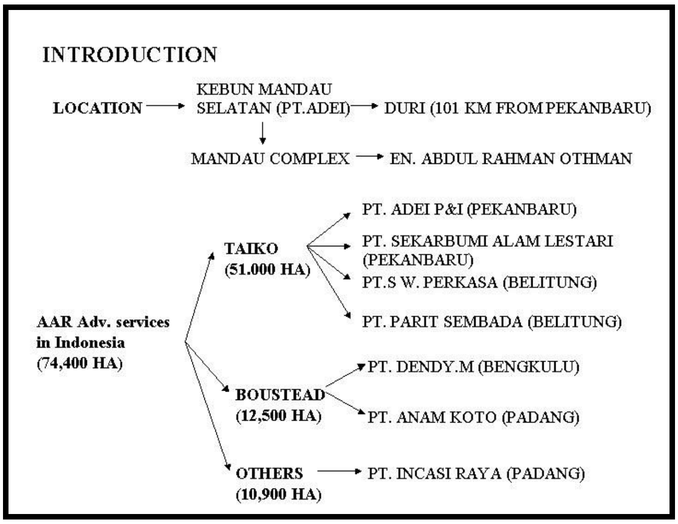
AAR INDONESIAN SUBSTATION
By Heriansyah



STAFF AND RESEARCH WORKERS

Name	Designation
Chan. W.H.	Officer Overseeing the Substation
Heriansyah	Officer based on the Substation
Dewi Sinta	Research Clerk
Alvin	Research Recorder
Candidate	Research Assistant

ENTRANCE TO THE OFFICE

AAR OFFICE OCCUPIES PART OF ESTATE FIELD OFFICE

ENTRANCE TO THE EXECUTIVE BUNGLOW COMPLEX

HERIANSYAH AND HIS HAPPY FAMILY

Course on Vehicle Maintenance and Safe Driving
By Teo Chor Boo

A basic course on vehicle maintenance and safe driving was conducted by UMW Toyota Service/Training Departments for AAR staff who drive regularly to estates to collect leaf and soil samples.

The course covered the identification of different major components of 4-WD vehicle and their functions, detection of failure symptoms, good driving etiquette and also procedure to follow in the event of an accident. Some hands on practical training on simple procedures was also provided.

Overall the course has instilled a greater awareness on the importance of vehicular maintenance and safe driving which would engender greater safety for both the participants and others.

SOCIAL AND PERSONAL

WELCOME!

En. Asraf Mohd Idrus who joined us as Agronomist in April 2003.

Born 1979. Home town:Kemaman, Trengganu. Education: B.Sc, Plant Technology (Hons), University Malaysia Sabah, 2003.

He is now based in AAR Paloh substation.

Cik Sharmie Bt. Minka who joined us on 1/3/03 as a Clerk at our Sabah Substation.

Mr. Wong Choo Kien who joined us as Plant Breeder in July 2003.

Born 1977. Home town: Ipoh, Perak. Education: BSc. (Hons) Agrobiotechnology, University of Malaya.

He is now based in AAR Paloh substation.

CONGRATULATIONS!

PROMOTIONS

No.	Name	Promoted to
1.	Umi Kalsum Bt. Sabran	Res. Clerk II
2.	Lynda Anne a/p Lourdenathan	Res. Clerk II
3.	Aspallila Bt. Abdullah	Res. Clerk II

No.	Name	Promoted to
4.	Mohd Kamal Bin Othman	Lab. Asst. III
5.	Rosita Bt. Mohd Akhir	Lab. Asst. SG
6.	Hatina Bt. Muhamed	Lab. Asst. I
7.	Noraini Bt. Ismail	Lab. Asst. III

cont.

No.	Name	Promoted to
8.	Noraniah Bt. Anday	Lab. Asst. III
9.	Mohd Apandi Bin Husin	Res. Asst. SG
10.	Mazlan Bin Mamat	Res. Asst. II
11.	Saruddin Bin Selamat	Res. Asst. II
12.	Subramaniam Velu	Res. Asst. SG
13.	Taliu Bin Mudah	Res. Asst. III
14.	Mohd Rustam Bin Mamat	Res. Tech. IV

Congratulations to Gan Huang Huang who obtained her M.Sc. Statistics (UM) with distinction !

MR. & MRS. PATRICK NG

EN. ARIF AND WIFE

NEWLY PROMOTED FROM RECORDERS

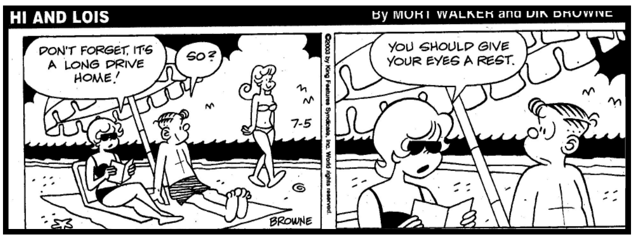
No.	Name	Promoted to
1.	Azman Bin Talib	Res. Tech. IV
2.	Rahman Bin Sihing	Res. Tech. IV
3.	Roslan Bin Mohd@Ariffin	Res. Tech. IV
4.	Asrul Affendi Bin Mohd Jonah	Res. Tech. IV
5.	Suresh a/l Selvaraj	Res. Tech. IV
6.	Rajenderan a/l Subramaniam	Res. Tech. IV
7.	Sivasakti a/p Subramaniam	Res. Clerk IV
8.	Jagathasan a/l Subramaniam	Res. Tech. IV
9.	Salniza Bt. Seali	Res. Tech. IV
10.	Zulkifli bin Mohd Noh	Res. Asst. III
11.	Kalaiselvam a/l Surenthiran	Res. Tech. IV
12.	Muthuraja a/l Sanacey	Res. Tech. IV
13.	Amran Bin Abd. Rahman	Res. Tech. IV
14.	Mohd Zaid Bin Miskan	Res. Tech. IV

MARRIAGE

- ♥ Mr. Patrick Ng to Miss Stephanie Cheong on 25/1/02 (inadvertently omitted in our last issue).
- ♥ Cik Sharmie Bt. Minka to En. Rashid Bin Medical on 22/3/03.
- ♥ En. Arif Sugandi to Cik Ari Sulistyo Rini on 27/3/03.
- ♥ Miss Vanaja a/p Mani to Mr. B. Nagarajan on 19/4/03.
- ♥ Miss Lynda Anne a/p Lourdenathan to Mr. Thomas Devasagayam on 24/5/03.

BIRTH

Puan Norlela Nordin - 3rd child (daughter) Nur Damia Lutfiah on 13/3/03



This advice is specially for Planting Advisors, Agronomists and Auditors who drive long distances.

Think about this ………

"MANY CONVERSATIONS ARE MONOLOGUES DELIVERED IN THE PRESENCE OF WITNESSES"

From 'Light & Easy'
(Radio Station Channel 105.7)

Chan,W.H.