AA RESEARCH NEWS

May'98

EDITORIAL

The plantation industry in Malaysia was once the backbone of the country's economy. Unfortunately, it has taken a back seat since our country progressed towards industrialisation. The plantation industry was subsequently labelled as a sunset industry and generally shunned by the younger generation. The situation became so bad that Universiti Pertanian Malaysia (UPM) saw it fit to change its name to Universiti Putra Malaysia last year. It was thus not surprising that the plantation sector found it hard to attract bright professionals. In fact, AAR together with its principals had to organise a seminar last year at UPM for students of UPM, UKM and UM to dispel some of the misconceptions and create greater awareness of the opportunities available in our organisations hoping to attract some of them to join us. One of the seminar papers entitled "A Carrier in Research and Development in Plantation Crops" is reproduced on pages 2 to 5.

Today, in the midst of one of our country's worst economic crisis, the plantation sector has emerged as a golden industry bringing home the much needed foreign exchange and providing good rewards to the investors and workers. The message is simple - never ever neglect agriculture. Even the most developed countries in the world protect and nurture their agricultural sector.

CONTENTS

ATTITUDE

"The pleasure you get from your Life is equal to the "Attitude" you put into it"

AAR has been fortunate to have very supportive principals who have the foresight to invest in research and development. It is with a sense of pride that AAR has been able to contribute positively to the plantation industry since its inception in 1986. In this issue, we provide the profile of an "Effective Advisory Service In The Private Sector" and abstracts of 6 recent papers by AAR. We hope you will find them useful and provide feedbacks.

Ooi, L.H.

A Short Note On Effective Advisory Service In The Private Sector

Chan Weng Hoong and Goh Kah Joo

Introduction

Research and development (R&D), has played an important role in increasing yields and productivity of estates in Malaysia in the last few decades.

In the private sector, R&D organisations are mainly engaged in applied research i.e. in problem solving and also in carrying out technical advisory services (Wood, 1988) Research contributions of private R&D organisations trend towards cost effectiveness of commodity production and effectiveness of implementation, generally providing benefits specific to their own plantation group.

The transmutation of research findings into commercially viable practice requires effective diffusion of the same to operating centres so that the possibilities being developed can be implemented well on the ground. Whilst overall productivity of plantation groups are influenced by several factors, the role of advisory services in communicating R&D findings and problem solving in estates whereby productivity can be constantly upgraded cannot be over emphasized.

Constituents of effective advisory services

Main ingredients are probably:-

1. A well planned R&D programme

A sound R&D programme in tune with current and future needs and problems faced by the industry in general and by the estates in particular would be a prerequisite in providing continued new R&D findings for effective service to the estates.

2. Good information on estate

While R&D provides excellent information, it is pertinent for the estate to keep good records of not

only the farm accounts but also the agronomic data such as planting practices, rainfall, road density, fertiliser delivery, etc. In fact, information on and from the estate is critical towards the correct assessment of situations and problems on the estate and the palm conditions. These data are commonly used to formulate strategy and solutions to problems faced by each estate.

3. Effective advisory officers

a. In order to provide good services, the advsory officer should be well versed with general estate practices and also in the technologies he is promoting. Preferably, he should be both the research and advisory officer as he would be then be able to advise on practices that he is personally familiar with, having carried out the operation himself and also seen the cost benefits involved. Moreover, by being a researcher, he will be aware of the latest developments in his field outside the company. This helps either to confirm his advice or guide him on the implementation of the latest technologies.

b. A good advisory officer should be one who is able to interact well with practitioners in the operating centres, encouraging feedback about operational problems and implementation of best technique. He should consider himself to be in partneship with the practitioner in the improvement of productivity.

c. An effective advisory officer should also be there on the scene when requested upon, being available to provide advice and guidance when required.

d. In imparting advices on new technologies, the officer should be sensitive to the constraints of the estates. His message should be workable within the limitations of the estate and where possible also be 'manager friendly'

e. The advisory officer should ensure early submission of reports so that recommendations contained therein can be implemented without delay.

f. The advisory officer should also maintain close rapport with planting advisors and provide assistance in the drawing up of agricultural policies for the Company. He must convince them of the value of new practices which bring us to the next ingredient.

4. Demonstration plots and field days

While trials provide a good scientific basis to formulate sound decisions and practices, they are commonly conducted in small plots which are frequently unconvincing to the practitioners. A way out is through demonstration plots (semi-commercial) and field days where the new technologies such as mechanisation can be introduced to the planters. As the saying goes "Seeing is believing and doing is understanding". Once you believe and understand the logic and value of the new practices, you are usually more amenable to change and adopt them.

Conclusion

Overall, the advisory officer appears to play an important role in the provision of good advisory service to the estates. Backed by a sound R&D programme and armed with good public relation and keen team spirit he could, together with the Planting Advisor and Estate Manager, enhance productivity and yields in the estates through provision of sound advice.

Acknowledgement

We wish to thank our Principals, Messrs. Boustead Holding Bhd. and KL Kepong Bhd., for their permissions to publish the article. Thanks are also accorded to Mr. Chew Poh Soon, Head of Agricultural Research, AAR, for his profound insights on advisory services and criticisms of this article.

Reference

B.J. Wood (1988). Research Management in the Oil Palm Industry. Proceedings of the on Management of Oil Palm Industry. The Planter 64 (752) 520-533.

A Career In Research And Development In Plantation Crops

Introduction

Since the start of the decade until just prior to the current economic down turn, the government, in its quest to be an industrialised economy in year 2020, has de-emphasised agriculture and plantation development. Consequently many universities have not been attracting the better students into agriculture and related fields. In fact the word 'agriculture' has been removed from the names of university departments and faculties! Similarly many graduating students are unaware of the important contributions of agricultural and plantation crop research which has led to the economic development of this country. Many career opportunities still exists in this field especially during this economic down turn when many companies have returned to their roots i.e. plantation agriculture; in their corporate aspirations.

Soon after plantations took off in this country in the earlier part of this century, the importance of setting up R&D units within each company to assist in the development of agronomic practices for the new crops was quickly recognised.

Many of the current improved crop varieties and agronomic practices originated from these R&D units, supplementing and complementing the efforts of the government research institutes. There is presently about a dozen such R&D units ranging from 1 to 2 scientists' effort, mainly advisory, to those exceeding a score. There has been a misconception in some companies that with the establishment of the various crop research institutes e.g. Rubber Research Institute of Malaysia (RRIM), Palm Oil Research Institute of Malaysia (PORIM), Malaysian Cocoa Board (MCB), the in-house effort can be accordingly trimmed down. These institutes, however, are usually charged with the responsibilities of doing end-use and more basic biological research, requiring the expertise of plantation-based scientists to translate and exploit them into agronomic practices. In fact more plantation-based scientists are needed in view of the various technological breakthroughs occurring in other fields which can be adapted into plantation practices.

In this paper we attempt to elucidate the role and job of a plantation R&D scientist to young graduates to entice them into this career and to create an appreciation of our efforts in others. We do this by explaining the role of Applied Agricultural Research Sdn Bhd (AAR) in Boustead/Kuala Lumpur Kepong (KLK) plantations to exemplify one of the larger and leading plantation R&D efforts in this country.

Objectives And Role of AAR in Boustead/KLK

- The objectives of AAR are:
- To help the company realise maximum profits and best results through sustainable crop practices and materials.
- To improve planting practices and planting materials for their estates.

We try to achieve these by the following role/ activities:

- Evaluating and extending R&D results and technological breakthroughs, in-house or external, into agronomic advice to the estates.
  We are in applied research.
- Widening research in strategic areas of importance.
  We may even venture into more basic research if we feel that it can give us a compeitiive edge.
- Generating scientific information for the industry.
  We believe that by sharing knowledge we stand to gain more.

To give an idea of AAR's sphere of influence and responsibility, AAR provides agronomic services to more than 200,000 ha of plantations in P. Malaysia, E. Malaysia and Indonesia. The area is still expanding. Eighty percent of the plantations are planted with oil palm, hence the concentration of its research efforts in this crop. Right at the start, AAR recognised that it could not be undertaking every aspect of research due to its limited resources, so it adopted a focussed strategic R&D programme which emhasised high efficiency as the best means to increase profitability in the plantations.

AARs' R & D Thrust Programmes

1. Oil Palm Nutrient Cycling And Balance

Fertilisers constitute a major portion of the fruit production cost in oil palm, hence AAR's emphasis on efficient fertiliser use in oil palm. As oil palm is a perennial crop, the system has to be sustainable i.e we should not be mining the fertility of the soil. The nutrient cycling and balance approach is the the most logical. We should be putting in fertilisers only what we take out as nutrients in the crop removed minus some minimal losses. AAR has assembled the most comprehensive data for the various physical and biological processes involved which enable its agronomists to make site-specific fertiliser recommendations; presently for 40 ha blocks which may eventually become smaller. Appropriate corrective fertilizer treatments for deficient areas are also available. In fact, enough data for drawing up the fertilizer recommendation model and systems for almost every agronomic situation in Malaysia are available at AAR.

2. Oil Palm Breeding And Selection

Having good planting materials is the first prerequisite of a successful planting, AAR has assembled a broad genetic base of advanced breeding materials and accessions. It has drawn up a comprehensive advanced breeding programme which allows it to produce of 5-6 million hybrid seeds per year. AAR is one of the few companies in the world producing planting materials with high oil yield potential and low height increment. It is presently selecting superior ortets (parent palms) for cloning for more rapid exploitation. Future planting materials with special attributes e.g. high oil unsaturation (for healthy oil) long bunch stalk (for ease of harvesting) are also in the pipeline.

3. Oil Palm Tissue Culture

AAR is a leading laboratory in oil palm tissue culture and has produced more than ¼ million ramets (clonal plants) and planted more than 1200 ha. to date. It has an efficient production system producing ramets with acceptable levels of abnormality. Some superior clones have been obtained and it will be undertaking scale-up production for larger scale planting. AAR is one of the leading laboratories in the liquid culture method. This method is amenable to large scale production and automation as compared to the current gelled method.

4. Information Technology (IT) In R&D & Management

AAR has at a very early stage recognised the usefulness of IT and satellite technologies in estate management besides research.

GIS/GPS technology to assist management of the estate.

AAR pioneered the use of GIS/GPS (Geographical Information System, Global Position System) in plantations. With these tools the manager can quickly and accurately map his estate boundries, fields, rivers, ravines and elevations and facilitate his planning for field blocks, contours, roads, drains etc. Many more uses will be found.

Decision Support System (DSS) package to integrate agronomic and management information.

Information from agronomic research and estate management databases created can be integrated and through the use of e.g. expert systems, alternative appropriate courses of action can be formulated for any plantation situation to assist the manager to make his decision.

Techno-economic Management.

With the acute labour problem facing the Industry there is a dire need to increase labour efficiency and mechanisation forms an integral part of the systems and approaches investigated. Labour-saving and user-friendly devices and systems are constantly sought.

Staff And Facilities

In order to make any significant in-road in R&D in plantation crop, a critical mass of good research personnel and facilities must be available. Table 1 gives the breakdown of the research staff and facilities at AAR. Improvements in these two aspects is a continuous process.

TABLE 1: AAR's Staff and Facilities

A. Staff

Personnel		Disciplines	Qualifications
Research Officers	(19)	Agronomist - 13 (11 - oil palm, 2 - rubber)	Ph.D - 2
Lab./Field Managers	(4)	Breeders - 2, Tissue culturist- 1, Chemist - 1	MSc - 4
Administrative Officer	(1)	Mathematician - 1, Analyst Programmer - 1	B.Sc (Hon.) - 13
Research & Administrative Assistant	(73)		
Research Recorders	(148)		
Total	**(245)**		

B. Facilities

Station	Location	Facilities
Main Office	Sg. Buloh	Tissue Culture Lab., Chemistry Lab., Agronomy Lab., Data Management, Seed-production Lab., Rubber Exploitation Product Factory, Fertiliser Factory
Paloh Substation	Paloh	Breeding & Agronomy
Sabah Substation	Sri Kunak	Agronomy Trials

AAR Agronomist (Arif) and Research Assistant (Saruddin) examing soil on Tuan Mee Estate.

Professional Standing Of AAR's R&D And Research Officers

As this country is the leading centre of oil palm action in the world, Malaysia can unreservedly lay claim to be the leader in oil palm R&D. Likewise, AAR can lay claim to be among the leading laboratories in: oil palm agronomy, oil palm tissue culture and production of short high yielding varieties, plant & soil analyses, use of GPS/GIS technology in plantations and production of rubber exploitation products.

Likewise AAR's research officers are leaders in their professional societies in the industry and scientific communities. They have high standing and good interaction with university and research institute scientists. AAR has contributed many of its research finndings in local and international professional publications and meetings. AAR research officers have been authors, editors and reviewers of local and international publications

Publications

AAR has more than 250 papers published/presented in the following. conferences and journals.

eg - Conferences	Journals
International Oil Palm/	Elaeis
Rubber/Cocoa & Coconut	Fertilizer Research
Conferences	Plant & Soil
International Plant Nutrition	SABRAO Journal
Colloquium	Euphytica
SABRAO Congress	Plant Breeding Abstract
ISOPB/ISOPA Conferences	Pertanika
MSSS Conferences	Planter

Patents

AAR has also submitted patents for the following products:

AAR Jacket System for rubber exploitation .
AAR Rain Guard for extended tapping during rainy days.
AA+ Mulch for improved growth of immature oil palms.

There are a number of other products and innovations in the pipeline.

Profile of A Plantation R & D Scientist

The following is a typical profile of a plantation R&D scientist:

- An Agric./Bio. Sc. major, IT literate graduate
  In recent years graduates from physical sciences have also been recruited as new technological innovations and their application tend to cut across traditional disciplines.
- Likes outdoor and nature.
  Much of the work is in the field.
- Bright and inquisitive, positive & motivated as befitting a scientist.
- Intellectual yet pragmatic
  He must not only be well read on basics and theory but must be able to translate them into practice as his clients are practitioners.
- Confident with good communicative skills
  He must be able to impress his superiors, peers and subordinates on his abilities
- Leader and team player
  He is a leader in his area of expertise and a team player in others

The above attributes reflect the qualities sought after by AAR in its recruitment of new research officers. Many of these attributes exist in the candidates shortlisted by AAR and given the right environment and training available at AAR, these qualities can be further developed and expressed.

Concluding Remarks

Attractive career opportunities exist in the plantation R&D sector. If one enjoys intellectual pursuits and gets self fulfillment when one's ideas get translated into practice, combining the best of the academic and corporate worlds; loves the clean and healthy environment of nature and the outdoors; and contributing to their sustainability as a place for abode and livelihood for man, animals and plants; and get amply remunerated in the process, the plantation R&D is the place you would want to be.

Soh, A.C.

Integrated Nutrient Management for Sustaining High Yields of Plantation Tree Crops in Tropical Asia

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(Paper prepared for MSSS Conf. of Malaysia 1998 held from 21-22/4/98)

Abstract

Plantation tree crops are important in world trade and feature significantly in many tropical countries' economies. They are grown mainly on Ultisols, Oxisols, Alfisols and Inceptisols which frequently have several important soil constraints limiting the growth and yields of the crops. Adequate nutrient inputs are frequently required for successful crop cultivation in many of these soils dominated by low activity kaolinitic clays and

organic matter but a package of agro-management practices including fertilization is advocated to give the best results. The nutrient requirements of these perennial tree crops may be initially estimated by computing the nutrient balance and matching the requirements against the supply available from the soil. A full nutrient management programme however should take into account the potential crop growth and yields, refinements to the nutrient requirement computations using leaf and soil analysis diagnostic techniques and studying the inter-row management practices especially legume cover establishment and factors which could influence nutrient losses by run-off and leaching.The types of fertilizers used can be expected to affect soil properties including adverse effects such as soil acidification by nitrogenous fertilizers which should be avoided where possible. Fertilization will also affect quality of the plants including oil extraction ratios in oil palm and stability of crop yield as well as quality of the produce as seen in rubber. Changes in cropping practices, fertilizers used and use of high-yielding cultivars need to be met by additional information especially on soil physical conditions and water-availability as well as new approaches to ensure optimal nutrient management. It is likely that the best results will come from an integrated site-specific nutrient management approach, taking into account the site factors affecting growth and yields and agro-management practices affecting the efficiencies of the fertilizers applied.

Applications Of Global Positioning System And Geographical Information System In Oil Palm Estates

Ooi Ling Hoak & Tey Seng Heng

(Abstract of paper prepared for presentation at the Porim National Seminar on Mechanisation in Oil Palm Plantation, Bangi, 30th June to 1st July 1998)

A study was carried out in a 2344- hectare oil palm estate to explore the benefits of using Global Positioning System/Geographical Information System (GPS/GIS) in its management.

The major advantage of using GPS/GIS is that accurate maps superimposed with relevant information can be produced quickly. Agronomic and management information such as road and drainage system, contour, soil, crop, manuring and other data may be analysed, superimposed on the maps and displayed in an easy to interpret manner to assist the estate manager to make sound decisions.

A GPS survey carried out on the estate's 55 planting blocks indicated significant errors in their computed hectarages. 56% of the blocks registered more than 10% error in hectarages. Such errors have important implications. For example, payments for contract work based on wrong block hectarages are unsatisfactory. Wrong hectarages also distort yield and other production cost figures which may result in wrong allocation of resources.

A GPS survey of the road system indicated that there were 353,673 m of roads. This is equivalent to 151 m ha^{-1} which is excessive. With the introduction of one-tonne mini-tractors for mechanised in-field evacuation of ffb, about 32 m ha^{-1} of roads should be sufficient for the flat areas of the estate.

GPS/GIS technology can also be used to monitor all kinds of field operations. A trial carried out in the estate indicated that it is very useful for monitoring the application of fertilizer by tractor mounted mechanical spreader. It is useful for yield monitoring and mapping. It can also be used for drainage planning.

The potential uses of GPS/GIS in estate management and research are numerous. The plantation industry can benefit greatly if it is put to wider and proper use.

ABSTRACTS OF PAPERS SUBMITTED FOR 1998 IOPRI CONFERENCE,

Role Of Private Sector Research In Oil Palm Crop Production

Chew, P. S., Soh, A.C., Goh, K.J. and Kee, K.K.

Large plantation companies usually have their own research or 'scientific' staff. In Malaysia, there are many oil palm research stations with various research programmes and staff levels. Their significant achievements enabled the industry to grow tremendously and achieve large advances in yield. The formation of Palm Oil Research Institute of Malaysia (PORIM) has greatly increased research capability. This coincided with the expansion in numbers but not in sizes of plantation research stations. Currently, the industry faces serious challenges from low labour availability, rising costs, demands by environmentalists and need to increase productivity. More strategic research efforts are essential. PORIM should carry out this research e.g. on exploitation of new germplasm, biotechnology, tissue culture, product synthesis and mechanisation while the plantation researchers try and apply the new information and planting materials to improve productivity and efficiency. It is anticipated that improved planting materials and site-specific practices will be critical and only the plantation researchers can exploit them well. This will spill over to other groups and the smallholders, therefore benefiting the whole industry. The private sector there-

fore has a vital role to play. However, its fragmented nature and small units are not conducive to the long-term research needs. Improved coordination and more joint research projects, and further means to ensure their efficacy are needed. For the researchers to succeed in their roles, they must have the full support and cooperation of the Directors and management staff. The Malaysian experience will probably be useful also to the rapidly developing industry in Indonesia.

Validation Of A Site Yield Potential Model For Oil Palms In Malaysia

Kee, K.K., Chew, P.S., Gan, H.H. and Goh, K.J.

The genetic yield potential of mature oil palms is the largest yield obtainable if all the environmental conditions, agronomic and management decisions were perfect. The actual yield obtained on a site, however, is usually lower and dependent on site, agronomic and management deficiencies which interact to limit the full expression of the genetic potential. If all constraints relating to incorrect agronomic and management inputs are removed, then the yield obtained would be the site yield potential (SYP). The ability to reliably predict SYP would be very useful for setting realistic yield targets and to focus attention on yield limiting factors that need to be alleviated. AAR has developed an empirical model for prediction of SYP of oil palm based on palm, soil, site and climatic characteristics. Preliminary evaluations of the model (ASYP 1) for mature palms on a range of soils had indicated satisfactory agreement. An improved model (ASYP 2.6) has been developed to predict SYP of palms from planting to maturty. Two trials were set up to test the improved model with young oil palms on Munchong (Typic Hapludox) and with mature oil palms on Kawang (Typic Kanhapludult) soils. The model projected SYP of 19, 26, 32 and 36t $ha^{-1}y^{-1}$ for the first 4 years of harvesting on Munchong series. The corresponding best treatment yields obtained were 11.5, 25, 33 and 34t $ha^{-1}y^{-1}$. Except for the first year of harvesting, the differences between the best treatment yields and SYP were within 5% of SYP from year 4-6. SYP on Kawang series ranged from 30 to 31t $ha^{-1}y^{-1}$ for palms from 9-14 years old. Trial mean yields were, however, more variable, ranging from 26 to 31t $ha^{-1}y^{-1}$ or 83 to 102% of SYP. Differences between SYP and total yields over the duration of the trials were < 8% of the SYP for the 2 sites. Although results indicated highly satisfactory agreement between predicted SYP and actual yields achieved for the 2 soils, further validation work is needed with specifically designed trials for model improvement and over a wider range of environments.

Optimising Return From Fertilizer For Oil Palms: An Integrated Agronomic Approach

Teo, C.B., Chew, P.S., Goh, K.J. and Kee, K. K.

Fertilizers account for about 24% of total production costs in mature oil palm. The principal goal in optimizing fertilizer usage is to produce sustained maximum yields and profits per unit area through balanced fertilization and optimal fertilizer rates from improved fertilizer efficiency. Losses of the soluble nutrients e.g. N, K, Mg and B appear mainly due to surface run-off and leaching or immobilization by weeds in young palms. Soil immobilization is usually minimal and losses may be reduced by correct choice and rates of fertilizers, methods, timing and frequency of application. Less soluble fertilizers e.g. rock phosphates and magnesium limestones are much less susceptible to leaching and run-off losses. However, nutrient availability could be problematic in high pH soils. Additionally, high P fixation usually occurs in soils with high Fe and Al. A critical requirement for efficient fertilizer use is good growing conditions and yield response to nutrients applied. Identification and correction of the site limiting factors are therefore vital. High fertilizer rate alone without correction of underlying agronomic limitations e.g. drainage or pest damage will result in low fertilizer efficiencies. It is vital therefore that estate management should create and maintain the best conditions for growth and yield. As soil, terrain and moisture availability may vary markedly, a site-specific approach should be practised. Fertilizer rates should meet the nutrient requirements for site yield potentials. Information to improve fertilizer efficiency and their analysis will be easier in future with availability of new technologies, enabling an integrated agronomic approach to be practised.

Ground Magnesium Limestone As A Source Of Magnesium For Mature Oil Palm On Sandy Soil In Malaysia

Goh, K.J., Chew, P.S. and Teoh, K.C.

Interaction of magnesium (Mg) and potassium (K) in oil palm on sandy soil in Malaysia was examined by means of a 3 Mg x 2 K factorial experiment. Ground magnesium limestone (GML) was used to supply Mg to investigate its potential as a source of fertiliser. K was applied in the form of muriate of potash (MOP). A standard treatment comprising kieserite and MOP was also included for comparison.

Magnesium deficiency symptoms were prominent in plots without Mg treatment. Both GML and kieserite were effective in overcoming the deficiency

and increased fresh fruit bunch (FFB) yield by an average 11% over five years. The relative agronomic efficiency of GML compared to kieserite was 83% indicating that the soluble sulphate form of Mg had higher supplying capacity. But the relative economic efficiency of GML was 1.5 times better than kieserite due to its lower price.

The positive FFB response to GML was mainly attributed to the increased soil Mg content rather than improvements in soil pH and soil Ca content. GML also significantly enhanced leaf Mg concentration but caused an apparent drop in leaf K concentration. However, the antagonistic interaction of Mg and K on FFB yield was not found in this experiment despite the continuous applications of GML. Leaf B and Mn concentrations were generally lower with GML input.

There was also a significant FFB yield response to K up to 3.0 kg K palm^{-1} yr^{-1}. At this rate, soil exchangeable K accumulated to 0.40 cmol kg^{-1} which was above the generally accepted critical level of 0.20 cmol kg^{-1}. The results further showed the importance of cationic relationship in oil palm nutrition.

SOCIAL AND PERSONAL

PROMOTIONS

Names	Promotion Date	Section	Designation
Noraniah Bt Anday	01/05/1998	Tissue Culture	Gr. IV Lab Tech
Noraini Bt Ismail	01/05/1998	Tissue Culture	Gr. IV Lab Tech
Mohd Faizul Bin Ibrahim	01/05/1998	Main Office	Gr. IV Res. Asst.
Sakari Bin Musa	01/05/1998	Main Office	Gr. IV Res. Asst.
Abd Razak Bin Musa	01/05/1998	Main Office	Gr. IV Res. Asst.
Rajaletchimi a/p Paramasivam	01/05/1998	Paloh	Gr. IV Res. Asst.
Mariayee a/p Kuppusamy	01/05/1998	Balau	Gr. IV Res. Asst.
Santramady a/p Kannan	01/05/1998	Seed Production	Gr. IV Lab Tech

RESIGNATION

Name	Date Resigned	Section	Grade
Jansari Bin Jamaluddin	01/05/1998	Main Office	Gr. III Res. Asst.

CONGRATULATIONS:

BIRTH

- Siti Norashikin Bt Moksen gave birth to a baby boy Izz Zikry Bin Mohd Suhaili on 16/4/98.

MARRIAGE

- Isnine Bin Norhassan married Cik Noraimi Bt Minka on 11/4/98

CHEN, K.C.

Signboard on fashion house in a small town.

House of Elizabeth Tailors and Richard Buttons

Chan, W.H.