AAR NEWSLETTER

February 2013

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"To be internationally recognized as the premier centre for research and development offering excellent products and services in tropical plantation tree crops". - AAR Vision

WE HAVE MOVED!

Our Headquarters

& Labs (Chemistry, Crop Protection & Microbiology Labs) have moved!

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Message from AAR's Director of Research, Mr. Goh Kah Joo

AAR was established under the leadership of Mr. Chew Poh Soon in 1986 when we moved from HRU (Highlands Research Unit) to Sg Buloh. Mr. Chew retired in 2000 after 14 years as Head of Agricultural Research. He was succeeded by Dr. Soh Aik Chin FASc, who served for 7 years before retiring in February 2007. Dr. Kee Khan Kiang took over the leadership before retiring in January 2012.

Mr. Chew, Dr. Soh and Dr. Kee are recognized leaders in their own field of expertise and are well known both within Malaysia and internationally amongst oil palm research organizations as well as the plantation industry. Under their outstanding leadership they had made AAR a leading Oil Palm Research Centre of Excellence. We shall continue to build on what we had already achieved. Our vision is "*To be internationally recognized as the premier centre for research and development offering excellent products and services in tropical plantation tree crops*".

Our operation now spans both East and West Malaysia and across to Sumatra, Belitung, Kalimantan, Indonesia and Columbia, South America. We had pioneered the application of GIS/GPS as well as remote sensing technologies in the Plantation Industry. We continue to conduct joint trials with local and foreign universities, the Department of Agriculture, the Malaysian Palm Oil Board and other local and international research organizations and service provider. Today we are the world's largest producer of oil palm tissue culture plantlets through our modern Tissue Culture laboratory at Ijok, Selangor.

Our Molecular Laboratory known as the AAR-UNMC Biotechnology Research Centre (BRC) was officially opened by Prof Sayed Azam-Ali (Vice President, Research) UNMC on 29 September 2009. The BRC is located adjacent to the University of Nottingham Malaysia Campus, Semenyih. The overall and primary goal of the AAR biotechnology unit is to develop biotechnological tools that are rapid, sensitive and reliable to support and complement our crop improvement and agronomic research program, which encompasses oil palm breeding, tissue culture, pests and diseases and agronomy.

We remain committed to provide the best services and products to our Principals and clients through our objectives and activities and supported by a large research and development programme.

Message from the Editor

It brings me great honor to be able to contribute to the company's newsletter.

Tireless effort from numerous individuals have enabled the company to excel since early years of its formation. Since then many of these outstanding individuals have retired and yet in their retirement, returned to contribute more to the company.

In the last couple of years, Dr. Kee Khan Kiang and Mr. Tan Cheng Chua, both who have worked since the inception of the company have retired yet continue to devote more of their time to the Company either in the same or different capacity. This issue would hopefully capture a glimpse of their long service put on record to commemorate as well as to motivate recently recruited officers in order to continue to excel in line with the company's Vision, *"to be internationally recognized as the premier centre for research and development offering excellent products and services in tropical plantation tree crops*"

This issue will also highlight work and contributions by AAR-UNMC Biotechnology Research Centre, commissioned in 2009, and its central role in supporting and complementing AAR's Crop Improvement and Agronomic Research programs.

Happy Reading!

S. Chin

Message from Dr. Kee Khan Kiang (President Director PT AAR Indonesia)

I regard our company as the jewel of the crown in the oil palm industry. We are one of the leading research companies and also regarded as one of the most advance research stations in Malaysia. Our research are both **Innovative** and **Pioneering** as seen in our efforts being pioneers in GPS/GIS system in the oil palm industry and the results of our trials are readily translated into field practices. By providing sounds agronomic advices and technical support to our principals we allow them to be more efficient and cost effective and therefore **Sustainable**.

We were only a small research company with only 15 research officers when we first started in 1986. Now we are with a workforce of 50 officers and 500 workers, spread across different areas of research. Time does pass on quickly. Other than the Agronomic side of things, we are currently implementing a multidisciplinary approach where our Plant Breeding, Tissue Culture and P&D team work together to achieve the best refined solutions for the problems we face in the industry. Also, by harnessing Biotechnology to support and complement all areas of research in AAR, this will definitely push us forward.

Just like a how a ship does not sail without its crew, AAR is nothing without its people. One thing remains unchanged in the 25 years of AAR; our main assets in AAR are the people running it. We have had very good leadership under our former Directors of Research, Mr. Chew Poh Soon and Dr. Soh Aik Chin who have led a strong foundation and framework for the success of our company. Under my tenure as Director of Research, I had also strived to guide AAR in the same framework and discipline and without a doubt, I am confident that our new Director of Research, Mr. Goh Kah Joo will lead AAR in the same capacity or if not, to even greater frontiers. Despite the handover in leadership, I am compelled to help the company to progress further after working in AAR for 30 years, therefore I'll still serve the company though at a different capacity.

We have added an extra security feature to our production of hiqh quality oil palm seeds!

Our oil palm seeds are now engraved with the "AA Hybrida IS" logo, hence giving peace of mind to our Clients on their orders.

For further information, kindly contact Mr. Tan Cheng Chua (Division Head, Agricultural Products) or email your queries to "sales@aarsb.com.my".

Integration of Biotechnological Procedures into AAR Crop Improvement, Plant-Pathogen Interaction and Efficient Nutrient Uptake for Oil Palm.

Wong WC, Gan ST, Marianne LHY, Choo CN, Sim SC, Mahamooth TN

The typical crop improvement cycle takes 10-15 years to complete and includes germplasm collection, genotype selection and crossing, progeny testing, proprietary protection and mass propagation (Figure 1, Pauls, 1995). Given the long generation of oil palm breeding (~25 years), the possibility of early selection will always be the oil palm breeder's wish. In addition to the early selection at nursery stage, the marriage of plant breeding and tissue culture technology allows clonal planting materials to be produced from the elite palms without genetic recombination as well as better characteristics and higher yield could be potentially achieved (Soh *et al.*, 2011). Nevertheless, Corley (1982) has reported earlier that the environmental factors and soil fertility could also contribute to the oil yield. The complexity of the interaction between genetic and environment factors (G x E) are now possible to explain using a combination of biotechnological tools comprising genetic, molecular biology and bioinformatics. Therefore, inputs from biotechnology are introduced into AAR plant breeding, tissue culture and agronomy research trials. Our main objectives of setting up oil palm biotechnology R&D programme are:

1. To enhance the efficiency of AAR oil palm breeding program as well as for proprietary oil palm new variety protection.
2. To understand and improve the *in vitro* culture system for the successful cloning of elite palms and mass clonal propagation.
3. To employ biotechnology techniques to enhance sustainable mineral nutrition of oil palm and develop disease control strategies.

In view of the recent announcements of decoded oil palm and *Ganoderma* genomes, these success stories heralded the new era of the oil palm crop improvement. However, it remains a non-trivial task with the majority of initial genome annotation dependent on the use of gene prediction algorithms. In this paper we do not intend to be overwhelmed by Next Generation Sequencing (NGS) technology or oil palm genome sequencing projects but to discuss how the commercial aspect of oil palm biotechnology will facilitate the AAR crop improvement, P&D and agronomy research programmes.

AAR Biotechnology for Crop Improvement can be defined as the application of tissue culture and molecular genetics to complement breeding selec-

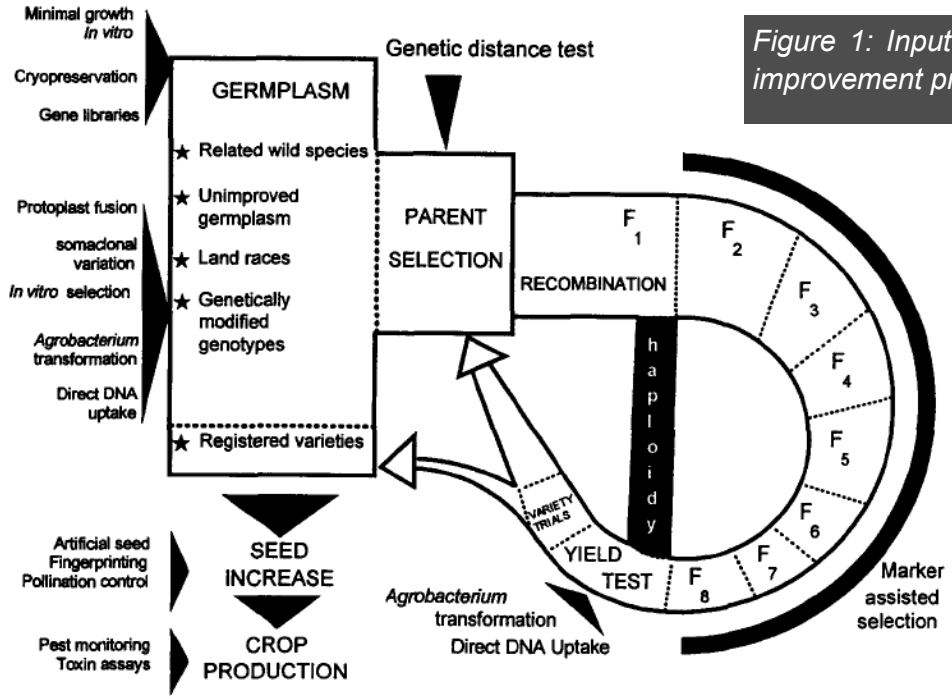


Figure 1: Inputs from biotechnology into crop improvement program (Pauls, 1995)

selection. It is possible to use the genomic tools to determine the genome variation, which allows our plant breeders to harness the wealth of the genetic information available at the DNA level for precise breeding crossing and accurate selection. Oil palm tissue culturist are also trying to improve the oil palm tissue culture system amenable to *in vitro* manipulation as well as avoiding the production of somaclonal variants (abnormality) from high yielding cell lines. Our main roles as biotechnologists are to develop novel breeding approaches, e.g. whole-genome marker screening without the need of phenotypic evaluation for breeding selection based on a paper written by Wong and Bernardo (2008) and to create knowledge for tissue culturists to bypass the oil palm embryogeny with lesser effect of somaclonal variation.

We understand that most of the oil palm industry players are struggling to maintain strong oil palm breeding and tissue culture capabilities. Perhaps, mutual beneficial partnership with Malaysian Palm Oil Board (MPOB), University of Nottingham Malaysia Campus (UNMC), University of Nottingham (UoN, UK) and local universities may lead to considerable success for AAR oil palm crop improvement. Our work with OPGP (Oil Palm Genomic Project), which is a consortium of organisations from France, Spain, Colombia, Indonesia and Malaysia, aims to develop genomic resources that can be applied in marker-assisted selection for better efficiency in oil palm breeding. Given the free communication, genomic resources, capabilities and skill personnel from CIRAD (Cente De Cooperation International En Recherché Agronomique Pour Le Développement, Montpellier, France) and NEIKER (Neiker-Tecnalia, the Basque Institute for Agricultural Research and Development, Spain), we anticipate that genomics will become the powerhouse of AAR crop improvement in the near future.

The AAR and UNMC joint effort to establish the crop biotechnology research hub in AAR-UNMC Biotechnology Research Centre located adjacent to University of Nottingham Malaysia Campus in Semenyih, is the vital capital for developing the technologies useful for crop biotechnology research, i.e. breeding, tissue culture, pathology, plant nutrition and physiology, etc. It also promotes the borderless transfer and exchange of information and resources between AAR researchers and UNMC academic staff as well as postgraduate students. There are two main projects being carried out by the researchers from AAR and UNMC. The first project is developing a molecular tool box to verify the purity of hybrid *tenera* in the commercial population of oil palm seedlings. This project aims to explore the development of molecular markers capable of detecting illegitimate crosses, tissue culture mix-ups and other identity-related issues. In this project, we will use Representational Difference Analysis (RDA) and Heterologous Affymetrix Microarray (x-species) analysis to generate a number of marker polymorphisms close to the shell thickness gene. These markers can potentially be used for verification of identity and purity of *tenera* hybrid oil palm, thereby helping to ensure that the planted oil palm seedlings are of the selected shell-type and thus, quality. Such markers may also allow alternative alleles of shell-thickness from different sources of germplasm to be exploited more thoroughly.

The second project in collaboration with UNMC is the development of a diagnostic kit for early detection of mantled clonal palms at the nursery stage. Tissue culture-derived palms can develop abnormal flowers in which stamen primordia are converted into carpel-like tissues. Individual mantled palms may show variation in mantling and reversion to the normal phenotype over time. This phenomenon is called “mantled abnormality” which was first described by Corley *et al.* in 1986. Floral abnormality that give rise to mantled fruit is a limiting factor in the cloning of oil palm through tissue culture. To-date, much research effort and clonal trials have been carried out and reliable protocols, coupled with effective culling practice, have been developed to obtain clones with low mantling rate. However there is no reliable method to recognize these vegetatively normal in appearance aberrant plantlets that occur sporadically within and between clones. The mantled abnormality may result in partial or complete flower sterility that is associated with a lower oil yield production. Thus, the early detection of mantled palms is critical to oil palm clonal mass propagation.

This project focuses on the discovery of a novel de-

tection system for oil palm somaclonal variations, including fruit mantling in the future. The “mantled” phenotype affects on average 5% of the regenerants obtained through somatic embryogenesis, and both its occurrence and severity are highly variable between and amongst clonal offspring. The mantled variation still jeopardizes the development of oil-producing fruits and therefore, impedes the commercial production of clonal plantlets. To monitor the somatic embryogenesis protocol and (or) discard variant lines before field planting, an early detection test of this somaclonal variation is clearly needed. There are a number of previous studies associated with the methylation and acetylation / deacetylation of histones in both human, animal and *Arabidopsis* for studying epigenetic variation causing abnormalities (Mielnicki *et al* 1999; Redner *et al* 1999; Yarden *et al* 1999; Li *et al* 2002; Tian *et al* 2001). Histones which are methylated and deacetylated on certain lysine residues can act epigenetically to repress "gene" expression, and therefore, most probably contribute to the mantling formation. In this project, we investigate the roles of the “methylation” in the formation of mantled fruits and locations of these processes taking place in order to develop a detection system.

The historical development of oil palm tissue culture described by Soh *et al* (2011) highlighted the advances achieved by AAR (Table 1). We aim to continue pioneering in oil palm tissue culture, thus, oil palm biotechnology programme commensurates and facilitates its R&Ds by developing the biochemical and molecular methods to understand and characterise the key drivers of the oil palm embryogenesis and the explant response to the *in vitro* environment as well as tissue culture conditions. Since the first formal report of establishment and maintenance of regenarable embryogenic oil palm cell suspension culture were published by Touchet *et al* (1991), much research has been carried out by AAR and we successfully established the liquid suspension culture techniques for efficient mass propagation in early 2000. The regenerable embryogenic cell suspensions or liquid cultures have the potential to produce millions of plantlets. However, low callogenesis (callus induction and callus differentiation) and embryoids formation have become the major challenges of developing the embryogenic liquid cultures, apart from mantling abnormality issue and selection of elite palms for cloning. The factors affecting the oil palm somatic embryogenesis have yet to be fully elucidated. Our existing tissue culture-biotech trials were initiated with the following objectives (1) to determine the optimal developmental stages for embryogenic culture initiation, maintaining and regeneration, (2) to correlate the embryogenic potential with the genotypes and culture conditions. In addition, we are working closely with MPOB in particular searching of markers for early detection of culture amenability (e.g. embryogenesis) and tissue culture abnormalities (e.g. somaclonal variants). Both markers will benefit tissue culturists to cut down the time, workforce and production costs in mass propagation of elite materials. We shall not limit our attempts to use molecular tools for early detection of tissue culture amenability and abnormality, but also to create the knowledge of *in vitro* biological processes for oil palm tissue culture advancement.

Figure 2: AAR’s oil palm tissue culture process (modified from Soh et al, 2006ab)

Table1: Historical Development in Oil Palm Tissue Culture Clonal Propagation (Soh et al., 2011)

Year	Event
1974	First reports on successful plant regeneration from tissue culture of oil palm by the British (Unilever) and the French (CIRAD) groups.
1982	AAR team began R&D on tissue culture clonal propagation of oil palms at HRU Sdn. Bhd., its previous company.
1984	AAR's first regenerated plantlet from a seedling clone was planted.
1986	AAR's first clonal trials of mainly seedling clones and one ortet clone were planted. First announcement of flowering and fruiting (mantling) abnormality in oil palm clones by the Unilever group (Corley *et al*., 1986). Subsequent similar reports by CIRAD and other groups, including AAR. However, AAR's first clonal trials were free from mantling. Publication by Soh (1986) on the expected yield increase with oil palm clones and proposed breeding/selection strategies in light of ortet selection inefficiency and the mantling abnormality risk. The team from HRU moved over to AAR. AAR inherited half of the cultures from HRU in 1987.
1987	Trial to test CIRAD's clones resulted in severe mantling abnormality in some clones.
1989	AAR's first formal trials on ortet clones were planted. Severe mantling was observed in one clone which was free of mantling in the earlier trial. Other clones had negligible to mild mantling. Pilot field testing of these averaged 6% mantling, with a range from 0 to 36%. Commercial production laboratories set up by Unilever and CIRAD were discontinued because of the mantling problem, and the groups reverted to further R&D.
1989-2005	Papers by AAR in local and international journals on ortet selection efficiency and breeding strategy, e.g. Soh (1990; 1998; 1999; 2004; 2005), Soh and Chow, (1989; 1993), Soh *et al*. (1994; 1995; 2001; 2003b, c).
1990-1995	Trial and pilot commercial field tests of embryo- and seedling-derived clones of reproduced superior crosses or progenies besides the early ortet clones were conducted. The embryo- and seedling-derived clones resulted from the alternative cloning strategies proposed by Soh(1986). Mantling was negligible in the embryo-derived clones; the high yield of their superior family (achieving 40 t FFB) was reproduced and the top clones have been recloned. Except for one clone, mantling in the other ortet clones was minimal. The seedling-derived clones still averaged about 8% mantling, presumably from the limited number of seedlings sampled.
1996	The beginning of a large-scale clonal trial and commercial field tests of ortets from improved cloning protocol and ortet selection strategies adopted at AAR. Confidence was built from the results of the pilot commercial field tests. On average, about two trials were planted per year totaling >24 trials to date. Commercial clonal or ramet field test plantings rose to 100,000 – 300,000 plants per year.
1997	AAR's paper (Wong *et al.,* 1997) to an international audience and in an international journal announced the feasibility of large-scale clonal propagation of oil palm using the gel culture protocol.
1999-2003	The announcement and publication to an international audience of the feasibilities of recloning and the liquid suspension culture techniques for efficient mass propagation of superior proven oil palm clones (Wong *et al.,* 1999b; Soh *et al.,* 2001; 2003a; Tan *et al.,* 2003).
2004-2005	The building and commissioning of AAR's new commercial tissue culture laboratory with the capacity to produce 1.5 million proven clonal palms for commercial planting.
2006-2008	Commercial clonal or ramet field plantings rose to 500,000 – 750,000 plants per year for the last few years, totaling about 30,000 ha of commercial areas to date from 1990s.

AAR-UNMC Biotechnology Laboratory and P&D/ Microbiology Laboratory have embarked on several projects involved in plant pathogens affecting the oil palm. Biotechnological tools have now paved the way for biological scientists to address fundamental problems affecting crops and to derive solutions or curative measures. To illustrate the applications of biotechnological tools and applied research undertaken by both laboratories, we shall discuss further on on-going research pertaining to leaf spot diseases.

Leaf spot diseases are a common foe of nursery oil palms but more recently have raised concerns on the spread amongst mature oil palm plantings. The pathogens are nearly all attributed to fungi. Under nursery conditions, AAR advocates best nursery management practices and often is sufficient to keep leaf spot diseases at bay. In the past, identification of diseases such as *Curvularia* leaf spot disease relies on physical damage symptoms observed on the plant (Figure 3). Furthermore, the corrective treatment involving fungicide spraying would also be determined based on the identification of the disease, i.e., *propineb* (a.i.) for treatment against *Curvularia* leaf spot disease or *thiram* (a.i.) for treatment against *Helminthosporium* leaf spot disease. On-going research has now revealed that leaf spot disease is not necessarily confined to a single pathogen and that the presence of a secondary pathogen may reduce efficacy of selective fungicide treatments (Figure 4). Through molecular methods, identification of these pathogens can easily be determined (Table 2). DGGE or Denaturing Gradient Gel Electrophoresis on the other hand, is a tool that enables rapid identification of a microbial population within a sample, circumventing the need for traditional microbiological approach in isolation of pure fungal species from any sample, be it oil palm pinnae with symptoms of leaf spot disease. Through such on-going findings, AAR continues to improve its agronomic recommendations. In the case of leaf spot diseases, AAR now recommends alternate treatment with different fungicides, e.g., *propineb* (a.i.) with *thiram* (a.i), *carbendazim* (a.i) or *epoxiconazole* (a.i), which is found to be more efficient to curb any leaf spot disease outbreak in a nursery compared to a single fungicide treatment.

Figure 3: Nursery oil palm seedling bearing symptoms of Curvularia leaf spot disease

Biotechnology to Enhance Sustainable Oil Palm Mineral Nutrition on the other hand adopts the cellular and molecular physiology techniques to enhance the oil palm ability in nutrient uptake and utilizations. In areas where soil fertility limits crop productivity, the traditional agronomic approaches attempt to raise productivity by diagnosing nutrient requirements (both demand and deficiency) and concentrating on supplying the optimum fertilizer

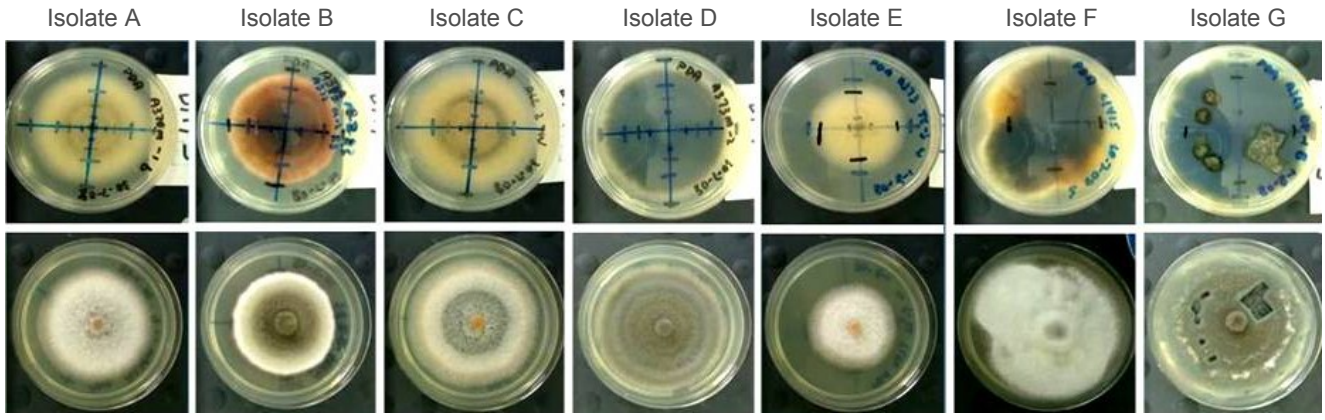


Figure 4: Images of distinct fungal isolates cultured from necrotic leaf spots from 2 nursery seedlings bearing symptoms associated with Curvularia leaf spot disease.

inputs. With applications of biotechnology, the research direction focuses on improving oil palm yields via identification and selection of oil palm planting materials with enhanced ability in nutrient uptake and photosynthesis.

Existing agronomic trials on the responses of various planting materials to fertilizer inputs demonstrated the capability of a few oil palm progenies in producing higher yields at lower fertilizer inputs. Such progenies demonstrate its economic potential in producing the same or ideally higher yield at a fraction of the fertilizer inputs. Using a combination of isotope tracer and molecular marker techniques, we can to detect and select progenies which are efficient in nutrient uptake as well as high yielding. Similar approaches have been applied on other commercial crops such as barley, rice, soybean, etc. and have successfully enhanced yield by a factor of 20% to well above 200% compared to traditional methods (Tirol-Padre *et al* 1996; Römer and Schink, 1998; Pan *et al* 2008; Terry *et al* 2010).

References:

- *Aggrey B.N.* (2008). Biotechnology in plant nutrient management for agricultural production in the tropics: The research link. *African J. of Biotechnology*. Vol 7 (6), 664-669.
- *Corley R.H.V.* (1982) Clonal planting material for the oil palm industry. *Planter*, Vol 58 (680), pp. 515-528.
- *Li G., Hal, T.C., Holmes-Davis, R.* (2002) Plant chromatin: development and gene control. *Bioassays*, 24: 234-43.
- *Mielnicki L.M., Ying A.M., Head K.L., Asch H.L., Asch B.B. (*1999) Epigenetic regulation of gelsolin expression in human breast cancer cells. *Exp-Cell-Res.*, 249 (1): 161-76.
- *Pauls K.P.* (1995) Plant biotechnology for crop improvement. Biotechnology Advances, Vol.13 (4), pp. 673-693.
- *Redner R.L., Wang J., Liu J.M.* (1999) Chromatin remodeling and leukemia: new therapeutic paradigms. *Blood*, 94(2): 417 – 28.
- *Römer W, Schenk H* (1998). Influence of genotype on phosphate uptake and utilization efficiencies in spring barley. *Eur. J. Agronomy* 8, 215-224.
- *Pan XW, Li WB, Zhang QY, Li YH, Liu MS* (2008). Assessment on phosphorus efficiency characteristics of soybean genotypes in phosphorus-deficient soils. *Agri. Sci. China* 7, 958-969.
- *Soh A.C., Wong G., Tan C.C., Chong S.P., Choo C.N., Nor Azura A., Ho Y.W.* (2006a) Progress and challenges in commercial mass propagation of clonal oil palm. Paper presented at the IOPC 2006 International Oil Palm Conference. 19-23 June 2006.
- *Soh A.C., Wong G., Tan C.C., Chong S.P., Choo C.N., Nor Azura A., Ho Y.W.* (2006b) Advances and issues in commercial propagation of oil palm clones. Paper presented at the Ministry of Plantation Industry and Commodities Workshop.
- *Soh A.C., Wong G., Tan C.C., Chew P.S., Chong S.P., Ho Y.W., Wong C.K., Choo C.N., Nor Azura A., Kumar K.* (2011) Commercial-scale propagation and planting of elite oil palm clones: Research and development towards realization. *J. Oil Palm Res.*, Vol.23, pp.935-952.

Plant	Disease diagnosis †	Fungal Isolate	Species identification (18S rRNA) #
1	*Curvularia* leaf spot disease	A	*Curvularia* sp. (HMO60600)
		B	*Penicillium janthinellum*
		C	*Curvularia* sp. (HMO60600)
2	*Curvularia* leaf spot disease	D	*Colletotrichum gloeosporioides* (HM1463134)
		E	*Curvularia* sp. (HMO60591)
		F	*Pleospora herbarum*
		G	*Colletotrichum gloeosporioides* (CG0804)

Table 2: Species characterisation of fungal isolates.

† Diagnosis based on asymptomatic disease characterisation.

Accession number (GenBank) of highly homologous DNA sequences is indicated within parentheses.

- *Tian L., Chen Z.J.* (2001) Blocking histone deacetylation in Arabidopsis induces pleiotropic effects on plant gene regulation and development. *PNAS*, 98: 200 – 5.
- *Tirol-Padre A, Ladha JK, Singh U, Laureles E, Punzalan G, Akita S* (1996). Grain yield performance of rice genotypes at suboptimal levels of soil N as affected by N uptake and utilization efficiency. *Field Crops Res.* 46, 127-143.
- *Terry JR, Juan PT, Michael TR, Fukuta Y, Wissuwa M* (2010). Genotypic variation in grain phosphorus concentration and opportunities to improve P-use efficiency in rice. *Field Crops Res.* 119, 154-160.
- *Touchet de B., Duval Y., Pannetier C.* (1991) Plant regeneration from embryogenic suspension cultures of oil palm (Elaeis guineensis Jacq. *Plant Cell Report*, 10: 529-532.
- *Wong C.K. & Bernardo R.* (2008) Genomewide selection in oil palm: increasing selection gain per unit time and cost with small populations. *Theor. Appl. Genet.*, 116, 815-824.
- *Yan XL, Wu P, Ling HQ, Xu GH, Xu FS, Zhang QF* (2006). Plant Nutriomics in China: An Overview. *Annals of Botany* 98, 473-482.
- *Yarden R.I., Brody L.C.* (1999) BRCA1 interacts with components of the histone deacetylase complex. *Proc-Natl-Acad-Sci-U-S-A,* 96(9):4983 – 8.

Message from Mr. Tan Cheng Chua (Division Head, Agricultural Products)

After serving with the company shy of 3 decades, we catch up with Mr. Tan Cheng Chua to have a little peek into his vast experience working with the company. Mr. Tan will continue to serve with the company after retirement.

***What did you do in the short period of your retirement*?** In the first few days I didn't know what to do and constantly felt edgy and often thought of the office but more importantly my colleagues. I then decided to return to the office to spend some time with them. However this did not last long and I was contended with my 'idleness' and started enjoying it.

Describe your first working experience with AAR. Since childhood, I was always keen to work in the agriculture industry, especially since my father had friends in Guthrie and I spent some time in a Guthrie plantation in Sungai Petani. I had an immediate liking to the quiet environment and the colonial manager's bungalow with its large compound of fruit trees. So it was not surprising that I joined the Multi-Purpose Management as a Cadet planter based in KSM Kahang Estate, next to Endau-Rompin, and with an aspiration for an R&D position, I joined HRU (precursor of AAR). Since then I've never looked back. I remembered that my first two days in HRU were spent at a Crop Protection conference- free food, plenty of new friends speaking the same "language". But after I came back to my new office, reality struck me when I was assigned with a lot of work on all sorts of subjects from tissue culture to agronomy to computing to studying the pollinating weevils to photography! I later learnt that at HRU a newcomer are thrown into the deep end of the pool to see if he swam or sunk. I managed to swim but swallowed a lot of water in the process!

***What are your unforgettable memories and what accomplishment in your career are you proud of*?** One of my most unforgettable experiences in AAR was the dura contamination in clones at Kampar Estate. We were shocked to find dura ramets among our DxP clones. Its impossible! The tissue culture process could not have turned teneras into duras. We were all in panic mode. Being in charge of all clonal plantings, I was asked to do a thorough census to assess the severity of the contamination. From the anxiety and physical work and the lots of constant bending and hopping over drains, I was rewarded with a backache problem that was to plague me for the rest of my career. Anyway, the late Tan Sri Lee Loy Seng was very understanding about the problem and told us to replant the 13 Ha of duras in his property without raising any fuss. We later discovered that the contamination was due to us underestimating the capabilities of the newly introduced pollinating weevils to enter our pollination bags and thus contaminated the bunch of our recreated crosses from where we obtained and subsequently cloned the seedlings which happened to be duras.

I'm proud of setting up the complete system to

I'm proud of setting up the complete system to handle ramets from the conditioning stage for newly produced tissue culture ramets, to the estate nursery and on to field planting, together with all the necessary abnormality census protocols. The conditioning system has evolved to the present system with over 90% success rate. The bare-rooted conditioned ramets can be sent anywhere by road, rail or air with minimal space requirements and weight issues. More importantly the success rates by estate nurseries now in handling such ramets are very high – for example, in PT MAP, Kalimantan Tengah, 92% of 100,000 ramets sent there are field plantable, after culling and casualties. I'm also proud of the establishment of a spear cutting technique to obtain young oil palm leaves for the tissue culture process together with Dr. Soh and our HRU pollination team. As I have been involved in our Tissue Culture programme since the first day I started work at HRU/AAR, I am proud to be part of the team that has taken the TC section to where it is today – in the forefront of world commercial production of oil palm ramets, with over 30,000 ha of our ramets planted in Malaysia and Indonesia! The other more recent achievement is to lead the tissue culture and seed production teams to more than double our production and sales of planting materials especially seeds.

What compelled you to stay with the company for such a long time? Any advice to the numerous new officers? I had good colleagues, I liked the job and I knew I could do it. Although there was much to be done the rewards were reasonable. My advice is that to make sure you like the job and have passion for it. You are not here waiting for things to happen but to make things happen. Teamwork is very important and as long as you can get along with others there shouldn't be a problem. Don't look at the clock for the right time to go back, get the job done and other things can wait, and don't give up so easily. Do not bug your fellow colleagues to do your work, get it done yourselves. Most importantly, own up to your mistake(s) because when you do so, the damage control can come in as to keep the damage or consequence of the mistake to a minimum.

Describe your working years in AAR in one sentence and how would you like to see AAR in the next 25 years? "It's a great learning experience". It is a good way to know yourself, to know your limit and what you can achieve in your life. The world is progressing exponentially. What was achieved in 100 years in the past, can possibly be achieved in 10 years now.

Be it our clonal planting materials (AA Vitroa) or our semi-clonal oil palm seeds (AA Hybrida IS), we strive and will continue to strive for perfection...high FFB yields and OER!

For further information, kindly contact Mr. Tan Cheng Chua (Division Head, Agricultural Products) or email your queries to "sales@aarsb.com.my".

AAR SOCIAL NEWS

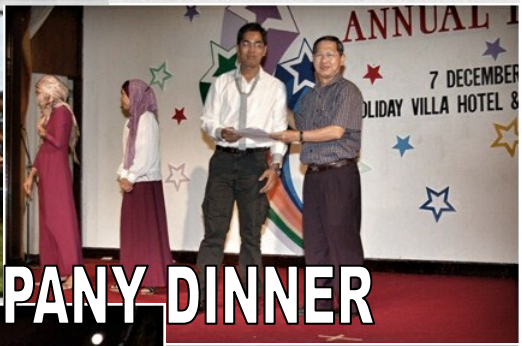
2012 AARSC HIGHLIGHTS

Last year, AAR Sport's Club was led by our youthful Mr. Muhamad Ezwan as President, aided by his Deputy, Mr. Chen Zi Yen, and fellow committee members. Together, they strived away in organizing a string of memorable events to entertain the likes of over 500 AAR employees.

Was it a daunting task one might ask? An immediate "yes" would be the response but despite the ups and DOWNS that comes with the task, they now look back with beaming smiles and a sense of pride that they were able to contribute to the welfare of AAR's employees.

The year started with the annual company trip to Redang Island (Terengganu), a 3 day 2 night stay packed with fun-filled activities which included snorkeling and beach activities. It was an absolute thrill for the likes of our staff and their family members and also being able to catch up with old friends from our various sub-stations...despite the daunting 6 hour bus journey!. Later on in the year, AARSC also organized a Sports Day at our Tissue Culture Laboratory, Tuan Mee Estate. Followed by a Family Day for our staff at AAR Paloh Sub-station.

The penultimate event of the year without a doubt was our Company Annual Dinner which took place at Holiday Villa Hotel, Subang...a night that would bring AAR employees from across the country all together. It was definitely a night to remember with the crowd entertained by our emcee's of the night (Mr. Shannon Kan and his "Gangnam" dance steps and Ms. Masni with her "Sheila Majid" soulful voice). More entertainment came from our dance troupes and musicians from the other sub-stations.



AAR SOCIAL NEWS

NEW RECRUITS (2009-Present)

Our Family continues to grow as we stride further to achieve our Vision, "*To be internationally recognized as the premier centre for research and development offering excellent products and services in tropical plantation tree crops*". To get to know a bit more of our new officers, please visit our website.

Lee Kok Yew
(Agronomist)
Joined in 2009

Gan Siou Ting
(Biotechnologist)
Joined in 2009

Chen Zi Yan
(Agronomist)
Joined in 2010

Mohd Firdaus
(Agronomist)
Joined in 2010

Aida N. Nazari
(Plant breeder)
Joined in 2010

Chin Shenyang
(Plant breeder)
Joined in 2010

Goh Yit Kheng
(Agronomist/Pathologist)
Joined in 2011

Muhamad Ezwan
(Agronomist)
Joined in 2011

Shannon Kan
(Agronomist)
Joined in 2011

Tung Hun Jiat
(Biotechnologist)
Joined in 2011

Illham A. Ahmad
(Tissue culturist)
Joined in 2011

Nur Akilla
(Tissue culturist)
Joined in 2011

Dr. Liew Yew Ann
(Agronomist)
Joined in 2011

Melody Palmen Pimon (Agronomist: Nursery/Extension)
Joined in 2011

Fatimah Mansor
(Seed Production)
Joined in 2011

Shea Chan Loong
(Agronomist)
Joined in 2011

Dr. Teo Tze Min
(Agronomist/ Entomologist)
Joined in 2012

Cheah Li Wen
(Agronomist/ Pathologist)
Joined in 2012

PT AARI SOCIAL NEWS

NEW RECRUITS (2010-Present)

Nova Tampubolon
(Admin/Human Resources Officer)
Joined in 2010

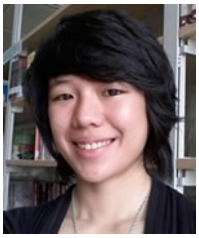
Mohamad Amarullah
(Agronomist)
Joined in 2011

Ivan Rendi Mustopa
(Plant breeder/ Agronomist)

Ramadhani Rahman Kusumah
(Agronomist)
Joined in 2011

Rama Rupama
(Agronomist)
Joined in 2010

Ofra Shinta Fitri
(Agronomist)
Joined in 2011



Puspita Demitria
(Agronomist)
Joined in 2012

AAR SOCIAL NEWS

2011-2013 PROMOTIONS

Congratulations!

Pn. Junaninah Ismail (Res. Clerk, Gr. I, 2013)
Pn. Tunku Nor Azreen (Res. Clerk, Gr. II, 2013)
Pn. Nadiah Taib (Res. Clerk, Gr. II, 2013)
Pn. Nor Afrida Mawardi (Res. Clerk, Gr. II, 2013)
Pn. Noraini Ismail (Lab. Ast., Gr. I, 2013)
En. Abdul Razak b Musa (Res. Ast., Gr. I, 2013)
En. Sakari b Musa (Res. Ast., Gr. I, 2013)
En. Mohamad Fazli b Ali (Res. Ast., Gr. I, 2013)
En. Zainuddin b Mamat (Res. Ast., Gr. II, 2013)
En. Munaswara a/l Suppiah Res. Ast., Gr. II, 2013)
En. Rajendran a/l Subramanian Res. Ast., Gr. II, 2013)
En. Mohd Rustam b Mamat Res. Ast., Gr. II, 2013)
En. Roslan b. Mohd. @ Ariffin Res. Ast., Gr. II, 2013)
En. Muhamad Zukiman b Saleh Res. Ast., Gr. II, 2013)
En. Umaran b Jackrey Res. Ast., Gr. II, 2013)
Mdm Parameswary a/p Das Res. Op., Gr. II, 2013)
En. Muganthan Rad a/l Demadu Res. Op., Gr. II, 2013)
En. Kuppusamy a/l Kumarasamy Res. Op., Gr. II, 2013)

Mr. Heng Yong Choon (Principal Research Officer, 2013)
Mr. Patrick Ng (Principal Research Officer, 2013)
Dr. Goh You Keng (Senior Research Officer, 2011)
Mr. Wong Choo Kian (Senior Research Officer, 2011)
Mr. Ng Woo Jian (Senior Research Officer, 2011)
Dr. Tasren Mahamooth (Senior Research Officer, 2013)
Pak Totok Suswanto (Senior Research Officer, 2013)
Dr. Wong Wei Chee (Research Officer, 2011)
Ms. Choo Chin Nee (Research Officer, 2011)
Ms. Soon Siao Hwei (Research Officer, 2011)
Mr. Sim Choon Cheak (Ast. Research Officer II, 2011)
Ms. Hor Mei Ling (Ast. Research Officer II, 2011)
Dr. Liew Yew Ann (Ast. Research Officer II, 2012)
Ms. Gan Siou Ting (Ast. Research Officer II, 2013)
Ms. Marianne Loong (Ast. Research Officer II, 2013)
Mr. Goh Yit Kheng (Ast. Research Officer II, 2013)
Mr. Mohd Firdaus (Ast. Research Officer I, 2011)
Mr. Lee Kok Yew (Ast. Research Officer I, 2011)
Mr. Chen Zi Yan (Ast. Research Officer I, 2011)
Mr. Sheah Chan Loong (Ast. Research Officer I, 2012)

AAR SOCIAL NEWS

At a glance:

AAR'S CHEMISTRY LAB

A strong R&D heavily relies on the quality of data produced. In the 25 years of the establishment of AAR, we have constantly maintained high standards in our Chemistry Laboratory.

AAR Chemistry Laboratory was established in 1986 when we moved from HRU to AAR. The laboratory is currently managed by Mdm. Tan Lei Hong as the Laboratory Manager, who has been with AAR since HRU days in 1974. Mdm. Petronella Gerald then joined AAR in 2000 as a chemist. Ever since then, both women have been heading the commercial and research sections respectively Our laboratory provides analytical services in leaf, soil, fertilizer and water analysis for both commercial and research/trial samples. Although our main priority is to our principals and non-principal (advisory) clients, we also provide the same services to outside clients which includes other countries from as far as Papua New Guinea, Thailand, Hong Kong and Singapore.

The laboratory is a member of the Agriculture Laboratory Association of Malaysia (AgLAM) and the Wageningen Evaluating Programs for Analytical Laboratory (WEPAL). It has also been the fertilizer coordinator for AgLAM in their proficiency testing (PT) program since its establishment in 1986 and is well known by our clients as a reliable and reputable chemistry laboratory. *We have been maintaining the highest accuracy and precision in our analysis as proven by our excellent performance records in the local PT program for leaf, soil and fertilizer in AgLAM and international PT program for leaf in WEPAL.*

Mdm Tan Lei Hong | Mdm Petronella

ANALYTICAL SERVICES FOR PLANTATIONS

AAR's Chemistry Lab offers analytical testing of **leaf, soil, fertilizer** and **water analysis**.

For further information, kindly email your queries to aarsb@aarsb.com.my (Attn: AAR Chemistry Lab) or contact Mdm. Tan Lei Hong or Mdm. Petronella through our HQ @ Selangor Science Park 1, Kota Damansara.

AAR SOCIAL NEWS

We've been around for a quarter of a century ...and we've definitely stamped our mark in the Industry

.....to be pioneers in Oil Palm R&D.

..... and we are still discovering new frontiers in Oil Palm R&D with newer tools such as Biotechnology ...along with a team of young and aspiring Researchers