New Entries to IPNI Library as References

[1] AAR, 2017, Cocoa: Fertilizer Requirements, Page 1-4.
Reference ID: 11000
Note: #11000e
Abstract: In modern cocoa cultivation, the aim is to maximize early growth and obtain high early yields and sustained peak yields subsequently. To achieve this, it is necessary to have a good understanding of the factors affecting growth and yield of cocoa and to put in the necessary management practices on time as required by the cocoa plant. An essential ingredient in most cocoa growing situations is high fertilizer input. However, the agronomy by cocoa is much more complex than with other crops eg. oil palm and there is very strong interaction between nutrition and other agronomic factors in cocoa such as shade, planting density, pests and diseases etc. To achieve high yields therefore, these factors should not be limiting

[2] B. Musa, Z. Ahmad Fairuz, M. Mohaimi, K. Harikrishna, 2016, Planting Materials: Performance in Sarawak - Sime Darby's Experience, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 69 - 79.
Reference ID: 19169
Note: #19169e
Abstract: The study focused on commercial DxP hybrids planting materials produced by Malaysian seed producers. The main objective of the study is to find out FFB yield and oil yield performance for commercial DxP hybrids of 1990s plantings, planted on different soil types (peat and mineral soils) in Sime Darby Plantation in Sarawak. The FFB yield data were collected from 1990s plantings of Sime Darby Plantations in Sarawak from 92 fields of 13 eatates. The planting densities of the fields were 136 palms per hectare or 148 palms per hectare for mineral soils and 160 palms per hectare for peat soils. Oil yield data was estimated by multiplying the mean mill oil extraction rate (OER) for the corresponding year of harvesting to the mean FFB yield of the field. Data were analysed using SAS programme, and due to unbalance data set, PROC GLM was used in the analysis procedure.
The results showed that significant differences were detected among DxP hybrids for mean FFB yield and oil yield traits. This suggested that testing of DxP hybrids is important in order to screen for the best source of planting materials to be planted in diverse and /or specific locations. Among the three planting densities, results showed that 148 palms per hectare and 136 palms per hectare contributed better FFB yield than a high density of 160 palms per hectare. A more structured planting density trial is suggested to be set up in order to determine the optimum planting densities suitable for Sarawak environment.

[3] M.K. Tang, V.N. Shylaja, N. Iswari, 2016, Zero Waste Management - Sime Darby Plantation's Experiences, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 155 - 161.
Reference ID: 23187
Note: #23187e
Abstract: Sime Darby Plantation is one of the oldest and largest palm oil producers in the world. Its pioneering spirit and inventiveness has led to many breakthroughs and

palm oil industry firsts, setting the standard in agricultural and operational best practices. Today, it is also an industry leader in promoting sustainable plantation practices worldwide, being the world's largest certified sustainable palm oil producer. In addition to being a leader in sustainable palm oil production, Sime Darby Plantation also has a heavy focus on climate change. One of the key areas focused by the company is researching the impact of climate change, which serves as a fundamental roadmap towards achieving zero waste management. This paper presents the milestones that Sime Darby Plantation has achieved in its sustainability journey, as well as its commitment towards achieving zero waste management in the palm oil industry.

[4] IPNI, 2017, Fun With The Plant Nutrient Team, Book1, Grade K, 1, IPNI.
Reference ID: 23201
Note: S 39 #23201

[5] IPNI, 2017, Fun With The Plant Nutrient Team - Book 2, Grade 2, 3, IPNI.
Reference ID: 23202
Note: S 39 #23202

[6] M. Barman, P. Dey, B.S. Dwivedi, A.N. Ganeshamurthy, P. Jha, A.K. Maji, M.C. Meena, H.R. Raghupathi, R. Santhi, P. Sen, R. Sharma, K.K. Singh, A.S. Rao, B. Sudhanand, H.L.S. Tandon, M. Velayutham, 2014, Soil Testing for Balanced Fertilisation, Fertiliser Development and Consultation Organisation (FDCO).
Reference ID: 23203
Note: S 21.6 #23203
Abstract: This is the 55th practical and reference book published by FDCO on various aspects of plant nutrients, fertilizers, organics, biofertilisers, crop nutrition through integrated nutrient management (INM), chemical analyses and technologies from promoting balanced and efficient nutrient use. These books have been very well received around the world. This book is a continuation of our efforts in providing technically sound and easily understandable account of scientific management of fertilizers and related inputs for pratical use by various stake holders (content details of FDCO books can be viewed in www.tandontech.net).

[7] H.L.S. Tandon, 2008, Human factor in soil and fertiliser development, New Delhi, FDCO.
Reference ID: 23204
Note: S 1.8 #23204

[8] C & CI, 2016, C&CI: Coffee and Cocoa International January 2016, Coffee & Cocoa International, 42, Page 1-50. C & CI.
Reference ID: 23205
Note: S serial #23205

[9] H.L.S. Tandon, 2002, Dictionary of Secondary & Micronutrients, New Delhi, India, Issue,Page Fertiliser Development & Consultation Organisation (FDCO).
Reference ID: 23206
Note: S 2.8.3 #23206
Abstract: Our active interest in publishing and disseminating practical research-based information on plant nutrients started about two decades ago. In the area of secondary and micronutrients, this interest included 3 editions of "Sulphur Research &

Agricultural Production in India", two editions of Sulphur Fertlisers for India Agriculture", two editions of "Secondary & Micronutrient in Agriculture", two editions of "Micronutrients in soils, crops and fertilisers", the multi-author volume on "Micronutrient Research & Agriculture Production" and the "Fertliser Quality Guide for Major and Micronutrients", among others (list on back cover).

[10] H.L.S. Tandon, K.N. Tiwari, 2008, Nutrient management in Horticultural crops, New Delhi, India, FDCO.
Reference ID: 23207
Note: S 1.8 #23207
Abstract: This is the 42nd book on soil, fertiliser and integrated crop nutrition published by FDCO. This guidebook was first published in 1987. Due to the excellent response from readers, it was reprinted in 1988. In 1991, its 2nd edition appeared which was reprinted in 1995, 1997 and again in 2000. Now before you is the 3rd revised and enlarged edition to meet the readers' demand.

[11] O. Erenstein, B. Gerard, P.Tittonell, 2015, Biomass use trade-offs in cereal cropping systems in the developing world: Overview, Agricultural Systems, 134, Page 1-5.
Reference ID: 23208
Note: H 8.2.1.3 #23208e
Abstract: Agricultural systems variously produce food, feed, fiber, fuel, and environment goods. The relative emphasis varies over space and time - associated inter alia to inter-related developments in demand, technology and policy. Cereal cropping systems in the developing worls traditionally emphasize food production with residual agricultural biomass (or crop residues) as an important by-product. Crop residues often have multiple uses such as live-stock feed, household fuel source, soil amendment, construction and/or marketed for cash income.A number of trade-offs exist between these biomass uses, often reinforced by emerging drivers such as demographic pressure, increasing demand for livestock products and the development of fodder markets. In addition, there are recent developments, such as the increasing advocacy of conservation agriculture practices. Conservation agriculture calls for the retention of substantial crop residues as mulch in the field, thereby often competing with prevailing uses such as animal feed and/or conflicting with established crop management practices. There is also increasing advocacy for second generation biofuels (ethanol production from hemi-cellulosic material) - albeit that for now these are unlikely to have substantial short term implications for most smallholders across large swathes of the developing world as biofuel use is primarily limited to traditional biofuel uses and mainly informal and small scale.

[12] X. Xu, P. He, F. Yang, J. Ma, M.F. Pampolino, A.M. Johnston, W. Zhou, 2017, Methodology of fertilizer recommendation based on yield response and agronomic efficiency for rice in China, Field Crop Research, 206, Page 33-42.
Reference ID: 23209
Note: #23209e
Abstract: A science-based, reliable, and cost-effective fertilizer recommendation method is needed to solve problems of low nutrient use efficiency and yield brought about by inappropriate fertilization practices inrice (*Oryza sativa* L.). We collated results from 2218 on-farm experiments conducted between 2000 and 2013 in major rice-producing regions of China to establish scientific principles and develop a methodology that would support fertilizer recommendations for rice. The study

analyzed the relationships among yield response, agronomic efficiency (AE), relative yield (the ratio of the yield without N or P or K to theyield of the full NPK), and soil indigenous nutrient supply. On average, yield responses to nitrogen (N), phosphorus (P), and potassium (K) fertilizer applications were 2.4, 0.9, and 1.0 t ha^{-1}, and the AE of N, P,and K application were 13.0, 12.7, and 8.4 kg kg^{-1}, respectively. Relative yield was used to classify the soilindigenous nutrient supply; average relative yields related to N, P, and K were 0.71, 0.89, and 0.89, respectively. A significant negative linear correlation was observed between yield response and relative yield,and a significant quadratic relationship was seen between yield response and AE. These findings allowedus to build the Nutrient Expert (NE) for Rice decision support system. With continuous optimization ofthe NE system in each cropping season, results confirmed the effectiveness of this method in improvingrice yields and profits. Compared with farmers' practices (FP), NE significantly increased grain yield inearly, middle, and late rice and increased gross profit in middle and late rice during the third year (2015) of field validation. In addition, with NE, there was greater improvement in the recovery efficiency of N (REN) in early, middle, and late rice and the AE of N and partial factor productivity of N (PFPN) in middlerice as compared with FP and soil testing (ST). Results of this study showed good agreement betweensimulated and observed AE of N application, indicating that NE is a promising nutrient decision supporttool that can be used in China.

[13] H.L.S. Tandon, 2008, Fertilisers - Their composition, characteristics, quality, transformations & applications, New Delhi, India, FDCO.
Reference ID: 23210
Note: S 1.8 #23210
Abstract: Why another bokk on fertilisers? Because fertilisers need to be better known, understood, appreciated and made use of the main sources of essential plant nutrients to soils and crops. Fertlisers as carriers of plant nutrients contain nothing which is not already a natural part of soils and vegetation. They simply give additional nutrient support in a practical and acceptable way to soils which have low nutrient reserves to meet the increasing needs of a growing human and animal population.

[14] L.M.M. Tijskens, 2004, Acta Horticulturae 604 - International Conference on Quality in Chains. An Integrated View on Fruit and Vegetable Quality, ISHS.
Reference ID: 23211
Note: S (CD-ROM) #23211

[15] Y.H. Chan, D.H.K. Lim, 1984, Clonal Cocoa Work on BAL Plantations, Page 45-60. Incorporated Society of Planters.
Reference ID: 23212
Note: #23212e > S 8.1.4 #151
Abstract: Two aspects of clonal cocoa work were carried out by BAL. The first concerned the choice of vegetative propagation methods while the second dealt with the selection and evaluation of elite clones.

[16] C. Mizota, 1977, Phosphate fixation by ando soils different in their clay mineral composition, Soil Science and Plant Nutrition, 23, Page 311-318. Taylor & Francis
Reference ID: 23213
Note: #23213e
Abstract: The phosphate fixation capacity at pH 4.5 and an equilibrium concentration of 250 mM phosphate was measured. The soil samples were divided into five groups

according to their clay mineralogical composition. The first group soils contain opaline silica and allophanelike constituents, and some unidentified minerals, the second opaline silici\ and crystalline layer .i1icates, the third opaline silica and crystalline layer silicates with additional allophanelike constituents or aluminarich gel-like materials, the fourth allophanelike constituents, allophane and imogolite and the fifth crystalline layer silicates, allophanelike constituents and alumina-rich gel-like materials, plus some halloysite-like minerals, respectively. The first group soils had phosphate fixation capacities of 3,000 to 8,000, the second group soils 1,000 to 3,000, the third group loib 2,000 to 13,000, the fourth group soils 8,000 to 15,000 and the fifth group soil. 5,000 to 12,000 mg P2O5/100 g oven-dry soil, respectively. The fourth group loils in which allophane and imogolite predominated showed the highest phosphate fixation capacity. The fractions which dissolved from almost all soil samples by treatments with 6% H2O3, Na2S2O4,-NaHCO3-Na citrate and 2% Na2CO3, were estimated to have very high phosphate fixation capacities (8,000 to 19,000 mg P2O5/100 g dry-matter), and there was not much difference among the loil samples examined. Iron and aluminum combined with humus, allophanelike constituents, alumina-rich gel-like materials and halloysite-like minerals in addition to allophane and imogolite contribute to the phosphate fixation of Ando soils.

[17] MPOB, 2016, Prosiding Persidangan Kebangsaan Pekebun Kecial Sawit, Hotel Kinta Riverfront, Ipoh, Perak, Page 1-204.
Reference ID: 23214
Note: S 8.1.1 #23214

[18] A.R.S. Gomes, T.T. Kozlowski, 1987, Effects of temperature on growth and water relations of cacao (*Theobroma cacao* var. Comum) seedlings, Plant & Soil, 103, Page 3-11.
Reference ID: 23215
Note: #23215e
Abstract: Growth of 55-day-old Theobroma cacao var. Comum seedlings varied with temperature regimes, various plant parts, growth parameters, and time of harvesting. Over a 60-day period the optimal day-temperature regimes were near 33.3°C for dry weight increase and relative growth rates of seedlings and leaves; 30.5°C for increase in leaf area, height growth, and leaf abscission; 22.2°C for dry weight increase of stems or roots, stem diameter growth, and root-shoot ratio. The rates of increase in dry weights of stems or roots as well as root-shoot ratios declined progressively at temperatures above 22.2°C Partitioning of dry matter was affected by temperature regime, with proportionally more photosynthate retained by shoots and less translocated to roots at high temperatures. The progressive decrease in the root-shoot ratio at temperatures above 22.2°C may decrease drought tolerance of seedlings because roots will be less capable of absorbing enough water to replace transpirational losses. This was shown by more negative shoot water potentials at high temperatures.

[19] M.K. Mandal, S. Dutta, K. Majumdar, T. Satyanarayana, M. Pampolino, V. Govil, A.M. Johnston, G.C. Shrotriya, 2015, Enhancing Rice Yield, Profitability, and Phosphorus Use Efficiency in West Bengal using the Nutrient Expert® Fertilizer Decision Support Tool, Better Crops - South Asia, 4, Page 12-14. IPNI
Reference ID: 23216
Note: #23216e
Abstract: Nutrient Expert®-based fertilizer recommendation helped increase rice

productivity and P use efficiency over farmers' fertilization practice.

[20] L. Armengot, P. Barbieri, C. Andres, J. Milz, M. Schneider, 2016, Cacao agroforestry systems have higher return on labor compared to full-sun monocultures, Agron. Sustain. Dev, 36, Page 1-10.
Reference ID: 23217
Note: #23217e
Abstract: The global demand for cacao has recently increased. To meet this demand, the cultivated area has been expanded in tropical forest areas and production has intensified by replacing traditional agroforestry systems with monocultures. This has led to a loss of biodiversity in cacao growing areas. More sustainable production systems such as agroforestry and organic managed systems are expected to yield less cacao, but by-crops and premium prices, respectively, might economically compensate for the lower yields. Here, we compared the productivity and the return on labor, that is the return per working day, of four different cacao production systems: agroforestry and monocultures under organic and conventional management. Cacao and by-crop yields, costs, revenues, and labor were registered during the first 5 years after establishment. Results show that cacao yields were, on average, 41% higher in monocultures, but the revenues derived from agroforestry by-crops economically over compensated for this difference. Indeed, the return on labor across the years was roughly twice as high in the agroforestry systems compared to the monocultures. We found similar cacao yields and return on labor in conventional and organically managed agroforestry systems. However, in the monocultures, cacao yields were 48% lower under organic compared with conventional farming, but the return on labor was similar, mainly due to the higher costs associated to the conventional management. Overall, our findings show that cacao agroforestry systems have higher return on labor.

[21] R. Borchert, 1973, Simulation of Rhythmic Tree Growth under constant conditions, Physiologia Plantarum, 29, Page 173-180.
Reference ID: 23218
Note: H 16 #23218e
Abstract: The observed rhythmic growth of trees under relatively uniform environmental conditions has been ascribed by some authors to endogenous factors, by others to slight fluctuations of envovironmental factors. A model for the simulation of rhythmic growth was developed based on the assumption that endogenous rhythms can result from feedback interaction between two potentially continuous provesses, like shoot and root growth, if the slower process is rate limiting for the faster one. Rhythmic growth in trees would be the consequence of feedback mechanisms needed for maintaining a constant shoot: root ratio. Period length of the rhythms depends upon the rates of the growth processes involved. Environmental factors modify period lengths through affecting growth rates. Growth patterns predicted by the model compare well with growth measurements of tropical trees. The transition from intermittent to continous growth, as observed under certain conditions, can be simulated by varying a single parameter in the model.

[22] A. Keil, N. Teufel, D. Gunawan, C. Leemhuis, 2009, Vulnerability of smallholder farmers to ENSO-related drought in Indonesia, Climate Research, 38, Page 155-169.
Reference ID: 23219
Note: H 26.1.3 #23219e
Abstract: Crop production in Southeast Asia is subject to considerable climate

variability caused by the El Niño–Southern Oscillation phenomenon. El Niño causes comparatively dry conditions leading to substantial declines in crop yields, with severe consequences for the welfare of local farm households. Using an interdisciplinary modelling approach that combines regression analysis with linear programming (LP) and stochastic simulation, and integrates climatic and hydrologic modelling results, the objective of the present study is to assess the impact of El Niño on agricultural incomes of smallholder farmers in Central Sulawesi, Indonesia, and to derive suitable crop management strategies to mitigate income reductions. We identify 5 farm classes by cluster analysis. Our LP model maximises their cash balance at the end of the time period most severely affected by El Niño. Main activities are the cultivation of rice, maize and cocoa. Accounting for water supply, external Cobb-Douglas production functions generate output according to level of production intensity and predicted weather patterns. Stochastic simulation accounts for variations in crop yields due to factors not captured by the production functions. Iterative model runs produce probability distributions of the model outcomes for each household class, whereby the downside risk of failing to achieve a specified minimum level of income is particularly policy relevant. The results illustrate that drought-related crop management recommendations must be tailored to farm households according to their location, farming system and resource endowment. Furthermore, our findings demonstrate the importance of policy measures aimed at an *ex post* alleviation of drought impacts.

[23] A. Keil, M. Zeller, A. Wida, B. Sanim, R. Birner, 2008, What determines farmers' resilience towards ENSO-related drought? An empirical assessment in Central Sulawesi, Indonesia, Climatic Change, 86, Page 291-307.
Reference ID: 23220
Note: H 26.1.3 #23220e
Abstract: Crop production in the tropics is subject to considerable climate variability caused by the El Niño-Southern Oscillation (ENSO) phenomenon that is likely to become even more pronounced during the twenty-first century. Little is known about the impact of ENSO-related drought on crop yields and food security, especially at the household level. This paper seeks to contribute to closing this knowledge gap with a case study from Central Sulawesi, Indonesia. Its main objective is to measure household resilience towards drought periods and to identify its influencing factors to deduce policy implications. Using indicators for consumption expenditures, we construct an index measuring household drought resilience; we then apply an asset-based livelihood framework to identify its determinants. Most of the drought-affected farm households are forced to substantially reduce expenditures for food and other basic necessities. Households' drought resilience is strengthened by the possession of liquid assets, access to credit, and the level of technical efficiency in agricultural production. The results suggest a number of policy recommendations, namely improvement of the farmers' access to ENSO forecasts, the provision of credit and savings products to facilitate consumption smoothing, and the intensification of agricultural extension in view of low levels of productivity found in agricultural production.

[24] R. Asare, R.A. Asare, W.A. Asante, B. Markussen, A. Raebild, 2016, Influences of Shading and Fertilization on On-farm Yields of Cocoa in Ghana, Experimental Agriculture, Page 1-16.
Reference ID: 23221
Note: H 8.1.4 #23221e
Abstract: Most cocoa farms in Ghana are cultivated in complex agroforest systems,

with plant growth and cocoa productivity being affected. The objective of this study was to investigate how shade trees affect cocoa yield, temperature and soil nutrients in low-input cocoa systems. Establishing plots on 24 farms in four locations (districts) in Ghana, we assessed the influence of varying canopy cover and fertilization on cocoa yields. Results showed no relationship between canopy cover and cocoa yields in the light crop season (February to August). For the main crop season (September to January), there was an interaction between shade and yields: Yields were higher on no-shade plots than on shaded plots in two districts, whilst there were no differences at the two other districts possibly due to differences in precipitation and soil nutrient status. On the other hand, there was a positive effect of increased canopy cover on yields within the shaded plots. Soil nutrient analyses revealed no significant differences between shaded and no-shade plots and adequate levels of N, K+, Fe2+, Cu2+ and Zn2+ were recorded. However, soil contents of P, C, Mg2+ and Ca2+ were below recommended values. Peak temperatures recorded in the cocoa canopies were above the recommended range for this species. Although shade trees had a slight modifying effect on peak temperatures, the magnitude appeared too small to have any practical effects.

[25] F.C. Zaia, A.C. Gama-Rodrigues, E.F. Gama-Rodrigues, M.K.S. Moco, A.G. Fontes, R.C.R. Machado, V.C. Baligar, 2012, Carbon, nitrogen, organic phosphorus, microbial biomass and N mineralization in soils under cacao agroforestry systems in Bahia, Brazil, Agroforestry Systems, 86, Page 197-212.
Reference ID: 23222
Note: #23222e
Abstract: Large amounts of plant litter deposited in cacao agroforestry systems play a key role in nutrient cycling. Organic matter, nitrogen and phosphorus cycling and microbial biomass were investigated in cacao agroforestry systems on Latosols and Cambisols in Bahia, Brazil. The objective of this study was to characterize the microbial C and N, mineralizable N and organic P in two soil orders under three types of cacao agroforestry systems and an adjacent natural forest in Bahia, Brazil and also to evaluate the relationship between P fractions, microbial biomass and mineralized N with other soil attributes. Overall, the average stocks of organic C, total N and total organic P across all systems for 0-50 cm soil depth were 89,072, 8,838 and 790 kg ha-1, respectively. At this soil depth the average stock of labile organic P was 55.5 kg ha-1. For 0-10 cm soil depth, there were large amounts of microbial biomass C (mean of 286 kg ha-1), microbial biomass N (mean of 168 kg ha-1) and mineralizable N (mean of 79 kg ha-1). Organic P (total and labile) was negatively related to organic C, reflecting that the dynamics of organic P in these cacao agroforestry systems are not directly associated with organic C dynamics in soils, in contrast to the dynamics of N. Furthermore, the amounts of soil microbial biomass, mineralizable N, and organic P could be relevant for cacao nutrition, considering the low amount of N and P exported in cacao seeds.

[26] S. Legros, I. Mialet-Serra, A. Clement-Vidal, J.-P. Caliman, F.A. Siregar, D. Fabre, M. Dingkuhn, 2009, Role of transitory carbon reserves during adjustment to climate variability and source-sink imbalances in oil palm *(Elaeis guineensis*), Tree Physiology, 29, Page 1199-1211.
Reference ID: 23223
Note: #23223e
Abstract: Oil palm (*Elaeis guineensis* Jacq.) is a perennial, tropical, monocotyledonous plant characterized by simple architecture and low phenotypic plasticity, but marked

by long development cycles of individual phytomers (a pair of one leaf and one inflorescence at its axil). Environmental effects on vegetative or reproductive sinks occur with various time lags depending on the process affected, causing source-sink imbalances. This study investigated how the two instantaneous sources of carbon assimilates, CO2 assimilation and mobilization of transitory non-structural carbohydrate (NSC) reserves, may buffer such imbalances. An experiment was conducted in Indonesia during a 22-month period (from July 2006 to May 2008) at two contrasting locations (Kandista and Batu Mulia) using two treatments (control and complete fruit pruning treatment) in Kandista. Measurements included leaf gas exchange, dynamics of NSC reserves and dynamics of structural aboveground vegetative growth (SVG) and reproductive growth. Drought was estimated from a simulated fraction of transpirable soil water. The main sources of variation in source-sink relationships were (i) short-term reductions in lightsaturated leaf CO2 assimilation rate (Amax) during seasonal drought periods, particularly in Batu Mulia; (ii) rapid responses of SVG rate to drought; and (iii) marked lag periods between 16 and 29 months of environmental effects on the development of reproductive sinks. The resulting source-sink imbalances were buffered by fluctuations in NSC reserves in the stem, which mainly consisted of glucose and starch. Starch was the main buffer for sink variations, whereas glucose dynamics remained unexplained. Even under strong sink limitation, no negative feedback on Amax was observed. In conclusion, the different lag periods for environmental effects on assimilate sources and sinks in oil palm are mainly buffered by NSC accumulation in the stem, which can attain 50% (dw:dw) in stem tops. The resulting dynamics of growth and production are complex because several dozen phytomers of different phenological ages develop at any given time and interact with a common pool of reserves.

[27] P.S. Chew, K.K. Kee, K.J. Goh, G. Singh, K.H. Lim, L. Teo, K.W.E. Chan. 2009, Cultural Practices and Their Impact, Sustainable Production of Palm Oil - A Malaysian Perspective, Kuala Lumpur, Page 163-197. Malaysian Palm Oil Association.
Reference ID: 23224
Note: #23224e > S 8.1.1 #20106 (chapter 7)
Abstract: In Malaysia, the oil palm is a perennial tree crop planted extensively as a monoculture. Although largely in plantations (59%) and Government and State Schemes (30%), a significant area (11%) is held by independent smallholders. The plantations and Government schemes have organised management systems with professional managers and specialist advisors. The plantation sector is now cultivating its third or fourth successive cycle of oil palm in the oldest plantations whilst many plantings are in their first generation of palms.

[28] E.A. dos Santos, A.-A.F. de Almeida, D. Ahnert, M.C. de Silva Branco, R.R. Valle, V.C. Baligar, 2016, Diallel Analysis and Growth Parameters as Selection Tools for Drought Tolerance in Young Theobroma cacao Plants, Plos One, Page 1-22.
Reference ID: 23225
Note: #23225e
Abstract: This study aimed to estimate the combining ability, of T. cacao genotypes preselected for drought tolerance through diallel crosses. The experiment was conducted under greenhouse conditions at the Cacao Research Center (CEPEC), Ilhéus, Bahia, Brazil, in a completely randomized block design, in an experimental arrangement 21 x 2 [21 complete diallel crosses and two water regimes (control and stressed)]. In the control, soil moisture was kept close to field capacity, with predawn leaf water potential (ØWL) ranging from -0.1 to -0.5 MPa. In the drought regime, the

soil moisture was reduced gradually by decreasing the amount of water application until ØWL reached -2.0 to -2.5 MPa. Significant differences ($p < 0.05$) were observed for most morphological attributes analyzed regarding progenies, water regime and their interactions. The results of the joint diallel analysis revealed significant effects between general combining ability (GCA) x water regimes and between specific combining ability (SCA) x water regimes. The SCA 6 genetic material showed high general combining ability for growth variables regardless of the water regime. In general, the water deficit influenced the production of biomass in most of the evaluated T. cacao crosses, except for SCA-6 x IMC-67, Catongo x SCA, MOC-01 x Catongo, Catongo x IMC-67 and RB-40 x Catongo. Multivariate analysis showed that stem diameter (CD), total leaf area (TLA), leaf dry biomass (LDB), stem dry biomass (SDB), root dry biomass (RDB), total dry biomass (TDB), root length (RL), root volume (RV), root diameter (RD) <1 mm and 1 <(RD) <2 mm were the most important growth parameters in the separation of T. cacao genotypes in to tolerant and intolerant to soil water deficit.

[29] S. Asseng, B.T. Kassie, M.H. Labra, C. Amador, D.F. Calderini, 2016, Simulating the impact of source-sink manipulations in wheat, Field Crops Research.
Reference ID: 23226
Note: #23226e
Abstract: Grain yields in wheat can be limited by the assimilate supply (source) or by the carbohydrate demand of the grains (sink). Recently, there have been questions regarding the capability of crop models to simulate the physiology of source-sink interactions in crops; however, crop models have never been tested with source-sink manipulated data. We tested the Nwheat model with detailed measured field experimental data with treatments of manipulated source (i.e., assimilate supply), sink (i.e., kernel number), and their combinations. In general, the model could reproduce observed effects of shading before and after anthesis as well as the additional impact of halving the spikes. A 90% shading during grain filling reduced individual grain weights drastically, with the remaining yield mostly determined by carbohydrate remobilisation, which the model reproduced. The model also reproduced the decline of biomass accumulation due to shading, but was not sensitive enough to simulate the observed reduction of kernels per m2 from a 90% reduction in solar radiation between booting and the beginning of grain filling, resulting in an overestimated grain yield. The model reproduced the positive impact of a 7% genetically increased radiation use efficiency (RUE) on growth and yield. A sensitivity analysis indicated that the yield response to increased RUE can vary among environments. The yield impact can be positive in many environments, but negative in terminal drought environments. In these environments, stimulated early growth from higher RUE can cause accelerated water deficit during grain filling and reduced yields.
The model adequately simulated source-sink interactions of most of the treatments, but there were obvious shortcomings in simulating kernel set and final grain size. Improving these will be critical for estimating crop-environmental interactions that affect assimilate supply, including breeding, industrialisation-induced or geo-engineered solar dimming, genetically and atmospheric CO2-related increased RUE, and source manipulations, such as pest and disease impacts.

[30] J.D. Langston, R.A. Riggs, Y. Sururi, T. Sunderland, M. Munawir, 2017, Estate Crops More Attractive than Community Forests in West Kalimantan, Indonesia, Land, 6, Page 1-14.
Reference ID: 23227
Note: #23227e
Abstract: Smallholder farmers and indigenous communities must cope with the opportunities and threats presented by rapidly spreading estate crops in the frontier of the agricultural market economy. Smallholder communities are subject to considerable speculation by outsiders, yet large-scale agriculture presents tradeoffs that they must navigate. We initiated a study in Sintang, West Kalimantan in 2012 and have returned annually for the last four years, building the baselines for a longer-term landscape approach to reconciling conservation and development tradeoffs in situ. Here, the stakeholders are heterogeneous, yet the land cover of the landscape is on a trajectory towards homogenous mono-cropping systems, primarily either palm oil or rubber. In one village on the frontier of the agricultural market economy, natural forests remain managed by the indigenous and local community but economics further intrude on forest use decisions. Conservation values are declining and the future of the forest is uncertain. As such, the community is ultimately attracted to more economically attractive uses of the land for local development oil palm or rubber mono-crop farms. We identify poverty as a threat to community-managed conservation success in the face of economic pressures to convert forest to intensive agriculture. We provide evidence that lucrative alternatives will challenge community managed forests when prosperity seems achievable. To alleviate this trend, we identify formalized traditional management and landscape governance solutions to nurture a more sustainable landscape transition.

[31] Anonymous, 2017, InfoSawit Vol XI No 2 FEB 2017, Info SAWIT, 11, Page 1-54. Palma Serasih Group.
Reference ID: 23228
Note: #23228e

[32] D.R. Kanter, M.-H. Schwoob, W.E. Baethgen, J.E. Bervejillo, M. Carriquiry, A. Dobermann, B. Ferraro, B. Lanfranco, M. Mondelli, C. Penengo, R. Saldias, M.E. Silva, J.M.S. de Lima, 2016, Translating the Sustainable Development Goals into action: A participatory backcasting approach for developing national agricultural transformation pathways, Global Food Security, 10, Page 71-79. Elsevier.
Reference ID: 23229
Note: #23229e
Abstract: A new set of objectives for sustainable development are now in place, known as the Sustainable Development Goals (SDGs),and countries need to develop concrete policy road maps to achieve them.This is particularly challenging in the agricultural sector given the heterogeneity of local conditions,the diffuse nature of its environmental impacts, and the important interactions with various aspects of sustainable development - from education and poverty alleviation, to human health and the environment. And yet it is precisely because of these interactions that vibrant, resilient and sustainable national agricultural sectors are key to the SDGs success. This paper presents a practical back casting approach and methodological toolkit - developed by the Agricultural Transformation Pathways (ATP) initiative under the auspices of the Sustainable Development Solutions Network (SDSN) - for countries to develop policy road maps towards 2030 using local tool sand expertise that could help transform national agricultural sectors in a way that is consistent with the SDGs.This

approach is illustrated using the Uruguayan beef sector as a case study, where productivity and environmental targets were developed in tandem with a wide range of stakeholders in order to maximize productivity, while minimizing a suite of environmental impacts from carbon foot print and biodiversity, to nitrogen losses. This marks the beginning of a new approach to achieving the SDGs in the agricultural sector:participatory target setting and pathway development across a number of areas crucial to sustainable development all under a harmonized framework provided by the ATP initiative.We hope the methodological approach and results of the Uruguay case study will become a touch stone for future work in this area.

[33] B. Pallas, A. Clement-Vidal, M.C. Rebolledo, J.C. Soulie, D. Luquet, 2013, Using plant growth modeling to analyze C source-sink relations under drought : inter and intraspecific comparison, Frontiers in Plant Science, 4, Page 1-13.
Reference ID: 23230
Note: #23230e
Abstract: The ability to assimilate C and allocate non-structura lcarbohydrates (NSCs) to the most appropriate organs is crucial to maximize plant ecological or agronomic performance. Such C source and sink activities are differentially affected by environmental constraints. Under drought, plant growth is generally more sink than source limited as organ expansion or appearance rate is earlier and stronger affected than C assimilation. This favors plant survival and recovery but not always agronomic performance as NSC are stored rather than used for growth due to a modified metabolism in source and sink leaves. Such interactions between plant Cand water balance are complex and plant modeling can help analyzing the irimpact on plant phenotype. This paper addresses the impact of trade-offs between C sink and source activities and plant production under drought, combining experimental and modeling approaches. Two contrasted monocotyledonous species (rice, oil palm) were studied. Experimentally, the sink limitation of plant growth under moderate drought was confirmed as well as the modifications in NSC metabolism in source and sink organs. Under severe stress, when C source became limiting, plant NSC concentration decreased. Two plant models dedicated to oil palm and rice morphogenesis were used to perform as ensitivity analysis and further explore how to optimize C sink and source drought sensitivity to maximize plant growth. Modeling results highlighted that optimal drought sensitivity depends both on drought type and species and that modeling is a great opportunity to analyze such complex processes. Further modeling needs and more generally the challenge of using models to support complex trait breeding are discussed.

[34] E. Mensah, B. Mensah-Brako, W.A. Agyare, F. Padi, 2013, Water Application Rate Effect on Growth Performance of Hybrid Cocoa Seedlings in the Semi-deciduous Forest Zone of Ghana, International Journal of Engineering Research & Technology (IJERT), 2, Page 1-12.
Reference ID: 23231
Note: #23231e
Abstract: An experiment was conducted to determine the effectiveness of different watering application rates on leaf minerals and physical growth parameters of cocoa seedlings in the nursery. The treatments were arranged in a completely randomized design (CRD) with three replications. Results showed that watering regime I (0.06 l/pot) recorded low values in both macronutrients and micronutrients and also in physical growth parameters as compared to watering regimes II (0.18 l/pot) and watering regime III (0.36 l/pot) and were below the recommended values. The study

showed that water application rate, watering regimes II (0.18 l/pot) and watering regime III (0.36 l/pot) were the most effective treatments in improving cocoa seedlings height, leaf area, plant stem girth, leaf number and tap - root length than watering regime I (0.06 l/pot). The study also revealed that application of 0.18 l/pot and 0.36 l/pot on hybrid cocoa seedlings gave a higher calcium, magnesium, potassium, phosphorous, nitrogen, iron, zinc, copper, manganese concentration in the leaves than the water application rate of 0.06 l/pot. The study indicating that hybrid cocoa seedlings required between 0.18 l/pot and 0.36 l/pot in the first five months in the nursery in semi-deciduous forest zone of Ghana in the absence of rain.

[35] W. Zhang, G. Cao, X. Li, H. Zhang, C. Wang, Q. Liu, X. Chen, Z. Cui, J. Shen, R. Jiang, G. Mi, Y. Miao, F. Zhang, Z. Dou, 2016, Closing yield gaps in China by empowering smallholder farmers, Page 671-687.
Reference ID: 23232
Note: H 18 #23232e
Abstract: Sustainably feeding the world's growing population is a challenge1-3, and closing yield gaps (that is, differences between farmers' yields and what are attainable for a given region) 4-6 is a vital strategy to address this challenge 3, 4, 7. The magnitude of yield gaps is particularly large in developing countries where smallholder farming dominates the agricultural landscape 4, 7. Many factors and constraints interact to limit yields 3-6, 8-10, and progress in problemsolving to bring about changes at the ground level is rare. Here we present an innovative approach for enabling smallholders to achieve yield and economic gains sustainably via the Science and Technology Backyard (STB) platform. STB involves agricultural scientists living in villages among farmers, advancing participatory innovation and technology transfer, and garnering public and private support. We identified multifaceted yield-limiting factors involving agronomic, infrastructural, and socioeconomic conditions. When these limitations and farmers' concerns were addressed, the farmers adopted recommended management practices, thereby improving production outcomes. In one region in China, the five-year average yield increased from 67.9% of the attainable level to 97.0% among 71 leading farmers, and from 62.8% to 79.6% countywide (93,074 households); this was accompanied by resource and economic benefits.

[36] F. Aneani, K. Ofori-Frimpong, 2013, An analysis of Yield gap and some factors of cacao (*Theobroma cacao*) yields in Ghana, Sustainable Agriculture Research, 2, Page 117-127. Canadian Center of Science & Education.
Reference ID: 23233
Note: H 8.1.4.1 #23233e
Abstract: Although cocoa productivity has recently been increasing in Ghana, it is still low compared with that of other countries such as Cote d'Ivoire and Malaysia. This situation has been attributed to the low adoption of cocoa production technologies. The study was aimed at analysing the yield gap as well as some cocoa yield factors. Cross-sectional socio-economic survey was conducted in six (6) cocoa growing districts: Nkawie, Goaso, Enchi, Oda, Twifo Praso/Assin Fosu and Hohoe. A structured questionnaire was employed in the collection of data from 300 respondents who were randomly chosen with multi-stage cluster sampling technique. The yield gaps and their proportion to yield potentials were estimated using data from the survey and on-station trials. The findings indicated an experimental yield gap of 1 553.4 kg ha-1, accounting for 82.1% of the experimental yield potential whereas farmer-based yield gap was 1 537.2 kg ha-1, also accounting for 82.0% of the farmer (survey) yield potential. The Ordinary Least Square (OLS) regression analysis indicated that

frequency of spraying fungicides against black pod disease, spraying insecticides against capsids, weeding of cocoa farms, cocoa variety planted by farmer, area of cocoa farm and total cocoa production variables had a significant impact on cocoa yield. It is recommended that the Government should encourage cocoa farmers, through pragmatic measures, to adopt improved technologies for enhancing productivity instead of focusing on excessive land expansion which eventually leads to low productivity.

[37] R. DeFries, J. Fanzo, R. Remans, C. Palm, S. Wood, T.L. Anderman, 2015, Metrics for land-scare agriculture : Nutrient content must be better integrated into planning, Global Nutrition, 349, Page 238-240.
Reference ID: 23234
Note: H 19.4 #23234
Abstract: Over the past half-century, the paradigm for agricultural development has been to maximize yields through intensifying production, particularly for cereal crops (1). Increasing production of high-yielding cereals—wheat, rice, and maize—has replaced more nutrient-rich cereals, which has eroded the content of essential dietary nutrients in the world's cereal supply. New approaches are needed to produce healthy foods, rich in essential nutrients, with efficient use of land. Standard yield metrics that measure the quantity of production are inadequate to assess progress toward this goal; thus, we propose alternative metrics of nutritional yields.

[38] I. Abdullah, S. Subali, 1986, Evaluation of clonal materials in Mardi Hilir Perak & Mardi Jerangau, Page 61-76.
Reference ID: 23235
Note: #23235e > S 8.1.4 #151
Abstract: The earliest clonal trials established in 1972 were the clonal trials at Site B ans Site C, at MARDI Jerangau. 5 clones have been released as new varieties from the two trials. These clones were 1C, 9C, 46B and 53B and are named as Klon Koko MARDI (KKM) 1,2,5,6 & 7 respectively.

[39] K.H. Lim, C.Y. Ho, B.J. Wood, 1986, Irrigation of Cocoa on Coastal soils in Peninsular Malaysia, Page 117-132.
Reference ID: 23236
Note: #23236e > S 8.1.4 #151
Abstract: The high average annual rainfall >2000mm in Peninsular Malaysia is enevenly distributed in most years. Coupled with the high evapotranspiration and loss by surface runoff, this mean that moisture deficits, especially in top soil, occur quite often. Since cocoa is essentially a surface feeder, and is highly susceptible to moisture stress, investigations were carried out on some methods of irrigation as potential means for improving cocoa yields, both in quantity and quality.

[40] D.H.K. Lim, Y.H. Chan, 1986, Some aspects on spacing and thinning in cocoa, Page 187-204.
Reference ID: 23237
Note: #23237e > S 8.1.4 #151
Abstract: This paper reports the results from 2 experiments on spacing and thinning of cocoa. Close spacing of single stem plants with and without thinning, single versus multiple stem plants at lower densities and various methods of thinning hybrid cocoa planted at high density were investigated.

[41] P. Bhattacharyya, H.L.S. Tandon, 2012, Biofertiliser Handbook - Research, Production, Application, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23238
Note: S 21 #23238
Abstract: This is the 50th book on plant nutrients, biofertilisers, organics, fertilizers, crop nutrition and related subjects to be published by FDCO begining with 1984 and sixth book related to biofertilisers including a dictionary and a sourcebook-cum directory published earlier this year. This handbook provides a research-based, partically useful account of all major biofertilisers from production to practical application. The various aspects which are fully reflected in the table of contents are: Biofertilisers- their classification, characteristics, crop specificity, advantage and limitations; impact of biofertilisers on crops, soils and economics; biofertiliser production technology; packing, labelling, handling and storage of biofertilisers; biofertilisers production consumption; biofertiliser promotion and marketing; biofertiliser application and practical recommendations; biofertiliser quality standards and methods of analysis; R&D efforts and resources; references and additional reading material; and finally , a multiple-choice test paper to test a person's biofertiliser knowledge (self test).

[42] M.J. Bahaudin, S.K. Syed Wazir, S. Omar, 1986, Influence of timing & frequency of pruning on yield of hybrid cocoa, Page 221-227.
Reference ID: 23239
Note: #23239e > S 8.1.4 #151
Abstract: There are several advantages in carrying out pruning on cocoa. Besides maintaining the shape of the developing tree, pruning also ensures easy access to the trees for spraying and harvesting. It also helps in controlling pests and disease. Ultimately, higher yields and optimum return from the trees could be expected. To reap all these benefits, it is important to determine, among others, when is the best time or period in the year to carry out this operation. Apart from knowing the appropriate time of pruning, it is also important to determine how frequent should pruning be carried out.

[43] H.L.S. Tandon, 2011, Soil Fertility - Fertilisers & INM: A dictionary beyond definations, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23240
Note: S 21 #23240
Abstract: Close to 50 practical and reference books have been published since 1984, when the Fertiliser Development and Consultation Organisation (FDCO) was started. These have found a very broad-based readership in a large number of countries and their success have been the greatest source of encouragement for us. These publications have tried to break the narrow circle of scientists writing by and large only for their own fraternity in technical journals. Why can't science by enjoyed?

[44] H.L.S. Tandon, 2011, Sulphur in Soils, Crops & Fertiliser, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23241
Note: S 25.5 #23241
Abstract: This is the 48th practical and reference bookpublished by FDCO an various aspects of plant nutrients, fertilizers and integrated nutrients management. Several of

these books went into 2-3 editions or major revisions and were very well received around the world. This book is a continuation of our efforts in providing technically sound and easily understandable synthesis of scientific information on plant nutrient sulphur (S) for practical use by various stake holders.

[45] H.L.S. Tandon, 2001, Organic Recycling & Biofertilisation in South Asia, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23242
Note: S 21 #23242
Abstract: This is the 32nd handbook in the FDCO's series of reference and practical publications on various aspects of mineral, organic and biofertilisers; nutrition of food grains, other field crops and commercial crops through major and micronutrients from diverse source; analytical methods, non-traditional sectors of fertiliser use and volumes on individual nutrients.

[46] H.L.S. Tandon, 1996, Nitrogen Research and Crop Production, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23243
Note: S 25.1 #23243
Abstract: This is the 30th book on soil, crop, fertiliser and integrated nutrient management published by Fertliser Development and Consultation Organisation (FDCO). These include both reference books and practical guidebooks. The present volume on nitrogen, essentially follows earlier volumes on sulphur, phosphorus and potassium but has the input of manay more people than earlier ones.

[47] H.L.S. Tandon, 2013, Methods of Analysis of soils, plants, waters, fertilisers & organic manures, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23244
Note: S 3.3 #23244
Abstract: This is the 40th book in the FDCO series of publications on soil, crop, fertiliser and other component of integrated nutrient management. This revised and enlarged 2nd edition deals primarily with the methods pf analysis and interpretation of the data obtained for practical application.

[48] M.C. Manna, A.S. Rao, A. Sahu, U.B. Singh, 2012, Compost Handbook - Research, Production, Application, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23245
Note: S 25.11 #23245
Abstract: Composting is a biological conversion of heterogeneous organic substrate, under controlled conditions, into a hygienic, humus-rich, relatively biostable product which improves soil health and nourishes the crops. During this fascinating process, a diverse group of microorganisms transforms decomposable materials into compost and turn out a value added farm input which not only nourishes the soils and the crops but provides an eco-friendly and renewable avenue for the recycling of various types of resources, often denigrated as "wastes". Through the application of modern technologies and microbial inputs, the process of composting can be accelerated, thus significantly reducing the time required for obtaining good quality compost from six months to 2.5 - 3 months.

[49] H.L.S. Tandon, 2012, Fertliser Management - Balance, Efficiency, Profitability, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23246
Note: S 21 #23246
Abstract: This is the 52st practical and reference book published by Fertliser Development and Consultation Organisation (FDCO) on various aspects of plant nutrients, fertilizers, organics, biofertilisers, and crop nutrition through integrated nutrient management (INM). These books have been very well received around the world. This book is a continuation of our efforts in providing technically sound and easily understandable account of scientific fertilizer management for practical use by various stake holders (content details of FDCO books can be viewed in www.tandontech.net)

[50] H.L.S. Tandon, 2004, Fertilizers in Indian Agriculture - From 20th to 21st century, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23247
Note: S 21 #23247
Abstract: This is the 38th book in the series of practical and rference books on fertilizers and other sources of plant nutrients for agriculture/horticulture published by FDCO. A great deal of development have taken place since 1990 when we published the volume "Fertilizer in Indian Agriculture", -past, present and future. Hence the need for revisiting the Indian fertilizer sector - the world's third largest.

[51] K.K. Bandyopadhyay, R. Bhattacharyya, B. Chakrabarti, B. Gangwar, V.S. Jakkula, S.V. Kaore, 2014, Soil Health Management - Productivity, sustainability, resource management, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23248
Note: S 8.1.1.8 #23248
Abstract: This is the 53rd practical and reference book published by Fertliser Development and Consultation Organisation (FDCO) on various aspects of plant nutrients, fertilizers, organics, biofertilisers, crop nutrition through integrated nutrient management (INM) and soil health aspects. These books have been very well received around the world. This book is a continuation of our efforts in providing technically sound and easily understandable account of scientific fertilizer management for practical use by various stake holders (content details of FDCO books can be viewed in www.tandontech.net)

[52] Y. Ahenkorah, G.S. Akrofi, 1968, Amazon Cacao (*Theobroma cacao L.*) Shade and Manurial Experiment (K2-01) at the Cocoa Research Institute of Ghana. I. First Five Years, Agronomy Journal, 60, Page 591-594.
Reference ID: 23249
Note: H 8.1.4 #23249e
Abstract: The experimental layout, initial crop husbandry, preliminary girth measurements and yield results before and after the imposition of 2 years' shade and fertilizer treatments on the Amazon cacao Shade and Manurial Experiment (K2-01) at Tafo are reported.
In assessing the uniformity of the 4-year-old cacao stand analyses of data on girth measurements gave C.V. of 10.26% and 12.86% for subplot and main plots, respectively. These are remarkably lower and highly satisfactory compared with the C.V. of 57.75% for the corresponding yield.

Statistical evaluation of variations between NPK fertilizer, block, cropping seasons, and shade effect is reported. The significant slope effect during the minor crop season was interpreted to be only a seasonal reflection of the probable variation in the available soil moisture. The shade effect of this experiment is compared with a similar and older experiment (Kl) at Tafo. The significant shade effect during the 1964/65 season in both cases varies with time of the year irrespective of the different shade trees.
Shade, K, and PK fertilizer effects are highly significant with the deshaded cacao yielding almost twice as the plots under heavy shade whilst the fertilizer is about 10% greater. "No shade" with PK treatment has the uniformly highest yield followed by the "medium shade" with PK and the least being "heavy shade" with PK fertilizer. Shade effect is well marked during the main cropping season while that of K is pronounced without overhead shade.
There is a suggestion of rapid depletion of exchangeable K after 7 years of continuous cropping. The Amazon cacao on the WACRI series does not respond to the NPK fertilizer until it is over 5 years old.

[53] H.L.S. Tandon, 2011, Biofertilisers and Organic Fertilisers, New Delhi, India, Fertliser Development and Consultation Organisation (FDCO).
Reference ID: 23250
Note: S 21 #23250
Abstract: This is the 49th book on plant nutrients, organics, biofertilisers, fertilizers, crop production and related subjects to be published by FDCO begining with 1984. We had first compiled and published a techno commercial source book on organic fertilizers in 1999. This was probably the only book of its kind. It was very well received and had to be reprinted in 2003. It has been out of print for a while.

[54] A.K. Din, H.A. Bakar, W. Omar, Z.A. Manaf, R.Z. Raja Omar, 2016, Transformasi Industri Sawit Sektor Pekebun Kecil: Memperkasakan Peranan, memperjuangkan harapan, Page 6-17. MPOB.
Reference ID: 23251
Note: #23251 > S 8.1.1 #23214
Abstract: Penglibatan pekebun kecil persendirian sangat signifikan dalam pembangunan industri sawit di Malaysia. Walau bagaimanapun, pencapaian kumpulan sasaran ini bagaimanapun pada masa ini didapati masih rendah dan memerlukan lebih bimbingan dan banyak sokongan. Isu-isu seperti tanaman tidak productif, luas kebun yang kecil, kekurangan modal, tidak mempraktikkan amalan pertanian baik, dan lain lain bagi mengurangkan keupayaan mereka untuk memainkan peranan penting dalam pembangunan industri sawit negara. Kumpulan ini perlu ditransformasikan bagi meningkatkan keupayaan dan productiviti mereka agar seiring dengan sektor perladangan dalam meningkatkan productiviti sawit negara, Semua pihak termasuklah Kerajaan, sektor swasta, badan bukan kerajaan atau pekebun kecil itu sendiri perli memberi sepenuh komitmen masing-masing dalam memastikan usaha transformasi yang dirancang ini berjaya.

[55] I.A. Seman, M.M.M. Mohd, R. Moslim, N. Kamarudin, 2016, Teknologi baru kawalan perosak dan penyakit sawit- ulat bangkus, kumbang badak dan Ganoderma, Page 19-37. MPOB.
Reference ID: 23252
Note: #23252 > S 8.1.1 #23214
Abstract: Pokok sawit (*Elaeis guineensis* Jacq) merupakan tanaman komoditi utama

di Malaysia dan beberapa negara lain di mana ianya menghasilkan minyak sawit mentah dan minyak isirong sawit. Tanaman sawit adalah mudah terdedah kepada risiko ancaman pelbagai jenis perosak terutamanya serangga dan penyakit yang disebabkan oleh kulat yang boleh menyebabkan kerugian yang serius pada negara pengeluar sawit. Di Malaysia, beberapa jenis perosak utama yang menyerang tanaman sawit telah dikenalpasti, termasuklah ulat bungkus, ulat beluncas, ulat tandan, kumbang badak dan anai-anai. Di antara perosak tersebut, serangga ulat bungkus dan kumbang badak lebih banyak dilaporkan menyerang tanaman sawit. Sementara reput pangkal batang (RPB) atau Ganoderma merupakan penyakit utaman yang menyerang tanaman sait (Idris, 2010). Serangan serangga perosak ulat bungkud, kumbang badak dan penyakit Ganoderma ini boleh menyebabkan kemusnahan yang terus ke atas tanaman sawit dan menjejaskan pengeluaran hasil sawit jika tiada kawalan dijalankan.

[56] A.A. Murdi, Z. Hashim, Z.H.A.Z.A. Nur, H. Othman, A.F. Ismail, I.F. Kadir, N. Kamarudin, 2016, Teknologi baja seimbang untuk Tanaman sawit, Page 38-47. MPOB.
Reference ID: 23253
Note: #23253 > S 8.1.1 #23214
Abstract: Industri perladangan kelapa sawit telah berkembang dengan pesat sehingga menjadikan tanaman ini sebagai tanaman komodity yang utaman di Malaysia. Melalui program NKEA, kerajaan menyasarkan purata pengeluaran hasil sawit negara sehingga 26 tan/hektar/tahun. Pembajaan merupakan salah satu faktor yang boleh meningkatkan hasil sawit. Pembekalan nitrien melalui pembajaan diperlukan untuk menampung nutrien tanah supaya tanaman sawit mendapat nutrien yang mencukupi, seimbang dan berterusan sepanjang tahun. Nutrien yang dibekalkan melalui pembajaan akan meningkatkan hasil secara maksima, penggunaan baja yang mengandungi nutrien seimbang dengan jumlah yang optimum akan menjimatkan kos dan mengurangkan pembaziran input. Ini kerana kos bahan dan upah menbaja sawit adalah tinggi iaitu di antara 50-65% daripada keseluruhan kos penyelenggaraan sawit matang.

[57] O.R.Z. Raja, M.Z.R.M. Rodi, J.C. Hollis, K.A. Tohiran, N. Khasim, W. Omar, 2016, Integrasi sawit dengan lada hitam dan kambing, Page 48-67. MPOB.
Reference ID: 23254
Note: #23254 > S 8.1.1 #23214
Abstract: Kawasan tanaman sawit pekebun kecil persendirian di Malaysia berjumlah 889,697 hektar dengan bilangan pekebun kecil yang berdaftar seramai 223,257 orang. Purata luas kebun sawit yang dimiliki ialah 3.9 hektar sahaja. Dengan keluasan ini, purata pendapatan bersih bulanan pekebun kecil sawit persendirian berjumlah RM1,175 sahaja. Jumlah pendapatan bersih ini maih terlalu rendah daripada sasaran pendapatan yang telah ditetapkan iaitu sebanyak RM4,000 sebulan. Isu ini lebih kritikal bagi pekebun kecil yang memiliki saiz kebun yang kecil. Di mana lebih 50% daripada pekebun kecil sawit persendirian memiliki purata luas kebun kurang daripada 2.5 hektar. Pelbagai inisiatif telah diperkenalkan oleh kerajaan yang bertujuan untuk meningkatkan pendapatan pekebun kecil sawit persendirian. Salah satu daripadanya ialah kerajaan menggalakkan pekebun kecil sawit persendirian.

[58] K.A. Tohiran, N. Khasim, M.Z.R.M. Rodi, J.C. Hollis, R.Z. Raja Omar, 2016, Integrasi Tanaman dan Ternakan: Peluang dan Cabaran, Page 68-85. MPOB.
Reference ID: 23255
Note: #23255 > S 8.1.1 #23214
Abstract: Aktiviti integrasi tanaman dan ternakan menyediakan pelbagai peluang untuk dimanfaatkan, namun beberapa cabaran juga mesti diketahui sebelum seseorang itu menceburinya. Dalam masa yang sama, tidak dapat dinafikan lagi ia adalah sebahagian penyelesaian bagi meningkatkan pendapatan pekebun kecil sawit khususnya milik persendirian. Terdapat pelbagai sumber sedia ada yang seharusnya dimanfaatkan oleh golongan ini bagi meningkatkan taraf hidup mereka.

[59] T. Oberthür, 2016, Plantation Intelligence: Management Processes for Planters.
Reference ID: 23256
Note: #23256e
Presented at 2nd C/PAL Palm Congress, 22-24 August 2016 Santo Domingo del Cerro, La Antigua, Guatemala

[60] C.S. Snyder, T.W. Bruulsema, 2007, Nutrient Use Efficiency and Effectiveness in North America: Indices of Agronomic and Environmental Benefit, IPNI, Page 1-4.
Reference ID: 23257
Note: #23257e
Abstract: MINERAL FERTILIZERS have made it possible to sustain the world's growing population, sparing millions of acres of natural and ecologically-sensitive systems that otherwise would have been converted to agriculture1. Today, economic and environmental challenges are driving increased interest in nutrient use efficiency. Higher prices for both crops and fertilizers have heightened interest in efficiency-improving technologies and practices that also improve productivity. In addition, nutrient losses that harm air and water quality can be reduced by improving use efficiencies of nutrients, particularly for nitrogen (N) and phosphorus (P).
The world's population, growing in both numbers and purchasing power, is projected to consume more food, feed, fiber, and fuel-increasing global demand for fertilizer nutrients2. Since fertilizers are made from non-renewable resources, pressure to increase their use efficiencies will continue. At the same time, efforts should increase to enhance fertilizer use effectiveness for improved productivity and profitability of cropping systems.

[61] P.C. Rosand, M.B.M. Santana, C.J.L. de Santana, D.L. Plucknett, H.B.E. Sprague. 1989, Cacao, Detecting Mineral Nutrient Deficiencies in Tropical and Temperate Crops. (Westview Tropical Agriculture Series No 7), Colorado, Page 409-425. Westview Press.
Reference ID: 23258
Note: H 8.1.4.1 #23258e > S 2.5 #936
Abstract: Cacao has higher mineral nutrient requirements than other tropical perennial crops that are able to grow in poor acid soils. When considering cacao nutritional requirements, it is also necessary to take into account genetic characters and the environmental conditions in which the tree is growing, especially regarding the degree of shade. Generally, Amazon varieties are more nutrient demanding than Amelonado varieties. Cacao without shade also demands higher amounds of nutrients than shaded trees.

[62] J. Tek, 2017, Know Our Past, Understand Our Present, Shape Our Future: MEOA Presentation Commemorating 100 Years of Oil Palm in Malaysia (1917-2017), Malaysia.
Reference ID: 23259
Note: #23259e
Abstract: 100 Years of Oil Palm in Malaysia by Tek, J. of MEOA presented 25 March 2017

[63] IFA, WFO, GACSA, 2016, Nutrient Management Handbook.
Reference ID: 23260
Note: #23260e

[64] L. Chuan, 2017, Use of Phosphogypsum in Agriculture in China, Page 1-32.
Reference ID: 23261
Note: #23261e

[65] C. Lefevre, F. Rekik, V. Aloantara, L. Wiese, 2017, Soil Organic Carbon: the hidden potential, Rome, FAO of UN.
Reference ID: 23262
Note: #23262e
Abstract: In the presence of climate change, land degradation and biodiversity loss, soils have become one of the most vulnerable resources in the world. Soils are a major carbon reservoir containing more carbon than the atmosphere and terrestrial vegetation combined. Soil organic carbon (SOC) is dynamic, however, and anthropogenic impacts on soil can turn it into either a net sink or a net source of GHGs. Enormous scientific progress has been achieved in understanding and explaining SOC dynamics. Yet, protection and monitoring of SOC stocks at national and global levels still face complicated challenges impeding effective on-the-ground policy design and regionally adapted implementation.
After carbon enters the soil in the form of organic material from soil fauna and flora, it can persist in the soil for decades, centuries or even millennia. Eventually, SOC can be lost as CO2 or CH4 emitted back into the atmosphere, eroded soil material, or dissolved organic carbon washed into rivers and oceans. The dynamics of these processes highlight the importance of quantifying global carbon fluxes to ensure maximum benefits of SOC to human well-being, food production, and water and climate regulation.
SOC is the main component of soil organic matter (SOM). As an indicator for soil health, SOC is important for its contributions to food production, mitigation and adaptation to climate change, and the achievement of the Sustainable Development Goals (SDGs). A high SOM content provides nutrients to plants and improves water availability, both of which enhance soil fertility and ultimately improve food productivity. Moreover, SOC improves soil structural stability by promoting aggregate formation which, together with porosity, ensure sufficient aeration and water infiltration to support plant growth. With an optimal amount of SOC, the water filtration capacity of soils further supports the supply of clean water. Through accelerated SOC mineralization, soils can be a substantial source of greenhouse gas (GHG) emissions into the atmosphere. Although the overall impact of climate change on SOC stocks is very variable according to the region and soil type, rising temperatures and increased frequency of extreme events are likely to lead to increased SOC losses.
Globally, SOC stocks are estimated at an average of 1 500 PgC in the first meter of soil, although their distribution is spatially and temporally variable. SOC hot-spots and

bright spots, which are respectively areas of high SOC content (e.g. peatlands or black soils) and large surface areas of low SOC content (e.g. drylands) constitute major zones of concern. With climate change and unsustainable management, these areas are likely to become net sources of GHG emissions. However, if managed wisely, they have the potential to sequester large amounts of carbon in their soils, thus contributing to climate change mitigation and adaptation.

[66] Fedepalma, 2015, La Palma De Aceite, Una Agroindustria Eficiente, Sostenible Y Mundial Mente Competitiva PALMAS: Memorias de la XVIII Conferencia Internacional sobre Palma de Aceite Tomo I, Page 1-296. Fedepalma.
Reference ID: 23263
Note: #23263e

[67] Fedepalma, 2015, La Palma De Aceite, Una Agroindustria Eficiente, Sostenible Y Mundial Mente Competitiva PALMAS: Memorias de la XVIII Conferencia Internacional sobre Palma de Aceite Tomo II, Issue,Page 1-362. Fedepalma.
Reference ID: 23264
Note: #23264e

[68] B. Musa, Z. Ahmad Fairuz, M. Mohaimi, K. Harikrishna, 2016, Planting Materials: Performance in Sarawak- Sime Darby's Experience, The Planter, 92, Page 897-908, ISP, Kuala Lumpur.
Reference ID: 23265
Note: #23265e > S serial #23383
(Reproduced from the 12th ISP National Seminar 2016 Book, Factors Impacting the Competitiveness of the Palm Oil Industry)
Abstract: The study focused on commercial DxP hybrids planting meterials produced by Malaysian seed producers. The main objective of the study is to find out FFB yield and oil yield performance for commercial DxP hybrids of 1990s plantings, planted at different soil types (peat and mineral soils) in Sime Darby Plantation in Sarawak. The FFB yield data were collected from 1990s plnatings of Sime Darby Plantations in Sarawak from 92 fields of 13 estates. The planting densities of the fields were 136 palms per hectare or 148 palms per hectare for mineral soils and 160 palms per hectare for peat soils. Oil yield data were estimated by multiplying the mean mill oil extraction rate (OER) for the corresponding year of harvesting to the mean FFB yield of the field. Data were analysed using SAS programme, and due to the unbalance data set, PROC GLM was used in the analysis procedure.

[69] S.M. Ishak, Z.A. Manaf, N.C. Jaafar, H.M. Taib, K.M. Salleh, M.A. Khomeini, N.H. Mansor, N.H. Basaruddin, N. Dahari, H. Desa, R. Rasuddin, Z. Aman, 2016, Kajian Awal outcome EPP1 - Tanam semula dan tanam baru sawit pekebun kecil, Page 86-97. MPOB.
Reference ID: 23266
Note: #23266 > S 8.1.1 #23214
Abstract: Skim Tanam Semula Sawit Pekebun Kecil (TSSPK) dan Tanam Baru Sawit Pekebun Kecil (TBSPK) telah dilancarkan pada tahun 2011 di bawah RMKe-10. Ia merupakan Entry Point Project 1 (EPP1) Key Economic Area (NKEA) komoditi sawit. Melalui program ini, pekebun kecil persendirian dibekalkan dengan anak benih berkualiti, baja untuk peringkat awal penanaman, bahan kimia untuk kawalan rumpai dan perosak serta insentif tunai untuk penyediaan kawasan dan menanam sawit. Pekebun kecil juga diberi khidmat nasihat mengenai penanaman dan pengurusan

tanamen sawit oleh pegawai pengembangan MPOB. Satu kajian telah dijalankan untuk mendapatkan meklumat asas dan menilai kesan awal perlaksanaan EPP1. Hasil kajian mendapati purata umur peserta skim adalah 59 tahun.

[70] A.H. Awang, K. Hashim, Z. Ramli, N. Lyndon, S.P. Tan, M.A. Johari, I. Ibrahim, N.H. Basaruddin, M.H.A. Hamid, I. Yusof, F.U. Muhamad Azian, N.H. Mansor, W. Omar, H.A. Bakar, 2016, Impak pemindahan teknologi oleh pusat TUNAS terhadap producktiviti pekebun kecil persendirian sawit di Teluk Intan, Perak, Page 98-109. MPOB.
Reference ID: 23267
Note: #23267 > S 8.1.1 #23214
Abstract: Industri sawit yang dimajukan sejak empat dekad lalu telah menjadi penyumbang utama sektor pertanian dan kesejahteraan rakyat negara. Pelbagai usaha telah dilaksanakan bagi memastikan hasrat ini dapat dicapai. Sebagai langkah untuk meningkatkan penjanaan pendapatan eksport negara, maka producktiviti pekebun kecil sawit persendirian perlu ditingkatkan. Justeru itu, pekebun kecil sawit perlu mengubah amalan pertanian mereka kepada yang lebih produktif dan berpendapatan tinggi melalui teknologi terkini yang telah dihasilkan. Maka TUNAS diberi tanggungjawab untuk menerapkan kaedah amalan pertanian terbaik kepada pekebun kecial sawit. Kajian ini bertujuan untuk menilai sejauh mana aktiviti yang dilaksanakan oleh Pusat TUNAS berupaya memindahkan teknologi dan menberikan impak kepada produktiviti pekebun kecil sawit dengan menggunakan borang kaji selidik.

[71] S.H.A.S. Fadzil, 2016, Kemudahan pembiayaan agrobank kepada usahawan sawit, Page 110-116. MPOB.
Reference ID: 23268
Note: #23268 > S 8.1.1 #23214
Abstract: Agrobank adalah sebuah Institusi Kewangan Pembangunan yang terlibat secara khusus dalam sektor pertanian sejak tahun 1969. Daripada sebuah Badan Berkanun kerajaan Agrobank telah berubah menjadi sebuah syarikat kewangan yang dimiliki sepenuhnya oleh Kementerian Kewangan berkuat kuasa diri 1hb April 2008. Sungguhpun begitu Agrobank masih terus menjalankan fungsi yang telah dimandatkan sepertimana digariskan di bawah Akta Bank Pertanian Malaysia Behad.

[72] S.M. Sum, Z. Ramli, R. Ramly, N. Lyndon, R.A.C. Rose, S. Selvadurai, N.H. Mansor, N.C. Jaafar, Z. Aman, M.K.A. Isnin, 2016, Sumbangan koperasi terhadap pembangunan komuniti pekebun kecil sawit: Kajian kes koperasi penanam sawit mampan (KPSM) Daerah Temerloh, Pahang dan Saratok, Sarawak, Page 117-133. MPOB.
Reference ID: 23269
Note: #23269 > S 8.1.1 #23214
Abstract: Koperasi adalah merupakan sebuah model alternatif yang dilihat mampu memenuhi keperluan komuniti setempat dan berperanan bagi membantu meningkatkan pembangunan komuniti. Kajian ini bertujuan untuk menilai sumbangan pembangunan organisai koperasi terhadap pembangunan komuniti pekebun kecil di Malaysia. Borang soal selidik telah diedarkan sebagai instrumen kajian dan analisa deskriptif telah dijalankan merangkumi analisis min, kekerapan, peratusan dan sisihan piawai. Seramai 40 ahli Koperasi Penanam Sawit Mampan (KPSM) Daerah Temerloh dan 46 shli KPSM Saratok Sarawk telah terlibat sebagai responden dalam kajian ini. Hsial kajian mendapati, KPSM telah menyumbang kepada elemen pembangunan

komuniti petani merangkumi peningkatan pendapatan dan taraf hidup, pasaran hasil tanaman, akses kepada input perladangan, peningkatan kemahiran melalui pendidikan, pemantauan aktiviti pertanian komuniti, penyediaan peluang pekerjaan, peningkatan hubungan pekebun kecil, serta kemudahan pengurusan aktiviti pertanian.

[73] R.A. Hamid, M.M. Sahri, 2016, Peluang keusahawanan dalam bidang pembuatan makanan berasaskan sawit, Page 134-143. MPOB.
Reference ID: 23270
Note: #23270 > S 8.1.1
Abstract: Pengguanaan minyak sawit dalam formulasi makanan dan minuman di Malaysia amat memberangsangkan. Malah sebahagian daripada produck-produck ini telahpun diekspot. Di samping itu, kelebihan pemakanan minyak sawit dengan kehadiran fitonutrient semulajadi seperti tokotrienol atau vitamin E dan karotena sawit harus ditekankan. Pengkomersilan produk-produk makanan yang diperkaya dengan fitonutrient sawit harus diketengahkan.

[74] H.A. Kadir, 2016, Peranan RISDA dalam aktiviti keusahawanan pekebun kecil, Page 144-154. MPOB.
Reference ID: 23271
Note: #23271 > S 8.1.1 #23214
Abstract: Tahun 2016 merupakan tahun bermulanya Rancangan Malaysia ke 11 (RMKe-11) dan Kerajaan melalui Kementerian Kemajuan Luar Bandar dan Wilayah serta RISDA terus komited untuk mensejahtera dan meningkatkan pendapatan masyarakat pekebun kecil melalui aktiviti-aktiviti keusahawanan.

[75] M.K.A. Isnin, K. Hashim, Z. Mohd, A. Azimat, 2016, Peladang Jaya sawit: Model pekebun kecil, Page 155-162. MPOB.
Reference ID: 23272
Note: #23272 > S 8.1.1 #23214
Abstract: Peladang Jaya Sawit merupakan satu pendekatan yang digunakan oleh MPOB untuk memberi dorongan dan inspirasi kepada pekebun kecil sawit persendirian di Malaysia sebagai satu pengiktirafan kepada mereka yang membuktikan pengeluaran hasil BTS yang tinggi serta aktiviti lain yang berjaya. Beberapa kriteria dilihat semasa penilaian bagi membolehkan pekebun kecil tersebut diiktiraf sebagai peladang jaya.

[76] M.K.A. Isnin, N.C. Jaafar, Z. Aman, 2016, KPSM Daerah Bera: Kejayaan dan cabaran masa kini, Page 163-168. MPOB.
Reference ID: 23273
Note: #23273 > S 8.1.1 #23214
Abstract: Koperasi penanam sawit mampan di tubuhkan dengan tujuan untuk membantu menyelesaikan masalah pekebun kecil sawit persendirian dan memudahkan pemindahan teknologi sawit. Sehingga 2015, sebanyak 30 KPSM telah ditubuhkan seluruh Malaysia dan salah satunya adalah KPSM Daerah Bera. Fokus kajian ini adalah untuk mengenal pasti faktor kejayaan ahli-ahli KPSM Daerah Bera dalam menangani masalah yang mereka hadapi dan bagaimana KPSM dapat membantu mereka meningkatkan pendapatan yang lebih tinggi melalui jualan BTS dan peniagaan baja serta peningkatan hasil BTS mereka.

[77] S.A. Wahab, M.A.K.A. Rahman, 2016, Model integrasi ternakan, skim bantuan kerajaan: Koperasi peserta Kundang Ulu, Johor, Page 169-175. MPOB.
Reference ID: 23274
Note: #23274 > S 8.1.1 #23214
Abstract: Sumber Jabatan Perkhidmatan Veterinar (JPV) pada tahun 2015 menunjukkan jumlah ternakan lembu di Malaysia adalah sebanyak 760,997 ekor yang hanya menghasilkan 52,202 m/tan daging sahaja. Angka yang ditunjukkan adalah sangat rendah berbanding permintaan negara keseluruhan pada tahun yang sama adalah sebanyak 210,166 m/tan. Ini menunjukkan pengeluaran sedia ada tidak dapat menampung permintaan yang semakin hari semakin meningkat terutama apabila musim perayaan.

[78] M.F.A. Aziz, A. Kuntom, N.A.N. Ibrahim, 2016, Perlaksanaan Skim Pensijilan Minyak Mampan Malaysia (MSPO) untuk pekebun kecil persendirian di Malaysia, Page 176-180. MPOB.
Reference ID: 23275
Note: #23275 > S 8.1.1 #23214
Abstract: Pekebun kecil adalah individu yang mengusahakan kebun sawit yang berkeluasan tidak melebihi 40.46 hektar atau 100 ekar. Pekebun kecil terbahagi kepeda dua kategori iaitu pekebun kecil persendirian dan pekebun kecil terancang. Sehingga akhir tahun 2015, seramai 220,023 orang pekebun kecil persendirian dengan keluasan bertanam berjumlah 876,252.10 hektar atau 16% daripada jumlah keluasan keseluruhan yang bertanam dengan sawit di Malaysia iaitu 5.64 juta hektar telah direkodkan.

[79] S. Bahrain, 2016, Potensi Ujian DNA sawit bagi meningkatkan produktiviti pekebun kecil, Page 181-187. MPOB.
Reference ID: 23276
Note: #23276 > S 8.1.1 #23214
Abstract: Sawit mempunyai tiga bentuk buah demula jadi iaitu dura, pisifera dan tenera. Tiga bentuk buah ini yang mempunyai hasil minyak berbeza-beza bergantung kepada kehadiran dan ketebalan tempurung. Setiap bentuk buah berbeza sawit mempunyai ciri-ciri yang berbeza dari segi ketebalan tempurung, mesokarpa ke buah, isirung ke buah dan minyak ke tandan.

[80] Z. Shawal, N.H. Muhammad, 2016, Kepentingan Mutu BKS dalam Industri Sawit, Page 188-193. MPOB.
Reference ID: 23277
Note: #23277 > S 8.1.1 #23214
Abstract: Industri kelapa sawit Malaysia berkembang pesat dalam tempoh 15 tahun dengan pertambahan 67% keluasan tanaman sawit daripada 3.38 juta pada tahun 2000 kepada 5.64 juta hektar pada tahun 2015. Penghasilan buah kelapa sawit (BKS) di sepanjang tempoh yang sama juga menunjukkan peningkatan yang ketara iaitu di sekitar 17 tan hingga 20 tan per hektar dengan kadar perahan minyak (OER) DI SEKITAR 18.86% - 20.62%.

[81] A. Hassan, 2016, Peranan PKPKM dalam merancakkan pembangunan ekonomi oekebun kecil sawit Malaysia, Page 194-195. MPOB.
Reference ID: 23278
Note: #23278 > S 8.1.1 #23214
Abstract: Kemampanan (sustainability) sektor pekebun kecil kelapa sawit (PKKS)

adalah sangat asing bagi pekebun kecil Malaysia. Bermula dengan Roundtable Sustainable Palm Oil (RSPO) dan terkini Malaysian Sustainable Palm Oil (MSPO) penglibatan pekebun kecil (PK) adalah minimum dengan bantuan syarikat korporat sawit yang menyediakan PK dengan pensijilan kilang memproses buah sawit. RSPO lebih kepada memenuhi syarat-syarat permintaan minyak sawit mentah (MSM). Pengenalan MSPO adalah titik tolak kepada penekanan kerajaan kepada penawaran buah sawit. Justeru, rantaian pengeluaran sawit, termasuk dari PK di gerak ke arah pensijilan MSPO dan, dengan secara tidak langsung memenuhi kehendak RSPO. Isu utama pensijilan MSPO adalah pengetahuan tentangnya. Walaupun RSPO telah rancak dibincangkan di kalangan pengeluar MSM, PK tidak nampak keuntungan dalam penglibatannya.

[82] A. Ismail, A. Hassan, K. Hashim, N.H. Mansor, N. Suhani, N. Balu, 2016, Peningkatan produktiviti dan pendapatan melalui pengurusan kebun secara efisien, Page 196-203. MPOB.
Reference ID: 23279
Note: #23279 > S 8.1.1 #23214
Abstract: Sektor pekebun kecil terdiri daripada dua iaitu pekebun kecil terselia dan pekebun kecil persendirian. Pekebun kecil terselia terdiri daripada pekebun kecil di bawah kerajaan persekutuan seperti Lembaga Kemajuan Tanah Persekutuan (FELDA), Lembaga Penyatuan dan Pemulihan Tanah Persekutuan (FELCRA), Pihak Berkuasa Kemajuan Pekebun Kecil Perusahaan Getah (RISDA), kerajaan negeri dan agensi kerajaan. Bagi sektor pekebun kecil persendirian, sumbangannya kepada pendapatan eksport negara telah menunjukkan peningkatan yang signifikan.

[83] IPNI, 2014, Nutrient Performance Indicators: The importance of farm scale assessments, linked to soil fertility, productivity, environmental impact and the adoption of grower best management practices, Page 1-13.
Reference ID: 23280
Note: H 1.8 #23280e
Abstract:
Purpose
This paper seeks to provide feedback on how the impact of plant nutrients can be assessed for a sustainable future. Specifically, it discusses the strengths and limitations of using indicators of nutrient use efficiency as indicators of nutrient performance.
Summary
• Efficient and effective use of plant nutrients is essential to meet global Sustainable Development Goals.
• To estimate broad scale nutrient use efficiency, partial nutrient balance (PNB) and partial factor productivity (PFP) indicators can be derived at a range of spatial and temporal scales and provide some intelligence on nutrient use.
• Partial factor productivity answers the question "How productive is this cropping system in comparison to its nutrient input?" It will, by definition, decline with increased nutrient inputs.
• Partial nutrient balance answers the question "How much nutrient is being taken out of the system relative to the amount supplied?" System PNB only indicates the fate of nutrients removed in harvested produce. It does not consider other transfer processes and so is not an indicator of nutrient loss to the environment.
• These indicators require good quality scalable (i.e., regional or local) data, clarification of the assumptions used and identification of the boundaries of the system

assessed.
• The use of national or global indicators may mask important spatial variations among regions, farming systems, and farms, the level at which interventions will be applied. Farm level nutrient performance data are needed to develop appropriate interventions to improve nutrient performance.
• Trends over time in regional, catchment or farm scale indicators to gauge trends are preferable to once only broad scale assessments.
• Even though it presents challenges, mixed crop and livestock systems as well as cropping systems should be considered in the assessment of nutrient performance indicators.
• A single performance indicator is likely to be misleading in the assessment of the efficiency and effectiveness of nutrient management. To provide meaning, it is proposed that other essential indicators be included and they would consider:
• Changes in soil nutrient levels or soil fertility.
• An assessment of the magnitude of the nutrient-limited gap between actual and achievable yield.
• Evidence of the adoption of nutrient best management practices such as the adoption of soil testing, farmer training, and/or farm record keeping, etc.

[84] J. Snoeck, P. Jadin, 1991, Calculation of fertilizer requirement for cocoa, Page 10-11. Malaysian Cocoa Board (MCB), The Incorporated Society Of Planters (ISP), Malaysian Cocoa Growers Council (MCGC).
Reference ID: 23281
Note: H 8.1.4 #23281 > S 8.1.4 #140
Abstract: Foliar analysis has been studied in many different research centers to determine fertilizer requirements of cocoa. In spite of a great deal of research, no qualitative recommendations for fertilizers can be given. Leaf analysis can only be used in cocoa to detect deficiencies, or imbalances in nutrition or trends in nitrient supply. Based on numerous fertilizer trials and soil data, IRCC devised a "soil disgnostic" method for fertilizer usage. Composite soil samples of upper horizons (0-20cm) are taken in cocoa plantations and analysed. Chemical analyses are compared tooptimal levels and nutrient balances, which were determined by observations and measurements of growth, flowering intensities, setting, cherelle wilt, pod development, pod production, number of beans per pod, pod values and yields.

[85] A.D.S. Liyanage, K.B. Dassanayake, M.J.I. Costa, 1991, Effect of nitrogen and potassium on the growth and yield of cocoa intercropped with coconut in the wet zone of Sri Lanka, Page 68-69. Malaysian Cocoa Board (MCB), The Incorporated Society Of Planters (ISP), Malaysian Cocoa Growers Council (MCGC).
Reference ID: 23282
Note: H 8.1.4 #23282 > S 8.1.4 #140
Abstract: Cocoa (*Theobroma cocoa* L.) has been identified as a promising intercrop from mature coconut plantations in the wet zone of Sri Lanka. Although fertilizer is an essential input for increasing the growth and yield of cocoa, no experiements have been undertaken to determine the fertilizer requirement of nitrogen (N) and potassium (K) fertilizers for cocoa grown under coconut in the wet zone of Sri Lanka.

[86] K.C. Willson, 1999, Mineral Nutrition and Fertilizers, Coffee, Cocoa & Tea, Page 134-141. CAB International Publishing.
Reference ID: 23283
Note: H 8.1.5 #23283 > S 8.1.5 #7523

[87] M. van Dijk, T. Morley, R. Jongeneel, M. van Ittersum, P. Reidsma, R. Ruben, 2017, Disentangling agronomic and economic yield gaps: An integrated framework and application, Agricultural Systems, 154, Page 90-99, ELSEVIER.
Reference ID: 23284
Note: H 13.1 #23284e
Abstract: Despite its frequent use in policy discussions on future agricultural production, both the concept of the yield gap and its determinants are understood differently by economists and agronomists. This study provides a microlevel framework that disentangles and integrates agronomic and economic approaches to yield gap measurement. It decomposes the conventional yield gap indicator into four components that together provide a better understanding of why actual farm yield falls below potential: (1) the technical efficiency yield gap, (2) the allocative yield gap, (3) the economic yield gap and (4) the technology yield gap. The results can be used to inform targeted policy and farming recommendations at plot, farm household, local and national level. The framework is operationalised and tested by combining results from crop models with detailed farm and plot level survey data for maize production in Tanzania.

[88] R. Abdullah, 2016, An Analysis of crude palm oil price against prices of selected oils and fats, Palm Oil Development no 64, Page 20-26. Malaysian Palm Oil Board (MPOB).
Reference ID: 23285
Note: #23285e
Abstract: Among 17 soils and fats in the world, palm oil leads in terms of production, trade and consumption. Its global production, export and consumption in 2015 were 62.79 million tonnes or 30.64% of the world production of oils and fats, 47.82 million tonnes or 57.61% of the world's exports of oils and fats, and 61.22 million tonnes or 30.08% of the world's consumption of oils and fats, respectively (Oil World, 2015a; Oil World, 2015b). These statistic indicate the dominance of palm oil in the sectors of production, trade and consumption, maily due to its supply and demand factors. Its high productivity of 3.6 t ha (author's estimate) ensures stability and ready availability of the oil, and its numerous uses in food and non-food applications have been globally accepted by the world. This is evident from the large share of palm oil exports (57.61%) in the total exports of oils and fats in 2015.

[89] A. Mokhtar, N.A. Shamsudin, I. Sahid, H. Muhamad, A.A. Aziz, 2016, Recovery of oil palm lumber production, Palm Oil Development no 64, Page 7-10. Malaysian Palm Oil Board (MPOB).
Reference ID: 23286
Note: #23286e
Abstract: The Malaysian timber industry has developed into a very significant socioeconomic sector, contributing 3.7% to the Growth Domestic Product (GDP) and 3.2% to the country's total merchandise exports in 2010. Indeed, the furniture business from the wood-based industry continues to expand due to the high demand from the worldwide market, particularly in the Asian region. This is evident from the total export of wooden furniture amounting to RM6.7 billion in 2014, and by the fact that Malaysia is positioned as the ninth biggest furniture exporter in the world (Malaysian-German Chamber of Commerce, 2014).

[90] Z. Shahrim, Z. Omar, Z. Zainal, Z.A.A. Hasan, 2016, Palm Tocitrienol: A Good Antioxidant for skin wound healing, Palm Oil Development no 64, Page 14-19. Malaysian Palm Oil Board (MPOB).
Reference ID: 23287
Note: #23287e
Abstract: Skin, as the largest organ of the body, acts as a barrier against the surroundings. It plays an important protective as well as reparative function in the body. When an injury occurs, either acute or chronic, our body automatically sets in motion dynamic and multiple steps of provcesses at the injured site (2014) as illustrated in Figure1. Wound repair takes an intricate course, but there is distinctively concerted interaction among inflammatory cells and related growth, forming and important coordination of the intricate phases of wound repair (Ozturk and Ermertcan, 2011). Over the years, the stages of wound repair have been well-documented.

[91] M.H. Saw, M.R. Ramli, S.W. Lin, 2016, Developing New Opportunities for Innovative Palm Oil Products, Palm Oil Development no 64, Page 1-6. Malaysian Palm Oil Board (MPOB).
Reference ID: 23288
Note: #23288e
Abstract: Fats and oils that have been modified or restructured to incorporate new fatty acids are called structured lipids. Primarily, these fatty acids are either short or medium chain, and are preferentially essential fatty acids. The reasons for changing the fatty acid profile in the new oils are to introduce a new fatty acid into the existing oil, to reduce its saturation, improve nutritional requisites, or provide additional functional characteristics. Traditionally, the process involves either a chemical or an enzymatic catalyst. Now, many possibilities have emerged from research and also from an innovative new range of enzymes introduced by enzyme manufacturers.

[92] C.Y. Lau, 2016, Current market trend, science and challenges in palm carotenes and tocotrienols, Palm Oil Development no 64, Page 11-13. Malaysian Palm Oil Board (MPOB).
Reference ID: 23289
Note: #23289e
Abstract: Crude palm oil is an edible vegetable oil derived from the pulp of the fruit of oil palm (Elaeis guineensis). Originating in West Africa, oil palm is now commonly found in the Southeast Asian countries such as Malaysia, Indonesia and Thailand. By nature, crude palm oil possesses a high concentration of carotenes (500-700 ppm) and tocotrienols (up to 1000 ppm). Carotenes (alpha-carotenes and beta-carotenes) are dark red compounds. They are widely used as natural food colourants in the food and beverage industry, whereas tocotrienols, due to their unique health properties, have started to gain popularity among the manufacturers of dietary supplements and producers of functional foods and beverages as well as cosmetic companies in recent years.

[93] Snyder, C, 2017, Plant Nutrition Today - Fall 2017 Spring No 1: Improving Fertlizer Nitrogen Performance, International Plant Nutrition Institute (IPNI).
Reference ID: 23290
Note: #23290e
Abstract: Fertilizer industry leaders, professional crop advisers, and their farmer customers are working more intentionally to improve fertilizer nitrogen (N) use efficiency and effectiveness. Their goal is to use site-specific 4R (right source, rate,

time, and place) N management practices, in concert with proven soil and water conservation practices, to get as much of the applied N into the crop as economically possible. Such complementary management actions increase the opportunities to raise crop yields and decrease crop yield gaps; while also helping to reduce the risks of residual nitrate-N buildup in the soil profile and helping to minimize losses of N to the environment via other major N loss pathways.

[94] Stewart, M, 2017, Plant Nutrition Today - Fall 2017 Spring No 2: Pop-up Fertilizer benefits, risks, and other considerations, International Plant Nutrition Institute (IPNI).
Reference ID: 23291
Note: #23291e
Abstract: Placing fertilizer in-furrow with the seed is a common practice in small grain and row crop production. Often called "pop-up", fertilizer placed with the seed can under certain conditions have several benefits including promotion of early root growth and plant vigor, which in turn can result in a crop with greater resistance to pests, improved ability to compete with weeds, hastened maturity (associated with P fertilizer), and increased yield.

[95] Prochnow, L.I, 2017, Plant Nutrition Today - Fall 2017 Spring No3: Favorable Soil pH: Does it really increase nutrient use efficiency?, International Plant Nutrition Institute (IPNI).
Reference ID: 23292
Note: #23292e
Abstract: More than ever agriculture needs to follow principles of sustainability that ensure build up and maintenance of long-term soil productivity. The benefits of high soil productivity include efficient use of crop inputs, environmental protection, social benefits to stakeholders, and greater farmer profits. Many soils around the world have a natural tendency to become acidic with time. Many factors, natural and managed, contribute to this increase in soil acidity. Soil acidity is especially widespread in tropical regions due to climates that cause intense weathering of soils. It is estimated that about 30% of soils in the world are acidic, but these regions still represent some of our most important food-producing centers.

[96] Bruulsema, T, 2017, Plant Nutrition Today - Fall 2017 Winter No.1: What's in a phosphorus footprint?, International Plant Nutrition Institute (IPNI).
Reference ID: 23293
Note: #23293e
Abstract: Footprints tell a story. They track where you have been. Carbon and water footprints are increasingly being used to track progress on issues like climate change and water scarcity. The concept of a phosphorus footprint of food has also been introduced. Both footprints and efficiencies are used as performance metrics to tell a story about agricultural sustainability. But they can confuse as well as enlighten! To get the story right, we need to understand these metrics.

[97] Phillips, S, 2017, Plant Nutrition Today - Fall 2017 Winter No.4: Why are crop canopy sensors not more popular?, International Plant Nutrition Institute (IPNI).
Reference ID: 23294
Note: #23294e
Abstract: Crop canopy sensors first appeared in the commercial marketplace nearly 15 years ago. Despite the technology's long tenure in the precision agriculture space, current estimates of adoption rates are quite low compared with other precision

services and variable-rate technologies. Although it is common for agricultural technologies to experience delayed adoption, crop sensors have never been used in more than 4% of the market area according to the biennial Purdue/ CropLife Precision Ag Dealer Survey.

[98] H. Muhamad, V. Subramaniam, Z. Hashim, N.S.K. Khairuddin, Y.M. Choo, 2014, Water Footprint: Part 1 - Production of oil palm seedlings in Peninsular Malaysia, Journal of Oil Palm Research, 26, Page 273-281, Malaysian Palm Oil Board (MPOB).
Reference ID: 23295
Note: #23295e
Abstract: The oil palm nursery is the first link in the palm oil supply chain where oil palm seedlings are produced for the cultivation of palms in plantations. The water footprint for this study focuses on the volume of water required for the production of oil palm seedlings in Malaysia, which include direct and indirect water consumption. This study was carried out at 21 nurseries in Peninsular Malaysia for the duration of four years.

[99] V. Subramaniam, H. Muhamad, Z. Hashim, Y.M. Choo, 2014, Water Footprint (PART3)-The Production of crude palm oil in Malaysia palm oil mills, Journal of Oil Palm Research, 26, Page 292-299, Malaysian Palm Oil Board.
Reference ID: 23296
Note: #23296e
Abstract: The Malaysia oil palm industry contributes immensely to the nation's economy. In 2013 alone the export revenue of palm products reached RM61.36 billion. The industry is constantly asked to prove the sustainability of its products. Currently, carbon footprint is such a catchphrase in the world that it has become a must for responsible producers to quantify their carbon footprint. The next catchphrase in the environmental front is water footprint.

[100] N. Zolkarnain, S. Yusoff, V. Subramaniam, Z.A. Maurad, Z.A. Bakar, R. Ghazali, H.A. Hassan, 2015, Evaluation of environmental impacts and GHG of palm polyol production using life cycle assessment approach, Journal of Oil Palm Research, 27, Page 144-155, Malaysian Palm Oil Board (MPOB).
Reference ID: 23297
Note: #23297e
Abstract: Preently, very few life cycle assessment (LCA) studies have been conducted and reported on the production of palm polyol. Previoysly, most of the LCA studies on the polyol production are limited to petroleum, soya or castor polyol. In this study, a LCA of a palm polyol was performed. The objective of this study is to identify any potential environmental impacts that could be associated with the production of palm polyol.

[101] D.L. Weed, 2002, Environmental epidemiology: Basics and proof of cause-effect, Toxicology, 181-182, Page 399-403, ELSEVIER.
Reference ID: 23298
Note: #23298e
Abstract: Bringing epidemiology and toxicology together to better understand cause and effect relationships requires attention to several interconnected problems: problems of commitment, complexity, and of communication. The most fundamental of these is commitment as it is reflected in the basic purpose of environmental epidemiology. The purpose of epidemiology is not to prove cause/effect relationships,

and not only because scientific proof is elusive. The purpose of epidemiology is to acquire knowledge about the determinants and distributions of disease and to apply that knowledge to improve public health. A key problem, therefore, is how much and what kinds of evidence are sufficient to warrant public health (typically preventive) actions? The assessment of available evidence lays the foundation for the problem of complexity: relevant evidence arrives from toxicologic and epidemiological investigations, and reflects the acquisition of knowledge from many levels of scientific understanding: molecular, cellular, tissue, organ systems, complete organisms (man and mouse), relationships between individuals, and on to social and political processes that may impact human health. How to combine evidence from several levels of understanding will require the effective communication of current methodological practices. The practice of causal inference in contemporary environmental epidemiology, for example, relies upon three largely qualitative methods: systematic narrative reviews, criteria-based inference methods, and (increasingly) meta-analysis. These methods are described as they are currently used in practice and several key problems in that practice are highlighted including the relevance to public health practice of toxicological evidence.

[102] G. Swaen, L. van Amelsvoort, 2009, A weight of evidence approach to causal inference, Journal of Clinical Epidemiology, 62, Page 270-277, ELSEVIER.
Reference ID: 23299
Note: #23299e
Abstract:
Objective: The Bradford Hill criteria are the best available criteria for causal inference. However, there is no information on how the criteria should be weighed and they cannot be combined into one probability estimate for causality. Our objective is to provide an empirical basis for weighing the Bradford Hill criteria and to develop a transparent method to estimate the probability for causality.
Study Design and Setting: All 159 agents classified by International Agency for Research of Cancer as category 1 or 2A carcinogens were evaluated by applying the nine Bradford Hill criteria. Discriminant analysis was used to estimate the weights for each of the nine Bradford Hill criteria.
Results: The discriminant analysis yielded weights for the nine causality criteria. These weights were used to combine the nine criteria into one overall assessment of the probability that an association is causal. The criteria strength, consistency of the association and experimental evidence were the three criteria with the largest impact. The model correctly predicted 130 of the 159 (81.8%) agents.
Conclusion: The proposed approach enables using the Bradford Hill criteria in a quantitative manner resulting in a probability estimate of the probability that an association is causal.

[103] J. Ollivier, A. Flori, B. Cochard, P. Amblard, N. Turnbull, I. Syahputra, E. Suryana, Z. Lubis, E. Surya, E. Sihombing, D.T. Gasselin, 2017, Genetic variation in nutrient uptake and nutrient use efficiency of oil palm, Journal of Plant Nutrition, 40, Page 558-573, Taylor & Francis.
Reference ID: 23300
Note: H 8.1.1.1 #23300e
Abstract: Observations of the vegetative and reproductive biomass produced annually and the mineral element contents have been conducted on diverse oil palm plant materials tested in a genetic test in Indonesia. The results show that the nutrient uptake (for trunk growth, leaf renewal and bunch export) greatly varies (CV D 10% for

N uptake and 17% for K uptake) with the origins of the planting materials considered. For equivalent production, the uptake in nutrients of certain plant material may differ very significantly; for the same level of uptake in nutrients, production can vary significantly. This study supports the hypothesis that the optimal nutrient thresholds are intrinsically linked to the plant material. It assumes that some planting materials have different needs and that a fertilizer regime could be adapted to their specific needs without losses in performance. To confirm these assumptions, the need of implementing specific experimental devices with differentiated fertilization regimes is discussed.

[104] A.B. Hill, 1965, The Environment and Disease: Association or Causation?, Page 14-20.
Reference ID: 23301
Note: #23301e
Abstract: Hill's "The Environment and Disease: Association or Causation" may be a good example of an article that has been read in quotations and paraphrases more often than in its original form. In it, Hill offered a list of nine aspects of an empirical association to consider when deciding whether an association is casual. This was not the first list of "casual criteria" to be offered, but it was perhaps the most popular. It is unfortunate that in the ensuing decades, this list or similar ones have been presented in textbooks as "criteria" for inferring causality of associations, often in such a manner as to imply that all the conditions are necessary. A careful reading of Hill shows that he did not intend to offer a list of necessary conditions; on the country, on page 299 he warned agasinst laying down "hard and fast rules of evidence that must be obeyed before we accept cause and effect."

[105] R.W. Bell, B. Dell, 2008, Micronutrients for Sustainable Food, Feed, Fibre and Bioenergy Production, Paris, France, International Fertlizer Industry Association.
Reference ID: 23302
Note: #23302e
Abstract: This book is written for practitioners and stakeholders in the fertiliser industry and for policy makers whose decisions may impact on the use of micronutrients in agriculture, horticulture and forestry. The aim of the book is to:
-Explain the growing importance of micronutrients in balanced fertilisation;
-Consider the micronutrient fertiliser types that are currently available and how to best use them;
-Assess the current market and prospects for micronutrient fertilisers; and
-Discuss the policy, regulatory and quality control framework needed to maximize the benefi ts from using micronutrient fertilisers.
Micronutrients are essential for the normal growth and health of plants, animals and humans. When soil or dietary supply are inadequate, defects in development arise and this can lead to poor growth and premature death. The World Health Organization (WHO) in its 2000 World Health Report, identified the lack of dietary iron (Fe) and zinc (Zn) as serious global health risks. Micronutrient constraints in agriculture continue to be reported from around the world.

[106] M.R.H. Rahuman, 2014, The Co-operative benefits of Malaysia and Indonesia in Palm Oil, Oil Palm Industry Economic Journal, 14, Page 9-23, Kuala Lumpur, Malaysia.
Reference ID: 23303
Note: #23303e

Abstract: The article has argued that the rising competition between Malaysia and Indonesia is affecting the palm oil industry in totality. The recent phenomenon of palm oil playing a role in Chinese shadow banking has also contributed to the depression in palm oil prices, particularly in 2013. With these in mind, and through the use of Prisoner's Dilemma game theory, the article argues for both Malaysia and Indonesia institutionalise co-operation, rather than compete strongly, through the setting up of a palm oil producing and exporting countries organization (POPEC). This is aimed at better management of the supply and inventory of palm oil in the global market in line with global demand conditions.

[107] M. Sidhu, A. Hasyim, E.F. Rambe, Z. Sinuraya, A. Aziz, M. Sharma, 2014, Evaluation of Various sources of Magnesium fertiliser for correction of Acute Magnesium Deficiency in Oil Palm, Oil Palm Bulletin, 69, Page 27-37.
Reference ID: 23304
Note: #23304e
Abstract: In view of it's high water solubility and rapid nutrient availability, kieserite is often used for correcting magnesium (Mg) deficiency in oil palm. However, the same characteristics makes it prone to higher losses in sites with sandy soils, hilly topography or high rainfall. Under such conditions, a less water soluble but equally effective Mg fertiliser may be more suitable. A trial evaluating the corrective capability of five less water soluble Mg fertilisers found that correction of Mg deficiency was a slow process requiring a minimum of two to three annual rounds to raise leaf Mg from 0.06% to above 0.20%. All fertilisers evauluated greatly improved the vusual appearance of Mg deficient plams. A significant decline in the number of fronds displaying new symptoms occurs as early as four to six months after treatment (MAT). By 16 MAT, majority of treated palms exhibit only light symptoms of Mg deficiency.

[108] K. Haron, Z. Hashim, N. Kamarudin, 2015, Efficient use of Inorganic and Organic Ferttilisers for Oil Palm, Oil Palm Bulletin, 71, Page 8-13, Selangor, Malaysia.
Reference ID: 23305
Note: #23305e
Abstract: Fertiliser application practices to increase oil palm productivity have been discussed extensively in many forums. This article investigates how to increase the efficiency of fertiliser use in oil palm plantations so as to contribute towards the saving of fertiliser inputs and to ensure maximum returns. Application of organic fertiliser alone was unable to produce high yield for oil palm due to low and inconsistent nutrient contents in organic fertiliser. The effects of integrating inorganic and organic fertlisers on soil quality and oil palm productivity are discussed. The soil quality was improved as shown by an increase in soil pH, which enhanced the availability of nutrients, thus increasing the efficiency of the fertilisers applied. This would result in a reduction in fertiliser inputs and contribute to an increase in oil palm productivity.

[109] N. Balu, N. Ismail, K.N.A. Kamarulzaman, 2015, Competitiveness of the Oil Palm Industry in Columbia, Oil Palm Industry Economic Journal, 15, Page 18-29.
Reference ID: 23306
Note: #23306e
Abstract: This article is aimed at discussing the competitiveness of the oil palm industry in Columbia in comparison with Malaysia's own industry in terms of production, trade, consumption and infrastructure. Prospects of investment in the industry in Columbia are also discussed. For the purpose of analysing the information gathered, a SWOT analysis was used to evaluate the strengths, weaknesses,

oppurtunities and threats of the Columbia's oil palm industry. Columbia was chosen for this article based on the fact that there is currently a lack of information and of a database on this country with regard to her oil palm industry.

[110] A. Ismail, C.J. Nazirah, 2015, The effects of establishing sustainable oil palm Grower's cooperatives on the incomes of oil palm smallholders, Oil Palm Industry Economic Journal, 15, Page 1-7, Malaysian Palm Oil Board (MPOB), Selangor, Malaysia.
Reference ID: 23307
Note: #23307e
Abstract: This article attempts to study the impact of establishing sustainble oil palm Growers Cooperatives (KPSM) on the incomes of oil palm smallholders in Malaysia. In the study, data on income were collected from members as well as non-members of KPSM in Saratok, Sarawak. The study found that the nett average fresh fruit bunch (FFB) price (after deducting transportation cost) obtained by KPSM Saratok members was higher than for non-members. For example, in July 2012, the average nett price obtained by KPSM members was RM524.80/t compared with RM414.60/t obtained by non-members. The price difference was RM110.20. During this period, from July 2012 until April 2014, the average nett price obtained by members of KPSM Saratok was RM410.80/t while non-members received a price of RM345.50/t. The average price difference in that period was RM65.30/t. Greater efforts have to be made to attract more independent smallholders to join the cooperatives as the cooperative is an institution that can help increase productivity and income of smallholders.

[111] A. Ismail, S.M. Ahmad, Z. Sharudin, 2015, Labour productivity in the Malaysian Oil Palm Plantation sector, Oil Palm Industry Economic Journal, 15, Page 1-10, Malaysian Palm Oil Board (MPOB), Selangor, Malaysia.
Reference ID: 23308
Note: #23308e
Abstract: This study attempts to measure oil palm labour productivity based on land-labour ration by job category, region and estate size; and based on output-labour ratio by job category and region. It culminates by suggesting action plans for improving labour productivity and reducing labour requirement. Primary data collected through an online survey were used in the study, while the calculation of labour productivity was done using Microsoft Office Excel and SPSS. From the study, it was found that the ideal land-labour ratio for oil palm plantations in Malaysia is 10:1. Currently, the ratio set by the government for oil palm estates hiring foreign workers is 8:1 (i.e 8 ha to 1 worker). To reduce the number of foreign workers in oil palm plantations, the current ratio needs to be increased from 8:1 to 10:1. To increase labour productivity, it is suggested that estate owners practise mechanisation, especially for harvesting (when palm height is less than 8m) and in-field collection of fresh fruit bunches (FFB).

[112] O.S. Oyewole, I.O.J. Ajayi, R.I. Rotimi, 2012, Growth of cocoa (*Theobroma cacao* L.) seedlings on old cocoa soils amended with organic and inorganic fertilizers, African Journal of Agricultural Research, 7, Page 3604-3608.
Reference ID: 23309
Note: #23309e
Abstract: A greenhouse study was conducted for six months to investigate the response of cocoa seedlings to organic and inorganic fertilizers. The treatments were cocoa pod husk (CPH), kola pod husk (KPH), nitrogen (N), phosphorus (P), potassium (K), N + P, N, CPH +N, CPH +NP, CPH + NPK, KPH + N, KPH + NP, KPH + NPK and

control. The mineral fertilizers were applied at the rate of 10 kg N ha-1 while the organic fertilizers (CPH and KPH) were at the rate of 2.5 t ha-1 and the combination of the two in 5 kg soil arranged in completely randomized design (CRD) replicated three times. The seedlings were regularly watered and data were collected on growth parameters. The performance of cocoa seedlings across the two locations as demonstrated by the results show that CPH and KPH could be used as sources of nutrient. However, these materials are not sufficient to meet the nutritional demand of the crop, hence, there is need for fortification with mineral fertilizer. CPH and/or KPH fortified with mineral fertilizers will aid the growth of cocoa seedling on old cocoa soil irrespective of the location. The percentage germination of the cocoa seedling was enhanced by the use of this organic material 73 and 95% for Ibadan and Mayo-Selbe, respectively. The treatment had a positive effect on the nitrogen level of the soil as CPH (8.14) and is slightly higher than NPK (6.99).

[113] F.S. Ellett, D. Ericson, 1986, Correlation, Partial correlation, and Causation, Synthese, 67, Page 157-173, New York.
Reference ID: 23310
Note: #23310e
Abstract: Philosophers and scientists have maintained that causation, correlation, and "partial correlation" are essemtially related. These views give rise to various rules of causal inference. This essay considers the claims of several philosophers and social scientists for causal systems with dichotomous variables. In section 2 important commonalities and differences are explicated among four major conceptions of correlation. In section 3 it is argued that whether correlation can serve as a measure of A's causal influence on B depends upon the conception of causation being used and upon certain background assumptions. In section 4 five major kinds of "partial correlation" are explicated, and some of the important relations are established among two conceptions of "partial correlation", the conception of "screening off", the conception of "partitioning", and the measures of causal influence which have been suggested by advocates of path analysis or structural equation methods. In section 5 it is argued that whether any of these five conceptions of "partial correlation" can serve as a measure of causal influence depends upon the conception of causation being used and upon certain background accumptions. The imprtant conclusion is that each of the apprcoaches (considered here) to causal inference for causal systems with dichotomous variable stands in need of important qualifications and revisions if they are to be justified.

[114] J. Freudenberg, M.Y. Wang, Y. Yang, W. Li, 2009, Partial correlation analysis indicates causal relationships between GC-content, exon density and recombination rate in the human genome, Page 1-10. BMC Bioinformatics.
Reference ID: 23311
Note: #23311e (published in BMC Bioinformatics 2009 Vol 10 Supp 1 S66)
Abstract: Background: Several features are known to correlate with the GC-content in the human genome, including recombination rate, gene density and distance to telomere. However, by testing for pairwise correlation only, it is impossible to distinguish direct associations from indirect ones and to distinguish between causes and effects.
Results: We use partial correlations to construct partially directed graphs for the following four variables: GC-content, recombination rate, exon density and distance-to-telomere. Recombination rate and exon density are unconditionally uncorrelated, but become inversely correlated by conditioning on GC-content. This pattern indicates

a model where recombination rate and exon density are two independent causes of GC-content variation.
Conclusion: Causal inference and graphical models are useful methods to understand genome evolution and the mechanisms of isochore evolution in the human genome.

[115] Anonymous, 2017, InfoSawit Vol XI No 4 APRIL 2017, Info SAWIT, 11, Page 1-56. Palma Serasih Group.
Reference ID: 23312
Note: #23312e

[116] IPNI, 2012, Research With Impact: Strengthening Families in Peru by Improving Coffee Yields, USA.
Reference ID: 23313
Note: #23313e
Abstract:
THE CHALLENGE:
Small holder coffee farmers who have migrated to the steep slopes of the northeastern Amazon in Peru commonly faced a repeating poverty cycle. Their perennially low yields and incomes prevent adequate reinvestment in their crops. Over time this situation has lead to extreme poverty and family instability. Soil nutrient depletion is a main factor limiting yields. Very little fertilizer is used, biomass production is low, and the risk of soil erosion is high. Eventually families move on in search of new land to start the cycle again.

[117] IPNI, 2008, Research With Impact: Overcoming Human Zinc Deficiencies with Proper Fertilization, USA.
Reference ID: 23314
Note: #23314e
Abstract:
THE CHALLENGE:
Zinc (Zn) deficiency in human diets causes people to have many health complications, including impaired brain development, weakened immune systems, and stunted growth. Zinc deficiency is responsible for the deaths of 450,000 children annually. Low Zn intake is clearly a major issue, especially among women, children, and the elderly living in the developing world. Most of the dietary calories in the developing world come from cereal-based foods with low Zn concentrations. This on-going international collaborative project examines practical techniques to boost the Zn content of common cereal grains to improve human nutrition.

[118] A. Nichols, 2007, Causal inference with observational data, The Stata Journal, 7, Page 507-541.
Reference ID: 23315
Note: #23315e
Abstract: Problems with inferring causal relationships from nonexperimental data are briefly reviewed, and four broad classes of methods designed to allow estimation of and inference about causal parameters are described: panel regression, matching or reweighting, instrumental variables, and regression discontinuity. Practical examples are offered, and discussion focuses on checking required assumptions to the extent possible.

[119] M.F. Pampolino, 2016, IPNI Southeast Asoa Program - Site-specific nutrient management (SSNM) and best practices on soil fertility management in field crops production system.
Reference ID: 23316
Note: #23316e
Presented at 19th PSSST Annual Meeting, May 18-20, 2016, Legazpi City, Phillipines.

[120] M. Pampolino, A. Ocampo, L. Luar, T. Oberthür, J.I. Serrano, J. Abella, A. Mendoza, 2016, IPNI Southeast Asia Program- Incresing Maize farming profitability in the Philippines through the use of nutrient expert for Maize.
Reference ID: 23317
Note: #23317e
Presented at CSSP 46th Annual Scientific Conference June 13-18, 2014 Phela Grande Hotel, General Santos City.

[121] G.N. Giordano, M. Lindstrom, 2015, Trust and health: testing the reverse causality hypothesis, Epidemiology & Community Health, 70, Page 1-8, BMJ Publishing Group Ltd.
Reference ID: 23318
Note: #23318e
Abstract: Background: Social capital research has consistently shown positive associations between generalised trust and health outcomes over 2 decades. Longitudinal studies attempting to test causal relationships further support the theory that trust is an independent predictor of health. However, as the reverse causality hypothesis has yet to be empirically tested, a knowledge gap remains. The aim of this study, therefore, was to investigate if health status predicts trust.

[122] T. Bruulsema, 2017, 4R Phosphorus Management Practices for Major Commodity Crops of North America, Page 1-12.
Reference ID: 23319
Note: #23319e
Abstract: Phosphorus plays a crucial role in sustainable crop production. Made from finite natural resources, phosphorus fertilizers support high and increasing crop yields, but their use can also elevate the risk for reduced water quality. Increasing the adoption of 4R phosphorus application practices-applying the right source at the right rate, right time, and right place-has great potential to improve both crop yields and water quality. This paper reviews a science-based effort to describe such practices for five major commodity crops produced in North America.

[123] S.K. Loh, K.Y. Cheong, Y.M. Choo, J. Salimon, 2015, Formulation and Optimisation of spent bleaching earth-based bio organic fertiliser, Journal of Oil Palm Research, 27, Page 57-66.
Reference ID: 23320
Note: #23320e
Abstract: Spent bleaching earth (SBE) generated from the palm oil refinery is convertible into value-added products instead of being discarded as waste to landfills. An alternative approach is to develop SBE-based bio organic fertiliser through co-utilisation with other sources of biomass of contrasting nutrients properties. The feasibility of blending SBE with various forms of biomass. Oil palm trunk (OPT), oil palm frond (OPF), empty fruit bunch (EFB) and chicken litter (CL). In different mixing ratios was studied and its optimum ratio determined. The mixtures of SBE and various

biomass at different mixing ratios were analysed for their macronutrient and micronutrient content, pH, organic carbon (OC), total nitrogen, carbon:nitrogen ratio (C:N) and organic matter (OM) content. The optimised blend of SBE:OPT:CL at the ratio of 1:1:0.5 exhibited sufficient nutrient contents (N: P2O5: K2O = 0.65:1.59:1.63) and good physicochemical properties (pH = 5.4, OM = 40% and C:N = 36:1) as a base material for bio organic fertiliser production. This optimum formulation was further enriched with urea (46% N), Christmas Island rock phosphate (CIRP, 25% P2O5) and muriate of potash (MOP, 66% K2O) to produce a bio organic fertiliser suitable for vegetable crops with desired nutrients N:P2O5:K2O ratio of 2:2:2.

[124] N.A. Hassan, C.W. Puah, N.A. Ibrahim, A.S. Baharuddin, Y.M. Choo, 2015, Composting of oil palm biomass: Fourier transform-infrared and Thermogravimetry analyses, Journal of Oil Palm Research, 27, Page 241-249.
Reference ID: 23321
Note: #23321e
Abstract: This study investigates the effetcs of composting conditions on the chemical characteristics of compost from oil palm biomass. Three samples each of empty fruit bunches (EFB), palm oil mill effluent (POME) and compost were collected from three compost plants in Malaysia. The plants employed open windraw composting system. The fourier transform-infrared spectra and thermogravimetry analysis were used to analyse the samples. It was found that composting resulted in the loss of aliphatic structures by formation of aromatic structures. This led to a stronger intramolecular bond and subsequently increased the stability of compost. The results of the study showed that the use of shredded EFB composting is the most efficient way to produce compost. It required 55% less amount of time as compared to untreated EFB and 60% less amount of time as compared to treatment without addition of microbes.

[125] Z. Rengel, P.M. Damon, 2008, Crops and genotypes differ in efficiency of potassium uptake and use, Physiologia Plantarum, 133, Page 1-13, Physiologia Plantarum.
Reference ID: 23322
Note: H 2.8.1.3 #23322e
Abstract: Cultivars with increased efficiency of uptake and utilization of soil nutrients are likely to have positive environmental effects through reduced usage of chemicals in agriculture. This review assesses the available literature on differential uptake and utilization efficiency of K in farming systems. Large areas of agricultural land in the world are deficient in K (e.g. 3/4 of paddy soils in China, 2/3 of the wheatbelt in Southern Australia), with export in agricultural produce (especially hay) and leaching (especially in sandy soils) contributing to lowering of K content in the soil. The capacity of a genotype to grow and yield well in soils low in available K is K efficiency. Genotypic differences in efficiency of K uptake and utilization have been reported for all major economically important plants. The K-efficient phenotype is a complex one comprising a mixture of uptake and utilization efficiency mechanisms. Differential exudation of organic compounds to facilitate release of non-exchangeable K is one of the mechanisms of differential K uptake efficiency. Genotypes efficient in K uptake may have a larger surface area of contact between roots and soil and increased uptake at the root–soil interface to maintain a larger diffusive gradient towards roots. Better translocation of K into different organs, greater capacity to maintain cytosolic K+ concentration within optimal ranges and increased capacity to substitute Na+ for K+ are the main mechanisms underlying K utilization efficiency. Further breeding for increased K efficiency will be dependent on identification of suitable markers and

compounding of efficiency mechanisms into locally adapted germplasm.

[126] M. Webb, S. Berthelsen, P.G. Curry, D. Yinil, C. Fidelis, 2008, Analysis of nutritional constraints to cocoa production in PNG, Page 1-137.
Reference ID: 23323
Note: H 8.1.4 #23323
Abstract: Several dozen cocoa growers generously gave their name and knowledge when participating in the survey. The CCI Agronomy staff contributed an enormous effort to carry out the survey, in particular Henry Tangbil and Peter Bapiwai, and also Susana Namaliu, James Hanson and Timie Karin. In addition to the Agronomy staff team, the following CCI staff gave valuable assistance. Alfred Nongkas, National Extension Liaison manager, informed all the provincial managers of the sampling team's visit & activities. Daslogo Kula and John Joseph assisted the team in New Ireland. Paul Nelau, Toby Wama and Joe Toumo assisted in Bougainville. Peter Homu and Peter Daniels assisted in Morobe. Winston Gore assisted in Oro (Northern). Yak Namaliu, Will Akus and Mathias Faure assisting in Madang. Stephen Mombi, Casphar Haua and Jherome assisted in East and West Sepik.

[127] Anonymous, 2017, Nutricion Y Fertilizacion Del Cacao (Nutrition and Fertilization of Cocoa), Page 1-10.
Reference ID: 23324
Note: H 8.1.4.1 #23324 (note: whole journal is in Spanish)
Abstract: Crop nutrient removal rapidly increased during the first 5 years after sowing and then established maintaining that rate of absorption for the remaining planting life (Figure 1) In general, potassium K is the nutrient most absorbed by cocoa, followed by Nitrogen (N), Calcium (Ca) and Magnesium (Mg).

[128] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Plantation Crops, Cambridge University Press.
Reference ID: 23325
Note: S 8 #23325

[129] Anonymous, 1988, Revista Theobroma, Revista Theobroma, 18, Page 224-272.
Reference ID: 23326
Note: H 8.1.4 #23326

[130] L.H.I. Nakayama, 1988, Influencia das formas de aplicacao de calcario e gesso agricola sobre o desenvolvimento do cacaueiro (Influence of the forms of lime and gypsum application on cacao growing), Revista Theobroma, 18, Page 241-246, Brasil.
Reference ID: 23327
Note: #23327 > H 8.1.4 #23326
Abstract: The efficiency of two forms of lime application associated or not with gypsum for growing cacao seedlings was studied. Catonga cacao seedlings were grown with Tropudult soil in pots for 270 days in greenhouse experiment. Lime and gypsum were spread on or incorporated in the soil surface. The dry matter production and the macro and micro- nutrients were determined for the aerial part of the plant. Lime incorporation increased the dry matter, seedling height and stem dismeter and gave a balance of nutrient contents in the second leaf of the seedlings. However, lime spread on the surface caused a decrease of the phosphorus content (0.08%) as well as in the growing parameters. The gypsum increased the lime efficiency and caused a balance of the phosphorus content of the plants.

[131] R.F. Schwan, A. Lopez, 1988, Mudanca no pertil da fermentacao de cacau ocasionada pela retirade parcial no polpa da semente (Change in the fermentation profile of cacao due to partial removal of bean pulp), Revista Theobroma, 18, Page 247-257, Brasil.
Reference ID: 23328
Note: #23328 > H 8.1.4 #23326
Abstract: Partial removal of cacao bean pulp, for whatever industrial reason, reduces the natural substrat used by microorganisms involved in the fermenting process, in the course of which the flovour precursors of chocolate are formed. The effect of this treatment in cacao fermentation was observed, using a domestic washing machine to partially extract the bean pulp (20% of the total weight). The fermentation process was subjected to microbiological and chemical analyses. Accelerated fermentation was observed in the treatments where beans had smaller amounts of pulp, which was evidenced by the more rapid change in the microbial chain and the temparature increase compared with traditional processes. This accelarated was seen in the degradation of bean pigments which subsequently showed a higher percentage of brown coloration in the cut test on the product.

[132] L.F. da Silva, 1988, Alteracoes edaficas provocadas por essencias florestais implantadas em solos de tabuleiro no Sul da Bahia (Edaphic changes caused by planting forest species in tabuleiro (Haplorthox) soils in the South of Bahia), Revista Theobroma, 18, Page 259-267, Brasil.
Reference ID: 23329
Note: #23329 > H 8.1.4 #23326
Abstract: In order to measure the behavior of five forest species gmelina (Gmelina arborea), pinus (Pinus caribaea var. hondurensis)., jacaranda (Dalbergia nigra), juerana (Parkia pendula) and vinhatico (Plathymenia foliolosa) in relation to the capibility reconciie beneficial edaphic alterations in the tabuleiro ecosystem (poor soils in the humid tropic conditions), a study was made in the South of Bahia including the forest as a reference level. The species, in greater or lesser degree, limited edaphc improvements. The G. arborea was niticeable as the major species for accumulating calcium, potassium and phosphorus at age seven; by years old, in reason of the richness of it detritus mantle and other factors. The obtained information constitutes an important aid for agricultural use for these poor soils (Oxisols), with the perspective of associating compatible species to the nature of the soil, maintaining or even improving its natural characteristics, especially its organo-mineral layer.

[133] S.S. Sasidaran, 2012, A Reflection of the Plantation Industry - Its Origin, Quest and Challenges: Part 1, The Planter, 88, Page 733-737.
Reference ID: 23330
Note: #23330e > S serial #21838 > S Serial #22449
Abstract: Part of the information provided in this text had been passes down from my late maternal grandfather and my late father. Both started their plantation careers in Kuala Perak Estate, Bagan Dato (1920) and Narborough Estate, Sungkai, Perak (1941) respectively. They had witnessed the early development through to the gradual expansion and transformation of estates under the expatriate planters. The author's personal experience while growing up in the estate environment during the critical period lasting 16 years prior to independence sheds some light and adds credence to the contents of this papaer: The chronology of events related to the industry during the daunting and perilous trial of the early plantations and the sacrifices, pain, anguish, hardship and challenges endured by the pioneers are presented to create an

awareness of its historical and glorious significance. Also the paradigm shift and the accelerated pace of conversion from rubber to oil palm with the never ending challenges confronting the stakeholders are highlighted in this paper.

[134] S.S. Sasidaran, 2012, A Reflection of the Plantation Industry - Its Origin, Quest and Challenges: Part 2, The Planter, 88, Page 821-826.
Reference ID: 23331
Note: #23331e > S serial #22101 > S Serial #22449
Abstract: In view of the accelerated expansion of land of rubber from the early 1900's and to ensure the industry continued to prosper, it was deemed appropriate and essential that adequate provision be made for investigations into crop improvement, soil management and the production of quality rubber from latex. Despite some valuable contribution from reaserch work carried out by the Botanic Gardens in Singapore and from a small number of research workers in Malaya in the early days, there was apparently a lack of coordination towards effective implementation of the findings. Moreover, the area under rubber then covered a stretch of land some 500 miles long with different soil types and site conditions where work assignments were difficult with limited research personnel and communication facilities. This situation had prompted the establishment of the Rubber Research Institute of Malaya (RRIM) in September 1926 with the appointment of the first expatriate Director of the Institute

[135] S.S. Sasidaran, 2012, A Reflection of the Plantation Industry - Its Origin, Quest and Challenges: Part 3, The Planter, 88, Page 915-920.
Reference ID: 23332
Note: #23332e > S serial #22103 > S Serial #22449
Abstract: The most devastating period that succumbed the plantation industry to its knees and almost cripped its very existence was the demoralising recession during the rubber slump (1929-1933) coupled with the debilitating epidemic (malaria, small pox, cholera, dysentery, plague and typhoid) not to mention other forms of deformities to the skin (scabies) and the legs (elephantiasis) that took a heavy toll on the hapless workers. Deplorable living conditions, poor sanitation and malnutrition were factors that had subscibed to the deaths of thousands of workers and young children.

[136] S.S. Sasidaran, 2012, A Reflection of the Plantation Industry - Its Origin, Quest and Challenges: Part 4, The Planter, 89, Page 65-69.
Reference ID: 23333
Note: #23333e > S serial #22269
Abstract: Recalling the early days, an expatriate manager was normally in control of 3000-5000 acres of rubber with one or two compatriots as assistants. But the local managers today handle an area of not less than 3000-5000 hectares of oil palms with one senior assistant (optional), two assistant and probably one cadet assistant or a maximum of two in training. It could be acknowledged that the density of trees for every unit of land and the intensity of supervision for oil palm, rubber and cocoa vary and could probably be the basic criterion applied to determine the extent of area feasible for a manager from the company's view point, apart from its main concern which is the overhead costs.

[137] E.L. Franco, P. Correa, R.M. Santella, X. Wu, S.N. Goodman, G.M. Petersen, 2004, Role and limitations of epidemiology in establishing a causal association, Seminars in Cancer Biology, 14, Page 413-426, ELSEVIER.
Reference ID: 23334
Note: #23334e
Abstract: Cancer risk assessment is one of the most visible and controversial endeavors of epidemiology. Epidemiologic approaches are among the most influential of all disciplines that inform policy decisions to reduce cancer risk. The adoption of epidemiologic reasoning to define causal criteria beyond the realm of mechanistic concepts of cause-effect relationships in disease etiology has placed greater reliance on controlled observations of cancer risk as a function of putative exposures in populations. The advent of molecular epidemiology further expanded the field to allow more accurate exposure assessment, improved understanding of intermediate endpoints, and enhanced risk prediction by incorporating the knowledge on genetic susceptibility. We examine herein the role and limitations of epidemiology as a discipline concerned with the identification of carcinogens in the physical, chemical, and biological environment. We reviewed two examples of the application of epidemiologic approaches to aid in the discovery of the causative factors of two very important malignant diseases worldwide, stomach and cervical cancers. Both examples serve as paradigms of successful cooperation between epidemiologists and laboratory scientists in the pursuit of the understanding of cancer etiology.

[138] T. Rhebergen, T. Fairhurst, S. Zingore, M. Fisher, T. Oberthür, A. Whitbread, 2016, Climate, soil and land-use based land suitability evaluation for oilpalm production in Ghana, European Journal of Agronomy, 81, Page 1-14, ELSEVIER.
Reference ID: 23335
Note: #23335e
Abstract: In the past decade, oil palm (*Elaeis guineensis* Jacq.) has become the world's most important oil crop.The large demand for palm oil has resulted in a rapid expansion of oil palm cultivation across the globe.Because of the dwindling availability of land in Southeast Asia, most expansion of the industry is expectedin Central and South America and sub-Saharan Africa, where land with suitable agro-ecological condi-tions is available. Using Ghana as a case study, a method for evaluating areas that are both suitable andavailable for oil palm production is presented. Our assessment used spatial data and GIS techniques, andshowed that areas with suitable climatic conditions (annual average water deficit <400 mm) is about 20%greater than was previously identified. The observed differences are the result of using different methods to determine suitability, and climate change. A major climatic factor limiting suitability for oil palmproduction in Ghana is the annual water deficit, with the most suitable areas located in the rainforest andsemi-deciduous forest zones with higher rainfall in southern Ghana. Opportunities for large-scale oil palmplantation development is limited, however, because of the lack of availability of large and contiguoustracts of land that are required for commercial plantation oil palm development. A feasible strategy foroil palm expansion is therefore smallholder production, which can make use of smaller parcels of land.Alternatively, oil palm production in Ghana can be increased by yield intensification on land alreadyplanted to oil palm. This can also reduce the requirement for further land clearance for new plantationsto meet the growing demand for palm oil. Such assessments will be essential for guiding governmentpolicy makers and investors considering investments in oil palm development.

[139] R. Howeler, T.M. Aye, 2014, Sustainable Management of Cassava in Asia, Colombia, Centro International Agricultura Tropical (CIAT).
Reference ID: 23336
Note: S 8.4.1 #23336
Abstract: Demand for cassava as a source of food, animal feed, starch, and many starch-derived products had been growing rapidly in Southeast Asia. This has created many oppurtunities for farmers growing the crop to increase their income and improve their livelihoods. But increasing their cassava production could come at environmental costs if farmers fail to manage their crop properly.

[140] V. Rao, K.C. Chang, 2016, Future Oil Palm Seed Gardens?, The Planter, 92, Page 605-613.
Reference ID: 23337
Note: #23337e > S serial #23365
Abstract: Commercial oil palms are hybrids between selected duras (D) and pisiferas (P). Duras have fruits with a thick shell while pissiferas are without shell and commonly female sterile. DxP, or tenera, are thin-shelled and, if between bred D and P populations, uniformly heterotic for yield. Commercial hybrid seeds are produced by isolating the female inflorescences of selected duras with pollination bags and, at anthesis, pollinating with the desired pisifera pollen. The isolation and pollination must be meticulous to prevent extraneous pollen contamination. The work is tedious and time-consuming. Many workers are required to produce the millions of seeds required by the industry each year: Less labour will be needed if the hybrid seeds are produced by controlled open pollination. For this, extraneous pollen is excluded by isolating the seed garden from (other) palms without, and ablating the male inflorescences of the palms within.

[141] Mikkelsen, R, IPNI, 2017, Plant Nutrition Today - Fall 2017 Spring no.4: Good Nutrition: Key to plant health, IPNI.
Reference ID: 23338
Note: #23338e
Abstract: Getting crops off to a good start is critical for achieving high yields. During this early stage of growth, seedlings are especially vulnerable to many environmental and biological stresses. Protecting plants from stress and disease begins with providing balanced nutrition from planting through harvest. The critical link between plant nutrition and disease resistance has become apparent as the frontiers of plant health are better understood. A few of these examples are explained here.

[142] Phillips, S, IPNI, 2017, Plant Nutrition Today - Fall 2017 Spring no.5: Citizen Science For Production Agriculture, IPNI.
Reference ID: 23339
Note: #23339e
Abstract: Citizen science can be defined as "the participation of non-scientists in the process of gathering, using, and interpreting data." The approach has been around for decades, but it's a little surprising that it has not been employed too much extent in production agriculture research. Considering farmers' vested interests in agricultural research, they could, and probably should, be more frequently involved in the scientific process.

[143] Oberthür, T, IPNI, 2017, Plant Nutrition Today - Fall 2017 Spring no.6 : El Nino, Fertilizer Application, and cocoa yield in Sulawesi, Indonesia, IPNI.
Reference ID: 23340
Note: #23340e
Abstract: In 2015, an unusually strong El Niño had been brewing in the Pacific Ocean. Fishermen of Northern Peru used the term to describe a warm southward coastal current that occasionally develops around December. Now meteorologists use the term to describe large increases in sea surface temperatures in the eastern and central equatorial Pacific that occur at irregular intervals.
In El Niño years, parts of Indonesia experience drought, just like in 2015. The map (**Figure 1**) indicates the areas that received the most rainfall in September 2015 with white colors, low rainfall is indicated by blue areas, while no rain is shown in gray. Sulawesi is almost entirely gray. Similarly, the Prediction of Worldwide Energy Resource website indicated a much lower cumulative rainfall in 2015 (1,350 mm) than in 2014 (1,656 mm) (NASA, 2016) for the Soppeng area of Sulawesi.

[144] Bruulsema, T, IPNI, 2017, Plant Nutrition Today - Fall 2017 Spring no.7: Healthy soil needs buried phosphate, IPNI.
Reference ID: 23341
Note: #23341e
Abstract: Today's conservation tillage systems do a lot less mixing. When soils were moldboard plowed, the top six to ten inches of soil were inverted, aggressively blending in concentrated layers, bands or pockets of nutrients. In a regularly plowed field, a sample taken to two inches depth gave more or less the same result as one taken to the full depth of plowing. With advent of conservation tillage and no-till systems, however, that changed. Applied nutrients are no longer mixed as thoroughly into the soil. Crop residues stay on the soil surface, and release their nutrients there. For a nutrient like phosphorus (P) that moves slowly through soil, this now holds more available P than the layers below. In recent studies of farm fields across Ohio and in the western Lake Erie watershed-conducted by Heidelberg University, USDA-ARS and Ohio State University-soil test P in the top two inches is now on average 43 to 48 percent higher than in the top 8 inches, and in some farm fields it is as much as three times as high.

[145] IPNI, 2013, Research With Impact: Enhancing Indian Farmer Income with Balanced Nutrition of a Rice-Maize Rotation, USA.
Reference ID: 23342
Note: #23342e
Abstract:
THE CHALLENGE:
It has become increasingly common for farmers to grow rice, followed by maize each year in their fields. This rice-maize cropping system provides an option for farmers to diversify and improve their income compared to growing only rice. Maize is popular because of its higher productivity and profitability, reduced water requirement, and greater resilience against poor weather and pest stress. High-yielding maize removes more nutrients from the soil than rice or wheat. Current fertilization practices have led to an imbalanced and insufficient reservoir of many nutrients in the soil. Improper fertilization practices are leading to an overall decline in farm productivity. IPNI always recommends that farmers apply fertilizer nutrients according to the demand of the crop and apply nutrients in ways that minimize their loss and maximize their efficiency.

[146] IPNI, 2013, Research With Impact: Improved Fertilization Boosts Olive Production in Morocco, USA.
Reference ID: 23343
Note: #23343e
Abstract:
THE CHALLENGE:
Olives are one of the most important fruit crops in Morocco. Its olive-growing region is currently estimated at around one million hectares (ha). The country's fruit production has nearly doubled in the last ten years. But this higher production is mainly due to increased tree planting as yields remain low. The average olive yield is about 1 t/ha under rainfed conditions and 2 t/ha when grown with irrigation. Nutrient deficiencies and imbalanced fertilization remain a primary constraint to higher yields. In most cases, fertilizers are applied without an understanding of the nutritional needs of the trees in individual orchards.

[147] Jensen, T, IPNI, 2017, Plant Nutrition Today - Fall 2017 Spring no.8: Improve productivity of perennial mixed forage stands, International Plant Nutrition Institute (IPNI).
Reference ID: 23344
Note: #23344e
Abstract: Evidence-based stewardship applies proven sciencebased principles to management decisions with full consideration of the characteristics of the specific site and the needs of the specific production system. Key soil properties are an essential subset of site characteristics. The many tame pastures of central British Columbia, Canada offer an excellent example. These pastures are the result of former forested land being logged for lumber, then cleared and converted to grazing land. After tree stumps and roots are piled and burned, the land is smoothed out and large rocks removed before broadcast seeding, and harrowing to mixed forage stands. The mixed forage stands will often consist of a mixture of cool grass species such as brome and timothy grasses, and legumes species such as clovers and spreading alfalfa. Many ranchers and mixed farm operators graze beef cattle on these pastures and don't see the need of applying supplemental nutrients as fertilizers, or use soil amendments. However, some significant improvements in productivity of these pastures can be realized with modest applications of fertilizers, as well as lime (CaCO3) and gypsum (CaSO4). Improvement is noticed by increased carrying capacity of pastures, and greater weight gain by livestock.

[148] J.P. Pellet, A. Elisseeff, 2016, Partial Correlation-and Regression-Based Approaches to Causal Structure Learning, Page 1-22.
Reference ID: 23345
Note: #23345e
Abstract: We present the Total Conditioning (TC) algorithm for causal discovery suited in the presence of continuous variables. Given a set of n data points drawn from a distribution whose underlying causal structure is a directed acyclic graph (DAG), the TC algorithm returns a structure, i.e., a DAG, over the variables that tends to the correct structure when n tends to infinity. The approach builds on the structural equation modeling framework, well suited for continuous variables, and relies on causal Bayesian networks semantics to handle consistency. We compare TC and a variant, TCbw, which borrows techniques from feature selection for robustness when the number of samples is small, to the state-of-the-art PC algorithm. We show that TCbw has identical or better performance when n exceeds the number of variables,

while benefiting from a better time complexity.

[149] UPM, 1979, Pertanika Vol.2 No.1, Pertanika, 2, Page 1-74, University Pertanian Malaysia, Selangor, Malaysia.
Reference ID: 23346
Note: #23346e

[150] UPM, 1979, Pertanika Vol.2 No.2, Pertanika, 2, Page 74-162, Selangor, Malaysia.
Reference ID: 23347
Note: #23347e

[151] D. Byerlee, W.P. Falcon, R.L. Naylor, 2017, The Tropical Oil Crop Revolution, USA, Page OXFORD University Press.
Reference ID: 23348
Note: S 8 #23348e

[152] A.N. Kravchenko, S.S. Snapp, G.P. Robertson, 2017, Field-scale experiments reveal persistent yield gaps in low-input and organic cropping systems, PNAS, 114, Page 926-931.
Reference ID: 23349
Note: H 11.6 #23349e
Proceedings of the National Academy of Science of the United States of America
Abstract: Knowledge of production-system performance is largely based on observations at the experimental plot scale. Although yield gaps between plot-scale and field-scale research are widely acknowledged, their extent and persistence have not been experimentally examined in a systematic manner. At a site in southwest Michigan, we conducted a 6-y experiment to test the accuracy with which plot-scale crop-yield results can inform field-scale conclusions. We compared conventional versus alternative, that is, reduced-input and biologically based–organic, management practices for a corn–soybean–wheat rotation in a randomized complete block-design experiment, using 27 commercial-size agricultural fields. Nearby plot-scale experiments (0.02-ha to 1.0-ha plots) provided a comparison of plot versus field performance. We found that plot-scale yields well matched field-scale yields for conventional management but not for alternative systems. For all three crops, at the plot scale, reduced-input and conventional managements produced similar yields; at the field scale, reduced-input yields were lower than conventional. For soybeans at the plot scale, biological and conventional managements produced similar yields; at the field scale, biological yielded less than conventional. For corn, biological management produced lower yields than conventional in both plot- and field-scale experiments. Wheat yields appeared to be less affected by the experimental scale than corn and soybean. Conventional management was more resilient to field-scale challenges than alternative practices, which were more dependent on timely management interventions; in particular, mechanical weed control. Results underscore the need for much wider adoption of field-scale experimentation when assessing new technologies and production-system performance, especially as related to closing yield gaps in organic farming and in low-resourced systems typical of much of the developing world.

[153] Anonymous, 2017, Nutrient Value Of Compost.
Reference ID: 23350
Note: #23350e
Abstract: Theoretical value of compost application:
Increase organic matter, Improve aggregate stability, Reduce bulk density, Increase water holding capacity, Increase cation exchange capacity, Enhance the soil microbial community, Suppress soil pests, Provide nutrients

[154] C. Donough, T. Oberthür, S. Cook, J. Cock, S.P. Kam, Y.L. Lim, H. Sugianto, 2016, IPNI Southeast Asia Program- Plantation Intelligence: Getting more value from Estate data.
Reference ID: 23351
Note: #23351e
Presented at IJM Plantations Berhad Oil Palm Seminar Part II, Sandakan, Sabah, Malaysia. 4 November 2016

[155] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Introduction, Advances In Irrigation Agronomy- Plantation Crops, Page 1-12. CAMBRIDGE UNIVERSITY PRESS.
Reference ID: 23352
Note: #23352 > S 8 #23325 (Chapter 1)
Abstract: There are a few easily identifiable or accessible sources where the results of international irrigation research have been brought together and interpreted in coherent and useful ways for individual crops. This is in part due to the diversity of sources, and also to the difficulty of reconciling the results of research conducted in contrasting situations, often with insufficient supporting information, to allow the results to be extrapolated to new situations with confidence.

[156] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Banana, Advances In Irrigation Agronomy - Plantation Crops, Page 14-51. Cambridge University Press.
Reference ID: 23353
Note: #23353 > S 8 #23325 (Chapter 2)
Abstract: The centre of origin of the wild banana Musa species, a giant perennial herb, is believe to be in South-east Asia, where it oppurtunistically exploits breaks in the rainforest such as river margins (Simmonds, 1962). Wild bananas are jungle weeds, pioneers in the succession to rainforest, and intolerate of shade (Price, 1995). From here, the banana is believed to have spread outwards into the Pacific and then westwards, reaching sub-Saharan Afica about two thusand years ago. The banana became a staple crop in upland East/Central Africa, which is still the greatest centre of cultivation. In the sixteenth century, early European travellers may have taken the banana from West Africa across the Atlantic Ocean to the Americas where it was quickly adopted (Simmonds, 1995).

[157] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Cocoa, Advances In Irrigation Agronomy - Plantation Crops, Page 53-74. Cambridge University Press.
Reference ID: 23354
Note: H 8.1.4 #23354 > S 8 #23325 (Chapter 3)
Abstract: The centre of diversity of the cocoa tree (*Theobroma cocoa* L.) is believed to be within the rainforests of lowland northern South America where the greatest range of variation in natural populations exist (Cheesman, 1944; Simmonds, 1998). The plant is grown for its fruits known as cocoa pods (botanically indehiscent drupes).

The pods contain seeds, which are fermented with the mucilage surrounding them and then dried to give fermented dried cocoa, the raw material used in the food industry for the production of chocolate and powder (for drinking, baking and ice cream manufacture). A small proportion is also sold as cocoa butter, which is used in the pharmaceutical and cosmetic industries (Wood, 1985a).

[158] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Coconut, Advances In Irrigation Agronomy - Plantation Crops, Page 76-103. Cambridge University Press.
Reference ID: 23355
Note: #23355 > S 8 #23325 (Chapter 4)
Abstract: The coconut (*Cocos nucifera* L.) controbutes to the livelihoods of millions of people in the developing world, not only through its production but also through employment generated by many associated industries. It is the most wide-spread, economically useful palm of the wet tropics, being found mainly in coastal areas between latitudes 20N and 20S of the equator.

[159] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Coffee, Advances In Irrigation Agronomy - Plantation Crops, Page 105-143. Cambridge University Press.
Reference ID: 23356
Note: #23356 > S 8 #23325 (Chapter 5)
Abstract: There are two principal types of coffee grown commercially: *Coffea arabica* L., commonly known as "arabica" coffee, and coffea canephora Pierre ex Froehner, commonly known as "robusta" coffee. A third (Coffea liberca Bull ex Hiern) is grown only on a very small scale. The useful product is the bean, a relatively heavy seed that ripens within a sweet red fruit. The seeds, rich in caffeine, from the basis of a beverage widely traded and consumed throughout the world.

[160] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Oil Palm, Advances In Irrigation Agronomy - Plantation Crops, Page 145-167. Cambridge University Press.
Reference ID: 23357
Note: #23357 > S 8 #23325 (Chapter 6)
Abstract: The centre of origin of the oil palm (*Elaeis guineensis* Jacq.) is the tropical rainforest of West Africa where its natural habitat is believed to be in swamps and along river banks. The main economic product is palm oil obtained from the mesocarp in the fruit. Palm kernel oil, which has a different fatty acid composition, is produced in smaller quantities. Kernel cake, produced after the kernel oil has been extracted, is used in animal feeds. Oil palm is the highest yielding oil crop in the world. Traditionally, palm oil was used in soap, margarine and cooking fat, but is now largely used in food products. It has also become the source of more diverse materials (Corley and Tinker, 2003). When grown as a smallholder crop, the oil palm contributes much more than oil to the communities living in the areas where it is cultivated. For example, the sap can provide raw material for sugar and alcoholic beverages. The palms are also a sourceof building materials, and some of the tissues are important sources of fibre.

[161] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Rubber, Advances In Irrigation Agronomy - Plantation Crops, Page 169-185. Cambridge University Press.
Reference ID: 23358
Note: #23358 > S 8 #23325 (Chapter 7)
Abstract: The rubber tree of commerce (*Hevea brasiliensis* Muell. Arg.) is indigenous to the Amazon rainforest, within 5N and 5S latitude of the equator. Its properties were well known to the Indians of South and Central America long before the arrival of the

Europeans in the sixteenth century. It is cultivated for its latex, which is used in the production of natural rubber, 60% of which is utilised in the manufacture of tyres (Figure7.1). Latex is a cellular lfuid consisting of suspension of rubber hydrocarbon particles, represented by the formula, in an aqueous medium. The noneteenth century saw the vulcanisation of rubber (heating with sulphur allows rubber to retain its physical properties unchanged over the temperature range 0-100), the development of specialist machinery and techniques for manufacturing rubber goods, the rise of commercial trade in rubber, and the first efforts to cultivate rubber when the demand for raw rubber began to exceed the supply from wild trees in Brazil (Varghese and Abraham, 2005).

[162] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Sisal, Advances In Irrigation Agronomy - Plantation Crops, Page 187-193. Cambridge University Press.
Reference ID: 23359
Note: #23359 > S 8 #23325 (Chapter 8)
Abstract: The sisal plant (Agave sisalana Perrine) is a source of coarse leaf fibres. These are used by industry in the manufacture of twines and ropes, carpet-backing, bags and matting (Figure 8.1). The principal areas of production are Brazil, where it is predominantly a smallholder crop, and East Africa, where it is a large-scale plantation crop (Figure 8.2). The importance of the crop, which is adapted to dry areas, has declined since the mid 1960s due mainly to competition from synthetics made from oil-based polypropylenes. As a result, little has changed in production methods in the last 50 years, and resources for research have been limited (Shamte, 2001).

[163] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Sugar Cane, Advances In Irrigation Agronomy - Plantation Crops, Page 195-220. Cambridge University Press.
Reference ID: 23360
Note: #23360 > S 8 #23325 (Chapter 9)
Abstract: Sugar cane (*Saccharum officinarum* L., the so-called Noble cane because of its fine thick stem) is believed to have originated in the islands of the South Pacific, probably New Guinea (2-10S) having evolved through human selection from strains of two wild species S. robustum and S. spontaneum and hybridisation with S. sinense (Purseglove, 1972; Bull and Glasziou, 1976; Julien et al., 1989; Jones et al.,1990; Simmonds,1998). Because of its natural sweetness, it had been grown for chewing since ancient times in the Pacific and South-east Asia. The production of sugar from sugar cane began in India, followed by China, Persia (Iran), Egypt and Spain and elsewhere around the Mediterranean. In the seventeenth century the first plantations were established in the West Indies, and the resultant need for labour, particulary for harvesting, led to sugar cane's links with the slave trade.

[164] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Tea, Advances In Irrigation Agronomy - Plantation Crops, Page 222-273. Cambridge University Press.
Reference ID: 23361
Note: #23361 > S 8 #23325 (Chapter 10)
Abstract: Tea (*Camellia Sinensis* L.) is believed to have originated within the fan-shaped area extending from the Assam/Burma border in the west to China in the east and south from this line through Burma and Thailand to Vietname (Kingdom-Ward, 1950; Mair and Hoh, 2009). This is an area of monsoon climates with a warm, wet summer and a cool, dry (or less wet) winter. From the main centres of cultivation in South-east Asia tea had been introduced into many other areas of the world and is now grown in conditions that range from Mediterranean-type climates to the hot, humid

tropics, from Georgia in the north 42N to Argentina 27S and New Zealand 37S in the south, and from sea level to 2700m altitude (Carr, 1972). By far the largest producer of tea is China (estimated planted area by 2008 = 1.4 million ha; annual priduction of processed tea = 1.3 million t) followed by India (474 000 ha; 800 000 t) and then Kenya (158 000 ha; 345 000 t) and Sri Lanka (222 000 ha; 319 000 t) (FAO, 2010b).

[165] M.K.V. Carr, 2012, Advances In Irrigation Agronomy - Synthesis, Advances In Irrigation Agronomy - Plantation Crops, Page 275-293. Cambridge University Press.
Reference ID: 23362
Note: #23362 > S 8 #23325 (Chapter 11)
Abstract: A diverse range of crops has been covered in the preceding chapters, embracing a wide range of products, all united by the common collective title of plantation crops. An attempt is now made to synthesise the findings reported for each crop, despite the dicciculties in making direct comparisons, to review the reporting of research findings, and finally to draw some collective conclusions in order to identify a way forward.

[166] S.J. Mokhatar, N. Wan Daud, C.F. Ishak, 2012, Response of *Hevea Brasiliensis* (RRIM 2001) Planted on an Oxisol to Different Rates of Fertilizer Application, Malaysian Journal of Soil Science, 16, Page 57-69.
Reference ID: 23363
Note: #23363e
Abstract: Rubber, *Hevea brasiliensis* is one of the important commodity crops that has contributed much to the nation's economy as this country was the third largest producer of pure latex and the fifth in terms of consumption of natural rubber in the world. The precise use of fertilizers is very important in a rubber nursery establishment to ensure quality production of planting materials and optimizations of the fertilizing cost. This study will assess the suitability of the current fertilizer application rate for latex timber clones and suggest a fertilizer rate for use in advanced planting materials nurseries. The study was conducted using a complete randomized design (CRD) with four replications.

[167] C.F. Dewhurst, M.R. Wilson, 2016, The Derbid Planthopper Proutista moesta (Westwood)(Hemiptera:Fulgoroidea) on Oil Palm in Papua New Guinea, The Planter, 92, Page 619-623, ISP, Kuala Lumpur.
Reference ID: 23364
Note: #23364e > S serial #23365
Abstract: Derbidae are one of the largest families among the Fulgoroidea, and species are often found on many palm species such as Areca, Cocos and Elaeis. The first record of Poutista moesta (Westwood) is given for Papua New Guinea (Northern Provinces). The distribution and aspects of the biology is discussed.

[168] ISP, 2016, The Planter Vol 92 No 1086 September 2016, Kuala Lumpur, 92, Page 599-674. Incorporated Society of Planters.
Reference ID: 23365
Note: S Serial #23365

[169] N. Dubois, D.W. Oppo, V.V. Galy, M. Mohtadi, S. van der kaars, J.E. Tierney, Y. Rosenthal, T.I. Eglinton, A. Lückge, B.K. Linsley, 2014, Indonesia vegetation response to changes in rainfall seasonality over the past 25,000 years, Page 1-5, Nature Geoscience.
Reference ID: 23366
Note: H 26.1.3 #23366
Abstract: The hydrologic response to climate forcing in the Indo-Pacific warm pool region has varied spatially over the past 25,000 years 1, 2, 3, 4, 5. For example, drier conditions are inferred on Java and Borneo for the period following the end of the Last Glacial Maximum, whereas wetter conditions are reconstructed for northwest Australia. The response of vegetation to these past rainfall variations is poorly constrained. Using a suite of 30 surface marine sediment samples from throughout the Indo-Pacific warm pool, we demonstrate that today the stable isotopic composition of vascular plant fatty acids (d13CFA) reflects the regional vegetation composition. This in turn is controlled by the seasonality of rainfall consistent with dry season water stress6. Applying this proxy in a sediment core from offshore northeast Borneo, we show broadly similar vegetation cover during the Last Glacial Maximum and the Holocene, suggesting that, despite generally drier glacial conditions 1, 7, there was no pronounced dry season. In contrast, d13CFA and pollen data from a core off the coast of Sumba indicate an expansion of C4 herbs during the most recent glaciation, implying enhanced aridity and water stress during the dry season. Holocene vegetation trends are also consistent with a response to dry season water stress. We therefore conclude that vegetation in tropical monsoon regions is susceptible to increases in water stress arising from an enhanced seasonality of rainfall, as has occurred in past decades.

[170] F. DaMatta, 2010, Ecophysiology of tropical Tree Crops, Nova Science.
Reference ID: 23367
Note: S 8.1 #23367

[171] P. Silva, 1988, Novas pragas do cacaueiro no Reconcavo da Bahia, Brasil, Revista Theobroma, 18, Page 269-272.
Reference ID: 23368
Note: H 8.1.4 #23368
Abstract: The caterpillars of the moths Stenoma strigivenata (Butler) and Bocchoropsis pharaxalis (Druce), and the larva of the longhorn beetle Sphallenum setosum (Germar) as recorded as new psets of the cacao tree in the Reconcavo Region of Bahia, Brazil.

[172] Q. Schiermeier, 2015, Hunting the Godzilla El Nino, Nature, 526, Page 490 – 491, Macmillan.
Reference ID: 23369
Note: H 0 #23369
Abstract: The tropical pacific seemed out of sorts this August, as oceanographer Kelvin Richard and his team cruised along the equator east of the Marshall Islands. Six tropical cyclones had barrelled across the ocean in the previous month, and more were spinning up as Richards' research expedition got under way. The sea surface across the region was abnormally warm, with water temperatires at least 1C higher than expected. And when the oceanographers peered below the surface, they found signs of intense turbulence extending hundreds of metres down. The team had found itself cruising through a spectacular El Nino warming event - one that may become the

strongest ever recorded. Big El Ninos can turn climate conditions in the Pacific upside down and disrupt weather around the globe. The impacts of this one have already been felt. Indonesia has suffered through withering drought that has intensified fires in forests and agricultural land, and pacific corals are experiencing one of the worst bleaching events on record.

[173] C.A. Varotsos, C.G. Tzanis, N.V. Sarlis, 2016, On the progress of the 2015-2016 El Nino event, Atmospheric Chemistry and Physics, 16, Page 2007 - 2011.
Reference ID: 23370
Note: H 0 #23370e
Abstract: It has been recently reported that the current 2015– 2016 El Niño could become “one of the strongest on record”. To further explore this claim, we performed the new analysis described in detail in Varotsos et al. (2015) that allows the detection of precursory signals of the strong El Niño events by using a recently developed non-linear dynamics tool. In this context, the analysis of the Southern Oscillation Index time series for the period 1876–2015 shows that the running 2015–2016 El Niño would be rather a “moderate to strong” or even a “strong” event and not “one of the strongest on record”, as that of 1997–1998.

[174] T.H. Yap, 2005, A Review on the Management of Lepidoptera Leaf-eaters in Oil Palm: Practical Implementation of Integrated Pest Management Strategies, The Planter, 81, Page 569 - 586.
Reference ID: 23371
Note: #23371e
Abstract: A natural environment, like the tropical rainforest, is a biological entity, where under normal circumstances an ecological equilibrium would exist. The biodiversity allows for natural checks and balances between destructive insect pests and natural biological agents (parasitoids, predators, entomophagous fungi, bacteria and viruses). The oil palm plantation is a cultivated extended hectarage of a monoculture of a single plant species. This ecological profile, often at most times, permits excellent oppurtunities for destructive insect pests to proliferate and propagate, thus triggering an outbreak. The bagworms, nettle caterpillars and sometimes caterpillars of the tussock moth are the accasional Lepidoptera leaft-eaters in both immature and mature oil palm plantations. In outbreaks, they are a bane to the oil palm plantation, as their voracious appetite causes severe defoliation resulting in crop and economic loss. Indirectly the decrease in leaf canopy area would also lead to increase in weed management costs. It is imperative that the intelligent management of these Lepidoptera leaf-eaters be aligned with the practical implementation of IPM strategies and practices.

[175] H. Vine, 1956, Studies of Soil Profiles at the W.A.I.F.O.R. Main Station and at Some Other Sites of Oil Palm Experiments, Journal of West African Institute for Oil Palm Research, 1, Page 1.
Reference ID: 23372
Note: #23372e
Abstract: The purpose of this paper is to describe and classify the soils of certain places where experimental work on oil palms is being carried out in southern Niegeria (fig. 1) and to report the results of simple analyses of profile samples that have been done. Later papers will report data for exchangeable potassium in palm plots showing Confluent Orange Spotting in varying degree at Nkwele Agricultural Station, studies of the changes in the topsoil under various cultural treatments in Experiments 33-1 amd

33-2 at W.A.I.F.O.R. Main Station, and investigations of nitrate fluctuations in these experiments (done in 1944 and 1945).

[176] J.D. Ferwerda, 1955, Questions Relevant to Replanting in Oil Palm Cultivation, Agricultural, Wageningen, Doctor in Agricultural Science, Page 111. Wageningen.
Reference ID: 23373
Note: #23373e

[177] ISP, ISP. 2016, The Planter Vol 92 No 1087 October 2016, Kuala Lumpur, 92, Page 683-772. Incorporated Society of Planters.
Reference ID: 23374
Note: S serial #23374

[178] M. Arujanan, 2016, Development of Agricultural Biotechnology in Malaysia in Comparison to Global Status, The Planter, 92, Page 689-697.
Reference ID: 23375
Note: #23375e > S serial #23374
Abstract: Agricultural biotechnology is rapidly advancing and is providing a number of tools to improve crop production that not only is important to feed the global population but also in healing and fueling the world. The global scientific community is already advancing from conventional breeding techniques and genetic engineering to more precise technologies such as gene editing. While Malaysia has a strong commitment to develop biotechnology and bioeconomy and had a good start with tissue culture, the country is lagging behind in modern biotechnology.
This paper outlines the global status of agricultural biotechnology, in particular developments in Asian countries. Malaysian biobased activities in the area of agriculture do not employ advanced modern biotechnology, making Malaysia to lag behind in agricultural biotechnology. The issues and challenges that need to be addressed for Malaysia to transform current research activities to the level that is comparable to global status are discussed

[179] E.T.L. Low, R. Singh, N. Rajanaidu, M. Ong-Abdullah, L.C.L. Ooi, N.D. Lakey, S.W. Smith, J.M. Ordway, R. Sambanthamurthi, 2016, New Frontiers for the Oil Palm Industry Through Genome Technology, The Planter, 92, Page 701-710.
Reference ID: 23376
Note: #23376e > S serial #23374
Abstract: The oil palm is the most productive oil bearing crop that is an important source of edible oil. As land resources become more limited, sustainable growth is needed to increase productivity on existing agricultural land to meet the needs of the growing populations. Nevertheless, genetic improvement of oil palm through conventional breeding is extremely slow and costly. Revolutionary approaches are needed to improve productivity and address the stagnating average yields observed over the last three decades. In 2013, the impetus to this "green" revolution came with the successful sequencing and annotation of the oil palm genome. The release of the genome data led to a myriad of discoveries that will eventually contribute to the development of disruptive technologies to assist the oil palm realise its real yield potential. Examples of these discoveries include the identification of the SHELL and fruit colour genes that have improtant implications in improving yield and harvesting standards. The SHELL gene discovery led to the development of the first oil palm molecular diagnostic assay that was made available to the industry. The assay will change the way the oil palm industry produces commercial planting materials and will

especially prove invaluable in enhancing breeding efficiency.

[180] Y.Y. Kwan, S.S.R. Syed Alwee, 2016, Application of MAS into Oil Palm Crop Improvement, The Planter, 92, Page 715-722.
Reference ID: 23377
Note: #23377e > S serial #23374
Abstract: Conventional oil palm breeding is a lengthy process as it requires 10-19 years for a generational improvement. Advancement in sequencing technologies and availability of oil palm genome sequence has intensified the identification of trait markers for crop improvement of the oil palm. Currently, markers for three traits have been identified in oil palm; fruit form, fruit colour and mantling. Application of these markers into marker-assisted selection in oil palm improvement programmes allows early selection process in the nursery and improved breeding efficiency.

[181] U.S. Ramli, B.L.Y. Chung, N.I.M. Tahir, S. Shahwan, H. Hassan, N. Zain, N.L. Rozali, S.B. Dzulkafli, N.A.M. Ishak, A. Othman, 2016, Proteomics and Metabolomics: Spearheading Oil Palm Improvement and Sustainability, The Planter, 92, Page 727-737.
Reference ID: 23378
Note: #23378e > S serial #23374
Abstract: Malaysia is the world's second largest producer of palm oil, and this golden crop is a major contributor to its revenue. Research in oil palm biotechnology, has positively impacted the oil palm industry. However, poor understanding of oil palm biology is hindering this progress. Recently, mass spectrometry has become increasingly useful tool for studying biological systems. Its rapid evolution has resulted in an impressive array of instruments and application; yet it is still largely used only by specialists. The Malaysian Palm Oil Board (MPOB) has established a Protemics and Metabolomics Platform (PROMET) as a core R&D facilit, making the technology and/or data usable by non-mass spectrometrists. PROMET was established in 2008 for research in oil palm protemics and metabolomics. The main focus was to unravel the important economic traits, such as high-value fatty acids and high-yielding genotypes through advanced omics technology. The facility also contributed to tackling basal stem rot by allowing post-genomics techniques. Availability of oil palm proteome and metabolome data in different fruit stages and tissues has provided crop-specific data to investigate the various physiological processes, such as fruit ripening, and uncover solutions to existing biological problems, eg drought stress. The key results from PROMET are discussed.

[182] M. Ong-Abdullah, J.M. Ordway, N. Jiang, S.-E. Ooi, A. Mokri, S.Y. Kok, N. Sarpan, N. Azimi, A.T. Hashim, Z. Ishak, S.K. Rosli, R. Nookiah, R. Singh, L.E.-T. Low, M. Sachdeva, S.W. Smith, N. Lakey, R.A. Martienssen, R. Sambanthamurthi, 2016, Tissue Culture and Epigenetics, The Planter, 92, Page 741-749.
Reference ID: 23379
Note: #23379e > S serial #23374
Abstract: A boost of 20-30 per cent in yield is expected from tissue culture-derived planting materials. Troubled by a shrinking land resource, cloning good performing palms is a well-received sustainble alternative. Cloning of elite oil palms is entrenched in breeding programmes as a way to outpace the long breeding cycle of the oil palm which is generally results in slow introduction of new improved planting materials into the commercial pool. However, the emergence of a somaclonal variant known as the mantled phenotype, which drastically reduced yield, caused the industry to relook at

the strategy as confidence in the cloning technology of oil palm took a nosedive. Aside from knowing that epigenetics was involved, most of the earlier research was unsuccessful in linking any markers to mantling. Through the big data approach the team finally pinned down the cause of mantling to a B-function MADS-box gene, DEFICIENS. The defect is an epigenetic mark regularted by a transposable element, KARMA that causes the formation of abnormal oil palm fruit with pseudocarpels. The hypomethylation of this element, fount in the intron of DEFICIENS, is common to all mantled clones along with alternative splicing and loss of small RNA. These findings have been translated into an assay to allow culling of mantled ramets at the nursery before committing limited plantation resources to clonal propagation, a boon to precision agriculture. The discovery of KARAM will certainly fuel a much wanted growth in oil palm clonal industry as confidence in this technology is expected to soar, thus altering the current plantation scene which relies heavily on planting materials through conventional breeding

[183] ISP, ISP. 2016, The Planter Vol 92 No 1088 November 2016, Kuala Lumpur, 92, Page 781-850. The Incorporated Society of Planters.
Reference ID: 23380
Note: S serial #23380

[184] A.H. Azlan, C.T. Lee, K.Y. Soh, S. Selvaraja, R. Rohan, I. Ariffin, S. Palaniappan, 2016, Impact of El Niño on Palm Oil Production, The Planter, 92, Page 789-806.
Reference ID: 23381
Note: #23381e > S serial #23380
Abstract: Oil palm growth is significantly influenced by rainfall and for that reason, Crude Palm Oil (CPO) production is affected during El Nino events. The National Oceanic and Atmosphere Administration (NOAA) website provides comprehensive climate and weather information which can be related to El Nino events and ultmately fresh fruit bunch (FFB) yields or CPO production. NOAA commonly uses the Oceanic Nino Index (ONI) to determine the strength of El Nino events where records over the last 50 years revealed that the current El Nino (2015/16) has proven to be severe (categorised as 'very strong') as the events in 1997/98 and 1982/83. Past records show that very strong El Nino events (1982/83 and 1997/98) have resulted in significant drops in FFB yields and CPO production of 10-16 percent and 8-14 per cent respectively. This paper will attempt to explain the definition of El Nino and review its historical impact on FFB production and yield pattern under irrigated and non-irrigated conditions dueing two El Nino events: strong El Nino (1997/98) and weal El Nino (2005/06)

[185] K.H. Lim, 2016, Ganoderma Management on Peat, The Planter, 92, Page 813-824.
Reference ID: 23382
Note: #23382e > S serial #23380
Abstract: Ganoderma infection remains the most significant constraint to sustainable oil palm cultivation in Malaysia and Indonesia, particularly on peat. Significant yield reduction is caused by direct loss of palm stand, lower yield of infected palms and need for earlier replanting.
Since there is presently no effective remedy for oil palms infected with Ganoderma, the mmanagementof this devastating disease on peat is focused mainly on early detection of infected palms by more ffrequentcensus, good implementation of sanitation practices and improvement of palm health to tolerate the disease.

This paper reports the results of trials on the effectiveness of a low-cost method for minimising the spread of ganoderma infection on oil palms planted on peat. Field trials showed that 20cm wide x 75cm deep trenches isolating an area of 4m x 4m around each infected palm was effective in minimising spread to neighbouring healthy palms. The soil from the excavation of the isolation trench was used for mounding the base of the infected palm, to prolong productive life.

[186] ISP, ISP. 2016, The Planter Vol 92 No 1089 December 2016, Kuala Lumpur, 92, Page 859-930. The Incorporated Society of Planters.
Reference ID: 23383
Note: S serial #23383

[187] G.F. Chung, 2016, A Tough Creeping Weed, *Epipremnum giganteum* (Roxb) Schott (Araceae) in an Oil Palm Estate near Sepang - Plant Description and Management, The Planter, 92, Page 867-877.
Reference ID: 23384
Note: #23384e > S serial #23383
Abstract: Recently a creeping aroid weed (identified as Epiprenmum giganteum) has been found to colonise large patches of inter-row areas in sheet form frequently encroaching into the palm circles and planting strips. In many palms, it has successfully climbed up the trunk becoming tough epiphytes. Serious loss in crop can occur from the failure to harvest many FFB and also many loose fruits in the palm base are not collected due to obstruction from its encroachment. This paper discusses briefly this aroid plant (with pictorial identification) and its management

[188] M.M. Ero, S. Sar, A. Kawi, D. Tenakanai, P. Gende, L.J.G. Bonneau, 2016, Detection of the Guam Biotype (CRB-G) *Oryctes rhinoceros* Linneaus (Coleoptera:Scarabaeidea) in Port Moresby, Papua New Guinea, The Planter, 92, Page 883-891.
Reference ID: 23385
Note: #23385e > S serial #23383
Abstract: *Oryctes rhinoceros* L. is an important pest of coconuts and oil palm. The damage to palms is primarily caused by adult beetles. They either cut through the fronds butts or bore through the palm bases with their forelegs and feed on the inner soft tissues. A strain of *Oryctes Nudivirus* (Rhabdionvirus oryctes) was identified from Malaysia in the 1960s and used effectively for classical biological control of the pest. However, in 2007 a more destructive population of the beetle was found in Guam. Molecular analysis confirmed its genotype to be different from that of the common population and also to be resistant against NudiVirus infection. The new population has subsequently been referred to as the Guam biotype (CRB-G) whilst the common type has been referred to as the Samoan/Pacific biotype (CRB-S/P). In 2010, similar damage was noted on coconuts in Port Moresby, National Capital District, Papua New Guinea/ Sympatric occurrence of both CRB-G and CRB-S in National Capital Distrcit with no NudiVirus infection on CRB-G was confirmed. CRB-G has been found to be less responsive to the aggregation pheromone (ethyl 4-methyloctanoate) used for monitoring and control of *O. rhinoceros*. Only CRB-S is found in East New Britain, New Ireland and West New Britain with NudiVirus infection. Widespread severe damage was observed in National Capital District and Central Province, whilst severe damage in New Ireland, East New Britain and West New Britain was localised in areas with readily available breeding sites. Light damages were noted in some areas in Milne Bay, Northern and West New Britain Provinces, but most areas were free of damage.

The results are discussed in relation to the impact of CRB-G is likely to have on the palm industries in Papua New Guinea if no effective control options are put in place.

[189] S.K. Ng, S. Thamboo, 1967, Nutrient Contents Of Oil Palms In Malaya, The Malaysian Agricultural Journal, 46.
Reference ID: 23386
Note: #23386e
Abstract: There is a considerable volume of data on the mineral nutrient composition of oil palm leaflets and on the use of such data as a guide for assessing fertilizer needs of oil palms (Chapman and Gray, 1949, Prevot and Ollagnier, 1954, Broeshart, 1956; Coulter, 1958 and Ferwerda, 1960). On the other hand, published information on the chemical composition of other plant tissues such as fruit bunches and male inflorescence is relatively limited and dates back before World War II (Zeller, 1911; Blommendaal, 1937; Georgi, 1931 and Wilbaux, 1937) and the data are less comprehensive than that of leaves.

While foliar analysis is a valuable diagnostic aid, it is evident that accurate evaluation of fertilizer requirements of oil palms growing under diverse soil conditions can only be finally decided by field experiments on representative soil types. In planning such field trials, data on the quantities of nutrients that go into the vegetative and reproductive organs of the oil palm in growth and production, and complementary soil analytical data should ensure that realistic fertilizer levels will be used. The value of this information cannot be over-emphasized in view of the length of time required to obtain conclusive results from field experiments with a perennial crop like oil palm. Moreover, where few fertilizer experiments exist, accurate data on the quantities of nutrients involved in vegetative growth and production of fruit bunches and male inflorescence enables interim fertilizer proposals to be formulated. This need is particularly felt now in Malaya where the oil palm industry is rapidly expanding but there have been insufficient fertilizer experiments covering the major soils to provide the information urgently required.

[190] IPNI, 2017, Better Crops With Plant Food Vol.101 (2017, No.2), 101, Page 1 - 35. International Plant Nutrition Institute (IPNI).
Reference ID: 23387
Note: S serial #23387e

[191] K.G. Cassman, 2017, Ecological Intensification of Maize-Based Cropping Systems, The Better Crops With Plant Food 101, Page 4 - 6.
Reference ID: 23388
Note: #23388e > S serial #23887e
Abstract: Ecological intensifi cation (EI) is the process of improving both yields and environmental performance of crop production with a focus on precise management of all production factors and maintenance or improvement of soil quality.

Innovation and adoption of EI practices will be facilitated by use of “big data” that farmers themselves generate, coupled with a robust spatial framework to identify cohort fi elds that respond similarly to these innovations.

[192] P. Grassini, K.G. Cassman, M. van Ittersum, 2017, Exploring Maize Intensification with the Global Yield Gap Atlas, Better Crops With Plant Food, 101, Page 7 - 9. International Plant Nutrition Institute.
Reference ID: 23389
Note: #23389e > S serial #23387e
Abstract: The Global Yield Gap Atlas (www.yieldgap.org) provides estimates of yield potential, yield gap, and water productivity for maize and eight other major food crops.

Maize yield gaps range from 80% in Sub-Saharan Africa and India to 15% in irrigated and favorable rain-fed environments in USA and Europe. The Atlas can help identify regions with greatest potential for sustainable maize intensification.

[193] R. Norton, C. Snyder, F. Garcia, T.S. Murrell, 2017, Ecological Intensification and 4R Nutrient Stewardship: Measuring Impacts, Better Crops With Plant Food, 101, Page 10 - 12. International Plant Nutrition Institute (IPNI).
Reference ID: 23390
Note: #23390e > S serial #23387e
Abstract: The impacts of improved management can be accessed through common production and nutrient balance measures. However, the assessment of the sustainability of ecological intensification (EI) requires that these measurements be linked to changes in soil nutrient status and to farm level profitability

[194] T.S. Murrell, J.A. Coulter, V. Nosov, J. Sawyer, D. Barker, O. Biryukova, J. Vetsch, 2017, Opportunities for Ecological Intensification Approaches when Yield Gaps Are Narrow, Better Crops With Plant Food, 101, Page 13 - 16. International Plant Nutrition Institute (IPNI).
Reference ID: 23391
Note: #23391e > S serial #23387e
Abstract: Four sites in the IPNI Global Maize Project located in areas thought to have narrow exploitable yield gaps demonstrate that management practices assembled to achieve ecological intensification produced comparable or greater maize yields than those achieved with standard farmer practices.

[195] F. Garcia, T. Satyanarayana, S. Zingore, 2017, Ecological Intensification Management When Yield Gaps are Wide, Better Crops With Plant Food, 101, Page 17 - 20. International Plant Nutrition Institute (IPNI).
Reference ID: 23392
Note: #23392e > S serial #23387e
Abstract: Regions with wide yield gaps in maize commonly lack adequate adoption of high-yielding hybrids and crop protection, they are susceptible to water deficits, and have inadequate soil and/or nutrient management practices. Kenyan research highlights the need to tailor sources of fertilizer in order to account for the multiple nutrient deficiencies associated with low inherent soil fertility. South Asian and Argentinean studies highlight a need for improved residue management, hybrid selection, planting time, plant population, row spacing, and NPS fertilization management.

[196] R. Zhao, P. He, 2017, Ecological Intensification to Increase Nutrient Use Efficiency while Maintaining Yield Levels: An Example from China, Better Crops With Plant Food, 101, Page 21 - 22. International Plant Nutrition Institute (IPNI).
Reference ID: 23393
Note: #23393e > S serial #23387e
Abstract: Results from an ecological intensification (EI) study conducted in a spring maize cropping system in Jilin found significantly greater grain yield in three of five years and higher nutrient use efficiency for all years under EI. Researchers anticipate that widespread adoption of EI practices will bring sustained benefits to maize cropping systems in northeast China.

[197] E. Francisco, 2017, Ecological Intensification When Maize is Not the Primary Crop, Better Crops With Plant Food, 101, Page 23 - 25. International Plant Nutrition Institute (IPNI).
Reference ID: 23394
Note: #23394e > S serial #23387e
Abstract: Today in Brazil, the most common way to grow maize is as a 2nd crop after soybean harvest. This cropping system evolution has also brought research, since the year 2000, on most beneficial cover crop species that can fit as intercrop with maize. Such cropping system intensification raises questions about needed adjustments to N management for both high yield and improved soil quality

[198] S. Phillips, K. Majumdar, 2017, The Role of Precision Agriculture in Closing Maize Yield Gaps, Better Crops With Plant Food, 101, Page 26 - 28. International Plant Nutrition Institute (IPNI).
Reference ID: 23395
Note: #23395e > S serial #23387e
Abstract: The specific set of agricultural technologies needed to address our goals for global food security will vary amongst regions, but precision agriculture (PA) has often been identified as a key component in developing high-production, high-efficiency systems.

[199] T. Satyanarayana, V. Nosov, S. Dutta, K. Majumdar, 2017, Educating Farmers and Crop Advisers About Ecological Intensification, Better Crops With Plant Food, 101, Page International Plant Nutrition Institute (IPNI).
Reference ID: 23396
Note: #23396e > S serial #23387e
Abstract: Currently, cereal yields in India and southern Russia are only at 40 to 65% of their potential, mostly because of management practices that do not consider the crop's dynamic response to the environment. Ecological intensification (EI) systems developed here have proven to be beneficial in terms of yield and profitability, while improving nutrient use efficiency. Education on EI adoption is widely needed, and some of the methods of educating the region's farmers and crop advisers about the benefits of EI are outlined in this article.

[200] L. Prochnow, T.S. Murrell, 2017, The Global Maize Project: What Have We Learned?, Better Crops With Plant Food, 101, International Plant Nutrition Institute (IPNI).
Reference ID: 23397
Note: #23397e > S serial #23387e
Abstract: Overall, average grain yield in ecological intensified (EI) systems surpassed

farmer practice by nearly 1 t/ha. If such an increase were extrapolated to all maize-growing areas of the world, an estimated 160 million (M) t of additional grain would be produced every year, representing about a 15% increase in world production. Besides the increase in yield, improvement in nutrient use efficiency (NUE) was proved possible under EI in several circumstances.

[201] IPNI, 2017, Better Crops With Plant Food Vol.101 (2017, No.1), 101, Page 1 – 24, International Plant Nutrition Institute (IPNI).
Reference ID: 23398
Note: S serial #23398

[202] S. Li, Y. Tong, R. Cui, R. Wang, 2017, 4R Potassium Management in Apple Production in North China, Better Crops With Plant Food, 101, Page 4 - 6. International Plant Nutrition Institute (IPNI).
Reference ID: 23399
Note: #23399e > S serial #23398
Abstract: Although selection of K fertilizer source often shows little agronomic differences, demonstrated gains due to better rate, timing, and placement of K are clearly worth exploring for the apple growers in northern China.

[203] T. Bruulsema, 2017, A Certification Program for 4R Nutrient Stewardship, Better Crops With Plant Food, 101, Page 7 - 9. International Plant Nutrition Institute (IPNI).
Reference ID: 23400
Note: #23400e > S serial #23398
Abstract: The implementation of principles of 4R Nutrient Stewardship using a collaborative approach is helping to guide producers to adopt practices that benefit both their profitability and the health of Lake Erie.

[204] R. Mikkelsen, 2017, Fertilizer Placement Boosts Crop Yields and Nutrient Recovery, Better Crops With Plant Food, 101, Page 10 - 10. International Plant Nutrition Institute (IPNI).
Reference ID: 23401
Note: #23401e > S serial #23398
Abstract: The principles of 4R Nutrient Stewardship involve using the right nutrient source, at the right rate, at the right time, and in the right place. Fertilizer placement is one of the essential components of crop production, but it does not always receive the attention it deserves.

[205] D. Puurveen, 2017, Long-term Crop Rotation Studies Remain an Invaluable Teaching Tool, Better Crops With Plant Food, 101, Page 14 -15. International Plant Nutrition Institute (IPNI).
Reference ID: 23402
Note: #23402e > S serial #23398
Abstract: The photograph on the following page provides a classic example of crop response to nutrient application. Crop growth improves and deficiency symptoms lessen as nutrients become less of a limitation. In this case, the image shows spring wheat plant samples taken from the long-term Breton Plots in Central Alberta, Canada. Samples were taken on June 24, 45 days after seeding (May 10). Plants are generally at the six-leaf stage, some plants are tillering depending on the nutrient input.

[206] G. Balboa, M. Stewart, F. Salvagiotti, F. Garcia, E. Francisco, I. Ciampitti, 2017, Intensive Soybean Management: An Integrated Systems Approach, Better Crops With Plant Food, 1, Page 16 - 19. International Plant Nutrition Institute (IPNI).
Reference ID: 23403
Note: #23403e > S serial #23398
Abstract: Ecological intensification impacted soybean yield, biomass and N uptake. Narrow row spacing, high seeding rate, other best production practices, and balanced nutrition increased partitioning efficiency for biomass, measured by seed harvest index (HI), grain N, and N HI (NHI).
Partial factor productivity of fertilizer (PFPf) increased when best production and fertilizer management practices were implemented in combination, with 19% and 28% increases under irrigated and dryland scenarios, respectively.
An integrated approach, simultaneously considering multiple management factors in a farming system, is needed for closing exploitable yield gaps.

[207] E. Zamuner, J. Lloveras, H. Echeverria, 2017, Can Agronomic Phosphorus Recommendations for Potato be Environmentally Sustainable?, Better Crops With Plant Food, 101, Page 20 - 22. International Plant Nutrition Institute (IPNI).
Reference ID: 23404
Note: #23404e > S serial #23398
Abstract: A better understanding of the relationship between the agronomic and environmental optimum for soil test P can guide potato growers in Buenos Aires province towards improved P fertilizer management.

[208] C&CI, 2017, C&CI: Coffee and Cocoa International March 2017, C&CI COFFEE & COCOA INTERNATIONAL, 44, Page 1 – 50, C & CI.
Reference ID: 23405
Note: S Serial #23405

[209] ISP, 2017, The Planter Vol 93 No1090 January 2017, 93, Page 1 - 70.
Reference ID: 23406
Note: S serial #23406

[210] ISP, ISP. 2017, The Planter Vol. 93 No. 1091 February 2017, Kuala Lumpur, 93, Page 79 - 152.
Reference ID: 23407
Note: S serial #23407

[211] I.S. Pramumijoyo, L.Z. Kyaw, Z.L. Kyaw, 2010, Report on Reginal Geology of Myanmar, Page 1 - 18.
Reference ID: 23408
Note: H 26.1.6 #23408e
Abstract: Myanmar is the largest country in mainland Southeast Asia with a total area of 676578 square kilometer and total population of about 54 millions. Its long coast of about 2000 kilometers covers almost the entire sea coast of Bay of Bengal. The neighboring country isThailand, Laos, China, India and Bangladesh. The topographic features are various features. The northern part, the eastern part and the western part is mainly highlands part and the central part is flat and the southern part is related with the costal. Myanmar can be subdivided into three provinces (Maung Thein, 1993): namely, the Western Fold Belt (WFB) in the west, the Central Lowland (CL) in the middle, and the Eastern Highland (EH) in the east. Geologically, the WFB consists

mostly of very thick sequence of the flysch type sedimentary rocks and tectonic mélange of basic and ultrabasic rocks and exotic limestone in the form of ophiolite suite as resulted by the subduction of the Indian Plate underneath the Burma Plate along the Bengal tectonic boundary and also continued collision between these two plates leading to high mountain arc in the west and northwestern parts of Myanmar. Further east, the Eastern Highland, which is a part of the Shan-Thai Block, a large tectonic domain connects to the Pacific tectonic plate, is composed mainly of older rock groups containing plateau limestone and metamorphic complex. The fertile alluvial plain is the Central Lowland, intermittently cropped out by the mountain range and hills running in north south direction and also enhanced by Mount Popa, a dormant volcano in its central part. A large active fault, the Sagaing Fault (Win Swe, 1981) is passing through the eastern margin of this province.

[212] K.O. Kyaw, 2017, Geology & Mineral Resources of Myanmar, Page 1 - 50.
Reference ID: 23409
Note: H 26.1.6 #23409e
Abstract: Myanmar is endowed with resources of arable land, natural gas, mineral deposits, fisheries, forestry and manpower.

[213] M.B. Wahid, N. Kamarudin, I.A. Seman, A. Darus, S. Sundram, R. Moslim, S.R.A. Ali, 2003, Handbook of Pests and Diseases of oil palm, Page 1 - 113. Malaysia Palm Oil Board (MPOB).
Reference ID: 23410
Note: S 8.1.1.4 #23410
Abstract: The oil palm plantation is a rich reservior of biodiversity, expressed by the various fauna and flora which form part of the environment. These fauna and flora will only become destructive, once the balaced environment is disturbed. Insects and mammals are not considered pests if their population is low and does not cause injury to the oil palm. Therefore it is important for us to know how to manage these organisms in order to have a balanced ecosystem which will reduce the chances of them becoming pests. A guide on economic threshold levels for insect and mammalian pests is provided at the end of the handbook.

[214] W.H.M. Taufiq, 2016, Pepper Statistical Yearbook 2006-2015, International Pepper Community.
Reference ID: 23411
Note: S 19.4 #23411
Abstract: Information is the base for planning and implementing of the future activities. Based on the information collected related to any field or sector provides realistic picture on the present situation and also how the situation changed with time series. That can be the base for the planning of future activities avoiding mistakes and also prioritizing the promising areas. Pepper statistical yearbook of IPC is the main source of information on Pepper industry published annually with global statistic on area under cultivation, production, export, import and re-export of pepper. This publication compile data collected from IPC member countries, non-member producing countries and also from importing and consuming countries with the global coverage.

[215] W.D.L. Gunaratne, K.R.K. Menon, C.M. Dewi, T.V. Zavier, Z. Jaroop, D. Palupi, T. Liyanage, 2016, Good Manufacturing Practices for Pepper, The International Pepper Community.
Reference ID: 23412
Note: S 8.10 #23412
Abstract: Spices play an important role in food industry and despite of all the modernizations in the global economy, traditional spices are fetching more demand in the market. Especially when consumers are more and more health conscious and try to be away from the synthetic flavors the only alternative left is the naturally frown spices. Among them, pepper and pepper products originated from the seeds of perennial tropical climber, peper nigrum L. are the most important. During the last decade a growing demand for pepper could be observed and at the same time the prices of pepper seems to be increased.

[216] W.D.L. Gunaratne, H.M.P.A. Subasinghe, C.A. Yap, M. Anandaraj, D. Manohara, C.B. Bui, 2016, Production and Processing of Pepper, International Pepper Community.
Reference ID: 23413
Note: S 8.10 #23413
Abstract: Black pepper is famous for its inherent pungent quality and noted as the most widely used spice in the world. *P. nigrum* L. is belongs to the genus piper of the family piperaceae.
This genus piper has over 1000 species but most important species in commerce are *P. nigrum* L., *P. longum* L. and *P. betle* L. Pepper is known to be the first species to be traded internationally and largely responsible for opening of trade routes between the West and East.

[217] G. Nallan, H. Salleh, M.M. Mohd Sein, A. Aban, T.F. Lee, 2017, Control of Wild Bamboos (*Schizostachyum* spp.) in Tongod Region of Sabah, The Planter, 93, Page 15-22.
Reference ID: 23414
Note: #23414e > S serial 23406
Abstract: There are over 1400 species of bamboos worldwide and about 200 species of bamboos in Southeast Asia. They are perennial with a rhizomatous growth habit and possess unique adaptability capabilities to grow from parts of rhyzomes in various habitats. In Sabah, many oil palm plantations are established on cleared timber forests. As a result, wild bamboos has established in many areas and hinders some estate operations such as harvesting and frond stacking. Two species of standing bamboos have been identified in Genting Plantations Berhad (GENP) estates in Tongod region which are Schyzostachyum brachycalum and Schizostachyum jaculans. Removal and eradication of these bamboos have proven to be very difficult and labour intensive.

[218] G.F. Chung, 2017, Review on Major Pests Management in Oil Palm, The Planter, 93, Page 29-54.
Reference ID: 23415
Note: #23415e > S serial 23406
Abstract: Many pests attack oil palm in Malaysia. Of these, a few species of rats are important pests of oil palm. Rats are known to attack oil palm of all growth stages. The crop loss due to rats in general is estimated to be about 7-10 per cent of palm oil production. Additionally, several species of bagworms, and nettle caterpillars are

important pests in Malaysia. Economic losses caused by leaf-eating caterpillars have been estimated to be as high as 40-50 percent loss of crop over a period of two years after a single defoliation of 100 per cent. Recently aerial spraying has been carried out to deal with serious outbreaks over very large areas.

[219] J. Zhang, S.Z. Chen, Z.G. Yu, C.S. Wang, Q.M. Wu, 1999, Factors influencing changes in rainwater composition from urban versus remote regions of the Yellow Sea, Journal of Geophysical Research, 104, Page 1631 - 1644.
Reference ID: 23416
Note: #23416e
Abstract: Rainwater samples were collected from three stations at the Yellow Sea in 1992-1993 and analyzed for some major species (Ca2+, K+, Na+, Mg2+, NO3-, NH4+, pH, PO43-, and SO42-). Absolute concentration and element-to-sodium ratios show clear seasonal variations with higher levelsi n winter and lower levels in summer for most of the species. Levels of major species from urban areas can be twice as high as those of remote regions, in terms of both absolute concentration and element-to-sodium ratio. The contrasts between urban and remote and between low and high elevations can be explained by proximity to the ocean, local pollution sources, and scavenging processes. Comparison with other world areas shows rather high levels of chemical species in rainwater from the Yellow Sea relative to remote world oceans or even some other coastal urban areas. Using sodium as a sea-salt tracer,i t was estimated that more than 50% of major species in rainwater could come from non-marine contribution ,and for some specie like NH4+ ,NO3-,and SO42, anthropogenic emissions are definitetly the major source. The high concentratoin of nitrogen species and elevated N /P ratio of rainwater as compared to riverine input, suggest the significance of atmospheric wet deposition to the marine production and biogeochemical circulation of nutrients in the region.

[220] X. Deng, R.J. Joly, D.T. Hahn, 1990, The influence of plant water deficit on distribution of 14C-labelled assimilates in cacao seedlings, Annals of Botany, 66, Page 211 - 217.
Reference ID: 23417
Note: H 8.1.4 #23417e
Abstract: The relationship between plant water status and distribution of 14C-labelled assimilates in cacao (*Thebroma cacao* L.) was eveluated after 14CO pulse labelling leaves of seedlings subjected to varying levels of water deficiency. The proportion of 14C exported by source leaves was stronly affected by seedling water status. An increasing proportion of labelled assimilates remained in source leaves at both 24-h and 72-h harvests as water stress intensity increased. Water stress reduced the distribution of exported label to leaves and to the expanding flush in particular but increased the proportion of label in stems and roots. The results suggest the current photoassimilates may be temporarily stored in source leaves and stems of cacao seedlings during periods of plant water deficit. The stress-induced changes in partitioning of labelled carbon were in concordance with changes in shoot to root biomass ratios, which likely due to greater reduction in growth of above-ground organs to that of roots.

[221] H. Hafid, F. McKenzie, 2012, Understanding farmer engagement in the cocoa sector in Sulawesi: A rapid assessment, Page 1 - 30.
Reference ID: 23418
Note: H 8.1.4 #23418

[222] H.S. Ooi, K. Subramaniam, 2017, Managing Engineering Innovations in the Palm Oil Industry, The Planter, 93, Page 85-98.
Reference ID: 23419
Note: #23419e > S serial #23407
Abstract: The engineering innovation outlook in Malaysia is not very good. The estimated number of technical people in Malaysia was reported to be only around 0.7 per cent of the workforce as compared to 30 per cent in the advanced countries. The government has set up various agencies and has launched various policy guidelines to create the ecosystem that can stimulate and sustain innovation and creativity in the palm oil industry. More incentives and support from all related agencies are needed to encourage capital investment in innovation. Entrepeneurs planning to seed technology innovation into the palm oil industry must provide in-depth technical guidance and engineering support services to the millers to ensure efficient plant operation and maintenance.

[223] M.S.D. Annuar, D. El Pebrian, 2017, Ergonomics Risks Assessment on In-field Collection Machinery, The Planter, 93, Page 103-114.
Reference ID: 23420
Note: #23420e > S serial #23407
Abstract: Mini tractor-trailer with grabber has been commonly used for in-field collection of oil palm fresh fruit bunch (FFB) in Malaysian oil palm plantations. The presence of this machinery system has contributed in lightening the in-field collection of FFB and increasing labour productivity in the operation. This paper examines the ergonomic riskes on the operator of mini tractor-trailer with grabber for in-field collection of FFB in oil palm plantations. Combinations of questionnaire survey technique and direct field observations were employed in collecting the data for this study. The Standard Nordic Questionnaire was used to obtain information about the prevalence of pain in ten different body regions of the operator while working. The Rapid Entire Body Assessment (REBA) was used to evaluate body postural musculoskeletal disorder and risks associated with the task. The findings of the study indicated that working period was the dominant factor that contributes to the number of musculoskeletal disorder complaints among the operators of mini tractor-trailer with grabber during in-field collection of FFB in Malaysian oil palm plantations

[224] A. Kushairi, A.R. Shuib, 2017, Innovations in Oil Palm Mechanisation, The Planter, 93, Page 119-136.
Reference ID: 23421
Note: #23421e > S serial #23407
Abstract: Oil palm, the major plantation crop in Malaysia generating substantial revenue to the industry and nation albeit the plantation sector, is labour intensive. A way forward for the plantation sector, hence its objectives, are to minimise labour dependency and maximise productivity by means of mechanisation. Despite being progressively mechanised since the 1980s, though mainly in infield transportation, further economic gains are achievable through the adoption of new technologies. The Malaysian Palm Oil Board (MPOB) consistently develops task-specific mechanisation technologies in harvesting, loose fruit collections and infield transportations for the wellbeing of the industry. Several of the technologies transferred tot he industry, such as the Grabber, blended well with the plantation landscape, while others, especially harvesting technologies, notably Cantas, are yet to be fully accepted. An efficient cost-saving harvesting technology is urgently needed in the plantations. Similarly, ergonomically-friendly loose fruit collection technologies are sought by the industry.

Plantation management responded positively to mechanisation; but require machines that are functionally efficient and economically feasible. These specifications are being addressed by MPOB, and in collaboration with members of the industry, academia and engineering firms, locally and abroad. Further utilisation of mechanisation in enhancing production efficiency remains as one of key factors for Malaysian oil palm industry to stay relevant.

[225] G.S.B. de Matos, A.R. Fernandes, P.G.S. Wadt, A.J. de Abreu Pina, V.I. Franzini, H.M.N. Ramos, 2017, The Use of DRIS for Nutritional Diagnosis in Oil Palm in the State of Para, Revista Brasileira De Ciencia Do Solo, Page 1-15.
Reference ID: 23422
Note: #23422e
Abstract: The oil palm crop has expanded significantly in the state of Pará, which has not been followed in a proportional manner by studies aiming at increasing yield through plant nutrition. The objective of this study was to evaluate general and specific norms of the Diagnosis and Recommendation Integrated System (DRIS) for genetic materials of oil palm (African and interspecific hybrid) at two ages (young and adult plants) and evaluate possible deficiencies in fertilization and soil correction practices. The DRIS norms were composed of means, standard deviations, and coefficients of variation of bivariate, specific, and general relationships among nutrients of 144 leaf samples. The DRIS norms specific for genetic material did not differ from the general norms; however, a large number of differences were found between specific bivariate relationships for age groups, among themselves, and in relation to the general norms. The regression analysis between the nutritional balance index and yield were better explained when age groups were discriminated. In the young plants, the number of cases of stands with deficiencies followed the order Ca > Fe > B > S > Mn > K > Mg = Cu > Zn > N > P; and for adults, this order was Ca > Mn > Zn > Fe > S = B > N = Cu > K > Mg > P. The DRIS norms can be utilized in diagnostics regardless of genetic material; however, they must be specified for the age of the plant. Most of the stands showed deficiency in Ca and micronutrients, coinciding with the least used nutrients in oil palm crops in the state of Pará, as well as emphasizing the need for soil liming.

[226] F.L. Neves, 2014, Effects of manure potassica photosynthetic the answers and nutrition of cacao genotypes to water stress on the ground: Efeitos da adubação potássica nas respostas fotossintéticas e nutricionais de genótipos de cacau à deficiência hídrica no solo, Agriculture, Brazil, Master's Degree in Vegetable Production, Page 100. University State of Santa Cruz.
Reference ID: 23423
Note: #23423e (H 8.1.4.1 #23423 abstract only) Thesis is in portuguese
Abstract: *Theobroma cacao* L. is a perennial species of great economic importance worldwide, grown almost exclusively for the manufacture of chocolate. Although cocoa is typically grown in areas of high annual rainfall, some growing regions have, in certain areas, shallow soils with low water storage capacity, and others are prone to irregular rainfall, which can intensify with warming overall, one of the main causes of productivity changes of cacao, considered a species sensitive to water deficiency in the soil. This study aimed to evaluate the effects of potassium fertilization on photosynthetic and nutritional responses of genotypes *T. cacao* to water deficit in the soil. Evaluated the PA -13 (drought tolerant) and CC- 40 genotypes (intolerant to drought), with genetic traits for drought resistance differentials; obtained from seeds, fruits harvested from self-pollinated flowers. There was sowing in plastic pots of 12 L containing substrates such as sand and soil, where the plants remained for 180 days

after sowing. The experimental design was a completely randomized design with treatments arranged in a factorial 2x3x4 , corresponding to two genotypes of T. cacao (PA -13 and CC- 40), three doses of potassium [10 , 20 (control) and 40 (mg dm-3) soil and four classes of soil water potential (ΨWsolo) (I = - 0.01 to -0.03 MPa, II = -0.04 to -0.07 MPa, III = -0.11 to -0.19 MPa, and IV = -0.25 to -0.51 MPa), with five replicates and one plant per experimental unit. We evaluated gas exchange and chlorophyll fluorescence emission at leaf level, between 170 and 180 days of cultivation, and the levels of macro and micronutrient contents of soil and leaves and roots of plants of both genotypes of T. cacao, subjected to various treatments after 180 days of cultivation. It was observed that the genotype PA-13 had the highest values of net photosynthesis per unit leaf area (A) compared to CC- 40 genotype classes III and IV ΨWsolo associated with doses of 20 and 40 mg dm- 3 of K in the soil . There was intergenotypes significant differences ($p<0.05$) for the intrinsic and instantaneous water use efficiencies, lower value which was presented by genotype PA -13, the lower dose of K applied to the soil . Doses of 20 and 40 mg dm- 3 of K in the soil contributed to decreased stomatal conductance to water vapor (gas) in both genotypes of cocoa evaluated. Classes ΨWsolo not significantly ($p<0.05$) influence the reduction gas for the genotype PA-13. In contrast, for the CC-40 genotype, decreased gs of class I to class II. With the decrease of classes was reduced ΨWsolo and regardless of genotype of K doses applied. A significant intergenotypic difference ($p< 0.05$) for the contents of macronutrients N, Ca and Mg in the leaf level, with the highest values found for the PA -13 genotype. However, for CC-40 genotype was the K macronutrient that presented with the highest content in the leaf level. Micronutrients evaluated in leaf level, only Mn showed significant intragenotípica difference ($p< 0.05$), with higher levels found in genotype PA-13. For the macronutrient content in root tissue, intergenotípicas significant differences ($p< 0.05$) were observed only for K and Ca, higher values were presented by genotype PA -13. There was intergenotypic variation for Mn and Zn in root level, and the PA-13 genotype presented the highest levels of these micronutrients. The PA-13 genotype showed a higher variable fluorescence. In contrast, CC- 40 had a higher maximum fluorescence regardless of their classes ΨWsolo and K rates applied. However, the quantum efficiency of photosystem 2 was higher for the PA-13 genotype at the highest dose applied of potassium in the soil. The increasing levels of K in the soil resulted in an increase of K concentration on leaves as in roots of both cacao genotypes evaluated, and increased soil pH at doses of 20 and 40 (mg dm- 3) soil. In short, the greater tolerance of the PA-13 genotype to water deficit in the soil, in relation to genotype CC-40, is due in part to the greater accumulation of mineral nutrients in leaf and root tissues, confirming their potential for use in programs improvement.

[227] G. Zhang, J. Zhang, S. Liu, 2007, Characterization of nutrients in the atmospheric wet and dry deposition observed at the two monitoring sites over Yellow Sea and East China Sea, J Atmos Chem, 57, Page 41 - 57.
Reference ID: 23424
Note: #23424e
Abstract: To investigate the atmospheric deposition of nutrients into the coastal and shelf regions of the northwest Pacific Ocean, observation sites were established upon Qianliyan Island (within the Yellow Sea) and the Shengsi Archipelago (within the East China Sea), respectively. Nutrient concentrations, including NH4; NO3; NO2; PO4 and SiO3, were determined in both aerosols and rainwater samples. The analytical results contain clear seasonal signatures, with high values during the dry season and low values during the rainy season. Similar trends are observed for deposition fluxes. The

amount of wet deposition is greater than that of dry deposition for the studied nutrient species. The influence of meteorological factors such as rainfall means that samples from Qianliyan Island record higher nutrient values than those from Shengsi. Along with riverine inputs, atmospheric deposition plays an important role in determining the biogeochemistry of nutrient species in coastal and shelf oceans.

[228] A. Yahya, P.S. Chong, T.A. Ishola, H. Suryanto, 2010, Effect of adding palm oil mill decanter cake slurry with regular turning operation on the composting process and quality of compost from oil palm empty fruit bunches, Bioresource Technology, 101, Page 8736 - 8741.
Reference ID: 23425
Note: #23425e
Abstract: Formation of compost from oil palm empty fruit bunches (EFB) and decanter cake slurry by adding palm oil mill effluent (POME) with regular turning operation was investigated. The experiment was conducted in a commercial composting plant under the normal production process. The addition of decanter cake slurry has hastened the composting process of the EFB. The C/N ratio after 51 days for the mature compost with the decanter cake slurry was 18.65 while that of the matured compost without the decanter cake slurry remained high at 28.96. The compost formed from the addition of decanter cake to EFB and POME had 46.4% nitrogen, 17.9% phosphorus, 17.7% potassium and 23.1% calcium more than that without decanter cake. The use of compost produced from EFB, POME and decanter cake slurry could solve more environmental problems and enhance economic benefits in the oil palm industry.

[229] M. Villarreal-Romero, S. Parra-Terraza, S. Hernández-Verdugo, T. Osuna-Enciso, P. Sánchez-Peña, A. Angulo-Castro, Y.R. Pinto-Ruiz, 2014, Biomasa y captura de nitrógeno de cultivares de *Mucuna pruriens* (L.) DC. y su descomposición en el suelo- (Biomass and capture of nitrogen of cultivars of *Mucuna pruriens* (L.) DC. and its decomposition in soil), ITEA, 110, Page 18 -33
Reference ID: 23426
Note: #23426e
Abstract: The practice of cultivation of legumes to manure to the soil and benefit to the subsequent crop of economic interest, need to know the rate of decomposition and release of nitrogen from its produced biomass; therefore, the objective of this work was to determine the capacity of biomass production, accumulation and fixation of atmospheric nitrogen of three cultivars of Mucuna pruriens, as well as determine the pattern of decomposition and release into to the soil. The work was carried out in a Typic Huplustert soil under field conditions of Culiacan Valley, Sinaloa, Mexico. The experimental design was a split plot in randomized blocks with four replications. The cultivars of mucuna produced similar amount of biomass and showed comparable capacity for accumulation of nitrogen in their foliage and atmospheric nitrogen fixation. No significant difference was observed between cultivars, within same incubation times, in the pattern of decay and release of nitrogen in the soil of their foliage. In all three cultivars of mucuna was observed that decomposition rate and nitrogen liberation from foliage was, comparatively to the rest of the incubation times, higher in the first 15 days of incubation applied to 20 cm deep and 15-30 days when applied to the soil surface. The amount of biomass produced, the amount of nitrogen accumulated in the foliage and the nitrogen fixed from the atmosphere by the three studied cultivars of Mucuna pruriens, demonstrates its ability to establish itself as ground cover crops in Culiacan Valley, Sinaloa, Mexico.

[230] M. Vakili, M. Rafatullah, M.H. Ibrahim, B. Salamatinia, Z. Gholami, H. M Zwain, 2014, A review on composting of oil palm biomass, Environ Dev Sustain, Page 1 - 19.
Reference ID: 23427
Note: #23427e
Abstract: Nowadays, the biomass produced in oil palm industry, such as oil palm fronds, palm pressed fibers, palm kernel shells, empty fruit bunch, and liquid waste discharged from the palm oil mill effluent and others, may lead to significant environmental concerns. The quantity of produced wastes by oil palm industry is increasing with the growth of this industry day by day. Therefore, the use of these wastes as compost is considered by researchers to overcome their negative impacts and recycle them to produce a useful byproduct for agriculture. This review analyzes the recent composting studies on palm oil biomass and provides useful information about the potential uses of these biomass in composting as an alternative method for enhanced and sustainable use of biomass produced from oil palm industry. In addition, environmental impacts of composting are discussed. This knowledge could build a platform for researchers in this area to understand the recent developments in palm oil biomass composting by means of addressing the environmental pollution concerns as well.

[231] M.P. Hoffmann, C. Donough, H. Sugianto, A.C. Vera, M.T. Van Wijk, C.H. Lim, D. Asmono, Y. Samosir, A.P. Lubis, D.S. Moses, A.M. Whitbread, T. Oberthur, 2017, Tolak unkur produksi untuk intensifikasi produksi kelapa sawit yang berkelanjutan di Indonesia dengan PALMSIM, Media Perkebunan, 162, Page 64 -75.
Reference ID: 23428
Note: #23428e
Abstract: Secara fisiologis model PALMSIM pertumbuhan kelapa sawit dapat digunakan untuk memperkirakan batas potensi produksi yang menjadi tolak ukur untuk intensifikasi produksi kelapa sawit secara berkelanjutan, baik dengan perluasan area ke lahan yang terdegradasi atau dengan meningkatkan produksi pada lahan yang sudah ditanami. Hal ini ditunjukkan melalui dua studi kasus. Dalam studi kasus pertama, PALMSIM memperkirakan hasil yang dibatasi air untuk Kalimantan ditumpang-tindihkan ke peta lahan terdegradasi yang baru diterbitkan menunjukkan bahwa secara potensial lahan tersebut adalah sesuai untuk budidaya tanaman kelapa sawit. Sebagai besar (3506% atau 115.300km) dari daerah yang diidentifikasi masuk dalam range potensi produksi 35-40 ton TBS ha. Dalam studi kasus kedua, PALMSIM digunakan untuk memperkirakan potensi produksi di enam lokasi perkebunan di Indonesia dimana Best Management Practices (BMP) diterapkan untuk intensifikasi produksi oleh International Plant Nutrition Institute(IPNI) Southeast Asia Program (SEAP) yang berkolaborasi dengan mitra perkebunannya. Potensi produksi umumnya lebih tinggi di Sumatera daripada Kalimantan karena radiasi matahari yang lebih tinggi. Defisit air adalah masalah di dua lokasi tersebut.

[232] S. Nur Shafawati, S. Siddiquee, 2013, Composting of oil palm fibres and Trichoderma spp. as the biological control agent: A review, International Biodeterioration & Biodegradation, 85, Page 243 - 253.
Reference ID: 23429
Note: #23429e
Abstract: Oil palm production is a main agricultural industry in Malaysia, in which oil palm fibres (trunk, frond and empty fruit bunch) are considered as major waste products. Huge amounts of waste products are created great environmental problems, ecosystem degradation, affect health of the communities and high disposal costs per

year. Composting is an alternative way to transform the bulky biomass into a valuable, manageable product for use in plantation or as market product. The aim of this review is to summarize composting process of oil palm fibres especially EFB and in application of Trichoderma sp. as the biological control agents. However, more research and review on the information regarding oil palm fibres compost and Trichoderma sp. application as the biocontrol agents in oil palm fibres compost needed to exploit their actual potential, which is the outstanding objective of this review.

[233] N. Sanginga, 2003, Role of biological nitrogen fixation in legume based cropping systems; a case study of West Africa farming systems, Plant and Soil, 252, Page 25 - 39.
Reference ID: 23430
Note: #23430e
Abstract: Nitrogen (N) has been gradually depleted fromWest African soils and now poses serious threats to food production. Many ways of increasing N supply (e.g. judicious use of inorganic fertilizers and nitrogen-fixing plants) have been tried in West African farming systems. Herbaceous and woody legumes commonly contribute 40–70 kg N ha−1 season. This represents about 30% of the total N applied as residues. Nevertheless and despite repeated demonstrations of the usefulness of green manures in enhancing soil fertility, their practices and adoption are still limited. Promiscuous soyabeans are being used to develop sustainable cropping systems in the moist savannah. Reliable estimates of N2 fixed by soyabeans and their residual N benefits to subsequent cereal crops in the savannah zone of southern Guinea have only infrequently been made. The actual amounts measured varied between 38 and 126 kg N ha−1 assuming that only seeds of soyabeans are removed from the plots, the net N accrual of soil nitrogen ranges between minus 8 kg N ha−1 and plus 47 kg N ha−1 depending on the soyabean cultivar. Residual soyabean N values of 10–24 kg N ha−1 (14–36% of the total N in maize) were obtained in a soyabean-maize rotation. Although cereal yields following legume cultivation have been attributed to greater N accumulation, our data show that the relative increase in maize N was smaller than the relative increase in dry-matter yield. Hence, the increased yields of maize following soybeans are not entirely due to the carry-over of N from soyabean residues (as well as to conservation of soil N) but to other rotational effects as well. It is thus clear that the Nbenefit of grain legumes to non-legumes is small compared to the level of N fertilizer use in more intensive cereal production systems but is nevertheless significant in the context of the low amounts of input in subsistence farming.

[234] N. Sahad, A. Md Som, A.S. Baharuddin, N. Mokhtar, Z. Busu, A. Sulaiman, 2014, Physicochemical Characterization of Oil Palm Decanter Cake (OPDC) for Residual Oil Recovery, BioResources, 9, Page 6361 - 6372.
Reference ID: 23431
Note: #23431e
Abstract: A characterization study on oil palm decan ter cakes (OPDC) was performed to gain an in-depth understanding of the material's characteristics to aid in potential residual oil recovery. The OPDC was characterized by a high moisture content, high biodegradability, high organic content, and a nutrient-rich composition. Microscopic observation showed that the oil attachments in OPDC, and a vast majority of the droplets, were less than 50 μm in size. Furthermore, contact angle measurement revealed the gydrophilic and oleophilic characteristics of OPDC. Specifically, the contact angles of water and crude palm oil (CPO) with OPDC were both less than 45°

with absorption rates of 0.0265±0.003 and 0.1042±0.05μL/s, respectively. The OPDC is a fibrous material, and the surface area and pore size measured were 7.103 m^2/g and 481.7 A, respectively. Fourier transform infrared spectroscopy (FTIR) and thermogravimetric (TG) analysis results showed the functional groups and degradation properties of OPDC, respectively.

[235] P.F. Rupani, R.P. Singh, M.H. Ibrahim, N. Esa, 2010, Review of current Palm Oil Mill Effluent (POME) Treatment Methods: Vermicomposting as a sustainable practice, World Applied Science Journal, 10, Page 1190 - 1201.
Reference ID: 23432
Note: #23432e
Abstract: The total oil palm cover has increased in the last few years, with a consequent boost in palm oil production. As a result, palm oil waste which is a by-product of the milling process will also increase. The palm oil production process in mills consists of several unit operations. The processing of fresh fruit bunches of oil palm results in the generation of different types of residue. Among the waste generated, palm oil mill effluent (POME) is considered the most harmful waste for the environment if discharged untreated. Palm oil mill effluent is a thick brownish liquid that contains high solids, oil and grease, COD and BOD values. Several treatment technologies have been used for POME treatment, since the direct discharge of POME adversely affects the environment. Due to the presence of high total solids in POME, attempts have been made to convert this waste into valuable products such as feed stock and organic fertilizer. Although POME is organic in nature, it is difficult to decompose in natural conditions. Earthworms can digest the POME producing valuable products such as vermicompost. Vermicompost is a useful product rich in nutrients that can be used as fertilizer in oil palm plantations. This review discusses the various ongoing treatment techniques of POME. The effective treatment of POME using vermicomposting technique is suggested as a good alternative sustainable management practice of this waste.

[236] M.N. Abdul Razak, M.F. Ibrahim, L.Y. Phang, M.A. Hassan, S. Adbd-Aziz, 2012, Utilization of Oil Palm Decanter Cake for Cellulase and Polyoses Production, Biotechnology and Bioprocess Engineering, 17, Page 547 - 555.
Reference ID: 23433
Note: #23433e
Abstract: The abundance of oil palm decanter cake (OPDC) is a problem in oil palm mills. However, this lignocellulosic biomass can be utilized for cellulase and polyoses production. The effectiveness of chemical and physical pretreatment in reducing the lignin content was studied by saccharification using a Celluclast 1.5 L and scanning electron microscope. Physicochemical pretreatment of OPDC with 1% (w/v) NaOH and autoclaving at 121oC for 20 min increased potential polyoses produced to 52.5% and removed 28.7% of the lignin content. The optimized conditions for cellulase production by a locally isolated fungus were a time of 120 h, a substrate of untreated OPDC, a spore concentration of 1 × 107 spore/mL, a temperature of 30oC, and a pH between 7.0 and 7.5. Trichoderma asperellum UPM1 produced carboxymethylcellulase (CMCase), β-glucosidase and filter paper activity (FPase) in the following concentrations: 17.35, 0.53, and 0.28 U/mL, respectively. Aspergillus fumigatus UPM2 produced the CMCase, β-glucosidase and FPase in the following amounts: 10.93, 0.76, and 0.24 U/mL. The cellulases from T. asperellum UPM1 produced 2.33 g/L of polyoses and the cellulases from A. fumigatus UPM2 produced 4.37 g/L of polyoses.

[237] T. Nutongkaew, W. Duangsuwan, S. Prasertsan, P. Prasertsan, 2011, Production of compost from palm oil mill biogas sludge mixed with palm oil mill wastes and biogas effluent, TIChe International Conference 2011, Hatyai, Songkhla THAILAND, Page 1 - 5.
Reference ID: 23434
Note: #23434e
Abstract: Analysis of composition of palm oil mill wastes for compost production revealed that palm empty fruit bunches (PEFB) contained the highest total organic carbon (52.83% dry weight), palm oil mill biogas sludge (POMS) and decanter cake (DC) had high total nitrogen (3.6% and 2.37% dry weight, respectively), while palm oil fuel ash (POFA) contained high amount of phosphorus and potassium (2.17% and 1.93% dry weight, respectively). The effect of mixture ratio of POMS and palm oil mill wastes was studied using the mixed culture Super LD1 from Land Development Department as an inoculum. The compost turned to dark brown and attained an ambient temperature after incubation for 40 days. The pH values were stable in the range of 6.9-7.8 throughout the process whereas the moisture content tended to decrease till the end with the final value around 30%. After 60 days incubation, the mixture ratio of POMS: PEFB: DC at 0.5:0.25:0.25 with the addition of biogas effluent (treatment D) gave the best qualities of compost with 31.75% higher nitrogen content than the other treatments. Furthermore, the amount of nutrients (3.26% N and 0.84% P) was higher than the level required for plant fertilizer (0.5% N, 0.5% P) therefore, meet the compost standard.

[238] N. Paepatung, A. Nopharatana, W. Songkasiri, 2009, Bio-Methane Potential of Biological Solid Materials and Agricultural Wastes, Asian Journal on Energy and Environment, 10, Page 19 - 27.
Reference ID: 23435
Note: #23435e
Abstract: This research studied the bio-methane potential of biological solid materials as alternative sources for biogas production. An agricultural residue (rice straw), wastes from four agro-industries, (cassava pulp, pineapple peel, decanter cake and empty fruit bunches) and two weeds (cat-tail [*Typha angustifolia* L.] and water hyacinth [Eichlornia crassipes Solms]) were evaluated as substrates for biogas production. The methane potential assays varied from 0.34 to 0.40 m^3 CH4 kg^{-1} VSadded. The maximum specific methane production rates comparing extent and digestibility of each material in a descending order were that of pineapple peel of 36.77 ml CH4d-1, cassava pulp of 36.57 ml CH4 d^{-1}, decanter cake of 32.86 ml CH4 d^{-1}, empty fruit bunches of 13.48 ml CH4 d^{-1}, cat-tails of 11.63 ml CH4 d^{-1}, water hyacinth of 11.57 ml CH4 d^{-1}, and rice straw of 10.98 ml CH4 d^{-1}. Rm values depended upon the substrates readily degradable composition and proportions, including lignocellulosic compounds. All experiments on biogas productivity were conducted for more than 90 days to reach the final yield. The experimental results revealed that bio-solids could be potential sources for biogas production, while further improvement of biogas yield and process flexibility in terms of various feedstocks is necessary.

[239] E.I. Moyin-Jesu, 2008, Comparative evaluation of different organic fertilizers on the soil fertility, leaf minerals composition and growth performance of dikanut seedlings (*Irvingia gabonnesis* L.), Emirates Journal of Food and Agriculture, 20, Page 1 - 9.
Reference ID: 23436
Note: #23436e

Abstract: An experiment was carried out at Akure in the rainforest zone of Nigeria to determine the effectiveness, of ten organic fertilizers on plant growth, soil fertility, and leaf nutrients composition of dikanut seedlings in the nursery. The organic fertilizer treatments were applied at 8t/ha (40g/10kg soil) to each polybag, a reference treatment NPK 15-15-15 compound fertilizer applied at 2g NPK/10kg soil (400kg/ha) and a control treatment (no chemical fertilizer nor manure), arranged in a completely randomized design (CRD) and replicated four times. The results showed that the organic fertilizers increased the seedlings' growth significantly ($P<0.05$), leaf and soil N, P, K, Ca, Mg, soil pH and O.M of dikanut compared to the control treatment. The oil palm bunch ash + poultry manure increased the plant height, leaf area, stem girth, leaf numbers and root length of dikanut seedlings by 22%, 50%, 33%, 21% and 49% respectively, when compared to the NPK chemical fertilizer treatment. It also increased the leaf N, P, K, Ca and Mg of dikanut seedlings by 35%, 37%, 39%, 36% and 65.3% respectively compared to the sole application of poultry manure. Oil palm bunch ash + poultry manure treatment increased the soil pH, O.M, N. P, K, Ca, Mg by 6%, 13%, 19%, 28%, 32%, 33% and 21% respectively compared to the cocoa husk + spent grain treatment. Therefore the, oil palm bunch ash + poultry manure applied at 8t/ha was the most effective treatment in increasing growth, soil and leaf parameters of dikanut seedlings.

[240] N. Mohammad, M.Z. Alam, N.A. Kabbashi, A. Ahsan, 2012, Effective composting of oil palm industrial waste by filamentous fungi: A Review, Resources, Conservation and Recycling, 58, Page 69 - 78.
Reference ID: 23437
Note: #23437e
Abstract: Palm oil production is a major agricultural industry in Malaysia, in which palm oil mill effluent (POME) and oil palm empty fruit bunch (EFB) are considered as major waste products from the palm oil industry. These waste products create an environmental hazard and entail high disposal costs every year. Composting is a biologically based process which is practiced to stabilize the organic matter for soil amendment (producing compost) and to protect the environment from the detrimental effects of these waste products. This study reviews the composting process of EFB and POME as a single substrate and/or their mixture by using potential filamentous fungi that are especially lignocellulolytic and antibiotic (in a matured stage) in nature within several effective parameters, for example, C/N ratio, moisture content, pH, temperature, etc. Several studies record the mature composting process as being 60 days. In most cases, temperature and moisture content was maintained up to 70°C and 60–75%, respectively. In addition, this study reviews EFB and POME with their constituents for an efficient composting process.

[241] Anonymous, 2017, InfoSawit Vol XI No 5 MAY 2017, Info SAWIT, 11, Page 1 - 56. Palma Serasih Group.
Reference ID: 23438
Note: #23438e

[242] D.R. Kala, A.B. Rosenani, C.I. Fauziah, L.A. Thohirah, 2009, Composting Oil Palm Wastes and Sewage Sludge For Use In Potting Media of Ornamental Plants, Malaysian Journal of Soil Science, 13, Page 77 - 91.
Reference ID: 23439
Note: #23439e
Abstract: The use of oil palm wastes, particularly the empty fruit bunch (EFB), frond

and trunk as compost are now receiving greater attention by researchers. Currently, these organic waste materials have not been fully utilized on a large scale, either agriculturally or industrially, for manufacture of useful by-products. Another organic waste that needs to be appropriately disposed of in Malaysia is the sewage sludge. Co-composting these waste materials could potentially convert these wastes into value added product. The objective of this study was to determine the best formulation using oil palm wastes and sewage sludge in producing a composted material to be used as a potting media in horticulture. Composting different oil palm wastes with sewage sludge was carried out in the glasshouse using a polystyrene box. Shredded oil palm wastes (EFB, frond and trunk) were mixed with sewage sludge in 3 different ratios (1:0, 3:1 and 4:1 ratio) and adjusted to 60% moisture content. Based on the temperature, C/N, NH4 +-N and NO3 - - N + NO2 - -N patterns of the oil palm wastes added with sludge during composting, the EFB, frond and trunk added with sludge composts seemed to perform similarly. However, due to the small volume of compost, the temperature did not sustain > 45oC because of dissipation of the heat. Oil palm trunk with sewage sludge at 4:1 ratio was found to be the most optimum compost as potting media for ornamental plants because of its texture suitable for potting media, not stringent or stiff, had high nutrient contents (2.05 % N, 0.640 % P, 1.39 % K, 0.705 % Ca, 0.229% Mg), pH 6.2 and low C/N ratio, 19.

[243] P. Houngnandan, N. Sanginga, P. Woomer, B. Vanlauwe, O. Van Cleemput, 2000, Response of Mucuna pruriens to symbiotic nitrogen fixation by rhizobia following inoculation in farmers' fields in the derived savanna of Benin, Biol Fertil Soils, 30, Page 558 - 565.
Reference ID: 23440
Note: #23440e
Abstract: Leguminous cover crops such as Mucuna pruriens (mucuna) have the potential to contribute to soil N and increase the yields of subsequent or associated cereal crops through symbiotic N fixation. It has often been assumed that mucuna will freely nodulate, fix N2 and therefore contribute to soil N. However, results of recent work have indicated mucuna's failure to nodulate in some farmers' fields in the derived savanna in Benin. One of the management practices that can help to improve mucuna establishment and growth is the use of rhizobial inocula to ensure compatibility between the symbiotic partners. Experiments were conducted in 1995 and 1996 on 15 farmers' fields located in three different villages (Eglimé, Zouzouvou and Tchi) in the derived savanna in Benin. The aim was to determine the response of mucuna to inoculation and examine the factors affecting it when grown in relay cropping with maize. The actual amount of N2 fixed by mucuna in the farmers' fields at 20 weeks after planting (WAP) averaged 60 kg N ha^{-1} (range: 41–76 kg N ha^{-1}) representing 55% (range: 49–58%) of the plant total N. The result suggested that mucuna in these farmers' fields could not meet its total N demand for growth and seed production only by N^2 fixation. It was estimated that after grain removal mucuna led to a net N contribution ranging from –37 to 30 kg N ha^{-1}. Shoot dry weight at 20 WAP varied between 1.5 and 8.7 t ha^{-1} and N accumulation ranged from 22 to 193 kg N ha^{-1}. Inoculation increased shoot dry matter by an average of 28% above the uninoculated treatments, but the increase depended on the field, location and year. For the combinations of inoculated treatments and farmers' fields, the response frequency was higher in Eglimé and Tchi than in Zouzouvou. The response to inoculated treatments was dependent on the field and inversely related to the numbers of rhizobia in the soil. Soil rhizobial populations ranged from 0 to 1188 cells g^{-1} soil, and response to inoculation often occurred when numbers of indigenous rhizobia were ~5 cells g^{-1}

soil. In two farmers' fields at Zouzouvou where extractable P was below 10 mg g^{-1} soil, mucuna did not respond to rhizobial inoculation despite a higher population of rhizobia. Significant relationships between mycorrhizal colonization, growth and nodulation of mucuna were observed, and inoculated plants with rhizobia had a higher rate of colonization by arbuscular mycorrhizal fungi (%AMF) than uninoculated ones. Therefore, it was shown that mucuna will establish and fix N^2 effectively in those fields where farmer's management practices such as good crop rotation and rhizobial inoculation allow a build up of AMF spores that might lead to a high degree of AMF infection and alleviate P deficiency.

[244] I.E. Henson, 2006, Modelling Vegetative Dry Matter Production of Oil Palm, Oil Palm Bulletin, Page 25 - 47.
Reference ID: 23441
Note: #23441e
Abstract: Previous oil palm simulation models such as OPSIM and SIMPALM have relied on direct measurement of vegetative biomass and biomass production as a basis for predicting total biomass production and bunch yield. To overcome the limitations imposed by the need for extensive on site measurements, methods of simulating vegetative biomass production (VBP) are needed. This paper describes approaches adopted for this purpose in the mechanistic, process-oriented model, OPRODSIM, a new comprehensive model of oil palm dry matter production and development.

[245] I.E. Henson, 2006, Measuring and Modeling Oil Palm Trunk Growth, Oil Palm Bulletin, 52, Page 1 - 24.
Reference ID: 23442
Note: #23442e
Abstract: The trunk reprsents an important component of the vegetative dry matter of oil palm. This paper describes the approaches taken to model trunk growth as part of a comprehensive model of oil palm dry matter production and development, and the problems and limitations encountered. Several approaches are described including the independent simulation of trunk height and biomass, determination of height from biomass and determination of trunk biomass from total vegetative dry matter production by means partition coefficients.

[246] P.H. Graham, C.P. Vance, 2000, Nitrogen fixation in perspective: an overview of research and extension needs, Field Crops Research, 65, Page 93 - 106.
Reference ID: 23443
Note: #23443e
Abstract: Recent reports point to a decline in agricultural dependence on symbiotic nitrogen (N2) ®xation, and in the use of rhizobial inoculants. This review contrasts the potential contribution of biologically ®xed N to intensive and extensive agricultural systems, and examines opportunities for continued major contributions in the latter. It identi®es six research and extension areas in which in-depth efforts are still needed, and examines some opportunities for improved N2 ®xation likely to arise through advances in molecular biology.

[247] W.J. Broughton, 1977, Effect Of Various Covers On Soil Fertility Under *Hevea Brasiliensis* Muell. Arg. And On Growth Of The Tree, Agro-Ecosystems, 3, Page 147-170.
Reference ID: 23444
Note: #23444e
Abstract: A survey was made of the relationship between ground covers, soil fertility, and the growth of Hevea brasiliensis. Four different cover management systems were widely tested in Malaysia, namely a mixture of creeping legumes (*Calopogonium muconoides*, *Centrosema pubescens* and *Pueraria phaseoloides*), grasses (mostly *Axonopus compressus* with *Paspalum conjugatum*), a pure crop of Mikania cordata, and a naturally regenerating system representing the normal colonisation process on cleared land. Of the four systems, legumes initially had the fastest rate of growth, and generally contained more nutrients than the other covers tested. The greater nutrient return to the soil from growing a leguminous cover was reflected in higher levels of these nutrients in rubber leaves. This, coupled with improved soil physical properties, led to an increased rate of growth of the rubber tree. Nitrogen fixation under legumes grown in association with rubber averaged 150 kg per ha per year over a 5-year period, with maximum rates of nitrogen fixation being about 200 kg per ha per year.
Competition effects from both the shade and roots of Hevea caused a gradual diminution in vigour of all the covers such that they virtually died out by about the 6th year after planting. Dry rubber yield benefits in ex-leguminous plots extended for about 20 years, and amounted to approximately 4 metric tonnes more than the ~elds achieved with any of the other cover systems. In simple economic terms this means that only 4% of the monetary benefit of a legume cover policy derives from nitrogen fixation while the remaining 96% stems from post-legume effects.
Two hypotheses have been invoked to explain these effects: first, that legumes re-cycle nutrients at or near the soil surface until such a stage that they can be efficiently utilised by Hevea; and second, that legumes, by processes not fully understood, cause increased Hevea root proliferation which facilitates nutrient uptake.

[248] X. Deng, R.J. Joly, D.T. Hahn, 1989, Effects of plant water deficit on the daily carbon balance of leaves of cacao seedlings, Physiologia Plantarum, 77, Page 407 - 412.
Reference ID: 23445
Note: H 8.1.4 #23345e
Abstract: The daily carbon balance of individual source leaves of Theobroma cacao L. seedlings was measured at 2 to 3 day intervals during a 19 day period of increasing plant water deficit and during an 8 day period of recovery following rewatering. In each case, responses of stressed seedlings were compared to those of irrigated controls. Leaves of irrigated cacao seedlings assimilated approximately 41 mg carbohydrate dm^{-2} during 24-h measurement cycles. The rate of carbon export from cacao leaves was sharply reduced as leaf water potential declined between -0.08 and -2.0 MPa. Further, the rate of export was closely associated with the net assimilation rate (A), with export capacity being severely reduced as a A fell to neat zero. Net accumulation of dry matter occurred as long as A remained greater than approximately 20 mg carbohydrate dm-2 over the 12-h photoperiod, but at lower assimilation rates, export exceeded concomitant assimilation. Carbon export continued at the expense of leaf carbon reserves as photoassimilation fell to near zero during periods of severe water stress. Night resporation rate was independent of plant water status.

[249] H.W. Elbersen, J.E.G. van Dam, R.R. Bakker, 2005, Oil Palm by-products as a biomass source: Availability and sustainability, 14th European biomass conference & amp; exhibition: biomass for energy, industry and climate protection, Paris, France, Page 2 - 5.
Reference ID: 23446
Note: #23446e
Abstract: Conservative estimates based on dry weight show that the potential amount of biomass produced in the Palm oil production is very large with an estimated 30 to 50 million tons (dry weight) world wide at the mill and 70 to 80 million tons (dry weight) in the field (Table 1). In the Palm Oil production chain there is an overall surplus of by-products and the utilisation rate of these by-products is low, as is especially the case for palm oil mill effluent and empty fruit bunches. For other mill by-products the efficiency of the application can clearly be increased. For field residues the best use now is disposal as mulch and fertilizer. The external demand for renewable resources can be a solution to the pollution problems associated with by-product generation at the mill while increasing overall profitability and sustainability if nutrients are recycled efficiently to the field.

[250] FAO, 2015, World fertilizer trends and outlook to 2018, Rome, Page 1 - 53.
Reference ID: 23447
Note: H 20 #23447e
Abstract: The world economy has broadly strengthened over the past three years and is expected to continue this strengthening during 2014 - 2015. The outlook for global grain supply-demand balance in the 2014/15 marketing season has improved further from what was previously thought earlier in 2014. The world cereal production in 2014 is estimated to reach 2 498 000 000 tonnes, or 2.2 percent below that of the record production in 2013. World food prices have continued to ease in 2014 abd are down about 1.7 percent from July 2013. World fertilizer nutrient (N+P2O5+ K2O) consumption is estimated to reach 186 900 000 tonnes in 2014, up by 2.0 percent over 2013. World demand for total fertilizer nutrients is estimated to grow at 1.8 percent per annum from 2014 to 2018. The demand for nitrogen, phosphate, and potash is forecast to grow annually by 1.4, 2.2, and 2.6 percent, respectively, during the period. Over the next five years, the global capacity of fertilizer products, intermediates and raw materials will increase further.

[251] P.M. Kopittke, N.W. Menzies, 2007, A Review of the use of the Basic Cation Saturation ratio and the "Ideal" soil, Soil Sci. Soc. Am. J, 71, Page 259 -265.
Reference ID: 23448
Note: H 1.7.4 #23448
Abstract: The use of “balanced” Ca, Mg, and K ratios, as prescribed by the basic cation saturation ratio (BCSR) concept, is still used by some private soil-testing laboratories for the interpretation of soil analytical data. This review examines the suitability of the BCSR concept as a method for the interpretation of soil analytical data. According to the BCSR concept, maximum plant growth will be achieved only when the soil's exchangeable Ca, Mg, and K concentrations are approximately 65% Ca, 10% Mg, and 5% K (termed the ideal soil). This “ideal soil” was originally proposed by Firman Bear and coworkers in New Jersey during the 1940s as a method of reducing luxury K uptake by alfalfa (Medicago sativa L.). At about the same time, William Albrecht, working in Missouri, concluded through his own investigations that plants require a soil with a high Ca saturation for optimal growth. While it now appears that several of Albrecht's experiments were fundamentally flawed, the BCSR (“balanced soil”)

concept has been widely promoted, suggesting that the prescribed cationic ratios provide optimum chemical, physical, and biological soil properties. Our examination of data from numerous studies (particularly those of Albrecht and Bear themselves) would suggest that, within the ranges commonly found in soils, the chemical, physical, and biological fertility of a soil is generally not influenced by the ratios of Ca, Mg, and K. The data do not support the claims of the BCSR, and continued promotion of the BCSR will result in the inefficient use of resources in agriculture and horticulture.

[252] F. Yang, X. Xu, W. Wang, J. Ma, D. Wei, P. He, M.F. Pampolino, A.M. Johnston, 2017, Estimating nutrient uptake requirements for soybean using QUEFTS model in China, Plos One, Page 1-12.
Reference ID: 23449
Note: #23449e
Abstract: Estimating balanced nutrient requirements for soybean (*Glycine max* [L.] Merr) in China is essential for identifying optimal fertilizer application regimes to increase soybean yield and nutrient use efficiency. We collected datasets from field experiments in major soybean planting regions of China between 2001 and 2015 to assess the relationship between soybean seed yield and nutrient uptake, and to estimate nitrogen (N), phosphorus (P), and potassium (K) requirements for a target yield of soybean using the quantitative evaluation of the fertility of tropical soils (QUEFTS) model. The QUEFTS model predicted a linear±parabolic±plateau curve for the balanced nutrient uptake with a target yield increased from 3.0 to 6.0 t ha−1 and the linear part was continuing until the yield reached about 60±70% of the potential yield. To produce 1000 kg seed of soybean in China, 55.4 kg N, 7.9 kg P, and 20.1 kg K (N:P:K = 7:1:2.5) were required in the above-ground parts, and the corresponding internal efficiencies (IE, kg seed yield per kg nutrient uptake) were 18.1, 126.6, and 49.8 kg seed per kg N, P, and K, respectively. The QUEFTS model also simulated that a balanced N, P, and K removal by seed which were 48.3, 5.9, and 12.2 kg per 1000 kg seed, respectively, accounting for 87.1%, 74.1%, and 60.8% of the total above-ground parts, respectively. These results were conducive to make fertilizer recommendations that improve the seed yield of soybean and avoid excessive or deficient nutrient supplies. Field validation indicated that the QUEFTS model could be used to estimate nutrient requirements which help develop fertilizer recommendations for soybean.

[253] N. Paduit, M.F. Pampolino, J. Reymundo, T. Oberthur, 2017, Scaling 4R Nutrient Management with Philippine Smallholder Cooperatives Using Nutrient Expert for Maize, The 20th PSSST Annual Meeting and Scientific Conference, Philippines, Page 1. IPNI.
Reference ID: 23450
Note: #23450e (note: conference abstract #23454e)
Abstract: Maize is the second most important crop next to rice in the Philippines. White corn is used as a substitute for rice especially in rural areas, while yellow corn is mainly used for livestock and poultry feeds. Being a valuable crop in the country, there is a need for farmers to be aware of the proper nutrient management to increase their yield while maintaining balancedt nutrient level in the soil.This can be done by following the 4R nutrient stewardship principles —applying the right source of nutrients, at the right rate, at the right time, and in the right place. Nutrient Expert® (NE) for Maize is a decision support tool that provides field -specific fertilizer recommendations based on 4Rs. The central challenge becomes one of scaling and delivering adequate nutrient advice to as many as possible smallholders. Smallholder cooperatives are organized

groups of people in the community where information is easily transferred from one member to another. In a cooperative, faster dissemination of information and technology is achieved because large number of audience can be reached instantly (FAO, 2011). Our scaling approach is built around this premise.

[254] A.Z. Yaser, R. Abd Rahman, M.S. Kalil, 2007, Co-Composting of Palm Oil Mill Sludge-Sawdust, Pakistan Journal of Biological Sciences, 10, Page 4473-4478.
Reference ID: 23451
Note: #23451e
Abstract: Composting of Palm Oil Mill Sludge (POMS) with sawdust was conducted in natural aerated reactor. Composting using natural aerated reactor was cheap and simple. The goal of this study is to observe the potential of composting process and utilizing compost as media for growing Cymbopogun citratus, one of Malaysia herbal plant. The highest maximum temperature achieved is about 40degrees celcius and to increase temperature bed, more biodegradable substrate needs to be added. The pH value decrease along the pocess with final pH compost is acidic (pH 5.7). The highest maximum organic losses are about 50% with final C/N ratio of the compost is about 19. Final compost also showed some fertilizing value but need to be adjusted to obtain an ideal substrate. Addition of about 70% sandy soil causes highest yield and excellent root development for C. citratus in potted media. Beside that, compost from POMS-sawdust also found to have fertilizer value and easy to handle. Composting of POMS with sawdust shows potential as an alternative treatment to dispose and recycle waste components.

[255] L. Luar, M. Pampolino, A. Ocampo, A. Valdez, D.F. Cordora, T. Oberthur, 2017, 4R Nutrient Management of Cassava in the Philippines, The 20th PSSST Annual Meeting and Scientific Conference, "Creating Awareness on the Importance of Soil Resource Conservation for Human Survival" May 10-12 2017, Bayfront Hotel, Cebu, Philippines, Page 1-4.
Reference ID: 23452
Note: #23452e (note: extended abstract only)
Abstract: In the Philippines, cassava is grown mainly for food, dried chips for animal feed, and starch for commercial production and trading. While it is one of the major important crops, it is generally grown with minimal or no fertilizer inputs. Most farmers do not fertilize cassava. The current national fertilizer recommendation is 56 kg N, 56 kg P2O5 and 56 kg K2O per ha regardless of variety and site characteristics or growing environment. The application of adequate N, P and K based on crop requirement at critical growth stages is important. The 4R nutrient stewardship concept provides guidance on applying the right source of plant nutrients at the right rate, at the right time, and in the right place to obtain high crop yields .This study aims to determine the yield responses of cassava to fertilization and to develop fertilizer recommendations based on 4R nutrient stewardship.

[256] S. Adjei-Nsiah, C.B. Obeng, 2013, Effect of Palm Bunch Ash Application on Soil and Plant Nutrient Composition and Growth and Yield of Garden Eggs, Pepper and Okra, International Journal of Plant & Soil Science, 2, Page 1-15.
Reference ID: 23453
Note: #23453e
Abstract: The effects of palm bunch ash (PBA) application on growth, nutrient uptake and yield of three vegetable crops; garden eggs, pepper and okra were studied both in the field and in the pot. The study which was carried out at the Forest and

Horticultural Crops Research Centre, Kade in the forest zone of Ghana was conducted in a split plot fitted in a randomised complete block design. The results of the study showed that PBA application significantly (P<0.05) increased soil pH, soil phosphorus and exchangeable cations. In the field experiment, mineral fertilizer application resulted in an increase in the fresh fruit yield of the garden eggs and the pepper over the control by as much as 93% while PBA application resulted in fresh fruit yield increase of between 55-91%. For okra, fertilizer application resulted in fresh fruits yield increase of about 83% over the control while yield increase as a result of PBA application ranged between 8 and 69%. There were also significant interactions between the vegetables and the PBA application rates. For the garden eggs, the highest fruit yield of 9.52 t ha-1 was obtained at PBA application rate of 4t ha-1 while for the pepper and the okra, the highest fruit yields of 6 and 4.96 t ha-1 were obtained at the PBA application rate of 2 t ha-1. Our study suggests that PBA could be used as a liming material and fertiliser supplement to increase soil pH of acid soils and increase the yield of vegetable crops.

[257] N. Paduit, M. Pampolino, J. Reymundo, T. Oberthur, 2017, Scaling 4R Nutrient Management with Philippine Smallholder Cooperatives Using Nutrient Expert for Maize, The 20th PSSST Annual Meeting and Scientific Conference "Creating Awareness on the Importance of Soil Resource Conservation for Human Survival" May 10-12 2017, Bayfront Hotel Cebu, Philippines, Page 1-3.
Reference ID: 23454
Note: #23454e (note: Extended abstract only, Poster= #23450e)
Abstract: Maize is the second most important crop next to rice in the Philippines. White corn is used as a substitute for rice especially in rural areas while yellow corn is mainly used for livestock and poultry feeds. Being a valuable crop in the country, there is a need for farmers to be aware of the proper nutrient management to increase their yield while maintaining balanced nutrient level in the soil. This can be done by following the 4R nutrient stewardship principle—applying the right source of nutrients, at the right rate, at the right time, and in the right place. Then, the central challenge becomes one of scaling and delivering to as many as possible smallholders adequate nutrient advice. Small-holder cooperatives are organized groups of people in the community where information is easily transferred from one member to another. In a cooperative, faster dissemination of information and technology is achieved because large number of audience can be reached instantly. Our scaling approach is built around this premise.

[258] S.H. Lim, A.S. Baharuddin, M.N. Ahmad, U.K. Md Shah, N.A. Abdul Rahman, S. Abd-Aziz, M.A. Hassan, Y. Shirai, 2009, Physicochemical Changes in Windrow Co-Composting Process of Oil Palm Mesocarp Fiber and Palm Oil Effluent Anaerobic Sludge, Australian Journal of Basic and Applied Sciences, 3, Page 2809-2816.
Reference ID: 23455
Note: #23455e
Abstract: The objective of this study is to investigate the characteristics and physicochemical changes in windrow co-composting process of oil palm mesocarp fiber (OPMF) and palm oil mill effluent (POME) anaerobic sludge at pilot scale. The addition of POME anaerobic sludge as a nutrient source and microbial seeding into the OPMF compost led to the prolonged of thermophillic condition (50 – 68°C) until day 39 of treatment. The pH value was remained stable (6.8-7.8) throughout the process whereas the moisture content was reduced towards the end of treatment with final moisture content around 50%. The final matured compost was achieved within

50 days with C/N ratio of 12.6. In addition, considerable amount of nutrients and low level of heavy metals were detected in the final matured compost. The results is indicated that windrow co-composting of OPMF and POME anaerobic sludge could produce acceptable quality of compost that can be used as fertilizer or soil amendment.

[259] T. Tiemann, 2017, Total and proportional fertilizer consumption and nutrient use in Southeast Asia, Page 1 - 27.
Reference ID: 23456
Note: H 26.1 #23456

[260] F. Beavington, P.A. Cawse, 1979, The deposition of trace elements and major nutrients in dust and rainwater in Northern Nigeria, The Science of the Total Environment, 13, Page 263 - 274.
Reference ID: 23457
Note: #23457e
Abstract: The deposition of trace and major elements from the atmosphere was measured throughout 1976 at a rural site in the Nigerian savanna. Separate measurements were made of the deposition in rainwater and dry deposition, and of the dry deposition velocity that is related to particle size. The total (wet & dry) deposition of many elements showed marked seasonal dependence, increasing by an order or magnitude when, in April, the northerly winds from the Sahara desert are replaced by a tropical maritime air stream which remains predominant until October. The concentration in rainwater and deposition of elements associated with soil dust in Nigeria exceeded those in the UK, eg for Al, Fe and Sc. However, the reverse was true for potentially toxic pollutants (As, Pb, Se, V). These differences were emphasised by a comparison of enrichment factors (ratio of element to Sc in total deposition relative to ratios of the same elements in average soil). In most cases the element/Sc ratios in total deposition and in locally grown sorghum grain were very similar though the ratios for some elements were higher in total deposition than in local and "average" soil. The input of elements from the atmosphere exceeded their removal in the grain.

[261] IPNI, 2017, 10 Years of progress - Program Report 2017, Page 1 - 64.
Reference ID: 23458
Note: #23458e
Abstract: 2017 marks the 10th Anniversary of the International Plant Nutrition Institute. As I look back and consider what we have accomplished over the last ten years, I believe we have achieved much and have made a great difference in nutrient management around the world. We began with 13 founding members; 13 of the global fertilizer industry's leading companies, who had a vision of what IPNI might accomplish. We had 22 scientists covering 7 program areas. Today, we have 30+ scientists covering 13 regional program areas and 3 nutrient focused areas. IPNI develops and promotes scientific information for the responsible management of plant nutrition. When we were first established we identified 4 strategic goals to guide our activities: leadership on global plant nutrition issues, facilitation of plant nutrient research, enabling education on sustainable use of plant nutrients, and supporting our members. Those goals have served us well and over time have evolved to better recognize and include the central role of the application of 4Rs (right nutrient source, right rate, right time, and right place) in supporting sustainable and responsible nutrient use. To support our strategic goals, IPNI developed a global tactical plan that identified what we considered as 5 worldwide needs: 4R Nutrient Stewardship, nutrient

education, improved fertilizer recommendations, closing yield gaps, and enhancing sustainability. We outlined what we could do to answer those needs and developed program tactical plans that addressed these needs with specific activities at the local level. This annual report reviews the key issues and needs in each of our programs. It features highlights and priorities from our tactical plan and illustrates accomplishments from implementing our tactical goals, and we provide examples of the impact of IPNI programs. There are many more achievements and examples that we could show our intent here is to offer a snapshot or wide-angle view of what IPNI is doing and accomplishing. We've made a lot of progress in the last 10 years, but we also recognize that agriculture is changing and the needs of the fertilizer industry are changing. Our tactical plans have helped us align our regional programs with global goals and needs, but we need even better alignment to meet the needs of the industry, the farmers, and the stakeholders concerned about nutrient use and management. Going forward IPNI plans to refocus our efforts to position ourselves to be more consistent in our messaging, our educational endeavors, and our nutrient research to better serve our members and clientele.

[262] M.A. Awodun, S.O. Ojeniyi, A. Adeboye, S.A. Odedina, 2007, Effect of Oilpalm Bunch Refuse Ash on Soil and Plant Nutrient Composition and Yield of Maize, American-Eurasian Journal of Sustainable Agriculture, 1, Page 50 - 54.
Reference ID: 23459
Note: #23459e
Abstract: A comparative study of effect of oilpalm bunch refuse ash (OBRA) and NPK fertilizer on soil and plant nutrient status and yield of maize was conducted in two field trials conducted at Akure, Southwest Nigeria. The treatments were 0, 2, 4, 6, and 8 t/ha OBRA and 250 Kg/ha NPK 15-15-15 fertilizer (NPK F). The soils were deficient in organic matter (OM), Mg, Ca, marginal in K and slightly acidic, OBRA was relatively high in K, Ca, and Mg, but low in OM, N and P. OBRA and NPKF increased soil pH, OM, N, P, K, Ca and Mg. OBRA at 8t/ha increased soil OM, N, P, Ca and Mg relative to NPK, and OBRA treatments increased soil pH relative to NPKF. OBRA and NPKF increased leaf N, K, and Ca and 6t/ha OBRA and NPKF gave similar and highest leaf N, K, and Ca content. OBRA and NPKF increased cob and grain yield relative to control. The 6t/ha OBRA and NPKF gave highest and similar grain yield. Relative to control, NPKF 2, 4, 6, and 8t/ha OBRA increases grain yield by 44, 29, 31, 43 and 9% respectively.

[263] M.N. Ahmad, M.N. Mokhtar, A.S. Baharuddin, S.H. Lim, S.R. Ahmad Ali, S. Abd-Aziz, N.A. Abdul Rahman, M.A. Hassan, 2011, Changes in physicochemical and microbial community during co-composting of oil palm frond with Palm Oil Mill Effluent anaerobic sludge, BioResources, 6, Page 4762 - 4780.
Reference ID: 23460
Note: #23460e
Abstract: The aims of this study were to investigate the physicochemical changes and microbial population during co-composting of 1 ton oil palm frond (OPF) with 1000 L palm oil mill effluent (POME) anaerobic sludge. In the first 30 days of composting, the temperature of the composting piles was observed in the thermophilic phase, within a range of 50 - 56C. Meanwhile, the oxygen level moisture content, and pH profiles of the compost were maintained at 2.0 to 12%. 60 to 70%, and 7.9 to 8.5, respectively throughout the composting process. The total bacterial count was estimated to be about 55 x 10(10) CFU/mL in the mesophilic phase, and then it increased up to 66 x 10(10) CFU/mL in the thermophilic phase, and finally decreased to 9.0 x 10(10)

CFU/mL in the curing phase. The initial C/N ratio, 64, decreased to 18 after 60 days of composting process, indicating the maturity of compost product from OPF-POME anaerobic sludge. The diversity of the bacterial community was investigated using polymerase chain reaction-denaturing gradient gel electrophoresis (PCR-DGGE) analysis. The results suggested that the co-composting process of OPF with POME anaerobic sludge was dominated by Pseudomonas sp.

[264] S. Kathiravale, A. Ripin, 1997, Palm Oil Mill Effluent Treatement towards zero discharge, National Science and Technology Conference 1997, Kuala Lumpur, Malaysia, Page 1 - 8.
Reference ID: 23461
Note: #23461e
Abstract: This study will concentrate on treating the POME by employing a combination of evaporation and adsorption techniques under vacuum condition. The raw effluent has a temperature of 80 - 85C, thus by introducing a vacuum of 350 mm Hg, the effluent will evaporate without any addition of heat. Next, the adsorption process was carried out using four different types of adsorbents in the vapour phase. Lastly, the experiment was also carried out in a pilot plant scale. The distillate, (before adsorption) when analysed showed a 99% removal of most polluting parameters minitored except for pH, COD and BOD. This was tackled by the adsorption process which further reduced the pH, COD and BOD values. The effluent was able to be concentrated to as high as 25% solid content from the initial content of 3 - 5% solids. This will result in a recovery of 80% of the water content and also the POME volume will reduce by the same percentage. The concentrated effluent analysis showed a high content of nitrogen, phosphorus and potassium which can be used as feed material for the making of fertiliser. Lastly, the pilot plant scale experiments were done and the analysis showed the same results as the bench scale.

[265] RCSTSS, N.A. Yacob, M.A.K. Megat Hanafiah, M. Mohamed. 2014, Regional Conference on Science, Technology and Social Sciences, Springer.
Reference ID: 23462
Note: #23462e
Abstract: The Regional Conference on Science, Technology and Social Sciences 2014 (RCSTSS 2014) is a biennial conference organized by Universiti Teknologi MARA (UiTM) Pahang. Showcasing recent advancements and trends in the three major academic disciplines, namely science, technology, and social sciences, RCSTSS 2014 facilitated knowledge sharing and networking among participants concerning new challenges in their fields. But more importantly, it also served as a platform to disseminate research findings and a catalyst to promote innovations in the development of the country as well as the region. More than 200 papers were presented by participants from various local and foreign universities and institutions of higher learning. Of these, 64 science and technology manuscripts have been selected to be included in this publication, namely architecture, biology, computer and information technology, engineering, environment and management, food science, forestry, health and medicine, mathematics and statistics, plantation and agrotechnology, physics, robotics and sport science. The papers included in this book have undergone a careful selection process to ensure that they meet the objectives of the conference. Hopefully, this publication will serve as a significant reference to academicians, researchers, and students who are pursuing further research in their respective fields.

[266] T. Ahmad, M. Rafatullah, A. Ghazali, O. Sulaiman, R. Hashim, 2011, Oil Palm Biomass–Based Adsorbents for the Removal of Water Pollutants—A Review, Journal of Environmental Science and Health, 29, Page 177 - 222.
Reference ID: 23463
Note: #23463e
Abstract: This article presents a review on the role of oil palm biomass (trunks, fronds, leaves, empty fruit bunches, shells, etc.) as adsorbents in the removal of water pollutants such as acid and basic dyes, heavy metals, phenolic compounds, various gaseous pollutants, and so on. Numerous studies on adsorption properties of various low-cost adsorbents, such as agricultural wastes and its based activated carbons, have been reported in recent years. Studies have shown that oil palm–based adsorbent, among the low-cost adsorbents mentioned, is the most promising adsorbent for removing water pollutants. Further, these bioadsorbents can be chemically modified for better efficiency and can undergo multiple reuses to enhance their applicability at an industrial scale. It is evident from a literature survey of more than 100 recent papers that low-cost adsorbents have demonstrated outstanding removal capabilities for various pollutants. The conclusion is been drawn from the reviewed literature, and suggestions for future research are proposed.

[267] IPNI, 2016, IPNI Research Projects: Interpretive Summaries 2016 Crop Year, Page 94. IPNI.
Reference ID: 23464
Note: #23464e
Abstract: One of the strategic goals of the International Plant Nutrition Institute (IPNI) is to facilitate research on the sustainable use of plant nutrients needed for agriculture to meet future global demand for food, feed, fiber, and fuel. We accomplish this objective through partnerships with colleges, universities, government agencies, and other institutions and organizations around the world where IPNI programs are established. This past year we provided financial and in-kind support to over 150 projects around the world. Our scientists work closely with the researchers and cooperators carrying out the research… often assisting with the initiation, design, and implementation, monitoring of progress, and the interpretation and dissemination of results. The studies are diverse, including fertilizer best management practices, site-specific nutrient management, and other components of 4R Nutrient Stewardship in cropping systems, but increasing crop yields and productivity is a common objective with most of our research.

[268] A.A. Tuen, G.T. Noweg, B. Amit, 2016, Value of forest patches in promoting biodiversity conservation in an oil palm dominated landscape - Case studies in Sarawak, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 1 - 16.
Reference ID: 23465
Note: #23465e
Abstract: The Oil Palm is undoubtedly one of the most efficient and productive oil crop in the world, with a production span of about 25 years and producing about 4.5 tonnes of oil per hectare. The industry's contribution to society and economy of Malaysia is immense - thousands of products ranging from consumer goods to industrial applivations, jobs for > 1 million of people and 5-6% of gross domestic product. However, the impact on the environment is also big and the industry faced many challenges relating to biodiversity conservation and climate change. The Malaysian government through agency such as Malaysian Palm Oil Board (MPOB) is doing its

best to counter these criticisms by promoting sustainable practices and supporting research on biodiversity conservation, greenhouse gas emission and carbon sequestration thus providing a more environmentally friendly face to the industry. In tandem with government efforts, responsible oil palm companies are also adopting environmentally friendly approaches in their business, including leaving aside patches of forest for biodiversity conservation.

[269] R. Abd Majid, K. Kumar, M.Z. Yusof, 2016, Harnessing Rainwater : Ladang Perlating Jerneh's Experience, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 1 - 10.
Reference ID: 23466
Note: #23466e
Abstract: The El Nino and any prolonged dry weather will definitely have a big impact on the crop production in the oil palm plantations between twelve to eighteen months later: Ladang Perlating Jerneh, located in Bahao, Negeri Sembilan is in a rain-shadow area. Besides the El Nino, this estate also suffers from two other inherent limitations i.e. lower annual rainfall (averaging only 1780 mm per year for the las 10 years) and poor soils (mainly Batu Anam, Durian and Malacca Series). Various approaches had been implemented since 2013 to mitigate the limitations. These included the construction of humps and sumps, silt pits, conservation terraces, frond stacking system. Most recently utilisation of Ganoderma pits and planting on platforms in the entire 2015/16 replating was implemented. The construction of platforms had been widely pratised in oil palm plantations and even smallholdings in Machap areas, Malacca, which also suffer from similar limitations of lower rainfall and poor lateritic soils (Malacca Series) and yet recorded high yield!

[270] M.H. Ahmad Tajudin, 2016, Cation Nutrient Management in Oil Palm, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 133.
Reference ID: 23467
Note: #23467e
Abstract: Oil palms are planted for a commercial purpose and it is important that every single oil palm planted must produce crop yield to its potential. In the field, the crop yield is measured in term of fresh fruit bunch (FFB) production. FFB production is governed by the genetic make-up of the planting materials and the environment. The environment is influenced by the climate, soil types, nutrition and best management practices (BMP). This paper discusses the contribution of soil types and nutrient management, particularly the cations, in ensuring high yields in commercial oil palm plantings. In this study, the coastal clay soils were shown to have sufficient supply of potassium, magnesium and calcium for oil palm cation nutrient requirement. Inference could be made from this study that the biophysical functions of the cations in maintaining turgor pressure in plant cells were interchangable among these three major cations depending on which one was available at any particular time. This cations played complementary roles in maintaining total cations in the oil palm for the biophysical functions. This relationship is termed as "complementary cationic relationship".

[271] N. Rajanaidu, A. Mohd Din, A. Kushairi, Y. Zulkifli, M. Marhalil, A. Norziha, O.A. Meilina, A.M. Fadila, A. Nor Azwani, L. Adelinna, 2016, Oil Palm Planting Materials: History and Progress, 12th ISP National Seminar 2016 Book, Pullman, Kuching, Sarawak.
Reference ID: 23468
Note: #23468e
Abstract: This paper largely addresses the pedigree and performance of oil palm planting materials in historical context. Discovery of the inheritance of shell by Beirnaert in Congo in 1941 and the subsequent cultivation of DxP as the planting material provided the impetus for the expansion of oil palm industry throughout the world. At the begining Belgian Congo and Unilever in Africa and Asia were involved in oil palm R&D. In Malaysia and Indonesia, the public and private sectors played active roles in oil palm expansion. CIRAD/PalmElit and ASD Costa Rica are major global oil palm seed producers in Africa, Asia and South America. At present, there is a capacity to produce nerly 400 million DxP seeds in Indonesia, Malaysia and other countries. In the early stages, there was a significant exchange of breeding materials between countries. The Djongo/ SP540 from Congo, the Yangambi (Congo), Calabar (Nigerian), Ekona (Cameroon), La Me (Ivory Coast), URT (Guthrie) and AVROS (Indonesia) are the major contributions of the paternal (pisifera) line used in seed production and breeding. On the maternal side, the Deli dura derived from four Bogor palms played a major role. Germplasm collections of Elaeis guineensis and oleifera were carried out by MPOB, IRHO/CIRAD, ASD Costa Rica, Indonesia, Ecuador and Colombia.

[272] K.H. Lim, 2016, Ganoderma Management on Peat, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 149 - 154.
Reference ID: 23469
Note: #23469e
Abstract: Ganoderma infection remains the most significant constraint to sustainable oil palm cultivation in Malaysia and Indonesia, particularly on peat. Significant yield reduction is caused by direct loss of palm stand lower yield of infected palms and need for earlier replanting. Since there is presently no effective remedy for oil palms infected with Ganoderma, the management of this devasting disease on peat is focused mainly on early detection of infected palms by more frequent census, good implementation of sanitation practices and improvement of palm health to tolerate the disease.

[273] M. Kusong, R. Ensali, D. Sagam, 2016, Harvesting and Crop Recovery: SALCRA's Experience, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 135 - 147.
Reference ID: 23470
Note: #23470e
Abstract: Harvesting and crop recovery is the most important operation in the oil palm plantation. Hence having Good Agricultural Practices (GAP) in place will ensure improved crop yield and revenues. Nonetheless, harvesting and crop recovery of fresh fruit bunches and loose fruit collection has become a recurrent issue nowadays. This paper discusses and shares the experience of Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) in harvesting and crop recovery specifically in developing plantation on the Native Customary Rights (NCR) land for 40 years. SALCRA's experience showed that harvesting and crop recovery are significantly influenced by the field contiguity based on land consented by landowners for development and topography, field cleanliness and accessibility, road network system,

availability and type of workers and, human factor. Along with SALCRA's journey in the development and management of NCR lands, work proccesses and systems were reviewed and improved. The significant impacts are seen from:
(i) nett proceeds declared to landowners
(ii) changing SALCRA operation from socio-economic to commercial approach
(iii) creation of rural transformation
(iv) improved living conditions of participants and
(v) incidence of casualty to some staff that force them to leave due to work pressures.
These improvements have become part and parcel of SALCRA's long journey to success.

[274] A. Kushairi, A.R. Shuib, 2016, Innovations in Oil Palm Mechanisation, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 103 - 114.
Reference ID: 23471
Note: #23471e
Abstract: Oil palm, the major plantation crop in Malaysia generating substantial revenue to the industry and nation albeit the plantation sector, is labour intensive. A way forward for the plantation sector, hence its objectives, are to minimise labour dependency and maximise productivity by means of mechanisation. Despite being progressively mechanised since the 1980s, though mainly in infield transportation, further economic gains are achievable through the adoption of new technologies. The Malaysian Palm Oil Board (MPOB) consistently develops task-sepcific mechanisation technologies in harvesting, loose fruit collections and infield transportations for the wellbeing of the industry. Several of the technologies transferred to the industry, such as The Grabber; blended well with the plantation landscape, while others, especially harvesting technologies, notably Cantas, are yet to be fully accepted. An efficient cost-saving harvesting technology is urgently needed in the plantations. Similarly, ergonomically-friendly loose fruits collection technologies are sought by the industry. Plantation management responded positively to mechanisation; but require machines that are functionally efficient and economically feasible. These specifications are being addressed by MPOB, and in collaboration with members of the industry, academia and engineering firms, locally and abroad. Further utilisation of mechanisation in enhancing production efficiency remains as one of key factors for the Malaysian oil palm industry to stay relevant.

[275] S.S.R. Syed Alwee, S. Krishnan, C.C. Tan, N.H. Hamid, J.S. Tan, 2016, Oil Palm Planting Material for Peat : Performance and Challenges, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 61 – 68.
Reference ID: 23472
Note: #23472e
Abstract: Although peat soil is classified as marginal soil and in its original state has many physical and chemical constraints for oil palm planting, through the use of right techniques and management, commercial planting of oil palm even on deep peat soils can be as profitable. Due to the nature of peat soils, the right type of planting material is ideally one that is short with a smaller architecture. The latest variety of planting material developed by FGV which is the, Yangambi 3way, is more suitable for peat soils as it is more resistant to learning which is a common phenomenon in peat areas. This is due to the smaller canopy architecture of the material. Limited planting of this material in peat areas suggested that its yield performance is comparable to similar planting material planted in inland and coastal soils, reaching 30 tonnes per hectare per year 8 years after planting. Density trial conducted with Yangambi 3way progenies

suggested that the canopy size, and hence overall architecture, is also suited for planting at up to 160 palms per hectare in marginal soils.

[276] C.Y.J. Tek, 2016, Synopsis of the Factors Impacting the Competitiveness of the Malaysian Oil Palm Industry, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 45 - 46.
Reference ID: 23473
Note: #23473e
Abstract: The oil palm industry is the main pillar of the Malaysia afri-commodity sector as well as a major contributor to the economic growth. This industry was identified under the Economic Transformation Programme (ETP) as one of the National Key Economic Areas (NKEAs) that is targeted to bring prosperity and economic growth to Malaysia in its pursuit to be a high income nation by Year 2020. On the eve of the centennial commemoration of oil palm commercialisation in Malaysia, we can reflect and appreciate how this industry has evolved, tracking its breathtaking transformation to become one of the most efficient and productive plantation agricultural systems in the world and yet possessing vast opportunities for further improvements. Oil palm has been instrumental in helping to alleviate and eradicate poverty and is the backbone of socio-economic development of this country, contributing an average of more than USD19 billion over the past 5 years while providing direct employment to over 700 000 people in sectors within the supply chain. There are also additional spin-offs and significant multiplying effects being realised from this industry. As the second largest producer and exporter of palm oil and other palm-based products in the world, Malaysia continue to play an important role in fulfilling the growing global demand for oils and fats in a sustainable manner.

[277] Z. Hashim, A.A. Murdi, Z. Yahya, 2016, Water Footprint Analysis of Oil Palm Planted in Malaysia, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 85 - 98.
Reference ID: 23474
Note: #23474e
Abstract: Oil palm (*Elaeis guineensis*) is one of the most rapidly expanding crops in the tropics. Environmental concerns about deforestation and greenhouse gas emissions and of late, water shortage or scarcity are the main threats to life on our planet. Watre is one of the most important factors affecting the growth and production of oil palm. In Malaysia, the oil palm which is rainfed, depands entirely on rainfall for its water requirements. The soil moisture must be optional for good growth and yield of oil palm. Malaysian Palm Oil Board (MPOB) has analysed the water footprint (WF) of fresh fruit bunch (FFB) profuction in Malaysia. This paper quantifies the WF of FFB production from oil palms grown in some areas in Malaysia, using inventory data gathered from 3 years data with waterfootprint network. The data for crop evapotranspiration (ET) of 5.5 mm per day was used to calculate the green and blue EFs. The results showed that for oil palm with FFB yield of 20.7 tonnes per hectare per year (average of 25-year life span) the WF - was 1166 m3 per tonne FFB (WFgreen, 1054; WFblue, 5; and WFgrey, 107m3/tonne). The results also showed that the green WF was higher than the grey and the blue WFs as planting of oil palm in Malaysia is rainfed. In general, biodiesel has a larger water footprint per unit of energy obtained than bio-ethanol, with the WF of biodiesel from coconuts being the largest. WF for biodiesels from oil palm rapeseed and groundnuts are more efficient, with water footprints in the range of 150-200 m3 per GJ. This paper also suggests some relevant aspects of water reservation practices and represents an important step

for mitigation to increase perception of all environmental aspects especially in preserving the freshwater ecosystem in oil palm plantations. Agricultural practices commonly used in oil palm plantations that potentially impact hydrological processes and water quality plus the hydrological changes and associated nutrient fluxes plantations are also briefly discussed.

[278] G.F. Chung, 2016, Review on Major Pests Management in Oil Palm, 12th ISP National Seminar 2016 Book, Pullman Hotel, Kuching, Sarawak., Page 115 - 131.
Reference ID: 23475
Note: #23475e
Abstract: Many pests attach oil palm in Malaysia. Of these, a few species of rats are important pests of oil palm. Rats are known to attack oil palm of all growth stages. The crop due to rats in general is estimated to be about 7-10 per cent of palm oil production. Additionally, several species of bagworms, and nettle caterpillars are important pests in Malaysia. Economic losses caused by leaf-eating caterpillars have been estimated to be as high as 40-50 per cent loss of crop over a period of two years after a single defoliation of 100 per cent. Recently aerial spraying has been carried out to deal with serious outbreaks over very large areas. (Lower Perak - 8500 ha in 2011 and northern Johore - 3000 ha in 2012).

[279] IPNI, C. Snyder, 2017, Plant Nutrition Today - Fall 2017 Summer no.1 : Crop Nitrogen use: A look from the rear-view mirror, Page 1 – 2.
Reference ID: 23476
Note: #23476e
Abstract: Many of us who are experiencing more gray hair (or less hair) enjoy a periodic glance backward, to see how straight … or crooked … our footsteps have been over the years. However, like footprints on the beach that are readily washed away by the tide and waves … the memories of our paths and records of our accomplishments can easily fade. The same is true, with crop and nutrient management performance records on the farm. We all have learned that “two points do not a line make”, “no two years are exactly alike”, and that “weather is not predictable from year to year, much less so from month to month.” That is why it is important to intentionally track the on-farm and in-field nutrient performance each year, or each season, to establish at least three nutrient performance data points over a 10-year period, and to evaluate the trend line. Long-term records are often quite revealing and can provide the most accurate indication of trends. One relevant research example of longterm nutrient performance evaluation, is work by Dr. J.K Ladha (with the Consultative Group for International Agricultural Research; CGIAR) and others, who looked at 135 studies from 114 long-term (6 to 158 years) cropping system experiments throughout the world. They critically examined the effects of nitrogen management on changes in soil organic carbon and soil organic nitrogen. Their work published in abbreviated form in Better Crops clearly showed that optimal fertilizer nitrogen management helps slow any decrease of soil organic carbon caused by tillage and crop management, or may cause a small increase in soil organic carbon depending on the amount of crop biomass produced and how crop residues are managed. Subsequent work published by Dr. Ladha and others in Nature constructed a 50-year (1961 to 2010) global cereal crop nitrogen budget. That long-term look indicated that: (1) 57%, 36%, and 48% of the fertilizer nitrogen applied to maize, rice, and wheat, respectively, was recovered by those crops in the year of application, (2) crop yields were continuing to increase, but (3) losses of soil nitrogen levels may be occurring in many places, causing potential threats to long-term system productivity.

Such data collection and analyses reveal some concerns, that warrant more local examination of nutrient management and trends over time.

[280] IPNI, M. Stewart, 2017, Plant Nutrition Today - Fall 2017 Summer no.2: Pay Attention To Sulfur, Page 1 - 2
Reference ID: 23477
Note: #23477e
Abstract: Sulfur (S) is an essential nutrient in crop production. Although it's classified as a secondary element along with magnesium and calcium, it is sometimes called "the fourth major nutrient" because some crops can take up as much S as phosphorus. Sulfur nutrition has gained a lot of attention in recent years for several reasons. These include higher crop yields that require more S, less S impurities in modern fertilizers, and less use of S-containing pesticides. Furthermore, reduced industrial S emissions to the atmosphere has contributed to increased S shortages. The maps shown at the end of this article illustrate how sulfate ion (SO4-2) wet deposition in the US has fallen over a recent 20-year period. Sulfur serves many functions in plants. It is used in the formation of amino acids, proteins, and oils. It is necessary for chlorophyll formation, promotes nodulation in legumes, helps develop and activate certain enzymes and vitamins, and is a structural component of two of the 21 amino acids that form protein. The crop's need for S is closely associated with nitrogen (N). The relationship between S and N is not surprising since both are components of protein and are involved in chlorophyll formation. They are also linked by the role of S in the conversion of nitrate to amino acids. Crops having high N need will usually also have high S needs.

[281] IPNI, R. Mikkelsen, 2017, IPNI 2017 Plant Nutrition Today - Fall 2017 Summer no.3 - Fertilizing For Delicious Tomatoes?, Page 1 - 2.
Reference ID: 23478
Note: #23478e
Abstract: A favorite topic of discussion this time of year is the quality of tomatoes available at market or from the garden. Some blame for disappointing tomatoes has been laid on modern tomato varieties, but there are more things to consider. For the home vegetable grower, taste is probably the most important concern. But in addition to taste, commercial growers have many other concerns for successfully producing and marketing their crop. Commercial tomatoes varieties are frequently selected for disease and pest resistance or growing season restrictions. Cultural practices, such as harvesting before the tomatoes are vine ripened, may not help achieve the best taste and quality. Soil fertility and management of plant nutrients influence the quality of tomatoes. Supplying adequate plant nutrition is essential to harvesting abundant, flavorful, and nutritious tomatoes. It is always best to start with a test of the soil to check what nutrients are already present. But realistically, most home gardeners have never heard of soil analysis or know how to even begin the testing process or interpret the lab results.

[282] A.R. Zaharah, H.A.H. Sharifuddin, R. Subramaniam, 1986, Nitrogen Fixation by Leucaena leucocephala as Measured by N-15 Dilution Technique, Pertanika, 9, Page 17 - 22.
Reference ID: 23479
Note: #23479e
Abstract: A field trial was conducted to measure the amount of nitrogen fixed by Leucaena leucocephala using the isotope dilution technique proposed by Fried and Broeshart (1975). Three varieties of Leucaena (Accession 55/65, Cunningham and

Peruvian) were planted both as a sole crop and mixed with Setaria anceps var. splendida grass. It was found that Leucaena canfix up to 78% of the nitrogen present in the plant tops within the period of three months. Leucaena grown as a sole crop tends to fix more nitrogen than those grown mixed with the grass.

[283] R.G. Lockard, E.J.A. Asomaning, 1964, Mineral Nutrition of Cacao (*Theobroma Cacao* L.), Plant & Soil, 21, Page 142 - 152.
Reference ID: 23480
Note: #23480e
Abstract: Following the completion of an insect-proof greenhouse at this Institute 9 a programme of research on the mineral nutrition of cacao was begun. The primary objective of the programme was to investigate the nutritional requirements of cacao and to analyse its growth habit. As a beginning, all macro- and micronutrient deficiency symptoms were induced on West African Amelonado cacao to see whether the symptoms were the same as those produced on cacao in other countries and to obtain nutrient levels in the control and deficient plants under conditions in this greenhouse. For convenience, this investigation was combined with an experiment on cacao plants infected with swollen shoot virus. This paper deals with the symptoms and nutrient levels of deficient plants which were not infected with virus. A subsequent paper 7 deals with the virus and virus × nutrient interaction effects. Leaf symptoms of macronutrient and micronutrient deficiencies of cacao have been illustrated and described in a number of reports, some of which include the results of chemical analyses.

[284] IPNI, 2013, Research with Impact: Balanced Fertilization of Grain Crops in Egypt Can Double Yields.
Reference ID: 23481
Note: #23481e
Abstract:
The Challenge:
The population of Egypt is approximately 75 million (M) people, with a cultivated area limited to only 3.6 M hectares (approximately the size of Switzerland). Wheat is the most important grain consumed in Egypt, but it is the largest wheat-importing country in the world due to production shortages. Wheat provides half of all national dietary grain consumption, followed by maize (38%), and rice (10%). More than 90% of Egypt is covered by deserts, with less than 4% of the country available as arable land for crop production. This limited farmland places pressure on improving food production on the relatively scarce agricultural land. Additionally, over a quarter of the Egyptian population lives below the poverty line, so assuring food security is a pressing social challenge. In Egypt, the application of mineral fertilizers is highly skewed towards nitrogen (N), which has led to the gradual depletion of other nutrients like phosphorus (P), potassium (K), and several micronutrients following many years of repeated crop harvest. The current nutrient consumption in Egypt is about 1.4 M metric tons, but the current ratio of the nutrient use of 100: 20: 4 (N: P2O5: K2O) is highly unbalanced. This unbalanced fertilization allows for a great opportunity to improve crop productivity through improved fertilizer management.

[285] M. Mohd Noor, 2002, Malaysian Palm Oil Extraction Rate (OER): Response to Market and Management Factors, Oil Palm Bulletin, 42, Page 7 - 14.
Reference ID: 23482
Note: #23482e
Abstract: The changed structure of the fresh fruit bunch (FFB) market has negatively affected the oil extraction rate (OER) of the Malaysian palm oil industry. This study, which employed econometrics to model the OER of the Malaysian palm oil milling industry, identified the fresh fruit market structure and mill maintenance as the two important OER influencing factors. Palm oil mills in Sabah and Sarawak in the eastern region of Malaysia, modelled by a dummy variable, indicated a significantly higher OER. The FFB market changed after the 1989/90 season because of the drastic increase in processing capacity. Competition for the raw material increased, bidding the prices upwards, i.e. the quality of harvested fruits suffered due to the lack of incentive to harvest the fruits properly. Fruit quality control is required to improve the OER. In addition, greater maintenanceof palm oil mills (POMs) is also needed to improve processing efficiency and maintain high OER.

[286] Z.H. Termizi, N.J. Sidik, T. Ahmad Hashim, N. Ahmat, 2014, The effects of different concentrations of NAA on oil palm (*Elaeis guineensis*) embryoid cultures and phytosterols production, Australian Journal of Crop Science, 8, Page 840 - 847.
Reference ID: 23483
Note: #23483e
Abstract: Oil palm tissue culture is subjected to indirect embryogenesis which involves five stages including mother palm selection and preparation, establishing an aseptic culture, multiplication of suitable propagules, formation of shoots and roots, and transfer to natural environment. This study aimed to investigate the effects of NAA concentrations on further improvement of oil palm (*Elaeis guineensis)* embryoid cultures of three selected Malaysian Palm Oil Board (MPOB) clones (PL 213, PL 209 and PL 220) and phytosterols production. Different concentrations (0, 0.5, 1.0, 2.0 mg L-1) of NAA were added to the MS basal medium and the cultures were incubated at 27 ± 2°C and 12 hours light/day photoperiod. Measurements on fresh weight of embryoids and number of shoots were recorded every two weeks throughout 16 weeks of experiment. The results indicated that PL 213 gave the highest mean of fresh weight (55.3±3.4 g) and number of shoots (123±4) in MS medium without NAA (control) followed by clones PL 209 and PL 220. There is a significant difference of clone and NAA concentration on the fresh weight of embryoid cultures but there is no significant effect of NAA concentration on the number of shoots. However, high concentration of NAA up to 2.0 mg L-1 had stimulated tissue necrosis and excretion of phenolic compounds into the culture medium. In the phytochemical study, clone PL 213 also produced the highest phytosterols in type and percentage. The useful sterol compounds that present in the extracts of PL 213 embryoid were γ-sitosterols, β-sitosterols, stigmasterol, campesterol, stigmasterol, 22,23-dihydro- and stigmasta-7, 22-dien-3-ol, (3.beta.,5.alpha.,22Z)-. It has been observed that higher concentration (1.0-2.0 mg L) of NAA gave poorer effects on the growth and the phytosterols production in all oil palm clones compared to control and 0.5 mg L-1 NAA used in this study.

[287] K. Haron, A.T. Mohammed, R. Mohamed Halim, A.K. Din, 2008, Palm-Based bio-fertilizer from decanter cake and boiler ash of palm oil mill, MPOB Information Series, Page 4.
Reference ID: 23484
Note: #23484e
Abstract: Decanter cake (DC) and boiler ash (BA) are wastes from the palm oil mill. A mill with 90 t hr-1 FFB processing capacity will produce about 160-200 t DC and about 180 t BA a month. Both the DC and BA are sources of nutrients for producing bio-compound fertilizer. Recycling them will reduce the cost of plam oil production.

[288] MPOB, 2015, Proceedings of The International Seminar on Gearing Oil Palm Breeding and Agronomy for climate change, International Seminar on Gearing Oil Palm Breeding and Agronomy for climate change, Kuala Lumpur Convention Centre (KLCC) Kuala Lumpur, Malaysia., Issue,Page 73. Malaysia Palm Oil Board (MPOB).
Reference ID: 23485
Note: #23485e