

The Impact of Organic Fertilizer Application to Oil Palm Production in FELDA Maokil 7: A Case Study

Asy Syura M. and *Tsan F.Y.

Faculty of Applied Sciences, Universiti Teknologi MARA

e-mail: tsanfuiying@salam.uitm.edu.my

* Correspondence author

ABSTRACT

Oil palm production is a major agricultural industry in Malaysia. For the year 2000, the share of palm oil in the world trade of oils and fats stood at 35 percent. In this way, palm oil was the largest oil trade in the world markets. The major producers of palm oil in the world are Malaysia, Indonesia, Nigeria, Ivory Coast and Colombia. Due to the unique physical and chemical properties, palm oil is used in numerous food products such as cooking oil, margarine, shortening bakery and confectionery fats. Similarly palm kernel oil can be used in the manufacture of chemicals, soaps, detergents, cosmetics and other personal care products. Fertilizer application is essential in Malaysian agricultural as it plays a major role in improving growth and yields. Oil palm needs large quantities of fertilizers annually to sustain high crop yields. The objective of this study was to determine the impact of organic fertilizer application to oil palm production. This study was conducted in the FELDA Maokil 7, Labis, Johor. Organic fertilizer used in the estate was composted shredded Empty Fruit Bunches (EFB) obtained from FELDA Palm Industries Sdn. Bhd., Maokil Palm Mill. To date, this practice is still applied in this estate. Data collected were subjected to statistical analysis. Reduce use of inorganic fertilizer as application of organic fertilizer was introduced generally resulted in significantly lower yield in block 92C with Sandy Cempaka Liat soil. This practice also resulted in significantly lower yield in block 92E(B) with Cempaka Lating soil. However, the yield in block 92E(A), with the same soil type of Cempaka Lating but is adjacent to the river running across the estate, was not significantly different as compared to the yield obtained before the introduction of organic fertilizer. The study recommended the application of organic fertilizer for areas with soil type Cempaka Lating coupled with the position of the area close to the water resources, for attempts to reduce the use of inorganic fertilizer in oil palm production, without much deviation from optimum yield.

INTRODUCTION

In Malaysia, 3.88 million hectares of land are cultivated with oil palm, producing 14 million tonnes of palm oil in 2004. Malaysia is the largest producer and exporter of palm oil in the world, accounting for 30% of the world's traded edible oils and fats supply. The industry provides employment to more than half a million people and livelihood to an estimated one million people.

The cultivation of oil palm rapidly increased in Malaysia in the sixties under the government's agricultural diversification programme, which was to reduce the country's economic dependence on rubber and tin. Later in the 1960s, the government introduced land settlement schemes for planting oil palm as a means to eradicate poverty for the landless farmers and smallholders. The oil palm plantations

in Malaysia are largely based on the estate management systems and small holder schemes.

Oil palm cultivation requires significant amount of fertilizers for optimum production. The estimate nutrients removed by oil palm producing 25 tonne/ha fresh fruit bunches (FFB) per year are 192, 11, 209, 36 and 71 kg per ha per year of N, P, K, Mg and Ca, respectively (Foster and Goh, 1997).

Fertilizers can be organic that are composed of organic matters such as carbon based fertilizers or inorganic compounds containing simple inorganic chemicals. They can be naturally-occurring compounds such as peat or mineral deposits or manufactured through natural processes such as composting or chemical processes.

Fertilizers typically provide varying proportions of minerals. The three major plant nutrients are nitrogen, phosphorus and potassium while the secondary plant nutrients are calcium, sulfur, magnesium and sometimes trace elements or micronutrients with a role in plant nutrition such as boron, manganese, iron, zinc, copper and molybdenum.

There has been much controversy over application of organic and inorganic fertilizers in crop production. In an effort to reduce the dependence on mineral fertilizers and to move towards more natural and healthier methods of food production, there are programs that encourage the recycling and use of agricultural wastes as organic fertilizers. This includes rice straw and husk, empty oil palm fruit bunches (EFB), saw dust, animal droppings, palm oil mill effluent (POME) and other materials. The use of EFB at 37.5 t/ha per year in oil-palm fields has been shown to increase the FFB yield significantly and to improve soil exchangeable K, Ca, Mg and the pH (Lim and Zaharah, 2002).

The benefit from the increased use of organic fertilizer also helps solve pollution problems caused by agro-industrial wastes and intensive livestock farming. However, the plantations must not be seen as a dumping ground for organic wastes.

Most of the organic sources, however, are invariably low in nutrient contents as compared to inorganic fertilizers. Inevitably, large quantities need to be used to provide all the macro and micronutrients required for optimum growth and yield of crops.

This study was aimed to investigate the impact of organic fertilizer application to oil palm production in FELDA Moakil 7, Labis, Johore, Malaysia. It is one of the estates of FELDA schemes, Federal Land Development Authority, better known as FELDA. FELDA is the foremost land development agency in Malaysia. FELDA was established on 1st July 1956 under the Land Development Act 1956 as a result of recommendation of Government Working Committee. The information gathered from this study may add some knowledge on the effectiveness and impact of the application of organic fertilizer to oil palm for optimum yield.

METHODOLOGY

This study was conducted in the FELDA Maokil 7. FELDA Maokil 7 was developed since 1984 with total area of 2667.38 hectares. The oil palm area that is not productive is about 667.23 hectares and the rest 2000.15 hectares are still productive until today. The ages of the oil palm in the area were 18 years and 17 years.

In FELDA Maokil 7, the oil palm areas are divided into blocks and identified as PM 92C, PM 92E, PM 92D, PM 89A and PM 00E. Oil palm blocks in FELDA Maokil 7 are different in terms of topography and soil types. The soil types in block PM92C and PM92E are sandy Cempaka Liat and Cempaka Lating respectively. Organic fertilizer has been applied only at these two blocks since September 2005 as these areas have problems in terms of their soil condition which is sandy and less fertile as compared to other areas or blocks.

The organic fertilizer used in these blocks until today is composted shredded EFB obtained from FELDA Palm Industries Sendirian Berhad, Maokil Palm Mill. The Mill has been certified with ISO 14001: 2004 and ISO 9001:2000 in February 2004 and Jun 2005 respectively. An amount of 50kg of this organic fertilizer was applied to each plant once annually. With the application of the organic fertilizer, the amount of inorganic fertilizer applied to these trees was reduced.

Data on the yield as a result of the switch to application of organic fertilizer in block PM92C and PM92E as compared to that of the same length of period before the introduction of organic fertilizer were analysed by using t-test. Correlation analysis of the yield to rainfall was also carried out.

RESULTS AND DISCUSSION

As organic fertilizer was introduced in September 2005 to reduce the use of inorganic fertilizer in oil palm production, t-test indicated a significant reduced production trend in block PM92C and block PM92E (B) (Table 1). However, for cultivation area of PM92E with better soil condition for oil palm yield, i.e. Cempaka Lating, such practice did not differ significantly from the previous practice of 100% inorganic fertilizer for the production of oil palm at block PM92E (A). It was probably due to the location of this block adjacent to the river. The yield in block PM92E (B) which has the same soil type of Cempaka Lating but located away from the water resource, however, could not retain the same production as mentioned when switched to the application of organic fertilizer.

The results indicated that the benefits of the application of organic fertilizer were affected by the soil type and availability of water. More sandy area did not allow the optimum production when the inorganic fertilizer was reduced and substituted with organic fertilizer. The less sandy soil of Cempaka Lating coupled with the position adjacent to river, however, allowed this practice of applying organic fertilizer to reduce the use of inorganic fertilizer to sustain satisfactory oil palm yield. The availability of water is well known to allow better nutrient uptake by plants. Moreover, the less sandy soil would normally be assumed to be more fertile than sandy soil type. Probably the availability of nutrients from the better soil in block PM92E (A) was also probably quite close to the sufficient level for optimum yield of

oil palm. Hence, the reduce use of inorganic fertilizer as the application of organic fertilizer was introduced, did not give significant negative impact for oil palm production.

Table 1: T-test (Two-Sample Assuming Equal Variances) for yield of oil palm as affected by the application of fertilizer

	PM92C		PM92E (A)		PM92 (B)	
	Inorganic	organic	Inorganic	organic	Inorganic	organic
Mean	2.11889	1.66889	2.02722	1.92833	2.02722	1.50833
Variance	0.18251	0.09362	0.14479	0.12476	0.14479	0.0667
Observations	18	18	18	18	18	18
df	34		34		34	
P(T<=t) two-tail	0.00091		0.42465		0.00003	

In view of the importance of water to oil palm production, correlation analysis was carried for yield and rainfall at 18 month-, 12 month- and 6 month- before harvesting respectively. Rainfall at 18 months before harvesting is known to be important for sex determination in oil palm. Higher rainfall will result in more development of female flowers. Then, water availability at 12 months before harvesting is important for socket development while rainfall at 6 months before harvesting will affect the fruit set.

Table 2: Correlation analysis of yield and rainfall before harvesting

Site	Rainfall at x months before harvesting			
		6	12	18
PM92C	Coefficients	-0.290	0.65	-0.171
	P	0.25	0.636	0.236
PM92E (A)	Coefficients	-0.156	0.169	-0.153
	P	0.235	0.213	0.29
PM92E (B)	Coefficients	-0.242	0.065	-0.161
	P	0.063	0.636	0.264

However, correlation analysis indicated that there was no significant correlation for yield and rainfall at 18 months, 12 months or 6 months before harvesting respectively (Table 2). It could be due to the absence of distinct dry seasons or in another word, there was some rain even during months with relatively low rainfall. By the end of 2006, extraordinary high rainfall of about 800 mm seemed to result in relatively lower oil palm yield at 6 months later (Figures 1-3). The estate was flooded and hence, was assumed to affect the yield. Moreover, the total sunshine hours was also assumed to be lower due to the high rainfall. It could have also reduced biomass production (photosynthesis) in this case. The population of pollinators could also be affected due to the high rainfall and reduced sunshine hours. Pollination could then be less and hence affected the fruit set.

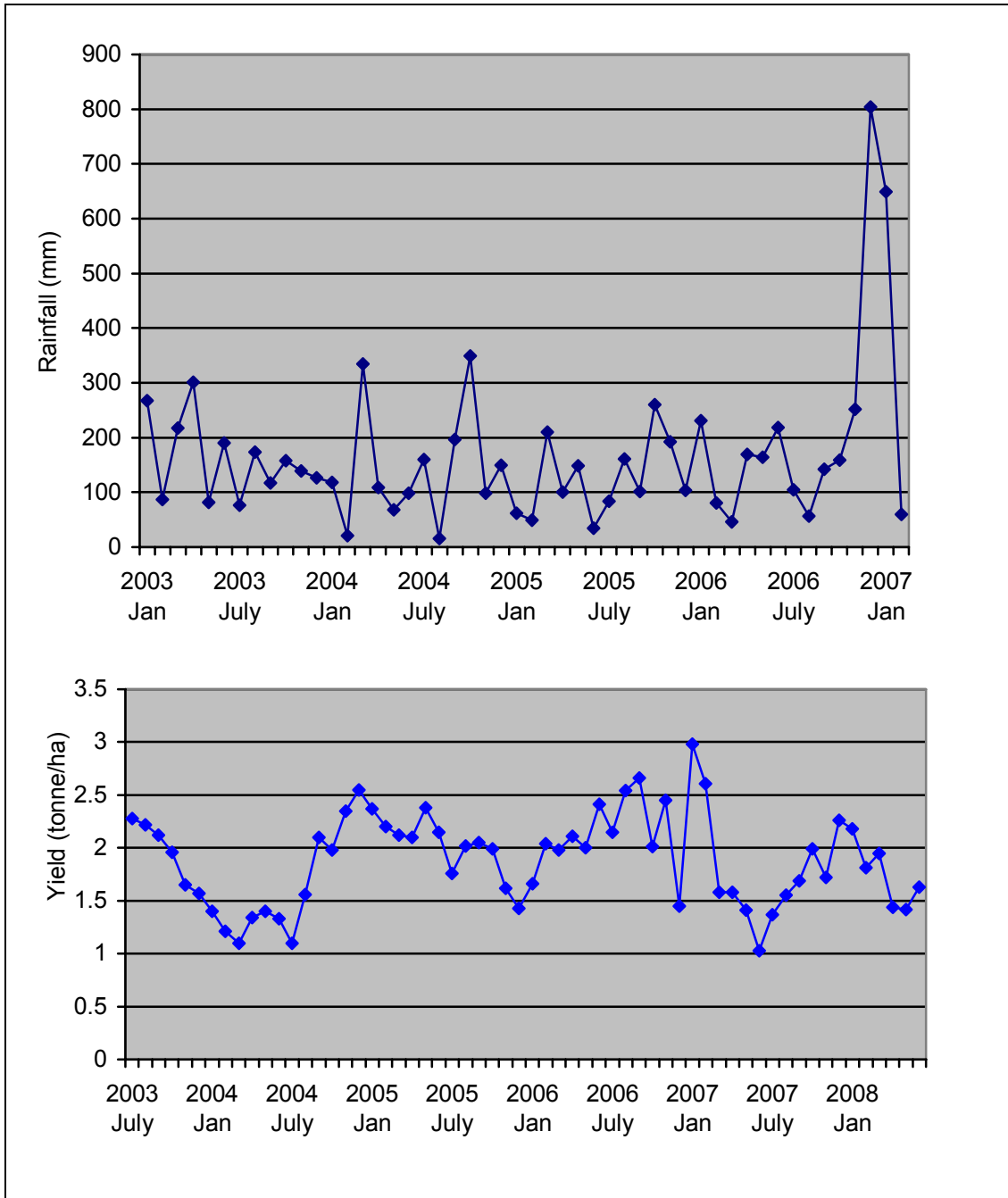


Figure 1: The rainfall at 6 months before harvesting (top) and yield (bottom) in area PM92C

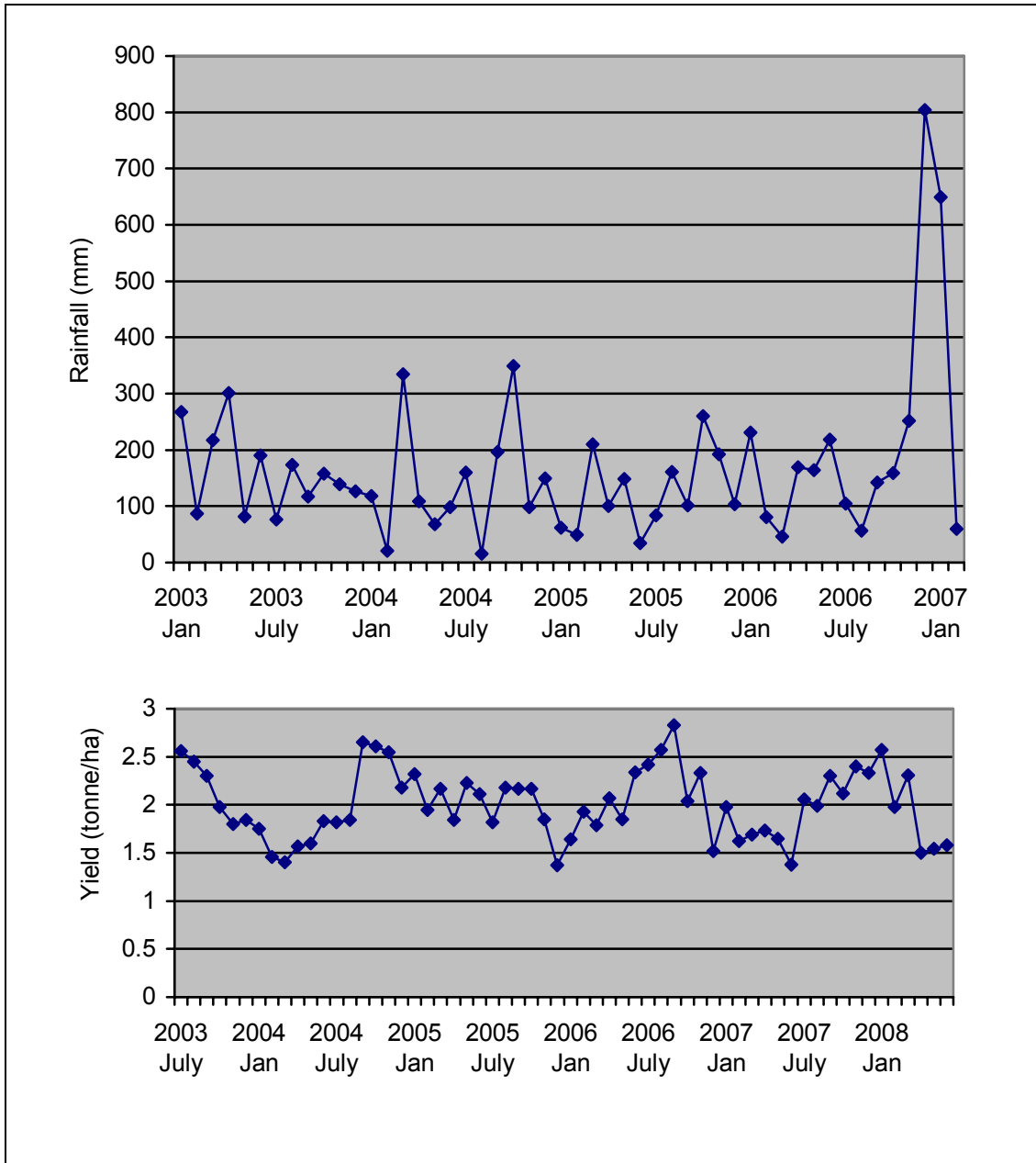


Figure 2: The rainfall at 6 months before harvesting (top) and yield (bottom) in area PM92E(A)

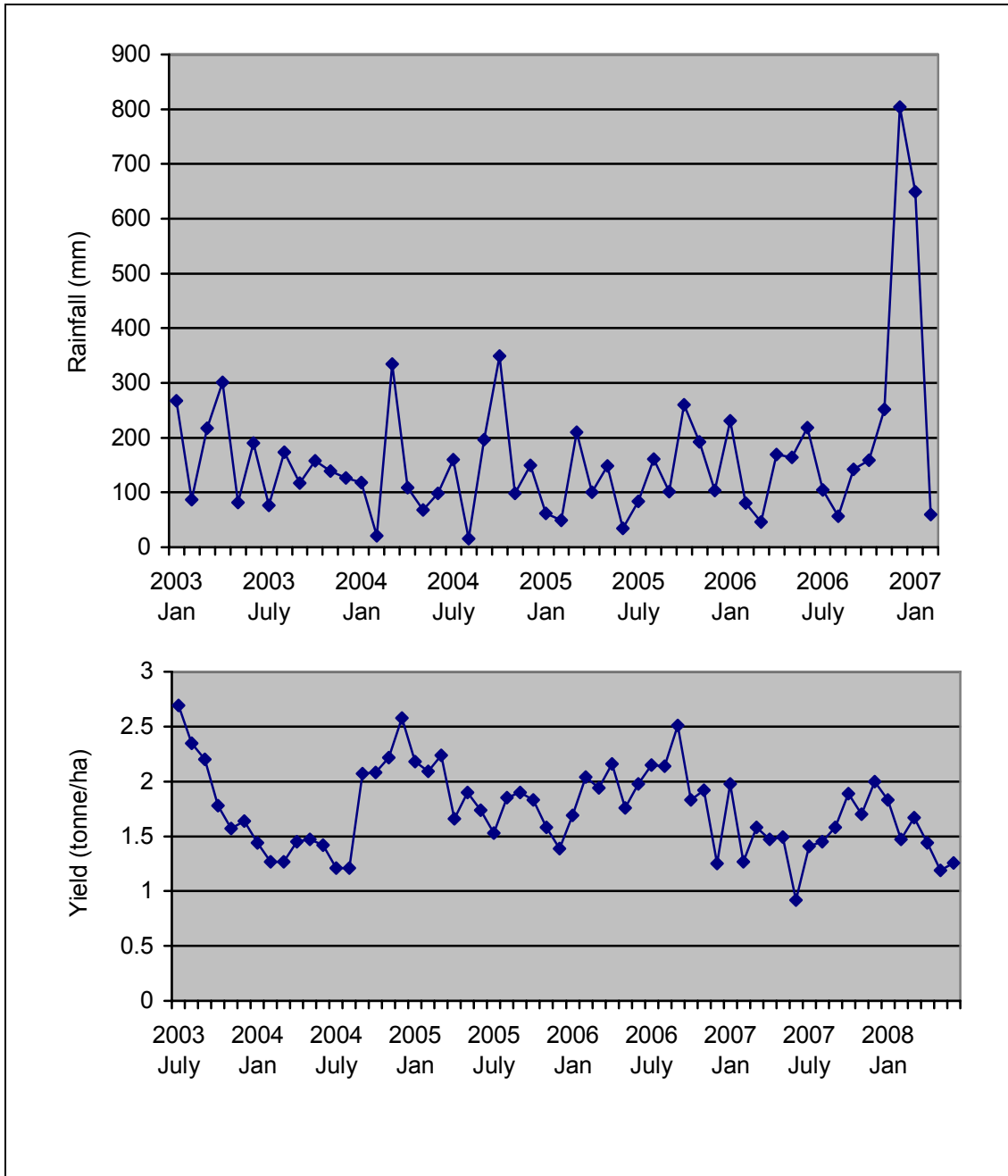


Figure 3: The rainfall at 6 months before harvesting (top) and yield (bottom) in area PM92E(B)

CONCLUSIONS AND RECOMMENDATION

From the results of the study, it can be concluded that the reduce of application of inorganic fertilizer and the substitute of this practice with organic fertilizer could not sustain the optimum yield or production of oil palm in block PM92C and PM92E (B). However, such practice did not cause significant difference in terms of yield for block PM92E (A), with soil type Cempaka Lating and for being closer to the river. In another word, optimum application of inorganic fertilizer is important for oil palm production in blocks PM92C and PME (B).

Rainfall generally did not affect the oil palm production in these plots, except for the case in December 2007 and January 2008. Extraordinary high rainfall resulted in reduced oil palm production, most probably due to flooding, reduced sunshine hours and to certain extent, the shift in the population of pollinators. More research on the application of organic fertilizer is necessary in attempts to reduce the application of inorganic fertilizer, probably by increasing the frequency of application of organic fertilizer.

REFERENCES

Foster, H.L., and Goh, H.S. (1997). Fertilizer Requirement of Oil Palm in West Malaysia. In: International Development in Oil Palm (Newall, W. ed.). Incorporated Society of Planters, Kuala Lumpur

Lim, K.C., and Zaharah, A.R. (2002). The Effect of Oil Palm Empty Fruit Bunches on Oil Palm Nutrition and Yields, and Soil Chemical Properties. *Journal of Oil Palm Research*, 14 (2): 1-9.