

Accelerated Oil Palm Replanting: The Way Forward for a Sustainable and Competitive Industry

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ABSTRACT

Accelerated replanting of old and unproductive oil palm is part of the government's National Key Economic Area (NKEA) Transformation Programme. It will enable changes to be made within the oil palm supply chain, as the driver of the national high income strategy. Despite its vast potentials, the industry, however, is burgeoned by the issue of stagnating fresh fruit bunches (FFB) yield. Increasing prevalence of old palms resulted from low rate of replanting at only 1.18% per annum was attributed mainly to the economic reason of higher FFB prices. If this trend continues, there would be a likely situation of 'the rush to replant', which could affect the overall supply chain, starting from the demand for seeds/seedlings, and subsequently affecting the milling and refining sectors, culminating in the export sector. This article, in highlighting the significance of replanting, has elucidated that the country requires continued accelerated replanting at the rate of at least 155 000 ha/yr.

INTRODUCTION

The Economic Transformation Programme (ETP) under the government's National Key Economic Area (NKEA) Laboratory has identified palm oil as one of the 12 key strategic sectors that is expected to drive the economy towards high income status by 2020. The industry is envisaged to generate RM 178 billion in Gross National Income (GNI), three times higher compared to RM 53 billion in 2009 (PEMANDU, 2010). The 10-year rolling target will be implemented through the entry point project (EPP),

covering upstream productivity and downstream expansion.

This article will attempt to focus on overviewing upstream productivity via accelerating the replanting of ageing oil palms. Enhanced replanting is envisaged to serve two prongs, firstly as an economic means to manage crude palm oil (CPO) supply and secondly to contribute towards improving national fresh fruit bunches (FFB) yield with introduction of higher yielding planting materials. In the past, growers were enticed to delay decisions to replant as business margin in the production of CPO had been favourable

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despite encountering difficulties in harvesting as the palms become taller and unproductive. Maintaining these old palms of 25 years and above, however, contribute to a stagnation of the national FFB yield.

OIL PALM REPLANTING IN MALAYSIA

In spite of the progress made by many oil palm estates, the national FFB yield had stagnated at about 19.01 t/ha/yr over the last two decades (MPOB, 2010). The national FFB yield increased only marginally from 18.72 t/ha/yr in 1980 to only 19.20 t/ha/yr in 2009. However, as depicted in *Figure 1*, the national FFB yield had reached record high of 22 t/ha/yr in mid 1980s since most of the palms were planted on highly suitable soils which were selected based on proper selection and planning. But as the industry progressed, suitable land availability had become a constraint to the continued development of the industry. New planting of oil palm in the 1990s had encroached into the slightly less suitable soils such as steep lands and peat lands.

In 2009, there were only 204 estates or 16% of the total number of oil palm estates in Malaysia, producing extremely excellent

TABLE 1. YIELD PERFORMANCE OF MALAYSIAN OIL PALM ESTATES, 2009

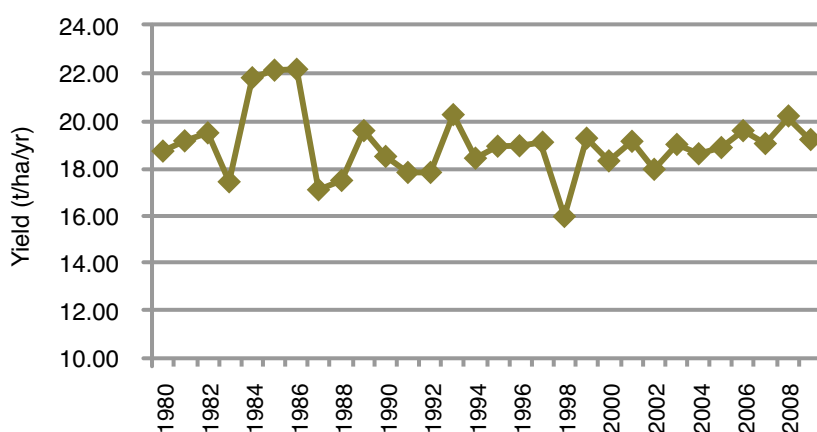
Yield (t/ha/yr)	Estate			
	Number	%	Area (ha)	%
< 10	600	14.20	283 550	8.19
10-15	754	17.84	572 503	16.54
16-20	1 077	25.49	1 114 270	32.20
21-25	1 084	25.65	1 039 220	30.03
26-30	507	12.00	362 332	10.47
31-35	157	3.72	79 547	2.30
> 35	47	1.11	9 569	0.28
Total	4 226	100.00	3 460 991	100.00

Note: Figures depicted are reflecting harvested area.
Source: MPOB data (unpublished).

FFB yield performance of more than 30 t/ha/yr (*Table 1*). This covered a harvested area of 89 116 ha or 2.58% of the total harvested area 2.46 million hectares. There were 507 estates with the area of 362 332 ha categorized as good estates, having yield performance of 26-30 t/ha/yr. However, there were as many as 1077 estates (25%) with a combined area of 1.11 million hectares having yield performance of 16-20 t/ha/yr. There were 32% estates (1354 estates) which recorded lower performances of less than 16 t/ha/yr of FFB yield. All in all, there were 2431 estates (58%), covering an area of 1.97 million hectares with FFB yield of less than 20 t/ha/yr.

Among others, the low yield performance has been attributed to the prevalence of ageing and unproductive palms resulting from the slow rate of replanting (Mohd Basri and Mohd Arif, 2010). Old palms are less productive. As indicated in *Table 2*, the old palms produced at an average of less than 17.01 t/ha/yr (MPOB, 2007).

The low rate of oil palm replanting in the country is closely related to CPO prices. When the CPO price is high, there is a tendency for most oil palm growers to delay decisions to replant. For the period 1997-2000, during which the CPO price averaged at RM 1545.38/t, only an average of 28 631 ha/yr of old palms were replanted and this represented 1.18% of the total area. In 2001, however, CPO price fell to a record low of RM 894.50/t and this had prompted growers to participate in MPOB's initiative on Replanting Incentive Scheme (SITS, 2001). With an incentive payment of RM 1000/ha, participating estates and independent smallholders replanted a total of 59 519 ha (*Table 3*). The scheme was extended into 2002, recorded another 80 961 ha of replanted area. This in total raised the whole SITS 2001 induced to 140 480 ha (*Figure 2* and *Table 3*).



Source: Malaysian Palm Oil Statistics (2009).

Figure 1. National average yield of fresh fruit bunches, 1980-2009.

TABLE 2. OIL PALM YIELD PROFILE (t/ha/yr)

Palm age	DxP	Clone
1	-	-
2	-	-
3	6.75	10.00
4	9.80	25.00
5	12.15	30.00
6	18.49	35.00
7	19.89	40.00
8	22.56	40.00
9	23.16	41.08
10	23.46	41.52
11	23.59	41.72
12	24.35	42.35
13	25.76	43.15
14	25.05	40.82
15	23.66	39.91
16	22.55	39.24
17	22.10	38.87
18	21.17	36.63
19	20.81	37.39
20	20.39	38.31
21	20.19	37.65
22	19.86	36.46
23	19.53	35.89
24	19.45	33.72
25	17.01	33.48
≥ 26	17.01	33.48

Source: MPOB data (unpublished).

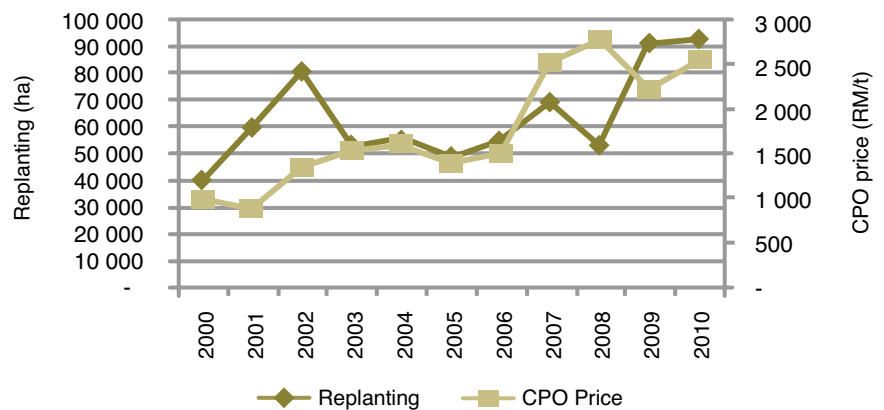
Nevertheless, after the completion of SITS 2001, the replanting of old and unproductive palms in the country slowed down once again. In particular, during the period 2004-2008, the replanting of old palms on average constituted to only 56 347 ha/yr or a mere 1% of the entire oil palm planted area in the country. The replanted area only represented 15% of the total area which was due for replanting. In fact, growers' replanting decision was primarily affected by bullish CPO prices that witnessed a sharp upward trend, rising from RM 1610/t in 2004 to RM 2777.50/t in 2008.

CPO prices were volatile for most months in 2008. It reached a record high in March at RM 3680.50/t, but declined sharply to its lowest level at RM 1516.50/t in November. Arising from cost

TABLE 3. REPLANTING vs. CRUDE PALM OIL (CPO) PRICE

Year	Replanting (ha)	CPO price (RM/t)
2000	40 110	996.50
2001	59 519	894.50
2002	80 961	1 363.50
2003	53 318	1 544.00
2004	55 229	1 610.00
2005	48 917	1 394.00
2006	55 050	1 510.50
2007	69 420	2 530.50
2008	53 117	2 777.50
2009	91 420	2 244.50
2010	92 846	2 555.00

Source: MPOB data (unpublished).



Note: Plotted from Table 3.

Figure 2. Oil palm replanting (ha) and crude palm oil (CPO) price (RM/t), 2000-2010.

being squeezed by bearish CPO price coupled with expensive fertilizer inputs, the industry recorded declining margins in the third and fourth quarters of 2008 (Mohd Arif, 2010). Resulting from this, a similar replanting scheme was instituted in November 2008, i.e. SITS 2008, which was part of the government's overall supply management incentive aimed at stabilizing CPO price. This scheme was complemented with fiscal allocations under the Second Economic Stimulus Package of 2009 and 2010. However, against the approved 133 498 ha, only about 92 846 ha were replanted up to June 2010. In spite of the increased financial assistance accorded to the palm oil industry to spearhead

replanting, the envisaged target is still far from being achieved. The primary contributing reason for this is an improved CPO price performance in 2009 and for the first half of 2010, both of which affected replanting decisions.

DELAYED REPLANTING AND AGE PROFILE

The delay in replanting resulted in an accumulation of old and unproductive palms. In 2006, there were 162 497 ha of old palms (Table 4) representing 4.09% of the total oil palm planted area. The demography of the oil palm industry is important in determining the upstream productivity. The prime age, i.e. 4-10 years and 11-15 years

TABLE 4. AGE PROFILE OF MALAYSIAN OIL PALM (estates)

Age (yr)	2006		2008		2010	
	ha	%	ha	%	ha	%
≤ 3	546 790	13.75	660 710	14.87	600 297	12.62
4-10	1 472 007	37.01	1 395 037	31.39	1 298 390	27.29
11-15	870 324	21.88	1 015 784	22.86	1 112 581	23.39
16-20	599 834	15.08	702 900	15.82	817 999	17.19
21-25	325 404	8.18	416 161	9.37	538 267	11.31
≥ 26	162 497	4.09	253 048	5.69	390 092	8.20
Total	3 976 856	100.00	4 443 640	100.00	4 757 627	100.00

Source: MPOB data (unpublished).

old category declined from 58.89% in 2006 to 54.25% in 2008 and 50.68%. The demographic change is more pronounced in term of the proportion of old and ageing palms. In 2008, the proportion of old palms in the country had increased as compared to 2006. In total, there were 253 048 ha of old palms representing 5.69% in 2008. As at June 2010, the accumulation of old palms continued to increase to 390 092 ha. This implies that over the last five years, the proportion of old palms had doubled from 4.09% in 2006 to 8.20% in 2010.

IMPLICATIONS OF DELAYED REPLANTING

Accumulation of Old Palms

Delayed replanting will result in a staggering accumulation of old palms which impede higher national yield. This is even more difficult in view of the annual emergence of palms approaching the age category of 25 years. For instance in 2010, a total of 81 187 will emerge in this old age category (*Table 5* and *Appendix 1*). As a result of aggressive expansion of oil palm planting in the country in the 1970s and 1980s, the accumulation of areas coming into the old age category would become increasingly acute in 2015 (149 097 ha) and more pronounced in 2020 (207 985 ha).

TABLE 5. YEARLY ENTRANTS OF OLD PALMS AGED 25 YEARS

Year	ha
2010	81 187
2011	97 809
2012	90 136
2013	91 172
2014	110 053
2015	149 097
2017	135 473
2018	148 901
2019	166 264
2020	207 985

Source: MPOB data (unpublished).

For the last 10 years, the average replanting rate is 63 628 ha/yr. Considering that if the rate of replanting will moderate at 50 000 ha/yr into the future the accumulation of old palms would increase to 0.45 million hectares in 2015 and 0.92 million hectares in 2020 (*Table 6*). This clearly indicates the severity of the problem of any further delay in replanting. Under this replanting rate assumption, the oil palm seed industry will be confronted with bearish demand because of a slow-down in replanting and new planting. The demand for planting materials is expected to decline to 25.98 million in 2015 and 18.70 million in 2020.

Higher Cost of Production

Delayed replanting could lead to a higher production cost as a result lower yield of old and ageing palms. With FFB yield of 20.40 t/ha/yr and 17.01 t/ha/yr for mature oil palm trees aged 5 to 25 years and for old palms above 25 years of age respectively, the cost of production for each age category can differ greatly (*Table 7*).

Harvesting cost of FFB for the old palm trees was around RM 65/t, 63% higher compared to palm trees below 25 years (RM 35/t). This is due to the difficulties in harvesting since old palms are taller. Old palms also contribute towards a higher pruning cost. On average, labour cost to undertake pruning of old palms is RM 3.01/palm, 100% more compared to RM 1.50/palm as in the case of mature palms below 25 years. This is equivalent to RM 26/t for old palms and RM 10.90 for matured palms below 25 years. On the other hand, the average labour cost of manuring for oil palm regardless of age, was RM 2/bag. With an application of 9 kg/palm/yr of chemical fertilizer, the total labour cost is expected to be RM 54/yr. However, based on an average FFB yield of 20.40 t/ha/yr for mature palms below 25 years and 17.01 t/ha/yr for the old palms, labour cost for manuring will be equivalent to RM 2.70/t and RM 3.20/t respectively.

TABLE 6. IMPACT OF REPLANTING (at the rate of 50 000 ha/yr)

Year	2010	2015	2020
Area = 26 years (ha)	81 187	149 097	207 985
Cumulative area ≥ 26 years (ha)	390 092	928 359	1 746 358
Replanting (ha)	50 000	50 000	50 000
Balance old palm area (ha)	340 092	628 359	1 196 358
New planting area (ha)	127 060	79 900	43 510
Total FFB production (t)	86 957 960	107 470 298	125 419 273
CPO production @ 20% OER (t)	17 391 592	21 494 060	25 083 855
Seedling (clone) @ 200 palms/ha	35 412 000	25 980 000	18 702 000
Total oil palm area (ha)	4 757 627	5 214 500	5 602 310
Yield (t/ha/yr)	18.28	20.61	22.39

Note: FFB – fresh fruit bunches.

CPO – crude palm oil.

OER – oil extraction rate.

Source: Simulated based on MPOB data.

TABLE 7. COST OF FRESH FRUIT BUNCHES (FFB) PRODUCTION (2008)

Relevant cost components	Average cost (RM/t)	
	≤ 25 years	≥ 26 years
Harvesting & collection	35.00	65.00
Pruning	10.90	26.00
Manuring	2.70	3.20
Spraying	8.20	9.80
Cost of transportation	35.00	35.00
Cost of fertilizer	112.50	134.20
Cost of weedicide	18.40	21.90
Total cost	222.70	295.10

Source: MPOB data (unpublished).

Based on *Table 7*, the total cost of FFB production for oil palm trees below 25 years and for old palms above 25 years are estimated at RM 222.70/t and RM 295.10/t respectively. In view of the more expensive fertilizer application cost for old palms, *i.e.* 33% higher compared to that required for matured palms below 25 years, it is therefore, not economical for incurring such high cost on unproductive palms.

'Rush to Replant'

It is possible that delayed replanting may result in a situation that compels growers into doing replanting as old palms are increasingly prevalent. The impact

of 'rush to replant' in 2015 and 2020 was simulated on the basis of current replanting of 50 000 ha/yr to prevail up to 2020, with areas under old palms to accumulate to 0.63 million hectares in 2015 and 1.2 million hectares in 2020.

The simulation results are shown in *Tables 8* and *9*.

Surge in demand for oil palm planting materials. If the industry were to suddenly embark on the need to replant, there would be a surge in demand for seedlings amounting to 151.65 million in 2015 and 257.97 million in 2020 (*Tables 8, 9, Appendices 2* and *3*). The current production capacity of seed production in the

country is 130 million. Although the industry is capable of meeting this demand requirement, however, the sudden surge will result in a chaotic situation of demand outstripping supply. This is because a period of 12 months is needed for the production of germinated seeds and another 12 months more for the production of seedlings. In short, the seed producers and nursery operators are not able to cope with this extremely high demand for planting materials, thus resulting in prices rising artificially to exorbitant levels.

Sharp decline in FFB supply. The rush to replant would result in an acute shortage of FFB supply. FFB supply is expected to be reduced by 7.04 million tonnes in 2015 and 16.47 million tonnes in 2020. Shortfall of supply could affect FFB prices.

Drastic decline in CPO output. Arising from the sharp decline in FFB supply, when growers rush to replant, the production of CPO in the country would be drastically reduced by 1.41 million tonnes in 2015 and 3.29 million tonnes in 2020. Subsequent to this, the mills would be faced with a situation of under utilization, which will then

TABLE 8. IMPACT OF 'RUSH TO REPLANT' IN 2015

Year	2010	2011	2012	2013	2014	2015
Area = 26 (ha)	81 187	97 809	90 136	91 172	110 053	149 097
Cumulative area ≥ 26 (ha)	390 092	487 901	578 037	669 209	779 262	928 359
Replanting (ha)	50 000	50 000	50 000	50 000	50 000	678 359
Balance area (ha)	340 092	387 901	428 037	469 209	529 262	-
New planting area (ha)	127 060	124 280	48 480	88 570	55 050	79 900
Total FFB production (t)	86 957 960	90 019 002	93 431 167	99 117 184	103 818 665	96 781 905
CPO production @ 20% OER (t)	17 391 592	18 003 800	18 686 233	19 823 437	20 763 733	19 356 381
Seedling (clone) @ 200 palms/ha	35 412 000	34 856 000	19 696 000	27 714 000	21 010 000	151 651 870
Total oil palm area (ha)	4 757 627	4 942 500	4 990 980	5 079 550	5 134 600	5 214 500
					CPO production shortfall	
					1 407 352 t	
					Export earnings shortfall @ RM 2500/t	
					RM 3 518 380	

Note: CPO – crude palm oil.

OER – oil extraction rate.

FFB – fresh fruit bunches.

Source: Simulated based on MPOB data.

TABLE 9. IMPACT OF 'RUSH TO REPLANT' IN 2020

Year	2010	2016	2017	2018	2019	2020
Area = 26 (ha)	81 187	159 376	135 473	148 901	166 264	207 985
Cumulative area ≥ 26 (ha)	390 092	1 087 735	1 223 208	1 372 109	1 538 373	1 746 358
Replanting (ha)	50 000	50 000	50 000	50 000	50 000	1 246 358
Balance area (ha)	340 092	737 735	823 208	922 109	1 038 373	-
New planting area (ha)	127 060	96 500	77 010	136 490	34 300	43 510
Total FFB production (t)	86 957 960	111 578 234	114 666 148	118 016 978	121 537 045	105 069 220
CPO Production @ 20% OER (t)	17 391 592	22 315 647	22 933 230	23 603 396	24 307 409	21 013 844
Seedling (clone) @ 200 palms/ha	35 412 000	29 300 000	25 402 000	37 298 000	16 860 000	257 973 632
Total oil palm area (ha)	4 757 627	5 311 000	5 388 010	5 524 500	5 558 800	5 602 310
					CPO production shortfall	
					3 293 565 t	
					Export earnings shortfall @ RM 2500/t	
					RM 8 232 912 158	

Note: CPO – crude palm oil.

OER – oil extraction rate.

FFB – fresh fruit bunches.

Source: Simulated based on MPOB data.

bring about a critical situation for palm oil producing country like Malaysia. This will culminate in a sudden surge of CPO imports being the likely option to counter such a situation. The shortfall in CPO production will then lead to a surge in locally delivered prices of palm oil.

Drastic decline in refined palm products output and loss of export earning. The downstream supply chain could also be further affected if the 'rush to replant' occurs. The more expensive raw material, *i.e.* CPO, would seriously affect the refining capability and subsequently, have a negative

effect on the export market as well. Arising from this, and based on the CPO long-term price of RM 2500/t, export earnings could fall by as much as RM 3.52 billion in 2015 and RM 8.23 billion in 2020. The loss in export earnings could affect the GNI target of RM 178 billion in 2020.

TABLE 10. SUMMARY OF REPLANTING SIMULATIONS (ha)

Year	Replanting rate (ha/yr)						
	50 000	75 000	100 000	125 000	135 000	145 000	155 000
2010	340 092	315 092	290 092	265 092	255 092	245 092	235 092
2011	387 901	337 901	287 901	237 901	217 901	197 901	177 901
2012	428 037	353 037	278 037	203 037	173 037	143 037	113 037
2013	469 209	369 209	269 209	169 209	129 209	89 209	49 209
2014	529 262	404 262	279 262	154 262	104 262	54 262	4 262
2015	628 359	478 359	328 359	178 359	118 359	58 359	-
2016	737 735	562 735	387 735	212 735	142 735	72 735	4 376
2017	823 208	623 208	423 208	223 208	143 208	63 208	-
2018	922 109	697 109	472 109	247 109	157 109	67 109	-
2019	1 038 373	788 373	538 373	288 373	188 373	88 373	11 264
2020	1 196 358	921 358	646 358	371 358	261 358	151 358	64 249

OPTIMAL REPLANTING RATE: A SIMULATION

Simulations on the various replanting rates were done as shown in *Appendix 3* and are summarized in *Table 10*. It can be seen from *Table 10* that, if the current replanting rate (50 000 ha/yr) prevails into the future, the old palms will accumulate from 340 092 ha in 2010 to 628 359 ha in 2015. The accumulation of old palms would then surge to 1 196 358 ha in 2020.

The simulation results show that if the replanting rate were to be increased to 75 000 ha/yr or 100 000 ha/yr or 125 000 ha/yr or 145 000 ha/yr, the hectareage of old palms would be slightly smaller.

Table 10 indicates that if on an annual basis, the replanting rate were to be increased to 155 000 ha/yr, the area of old palms would then reduce to 4262 ha in 2014. In the next four years after 2015 except in 2016, there would be no old palms. Only in 2019 and 2020, there would be 11 264 ha and 64 249 ha of palms just entering into the old age category respectively. Therefore, in order to ensure that no backlog of old palms would occur, replanting needs to be done consistently at the rate of at least 155 000 ha a year.

CONCLUSION

Competitiveness is embraced by the ability to increase productivity and output whilst maintaining cost at a reasonable level. In enhancing replanting, as stipulated under the oil palm NKEA's initiatives, new variety of oil palms with high yield need to be introduced to propel the yield curve in order to increase Malaysia's palm oil competitiveness.

In order to remain competitive within the international edible oils and fats complex, it is indeed a challenging task to increase the national FFB yield amidst the

constraints of factors of production, *i.e.* land and labour. The industry needs to improve productivity, among others through enhanced replanting of unproductive old and aging palms. An effective approach towards increasing the production of Malaysian palm oil is by focusing on yield improvements from existing areas by means of replanting with new higher yielding planting materials. Narrowing the yield gap of the low productive holdings is a way forward for a sustainable palm oil industry. Such a move could be pursued by replanting old palms at the rate of at least 155 000 ha/yr.

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		REPLANTING SIMULATIONS AT VARIOUS REPLANTING RATE (example of 50 000 ha/yr)												
Year		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Total area > 26 (ha)		253 048	-	-	-	-	-	-	-	-	-	-	-	
Area = 26 (ha)		55 857	81 187	97 809	90 136	91 172	110 053	149 097	159 376	135 473	148 901	166 264	207 985	
Cumulative area ≥ 26 (ha)		308 905	390 092	487 901	578 037	669 209	779 262	928 359	1 087 735	1 223 208	1 372 109	1 538 373	1 746 358	
Replanting (ha)		50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	
Balance area (ha)		-	340 092	387 901	428 037	469 209	529 262	628 359	737 735	823 208	922 109	1 038 373	1 196 358	
New planting area (ha)		-	127 060	124 280	48 480	88 570	55 050	79 900	96 500	77 010	136 490	34 900	43 510	
Yield (estate)														
	DxP													
	Clone													
1	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	6.75	1 218 201	1 932 595	1 392 482	1 770 600	1 742 800	984 800	1 385 700	1 050 500	1 299 000	1 465 000	1 270 100	1 864 900	
4	9.80	1 900 472	1 768 648	2 805 842	2 021 677	4 426 500	4 357 000	2 462 000	3 464 250	2 626 250	3 247 500	3 662 500	3 175 250	
5	12.15	2 271 997	2 356 197	2 192 762	3 478 671	2 506 467	5 311 800	5 228 400	2 954 400	4 157 100	3 151 500	3 897 000	4 395 000	
6	18.49	3 066 911	3 457 549	3 585 686	3 336 969	5 293 879	3 814 369	6 197 100	6 099 800	3 446 800	4 849 950	3 676 750	4 546 500	
7	19.89	4 371 425	3 299 127	3 719 343	3 857 182	3 589 633	5 694 713	4 103 180	7 082 400	6 971 200	3 939 200	5 542 800	4 202 000	
8	22.56	4 180 202	3 937 423	3 741 996	4 218 621	4 374 964	4 071 499	6 459 162	4 653 984	7 082 400	6 971 200	3 939 200	5 542 800	
9	23.16	4 893 763	4 291 377	4 042 142	3 841 517	4 330 818	4 491 319	4 179 784	6 630 948	4 777 760	7 273 625	7 159 422	4 045 558	
10	23.46	6 453 069	4 957 153	4 346 965	4 094 501	3 891 278	4 386 917	4 549 497	4 233 926	6 716 841	4 839 648	7 351 531	7 236 106	
11	23.59	41.72	6 488 828	4 984 623	4 371 053	4 117 191	3 912 841	4 411 226	4 574 707	4 257 388	6 754 061	4 866 466	7 386 943	
12	24.35	42.35	5 378 131	4 772 099	5 145 212	4 511 875	4 249 834	4 038 901	4 553 343	4 722 091	4 394 548	6 971 657	5 023 249	
13	25.76	43.15	5 382 974	5 689 555	7 085 723	5 443 149	4 773 138	4 495 923	4 272 776	4 817 007	4 995 526	4 649 017	7 375 355	
14	25.05	40.82	5 303 109	5 234 608	5 909 285	6 890 425	5 293 124	4 641 580	4 372 006	4 155 009	4 684 240	4 857 839	4 520 880	
15	23.66	39.91	4 920 934	5 008 844	4 944 145	4 636 874	6 508 082	4 999 414	4 384 023	4 129 408	3 924 452	4 424 316	4 588 282	
16	22.55	39.24	3 749 250	4 690 071	4 773 856	4 980 569	4 419 336	6 202 758	4 764 868	4 178 349	3 935 678	3 740 338	4 216 751	
17	22.10	38.87	3 290 706	3 674 431	4 596 477	4 678 591	4 881 179	4 331 146	6 078 978	4 669 782	4 094 967	3 857 139	3 665 697	
18	21.17	36.63	2 867 971	3 152 228	3 519 806	4 403 051	4 423 819	4 675 772	4 148 885	5 823 166	4 473 271	3 922 645	3 694 825	
19	20.81	37.39	3 316 604	2 819 200	3 098 624	4 328 176	4 405 497	4 348 591	4 596 259	4 078 332	5 724 142	4 397 202	3 855 939	
20	20.39	38.31	3 040 096	3 249 666	2 762 302	3 390 120	4 240 822	4 316 582	4 260 825	4 503 495	3 996 021	5 608 614	4 308 455	
21	20.19	37.65	2 221 971	3 010 277	3 217 791	2 735 207	3 356 867	4 199 225	4 274 242	4 219 032	4 459 321	3 956 825	5 553 600	
22	19.86	36.46	1 810 671	2 185 653	2 961 075	3 165 197	2 957 168	3 302 000	4 130 590	4 204 381	4 150 073	4 386 435	3 892 152	
23	19.53	35.89	1 760 366	1 780 584	2 149 336	3 112 604	2 645 795	2 908 031	3 247 133	4 061 955	4 134 519	4 081 114	4 313 548	
24	19.45	33.72	1 902 377	1 753 155	1 773 291	2 899 945	3 099 853	2 634 957	2 896 119	3 233 832	4 045 316	4 117 583	4 064 396	
25	17.01	33.48	1 380 999	1 663 724	1 533 222	1 872 002	2 536 147	2 710 977	2 304 402	2 532 801	2 828 148	3 537 831	3 601 033	
≥ 26	17.01	33.48	4 304 339	5 784 966	6 598 190	7 280 912	9 002 745	10 688 393	12 548 870	14 002 771	15 685 073	17 662 721	20 350 052	
Total FFB production	18.41	82 709 692	86 957 960	90 019 002	93 431 167	99 117 184	103 818 665	107 470 298	111 578 234	114 666 148	118 016 978	121 537 045	125 419 273	
CPO production @ 20% OER	20.00%	16 541 938	17 391 592	18 003 800	18 686 233	19 823 437	20 763 733	21 494 060	22 315 647	22 933 230	23 603 396	24 307 409	25 083 855	
Seedling @ 200 palms /ha	200	-	35 412 000	34 856 000	19 696 000	27 714 000	21 010 000	25 980 000	29 300 000	25 402 000	37 298 000	16 860 000	18 702 000	
Total oil palm area (ha)	-	-	4 649 934	4 757 627	4 990 980	5 079 550	5 134 600	5 214 500	5 311 000	5 388 010	5 524 500	5 558 800	5 602 310	
Yield (t/ha/yr)	-	17.79	18.28	18.21	18.72	19.51	20.22	20.61	21.01	21.28	21.36	21.86	22.39	

		'RUSH TO REPLANT' SCENARIO IN 2020												
Year		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Total area > 26 (ha)		253 048	-	-	-	-	-	-	-	-	-	-	-	
Area = 26 (ha)		55 857	81 187	97 809	90 136	91 172	110 053	149 097	159 376	135 473	148 901	166 264	207 985	
Cumulative area ≥ 26 (ha)		308 905	390 092	487 901	578 037	669 209	779 262	928 359	1 087 735	1 223 208	1 372 109	1 538 373	1 746 358	
Replanting (ha)		50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	50 000	1 246 358	
Balance area (ha)		-	340 092	387 901	428 037	469 209	529 262	628 359	737 735	823 208	922 109	1 038 373	-	
New planting area (ha)		-	127 060	124 280	48 480	88 570	55 050	79 900	96 500	77 010	136 490	34 300	43 510	
Yield (estate)	DxP													
	Clone													
	1	-	-	-	-	-	-	-	-	-	-	-	-	
	2	-	-	-	-	-	-	-	-	-	-	-	-	
	3	6.75	10.00	1 932 595	1 770 600	1 742 800	984 800	1 385 700	1 050 500	1 299 000	1 465 000	1 270 100	1 864 900	
	4	9.80	25.00	1 768 648	2 021 677	4 426 500	4 357 000	2 462 000	3 464 250	2 626 250	3 247 500	3 662 500	3 175 250	
	5	12.15	30.00	2 356 197	3 478 671	2 506 467	5 311 800	5 228 400	2 954 400	4 157 100	3 151 500	3 897 000	4 395 000	
	6	18.49	35.00	3 066 911	3 336 969	5 293 879	3 814 369	6 197 100	6 099 800	3 446 800	4 849 950	3 676 750	4 546 500	
	7	19.89	40.00	3 471 425	3 299 127	3 857 182	5 694 713	4 103 180	7 082 400	6 971 200	3 939 200	5 542 800	4 202 000	
	8	22.56	40.00	4 180 202	3 937 423	4 374 964	4 071 499	6 459 162	4 653 984	7 082 400	6 971 200	6 971 200	3 939 200	
	9	23.16	41.08	4 893 763	4 291 377	4 042 142	4 491 319	4 179 784	6 630 948	4 777 760	7 273 625	7 159 422	4 045 558	
	10	23.46	41.52	6 453 069	4 957 153	4 346 965	4 386 917	4 549 497	4 233 926	6 716 841	4 839 648	7 351 531	7 236 106	
	11	23.59	41.72	6 623 155	6 488 828	4 984 623	3 912 841	4 411 226	4 574 707	4 257 388	6 754 061	4 866 466	7 386 943	
	12	24.35	42.35	5 378 131	4 772 099	6 697 879	4 249 834	4 038 901	4 553 343	4 722 091	4 394 548	6 971 657	5 023 249	
	13	25.76	43.15	5 382 974	5 689 555	5 048 430	4 773 138	4 495 923	4 272 776	4 817 007	4 995 526	4 649 017	7 375 355	
	14	25.05	40.82	5 303 109	5 234 608	5 532 739	5 293 124	4 641 580	4 372 006	4 155 009	4 684 240	4 857 839	4 520 880	
	15	23.66	39.91	4 920 934	5 008 844	4 944 145	6 508 082	4 999 414	4 384 023	4 129 408	3 924 452	4 424 316	4 588 282	
	16	22.55	39.24	3 749 250	4 690 071	4 773 856	4 419 336	6 202 758	4 764 868	4 178 349	3 935 678	3 740 338	4 216 751	
	17	22.10	38.87	3 290 706	3 674 431	4 596 477	4 881 179	4 331 146	6 078 978	4 669 782	4 094 967	3 857 139	3 665 697	
	18	21.17	36.63	2 867 971	3 152 228	3 519 806	4 481 709	4 675 772	4 148 885	5 823 166	4 473 271	3 922 645	3 694 825	
	19	20.81	37.39	3 316 604	2 819 200	3 098 624	4 328 176	4 405 497	4 348 591	4 596 259	4 078 332	5 724 142	4 397 202	
	20	20.39	38.31	3 040 096	3 249 666	2 762 302	3 390 120	4 240 822	4 316 582	4 260 825	4 503 495	3 996 021	5 608 614	
	21	20.19	37.65	2 221 971	3 010 277	3 217 791	3 006 306	3 356 867	4 199 225	4 274 242	4 219 032	4 459 321	3 956 825	
	22	19.86	36.46	1 810 671	2 185 653	2 961 075	2 690 501	2 957 168	3 302 000	4 130 590	4 204 381	4 150 073	4 386 435	
	23	19.53	35.89	1 760 366	1 780 584	2 149 336	3 112 604	2 645 795	2 908 031	3 247 133	4 061 955	4 134 519	4 081 114	
	24	19.45	33.72	1 902 377	1 753 155	1 773 291	2 899 945	3 099 853	2 634 957	2 896 119	3 233 832	4 045 316	4 117 583	
25	17.01	33.48	1 380 999	1 663 724	1 533 222	2 536 147	2 710 977	2 304 402	2 532 801	2 828 148	3 537 831	3 601 033		
≥ 26	17.01	33.48	4 304 339	5 784 966	6 598 190	7 981 243	9 002 745	10 688 393	12 548 870	14 002 771	15 685 073	17 662 721		
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CPO production @ 20% OER	20.00%	16 541 938	17 391 592	18 003 600	18 686 233	19 823 437	20 763 733	21 494 060	22 315 647	22 933 230	23 603 396	24 307 409	21 013 844	
Seedling @ 200 palms /ha	200	-	35 412 000	34 856 000	19 696 000	27 714 000	21 010 000	25 980 000	29 300 000	25 402 000	37 298 000	16 860 000	257 973 632	
Total oil palm area		4 649 934	4 757 627	4 942 500	4 990 980	5 079 550	5 134 600	5 214 500	5 311 000	5 388 010	5 524 500	5 558 800	5 602 310	
Yield		17.79	18.28	18.21	18.72	19.51	20.22	20.61	21.01	21.28	21.36	21.86	18.75	
CPO shortfall														
Export earnings shortfall 8 233 912 158														