Improving Productivity: THE REPLANTING IMPERATIVE

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ABSTRACT

The replanting of old and uneconomic palms is one of the more practical strategies to improve oil palm productivity. High productivity will ensure that the oil palm industry continues to remain competitive even during times of low palm oil prices. In order to maintain a good productivity level, the percentage of tall and ageing palms should be small and preferably less than 10%. Changing the age profile by reducing the tall and ageing palms from the current 21.6% should improve the national fresh fruit bunches (FFB) yield. This could be done through replanting as seen from the analysis of the age profile which showed that by end of 2000, about 264 074 ha (7.8%) were in dire need of replanting. A hypothetical cash flow exercise at different FFB prices comparing immediate replanting against delayed replanting for 25-year old palms was done. Immediate replanting is referred to as replanting palms at the age of 25 years and delayed replanting is referred to as replanting of palms at the age of 30 years. At the end of the 10th year, the price sensitivity analysis showed that immediate replanting was viable when the price of FFB was at least RM 135/t. At this price, the accumulated Incremental Net Revenue (INR) is RM 5601/ha. At a 10% discount rate, the incremental Net Present Value (NPV) and Internal Rate of Return (IRR) were RM 34 and 10.1% respectively. The break-even price would be lower if the increase in the cost of replanting in the next five years had been taken into consideration. It is concluded that immediate replanting is economically viable when the long-term FFB price is at least RM 135 t^{-1}.

INTRODUCTION

In the age of globalization, a free market concept calls for a borderless world. One needs to consistently produce at maximum productivity in order to remain competitive. There are two common questions that need to be addressed. The first question is: *has our oil palm industry been competitive in the face of globalization?* The likely answer is no because when the palm oil price falls to RM 750/t, many plantations face

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cash flow problems and struggle to make a profit. The next question is: *what can we do to improve the situation?* This paper suggests that we can accelerate replanting in order to improve productivity and remain cost competitive for the next few decades.

The objective of this paper is to discuss the replanting imperative in the context of low palm oil prices, which are generally expected to continue into next year. Replanting of old and uneconomic palms is believed to be one of the more practical strategies to improve oil palm productivity. High productivity will ensure that the oil palm industry would continue to remain competitive even during times of low palm oil prices.

FACTORS INFLUENCING OIL PALM REPLANTING

The replanting cycle of oil palm covers a period of about 25-30 years. However, the decision as to when replanting of the old palms is to be carried out is dependent on physical factors such as palm height, density of palms and the need to improve infrastructure, and also economic factors (Idris, 1997).

Physical Factors

The height of the oil palm tree is the main limitation for the economic harvesting of FFB especially when the palms are taller than 12 m as the present harvesting pole can only reach up to about this level. Even with improved harvesting pole, the actual task of harvesting tall palms is still considered dangerous and many harvesters are reluctant to take the risk. Hence, many tall palms are not harvested leading to a drastic decline in yield per unit of mature area.

At planting, the density of oil palm varies from 135 to 160 palms/ ha and is dependent on the soil type and topography. It is normally a wise decision to replant the area if the density drops to less than half of the original density due to pests attack, diseases or other reasons. The FFB yield per unit area is dependant on the density. To illustrate an example, if at the optimum density of 136 palms/ha, a plantation can produce 18 t/ha/yr, then the average yield per palm is 130 kg/yr. However, if the density is reduced to 100 palms/ ha, the yield per hectare would be low at 13 t/ha/yr.

Owners of plantation may want to improve the existing infrastructure such as field roads, bridges, drains and harvesting paths with a view to introduce mechanization. This may lead to an early decision to replant as the lack of infrastructure may affect movement of harvesters and the efficient evacuation of FFB. Others may want to replant to take advantage of improved and better oil palm planting materials.

Economic Factors

The economic factors are very much influenced by the physical factors as mentioned. Acute physical factors will give rise to low yield per unit area and high cost of harvesting and maintenance. These high costs of production coupled with low yields in income may render the plantation as a non-profitable enterprise.

The cost of harvesting tall palm is high. On the average, the cost of harvesting tall palm is between RM 28 - RM 35/t as compared to shorter palms which cost around RM 20 - RM 23/t (Azman *et al.*, 2000).

The crop recovery from tall palms can be reduced in many ways. Firstly, it is observed that not all ripe bunches from tall palms can be recovered because of the difficulties in locating and sighting the ripe bunches. Secondly, harvesting bunches from tall palms also results in the loss of many loose fruits. With the current constraint of labour, many loose fruits are not collected. The average number of loose fruits in 21-25-year-old palms was estimated to be about 66.6 per bunch (Gan *et al.*, 1993). At palm oil price of RM 850/ t, the value of one loose fruit is 0.372 sen (Syed Mahdhar, 1993). In a density of 135 palms/ ha and each palm producing eight bunches per year, the value of uncollected loose fruits would be RM 267.57/ha/yr.

It is important for the plantation to maintain an optimum age profile of palms to accommodate the need for workers, cash flow and the capacity of mill. To achieve this, replanting may be prolonged or accelerated even though many plantations have a standard policy of 25 years per cycle. This is mainly influenced by factors such as productivity of the standing palms, availability of capital, availability of skilled harvesters and the attractiveness of the prevailing prices of palm oil.

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ADVANCEMENT IN REPLANTING TECHNOLOGY

Much advancement has been made in oil palm replanting technology compared to that carried out 25 years ago. Replanting enables plantations to adopt new technologies some of which could only be adopted once. Once these new innovations are adopted, it is almost difficult to change the adopted practices such as land preparation (in-

cluding infrastructure and soil conservation), optimum planting density and the use of the latest planting material. For example, the zero burning technique can reduce soil surface erosion, improve soil fertility, and accelerate earlier planting of seedlings and reduce the cost of land preparation when compared to clean clearing or partial burning (Hashim *et al*., 1993).

Large planting hole may be applicable under some environmental conditions and it is recommended in the following circumstances (Zin Zawawi, 1999):

- relatively dry areas and poor distribution of rainfall;
- soils with poor physical properties;
- marginal soils and poor moisture retention;
- relatively shallow soils or subsoil planting; and
- terrace planting on gentle or steep terrain.

New advancements such as soil compaction technique, higher planting density, water management and fertilizer requirements of oil palm on peat are now available. With the soil compaction technique, some peat area is accessible to light machinery and there is also no need for the *hole-in-hole* technique for holing. Optimum planting density recommended for peat is now 160 palms/ha as compared to 136 palms/ha previously (Mohd Tayeb *et al*., 1997).

On mineral soils, the concept of terracing has changed. Terracing acts not only as a platform to plant the seedlings but also as a road for the movement of light machinery. To incorporate mechanization on terraces, the size of terrace has been increased from 3 m to 4.8 m if the soil texture and soil depth are suitable.

The other area of advancement is the quality of planting material. The yield performance of D x P planting material used in the late sixties and early seventies was between 31.1 - 31.6 t/ha/yr. These palms grew faster at the rate of about 50-70 cm/yr. The yield of the new generation D x P planting materials in the nineties is better, exceeding more than 36.1 t/ha/yr. Some of these materials have other desirable characteristics such as being dumpier type (growing between 20-30 cm/yr), higher iodine value and thicker kernel. The economic life cycle of such palms may be extended to more than 30 years. Also, the choice of planting material may come from the seeds or clonal materials (Jalani *et al*., 2000).

THE AGE PROFILE OF PALMS

The age profile of palms in Malaysia in the year 2000 is shown in *Table 1*.

TABLE 1. THE AGE PROFILE OF OIL PALMS IN MALAYSIA AT THE END OF 2000

Age of palm	ha	Percent (%)
1-3	434 873	12.9
4-8	1 060 701	31.4
9-13	581 019	17.2
14-18	570 861	16.9
19-24	466 072	13.8
25 and above	262 272	7.8
Total	3 375 798	100

At the end of the year 2000, the total area planted with oil palm in Malaysia reached 3 375 798 ha. The analysis shows that 434 873 ha or 12.9% consist of palms between 1-3 years old; 1 060 701 ha or 31.4%, 4-8 years old; 581 019 ha or 17.2%, 9-13 years old; 570 861 ha or 16.9% 14-19 years old; 466 072 ha or 13.8%, 19-24 years old and 262 272 ha or 7.8% with palms more than 25 years old.

Normally, the oil palm yield curve undergoes three basic stages of yield performance. It ascends at the age of between four to eight years, plateaus at the age between 9 to 18 years and declines after more than 19 years due to poor recovery from tall palms. Therefore, from the year 2000 oil palm age profile, it could be estimated that 434 873 ha of palms (12.9%) are still in the immature stage, 1 060 701 ha (31.4%) are in the ascending stage, 1 151 880 ha (34.1%) are in the prime production stage and another 728 344 ha (21.6%) are in the declining stage. Hence, a fifth of the palms are in the tall and ageing category having lower productivity.

The national FFB yield has fluctuated from year to year since 1975 mainly due to the different proportions of young and old palms and partly due to seasonal effects. The lowest national FFB yield was 15.98 t/ha recorded in 1998 and highest the at 20.26 t/ha was recorded in 1993. The national FFB yield for the year 2000 was only 18.33 t/ha.

In order to maintain a good productivity level, the percentage of tall and ageing palms should be small and preferably less than 10%. Changing the age profile by reducing the tall and ageing palms from the current 21.6% should improve the national FFB yield. This could be done through replanting. Analysis of the age profile shows that by the end of 2000 about 262 272 ha (7.8%) are in dire need of replanting.

THE PROJECTED CUMULATIVE AREA NOT REPLANTED

The projected cumulative area not replanted from 2001 to 2005 is shown in *Table 2*.

The area due for replanting is based on historical data. The area expected to be replanted from 2001 to 2005 is based on a survey of plantation owners conducted in June 2000 by MPOB (MPOB, 2000). The data shows that 264 074 ha (7.8%) of oil palm area have been delayed in their replanting by the end of 2000.

The projected rate of replanting from 2001 to 2005 has been found to range from 45 000 to 86 000 ha a year. If this rate is maintained, it would not clear the backlog. At the end of year 2005, the remaining area still not replanted would be 323 061 ha. We therefore need to accelerate replanting during this period.

To some extent, the high palm oil price in 1997 to May 1999 made replanting unattractive even though many plantations have tall and ageing palms. Since then, the palm oil prices have declined drastically. The uncertainty of future palm oil prices further delayed replanting as about 340 000 ha accumulated at the end of 2000 need to be replanted beginning 2001.

ACCELERATED REPLANTING IMPERATIVE

It is proposed that the industry carry out accelerated replanting in order to clear the replanting backlog. The industry has to replant about 475 000 ha from 2001 to 2003. The proposed quantum of the accelerated replanting is 200 000 ha, 150 000 ha and 125 000 ha in year 2001, 2002 and 2003 respectively. By doing accelerated replanting, the backlog could be cleared by the end of 2003. Thereafter, the area due for replanting would be equal to the respective year. In order to expedite the proposal in 2001, estate owners are strongly recommended to immediately stop harvesting tall and ageing palms and to carry out replanting over the next six months.

The accelerated replanting would result in the reduction of palm oil production at the rate of 600 000 t, 450 000 t and 275 000 t in the year 2001, 2002 and 2003 respectively. With other government efforts such as the palm diesel production project and other new marketing strategies, the industry would stand to gain in terms of potential stimulation/recovery of the palm oil price arising from the immediate reduction of palm oil in the market.

It is suggested that for such accelerated replanting to be carried out, the government consider a subsidy such as double tax deduction for the development cost incurred. If the accelerated replanting is adopted, this means that the replanting scenario for the period 2001-2005 would be as in *Table 3*.

TABLE 2. THE PROJECTED CUMULATIVE AREA NOT REPLANTED IN MALAYSIA FROM 2001-2005 (25-year old palms)

Year	Area due for replanting (ha)	Area expected to be replanted	Cumulative area not replanted (ha)
Up to 2000	264 074	-	264 074
2001	72 809	53 151	283 732
2002	67 214	45 033	305 913
2003	71 165	58 355	318 723
2004	85 884	79 013	325 594
2005	84 443	86 976	323 061
Total	645 589	322 528	323 061

TABLE 3. THE NEW REPLANTING SCENARIO WITH ACCELERATED REPLANTING

Year	Area due for replanting (ha)	Cumulative area due for replanting (ha)	Proposed area to be replanted (ha)	Cumulative area not replanted (ha)
Up to 2000	264 074	264 074	-	264 074
2001	72 809	336 883	200 000	136 883
2002	67 214	204 097	150 000	54 097
2003	71 165	125 262	125 262	0
2004	85 884	85 884	85 884	0
2005	84 443	84 443	84 443	0
Total	645 589	-	645 589	-

A CASE FOR IMMEDIATE REPLANTING

A hypothetical cash flow exercise at different FFB prices comparing immediate replanting as against delayed replanting for 25-year old palms is presented in *Appendices 1* and *2*. A 10-year cash flow is considered sufficient as the situation is unique, that is to replant now or later unlike the normal situation where the decision to be made is whether to replant or not to replant. Furthermore, oil palm replanting has been proven profitable in the past.

An immediate replanting is referred to the replanting of palms at the age of 25 years; and the delayed replanting is referred to as the replanting of palms at the age of 30 years. The reason for the cut off point at 30 years is that the chance

for the plantation to find harvesters at this stage is very difficult since the palms would have reached more than 15 m tall. The idea is to assess the financial gain or loss comparing immediate and delayed replanting.

The economic analysis used are INR, NPV and Internal Rate of Return (IRR). The INR is the difference between the net revenue (NR) of immediate replanting and delayed replanting. The INR approach is appropriate based on the principle of economic intervention that is *with project* (immediate replanting) and *without project* (delayed replanting).

At the end of the 10th year, the price sensitivity analysis shows that immediate replanting is viable when the price of FFB is at least RM 135/t. At this price, the accumulated INR is RM 5601/ha. At a 10% discount rate, the incremental MPV and IRR are RM 34 and 10.1% respectively. The break-even price would be lower if the increase in the cost of replanting in the next five years is taken into consideration. It is concluded that immediate replanting is economically viable when the long-term FFB price is at least RM 135/t.

The question that arises is: *can the FFB price in the future be sustained at a level of more than RM 135/t?* The situation looks positive because in the last 20 years, the only times when the price of FFB fell below RM 135/t were in 1986 and 1990 (*Appendix 3*). Otherwise, if growers are not confident that the price can attain at least this level, it would be preferable to delay replanting.

CONCLUSION

The Malaysian oil palm industry has to improve its productivity in order to remain competitive in the global market. Based on MPOB historical data, about a fifth of the palms are now in the tall and ageing palm category. With the prevailing low palm oil prices, one of the strategies to be adopted by the industry is to replant the old palms. The intended rate of replanting by the industry in the next five years is not sufficient to clear the entire backlog of unreplanted areas. Therefore, the industry has to carry out accelerated replanting.

The immediate effect of replanting is the reduction of palm oil production and this would subsequently reduce the stock and hopefully improve the palm oil price. Replanting with the new advanced planting material will help rejuvenate and improve productivity. This will unable the Malaysian oil palm industry to be in a better position in facing future challenges. We have adopted this approach before and there is no reason why we cannot do it again. It is hoped that all plantations including smallholders dare to make the bold decision to replant as of TODAY or TOMORROW so as to prevent the current situation from worsening further.

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Appendix 1

The Cashflow for a Case of Immediate Replanting (RM/ha)

Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Age of Palm	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Yield	0	0	0	8.03	16.32	22.09	25.61	27.62	28.87	29.63	29.38
FFB price RM150	150	150	150	150	150	150	150	150	150	150	150
Gross Revenue	**0**	**0**	**0**	**1 205**	**2 448**	**3 314**	**3 842**	**4 143**	**4 331**	**4 445**	**4 407**
Costs:											
Felling and clearing	600	-	-	-	-	-	-	-	-	-	-
Upgrading road/bridges/culvert	200	-	-	-	-	-	-	-	-	-	-
Lining	100	-	-	-	-	-	-	-	-	-	-
Terracing/drainage	200	-	-	-	-	-	-	-	-	-	-
Holing/planting/pltg. material	1 000	-	-	-	-	-	-	-	-	-	-
LCC	200	-	-	-	-	-	-	-	-	-	-
Fertilizers	300	400	500	550	550	550	550	550	550	550	550
Pests and diseases	100	80	50	40	30	30	20	20	20	20	20
Weeds control	200	170	150	120	100	80	60	60	60	60	60
Harvesting	0	0	0	120	245	376	435	525	549	622	617
Transportation @ RM20/t	0	0	0	161	326	442	512	552	577	593	588
Contigency expences (5%)	145	33	35	50	63	74	79	85	88	92	92
Total cost	**3 045**	**683**	**735**	**1 041**	**1 314**	**1 551**	**1 656**	**1 793**	**1 844**	**1 937**	**1 926**
Net revenue (1)	**-3 045**	**-683**	**-735**	**164**	**1 134**	**1 762**	**2 185**	**2 350**	**2 487**	**2 507**	**2 481**
NPV (at 10% disc. rate)	**-3 045**	**-620**	**-607**	**123**	**775**	**1 094**	**1 233**	**1 206**	**1 160**	**1 063**	**956**
IRR	20.4%	-	-	-	-	-	-	-	-	-	-

The Cashflow for a Case of Delayed Replanting (RM/ha)

Age of Palm	26	27	28	29	30	0	1	2	3	4	5
Yield	16.30	15.80	14.60	13.75	12.06	0	0	0	8.03	16.32	22.09
FFB price RM150/t	150	150	150	150	150	150	150	150	150	150	150
Gross Revenue	**2 445**	**2 370**	**2 190**	**2 063**	**1 809**	**0**	**0**	**0**	**1 205**	**2 448**	**3 314**
Costs:											
Felling and clearing	-	-	-	-	-	600	-	-	-	-	-
Upgrading road/bridges/culvert	-	-	-	-	-	200	-	-	-	-	-
Lining	-	-	-	-	-	100	-	-	-	-	-
Terracing/drainage	-	-	-	-	-	200	-	-	-	-	-
Holing/planting/pltg. material	-	-	-	-	-	1 000	-	-	-	-	-
LCC	-	-	-	-	-	200	-	-	-	-	-
Fertilizer cost	450	450	450	0	0	300	400	500	500	550	550
Pests and diseases	0	0	0	0	0	100	80	50	40	30	30
Weeds control	30	30	30	20	20	200	170	150	120	100	80
Harvesting	489	474	438	481	422	0	0	0	120	245	376
Transportation @ RM20/t	326	316	292	275	241	0	0	0	161	326	442
Contigency expences (5%)	65	64	61	39	34	145	33	35	50	63	74
Total cost	**1 360**	**1 334**	**1 271**	**815**	**717**	**3 045**	**683**	**735**	**1 041**	**1 314**	**1 551**
Net revenue (2)	**1 085**	**1 037**	**920**	**1 247**	**1 092**	**-3 045**	**-683**	**-735**	**164**	**1 134**	**1 762**
Incremental net revenue (1-2)	**-4 130**	**-1 719**	**-1 655**	**-1 084**	**43**	**4 807**	**2 868**	**3 085**	**2 323**	**1 373**	**718**
Acc. inc. net revenue	-4 130	-5 849	-7504	-8587	-8545	-3 737	-870	2 216	4 539	5 912	6 630
Incr. NPV (at 10% disc. rate)	259	-	-	-	-	-	-	-	-	-	-
IRR	11%	-	-	-	-	-	-	-	-	-	-

Appendix 2

The Summary of Incremental Net Revenue, NPV (RM/ha) and IRR at Various FFB Prices

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Age of Palm	0	1	2	3	4	5	6	7	8	9	10
Price of FFB RM100/t											
Net revenue for immediate replanting (1)	-3 045	-683	-735	-238	318	658	905	969	1 043	1 026	1 012
Net revenue for delayed replanting (2)	270	247	190	560	489	-3 045	-683	-735	-238	318	658
Incremental net revenue	-3 315	-930	-925	-798	-171	3 703	1 588	1 704	1 281	708	354
Acc. incr. net revenue	-3 315	-4 245	-5 170	-5 968	-6 139	-2 436	-848	856	2 137	2 845	3 199
Incremental NPV (at 10% disc. rate)	(488)	-	-	-	-	-	-	-	-	-	-
IRR	8.0%	-	-	-	-	-	-	-	-	-	-
Price of FFB RM135/t											
Net revenue for immediate replanting (1)	-3 045	-683	-735	43	889	1 431	1 801	1 936	2 054	2 063	2 040
Net revenue for delayed replanting (2)	841	800	701	1 041	911	-3 045	-683	-735	43	889	1 431
Incremental net revenue (1-2)	-3 886	-1 483	-1 436	-998	-22	4 476	2 484	2 671	2 011	1 174	609
Acc. incr. net revenue	-3 886	-5 369	-6 805	-7 803	-7 825	-3 349	-865	1 806	3 817	4 991	5 600
Incremental NPV (at 10% disc. rate)	34	-	-	-	-	-	-	-	-	-	-
IRR	10.1%	-	-	-	-	-	-	-	-	-	-
Price of FFB RM200/t											
Net revenue for immediate replanting	-3 045	-683	-735	565	1 950	2 867	3 466	3 731	3 930	3 989	3 950
Net revenue for delayed replanting	1 900	1 827	1 650	1 935	1 695	-3 045	-683	-735	565	1 950	2 867
Incremental net revenue	-4 945	-2 510	-2 385	-1 370	255	5 912	4 149	4 466	3 365	2 039	1 083
Acc. incr. net revenue	-4 945	-7 455	-9 840	-11 210	-10 955	-5 043	-894	3 572	6 937	8 976	10 059
Incremental NPV (at 10% disc. rate)	1 003	-	-	-	-	-	-	-	-	-	-
IRR	12.0%	-	-	-	-	-	-	-	-	-	-

Appendix 3

Year	Average Price of FFB (RM/t)	Year	Average Price of FFB (RM/t)
1981	169.48	1991	147.97
1982	139.08	1992	162.90
1983	174.80	1993	143.76
1984	250.55	1994	216.85
1985	180.94	1995	257.10
1986	91.43	1996	222.46
1987	138.10	1997	264.71
1988	187.77	1998	453.65
1989	162.00	1999	222.15
1990	120.59	2000	188.28

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