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1. OIL PALM RETURNS

The information on the returns from the oil palm industry was extracted largely from published annual reports of oil palm companies. The data are from twelve oil palm companies, ten of which are Malaysian-owned. Two companies are operating and registered outside of Malaysia: one is registered in Singapore, the other in Papua New Guinea. The data were compiled for three consecutive years from 2009 to 2011. Data collection (particularly from Indonesia) is still on-going and the final analysis is pending, however the preliminary findings and recommendations are presented below.

1.1 General Assumptions

Most annual reports did not yield sufficient information to develop a complete assessment of the revenue from oil palm. Where data was not available, some general assumptions were made to fill in the gaps. At present, data from the Malaysia Palm Oil Board (MPOB) was the main source of reference (this will be updated when more reference sources become available). The main reference materials from MPOB were:

a. Review of the Malaysian Oil Palm Industry 2010
b. Malaysian Oil Palm Statistics 2010 – 30th Edition

More recent information up to year 2011 was obtained from the MPOB's website (see http://bepi.mpob.gov.my/). Data used for the revenue analysis includes the following:

1. **Cost of production** – for plantations in various region in Malaysia for 2009:

- Peninsular Malaysia – RM 1,160 per hectare
- Sabah – RM 1,100 per hectare
- Sarawak – RM 1,400 per hectare
- National average – RM 1,220 per hectare

2. **Yields for Crude Palm Oil (CPO) and Fresh Fruit Bunches (FFB)**:

Year	CPO yield (tonne/ha)	FFB yield (tonne/ha)
2011	4.01	19.69
2010	3.69	18.03
2009	3.93	19.20

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3. **Sales price of CPO and FFB**:

Year	CPO (RM/tonne)	FFB (RM/tonne)
2010	2,704.50	587
2009	2,244.50	481

1.2 Highlights of Data Collected

For the purpose of calculating the revenue from oil palm companies, data extracted from the annual reports are focused on (1) yield, (2) cost of production and (3) average sales price for FFB and CPO. Data from FFB production only takes into account FFB that was harvested by the company's own estates and does not include smallholders (also known as plasma collection of FFB in Indonesia).

- All companies except one reported their total FFB production for the financial year.

- Data for FFB yield per hectare were reported by all the companies in the sample, but data for CPO yield per hectare was only reported by six companies.

- The range of FFB yields for 2011 was between 16.5 tonne per hectare and 25.16 tonne per hectare. The national average for Malaysia for FFB yield according to MPOB was 19.69 tonne per hectare.

- The range of CPO yield was between 3.90 tonne per hectare and 5.47 tonne per hectare in year 2011. The national average for Malaysia for CPO yield according to MPOB was 4.01 tonne per hectare.

- Information on oil yield was focused on CPO yield only. It was from eleven companies. One company reported its combined yield of CPO and Palm Kernel and was therefore not used for analysis.

- Data for the cost of production were only reported by three oil palm companies. Production cost was divided into two main components i.e. estate cost and mill cost. Three oil palm companies provided partial production costs.

- Data on average sales price for CPO were indicated in all the annual reports for all three financial years whereas four companies stated the average sales price for FFB out of the eleven companies analysed.

- Analysis on the rate of returns which uses MPOB's average annual data may not reflect the actual rate of returns from private companies. It is important to note that MPOB's data covered the general oil palm industry in

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Malaysia which comprises of private estates, government schemes (e.g. FELDA, FELCRA), state schemes and smallholders.

1.3 Summary of Preliminary Findings

- In 2011, the average FFB yield was 21.75 tonnes per hectare, ranging from 16.5 tonnes to as high as 25.40 tonnes per hectare. The average FFB yields recorded in 2010 were 21.09 tonnes whereas in 2009, average yields recorded was at 22.44 tonnes.

- In 2011, the average CPO yield was 4.73 tonnes per hectare, ranging from 3.90 tonnes to as high as 5.47 tonnes per hectare. The average CPO yields recorded in 2010 were 4.66 tonnes whereas in 2009, average yields recorded was at 5.12 tonnes.

- In 2011, the average total production cost per tonne of CPO was RM 1,011, ranging from as low as RM 807 to as high as RM 1,248 (MPOB reported that the average production cost per tonne of CPO was RM 1,220). In 2010, the average total production cost was RM 943 whereas in 2009, the average total production cost was recorded at RM 938.

- The average price for CPO was RM 3,122 per tonne in 2011, ranging from as low as RM 2,906 to as high as RM 3,379 per tonne. Lower prices were recorded in 2010 and 2009, respectively at RM 2,566 and RM 2,225 per tonne.

- Based on the above (and where necessary using data from MPOB), the average rate of returns for in 2011 was estimated at RM 8,719 per hectare. The lowest rate of return was recorded at RM 7,020 and the highest was recorded at RM 12,269.

- In 2010, the average rate of returns was recorded at RM 6,010 per hectare, where the highest rate of return was recorded at RM 8,812 per hectare and the lowest rate of return was recorded at RM 4,317.30 per hectare.

- In 2009, the average rate of returns was recorded at RM 4,986 per hectare, where the highest rate of return was recorded at RM 9,988 per hectare and the lowest rate of return was recorded at RM 3,261 per hectare.

- Overall, the rate of returns range from a low of RM 3,216 to a high of RM 12,269 per hectare, generally reflecting variations in the average prices of CPO.

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Chart 1: Rate of returns and CPO prices for Year 2011

Chart 2: Rate of returns and CPO Price for Year 2010

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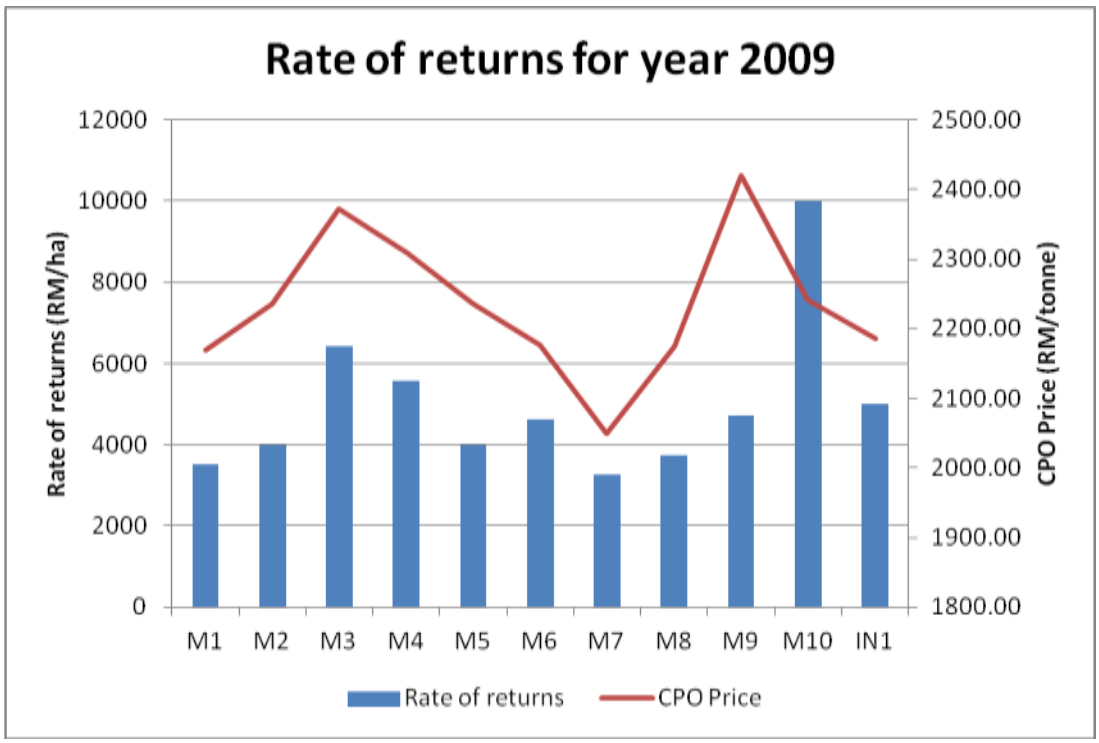
Chart 3: Rate of returns and CPO Price for Year 2009



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2. RESTORATION COSTS

2.1 Costs for Reforestation/Forest Rehabilitation of Dipterocarp Forests

Six case studies pertaining to reforestation/rehabilitation of dipterocarp forests were reviewed, of which, three were research projects while the remaining three were reforestation projects. From the collected data on research projects, the costs ranged from RM 380 to RM 11,688 per hectare. However, these projects differ considerably in the activities that were carried out. Furthermore, comparative measures of the success of these projects (e.g. seedling survival rates) could not be assessed.

The lowest cost published from a research project was from an evaluation of methods for rehabilitation of logged-over dipterocarp forests in Pasoh, Negeri Sembilan (Maswar et al., 1999), which was RM 380 per hectare for gap planting method with an area of 10m x 10m x $5ha^{-1}$. Costs for three other methods used in the study were RM 2,862 per hectare (line planting), RM 1,520 per hectare (gap planting: 20m x 20m x $5ha^{-1}$) and RM 684 per hectare (gap planting: 10m x 10m x $9ha^{-1}$) respectively. The costs for these methods covered site preparation, seedling procurement and planting activities. Another research, which was on the early establishment of dipterocarp seedlings (Raja Barizan & Newbery, 2008) cost RM 4,633 per hectare for an area of 5.6 hectare for four years (1991-1994). The cost covers aspects such as planting stocks, fertilizer, transportation, planting and maintenance.

A study on the rehabilitation of logged-over dipterocarp forest using an improved planting technique reported a cost of RM 11,688 per hectare for an area of 9.6 hectares for a period of five years (1998-2003). The study plot established for this project was 32 hectare but the plantable area was confined only to open and degraded sites which were about 30% of the area only. The high cost in this study was due to methodology whereby planting was done using own-raised seedlings and seedlings from a private nursery. The difference in cost between the two methods was due to the price of the seedlings, whereby the cost for own-raised seedlings was RM 4 per sapling versus RM 10 per plant from the private nursery.

Cost per hectare from actual restoration projects ranged from RM 3,000 to RM 8,000 per hectare. These figures are from Ulu Kalumpang Forest Reserve Restoration Project, Ulu-Segama Malua Sustainable Forest Management Project and Malua Wildlife Conservation Bank project.

The restoration cost for the Ulu Kalumpang Forest Reserve Restoration Project was RM 3,297 per hectare for five years for 5,118 hectare of lowland dipterocarp forests. The cost covered activities like planting preparation (RM 1,233 per hectare), activity and materials cost (RM 1,584 per hectare) and maintenance and seedling replacement (RM 480 per hectare) (Sabah Forestry Department, 2012).

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The Ulu-Segama Malua Sustainable Forest Management Project restoration cost was RM 3,394 per hectare for five years for 241,098 hectare of lowland dipterocarp forests. The overall duration of this project is 10 years (2008-2017), whereby the first five years focuses on silvicultural treatment and reforestation of highly degraded forests. The restoration cost mentioned earlier covers silvicultural treatment (RM350 per hectare), planting preparations (RM506 per hectare), activity and materials (RM1,038 per hectare) and maintenance and materials (RM1,500 per hectare) (Sabah Forestry Department, 2012).

For the Malua Wildlife Conservation Bank, restoration work has yet to be begin, however, New Forests has investigated costs for restoration work in Malua and the range is between RM 5,000 to RM 7,000 per hectare for three to five years of restoration activities like climber cutting, enrichment planting and maintenance of highly degraded forest. This cost however does not include long-term management responsibilities and operational commitment to conserve the areas so additional costs would need to be factored in (New Forests, 2012).

2.2 Costs for Restoration of Mangrove Forests

Costs of mangrove restoration were reported to range from USD 225 to 216,000 per hectare (RM 707 to 679,115) according to Lewis (2001) in a review of costs and benefits on mangrove restoration. The cost range however does not include the cost of any land purchase to provide a site for restoration. Higher costs are usually associated with excavation of fill, or backfilling of an excavated area to achieve a target restored site with the same general slope and tidal elevations relative to a reference site.

A case study presented by Lewis in the review was the conversion of abandoned shrimp aquaculture ponds back to their former condition as mangrove forests as an example of hydrological restoration as a more cost-effective method. The cost to restore mangrove forests from the abandoned ponds is about USD 200 per hectare (RM 629 per hectare) using hydrological restoration or USD 700 per hectare (RM2,201 per hectare) if using conventional planting methods.

TEEB (2009) gave another estimate on the rehabilitation and restoration of ‘post shrimp-farming’ mangroves whereby the rehabilitation cost for the first year was USD 8,240 per hectare (RM 25,907 per hectare) followed by an annual cost of USD 118 per hectare (RM 371 per hectare) for maintenance and protection of seedlings.

For the Mangrove Restoration Project in Sabah, Malaysia, the restoration cost were between RM 5,000 to RM 8,000 per hectare for a period of five years (2006-2010) covering 735.86 hectares of mangrove forests. The initial allocated restoration cost was RM 5,000 per hectare but was increased to the aforementioned range in tandem with the rising cost of goods and services (maintenance, petrol/diesel, workforce, etc.) in Sabah. The cost covers aspects such as replanting activities

(survey works, boundary marking, establishment of mangrove nurseries, etc.), staff recruitment and project supervision.

The Zambales Mangrove Rehabilitation Program in Philippines had a restoration cost of Php 114,347 per hectare (RM 8,385 per hectare) for 402.65 hectares of mangrove forests over a period of five years (2006-2011). The cost covered aspects such as nursery operations (procurement of propagules and seedlings of other species), establishment (site preparation, transportation and planting propagules/seedlings), maintenance and protection, infrastructure, information and education campaign, livelihood development and administration costs.

2.3 Costs for Restoration of Peat Swamp Forests

Cost estimates from Global Environment Centre (2012) for converting palm oil plantations back into peat swamp forests was approximately RM 34,500 per hectare. Costs include:

- Removal of oil palm trees or land preparation: RM 3,000
- Labour costs of planting 400 tree saplings per hectare : RM 900
- Saplings cost: RM 10,000
- Ditch blocking: RM 6,500
- Post-planting maintenance of site for 2 years: RM 7,400
- Fire prevention: RM 2,200
- Management, admin cost, monitoring: RM 4,500

Costing for each of the aspects above was:

- If land was cultivated with oil palm - Assuming one excavator for 2 days per hectare @ RM 1000/day including removal or shredding of removed materials plus RM 50 x 4 person per day for lining and marking of planting sites with bamboo stake[1]
- If land was not covered with oil palm – R M50 x 4 person x 8 days for cutting planting lines; equipment rental and fuel plus 400 bamboo stakes, etc.
- Labour costs - RM50 x 4 person x 2 days; planting equipment rental and fertiliser (RM 500)
- Saplings cost – RM 25 x 400 trees/ hectare
- Ditch blocking – RM 1000 for canal blocking materials (mangrove poles, sand bags and plastic sheet); Cost of labourers @ RM 50 x 10 people
- Post maintenance of site – RM 25 x 80 seedlings; fertilizer costs @ RM 200/yr; weeding and fertilizer application RM 50/day x 4 person x 8 times/ year x 2yrs

[1] Note however that there could be arguments for leaving existing oil palms in place in some cases. This is due to the spreading of the palms' roots which may bind the soil if the trees are allowed to remain. Against this, the oil palm is an exotic outside its native West Africa, so leaving it in place introduces a foreign element to regenerating "natural" forest.

- Fire prevention: 300 person days/yr patrolling @ RM 60/day including transport; fire control costs of RM 4000/yr for 100 hectare x 10 years

Cost for research on rehabilitation of degraded peat swamp forest was RM13,224 for 1.6 hectares for a period of eight months. Cost for techniques used in the study was:

- Open planting: RM 2327
- Open planting + mulching: RM 2787
- Open planting + topsoil: RM 2903
- Open planting + nurse trees: RM 5207

2.4 Cost of Restoration in Indonesia

In a progress report by Nawir et al. (2003) on a review of forest rehabilitation initiatives in Indonesia, the Ministry of Forestry estimated that current rehabilitation standard costs in Indonesia at the time was in the range of Rp 2.5 to Rp 5 million per hectare (RM 821 to RM1,642). This cost range may well reach Rp 87.2 – 218 trillion (RM 32 to RM 80 billion) with the increasing rate of degraded areas.

In the same review, the average cost per hectare from 38 projects in the preliminary database was from USD 43 to USD 15,221 (RM 135 to RM 48,247). The review also compared restoration costs based on funding sources, whereby average restoration costs per hectare from government funding sources ranged from USD 43 – USD 7,320 per hectare (RM 135 to RM 23,058 per hectare), USD 366 – USD 15,221 per hectare (RM 1,153 to RM 47,946 per hectare) for restoration projects receiving funds from donors and USD 115 – USD 8,500 per hectare (RM 362 to RM 26,775 per hectare) for private funding sources.

Sutisna (1999) carried out an experiment to determine how the taungya system benefits forest rehabilitation. The experiment covered an area of two hectare only with a total cost of Rp 10 million (RM 3,284 for two hectares; approximately RM 1,642 per hectare). The cost covered aspects like:

- Layout for plot: Rp 40,000
- Bordering for 2 hectare plot: Rp 199,500
- Sub blocking: Rp 27,500
- Vegetation inventory: Rp 40,000
- Site preparation: Rp 1,947,450
- Collection of plant materials: Rp 1,676,600
- Planting: Rp 900,000
- Weeding: Rp 630,000
- Fertilizing: Rp 822,425
- Construction of fence: Rp 2,439,600
- Border clearing: Rp 70,000

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- Hut building: Rp 1,271,500

RSPO Indonesia came up with a restoration and rehabilitation program for HCV areas or other conservation areas based on a modified 'Tree Adoption Program' conducted by Konsorsium Taman Nasional Gunung Gede Pangrango & Taman Nasional Halimun Salak. The amount provided for this program is Rp 10.5 million per hectare (RM 3,448 per hectare), consisting of planting preparation, planting activities, maintenance, replacement of dead saplings and community facilitation. In the activity, a group of 20 people are involved on a contract basis of three years (RSPO, 2010). The details of the cost involved are:

- Planting preparation: Rp 1,100,000.00 (RM 361)
- Planting activities: Rp 1,360,000.00 (RM 447)
- Materials cost: Rp 2,510,000.00 (RM 824)
- Maintenance and replacement of dead saplings: Rp 5,400,000.00 (RM 1,773)

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3. PRELIMINARY CONCLUSIONS

Based on the above data which are admittedly drawn from small samples of mainly Malaysian origin, there is a lot of variation in yields and returns, and truly massive variation in restoration costs. It may not be possible to come up with universally acceptable restoration costs, especially when national differences are taken into account even within a region such as Southeast Asia, let alone globally.

We therefore suggest that consideration be given to an alternative approach whereby income per hectare from planting is defined and suitable measuring criteria (such as 10-year averages to take account of market fluctuations) be agreed upon. These could then be measured in any country, except those new to palm oil planting, in which case there could be criteria for choosing a source of data, such as from a similar or neighboring country. Thus using universal rules, a figure could be generated for any country either in the local currency or in a standard one, such as US dollars.

The financial yield per hectare could then be subject to the same multiplier in any country to yield a compensation figure.

Such a scheme would have advantages as follows:

1. It provides one set of rules for everybody.
2. It automatically adjusts for cost differences in different countries.
3. It automatically adjusts for inflation (or deflation) in the medium term.
4. It would to be totally transparent.
5. It would address the real need directly, which is to set compensatory restoration costs at a prohibitive level.
6. It does away with the need to take account of actual restoration costs which show huge variations and are bound to be the source of much controversy.
7. Compensation cost will go up, admittedly with a time lag, if palm oil prices go through the roof, whereas compensation that is based on its cost would become more affordable when palm oil prices are high, thus weakening it as a disincentive to clear natural habitat.
8. Compensation payments will go down, admittedly with a time lag, if palm oil prices fall through the floor, which would mitigate against as being seen as totally unreasonable by planters.