FAUNA & FLORA INTERNATIONAL

# MYANMAR OIL PALM PLANTATIONS

## A productivity & sustainability review

John Patrick Baskett
Independent Plantation Advisor
January 2016

ARCADIA

FONDATION SEGRÉ

THE LEONA M. AND HARRY B. HELMSLEY CHARITABLE TRUST

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# ABBREVIATIONS

| | |
|---|---|
| ac | Acre |
| BMP | Best Management Practices |
| CIRAD | French Agricultural Research Centre for International Development |
| CPO | Crude Palm Oil |
| CSR | Corporate Social Responsibility |
| DICD | Department of Industrial Crop Development |
| DoA (IC) | Department of Agriculture (Industrial Crop). |
| EIA | Environmental Impact Assessment |
| EU | European Union |
| FD | Forest Department |
| FDI | Foreign Direct Investment |
| FFA | Free Fatty Acid |
| FFB | Fresh Fruit Bunch |
| FFI | Fauna & Flora International |
| FPIC | Free Prior and Informed Consent |
| GIS | Global Information System |
| GHG | Greenhouse Gas |
| GPS | Global Positioning System |
| ha | Hectare |
| HCV | High Conservation Value |
| hr | Hour |
| IDP | Internally Displaced People |
| IPM | Integrated Pest Management |
| ISO | International Organization for Standardization |
| JVA | Joint Venture Agreement |
| LCC | Legume Cover Crop |
| MIMU | Myanmar Information Management Unit |
| MoAI | Ministry of Agriculture and Irrigation |
| $MJ/m^2$ | Mega Joules per Square Metre |
| MoECAF | Ministry of Environmental Conservation and Forestry |
| MSPP | Myanmar Stark Prestige Plantation |
| NP | National Park |
| PA | Protected Area |
| Pers. comm. | Personal communication |
| PKC | Palm Kernel Cake |
| PKO | Palm Kernel Oil |
| PPF | Public Protection Forest |
| P&C | Principles and Criteria |
| Prop. | Proposed |
| Prot. | Protected |
| RF | Reserve Forest |

| | |
|---|---|
| RSPO | Roundtable on Sustainable Palm Oil |
| rtd | Retired |
| RTE | Rare, Threatened and Endangered |
| SEIA | Social and Environmental Impact Assessment |
| SLRD | Settlements and Land Records Department |
| UMFCCI | Union of Myanmar Federation of Chambers of Commerce and Industry |
| WD | Water Deficit |

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# SYNOPSIS

The productivity and the sustainability, as defined in the Roundtable on Sustainable Palm Oil Principles and Criteria (RSPO P&C),[1] of oil palm plantations in the Tanintharyi Region of southern Myanmar were assessed during three site visits by the author, the French Agricultural Research Centre for International Development (CIRAD), and Fauna & Flora International (FFI). In total, 12 plantations were visited. Plantations varied greatly in size, productivity, and in standards of sustainable production.

It is assessed that although climatic conditions in the region (4-5 months annual drought and 4-5 months very heavy rainfall) are not ideal for maximising the crop yield potential of this cultivar, some very reasonable yields are being obtained from early plantings established on flat to undulating terrain with good soils along the coastal belt, and that with enhanced input a productive industry can be sustained.

However there are many aspects of the plantation establishment, management and operation in this Region that preclude efficient production of sustainable palm oil and optimisation of oil palm crop yields. The aspects of greatest importance are:

- Government policies on allotment of land for extension plantings without adequate land use planning that ensure undue deforestation, adverse social and environmental conditions, and also planting on unsuitable soils and steep hill slopes to the detriment of future crop yields and economic returns.

- In general, but with a few exceptions, the plantations are poorly managed. Management strategies do not appear to focus on crop optimisation, primarily due to poor staff/worker policies and lack of training, and also to poor agronomic practices. Fruit processing facilities on some of the plantations are woefully inadequate resulting in high production losses.

- The shortage of funding from head offices is often cited as the reason for the problems experienced at plantation level.

- There is a need for improved research facilities and agronomic advisory visits to plantations. In particular, research trials should be established to determine the most appropriate genetic materials and fertilisers to use under the local conditions.

- Further consideration should be given to the expansion of oil palm smallholder schemes, especially for local populations.

[1] RSPO, 2013.

- Greater consideration should also be given by the government, the plantation owners, and plantation managements to instituting national sustainability guidelines, as promoted internationally by the RSPO that would be rigorously implemented by the industry.

Insufficient data was given to the visitors to provide an accurate economic assessment of the industry and its component operations. However, it is an economic fact that by increasing the production of oil per unit area, there should be a corresponding offset of the amount of land required to fulfil production targets.

Stringent forward planning is required of all parties to ensure that only the most appropriate land with the greatest potential for high and sustainable palm oil yields is selected for future development.

# 1 INTRODUCTION

Plantation crops such as palm oil and rubber play a critical role in Myanmar's national development strategy and have potential to be a source of significant local development benefits, such as creating a potential for jobs and increasing local income. Although oil palm is the world's most efficient oilseed crop with the potential to produce up to ten times more oil per hectare (ha) than other leading oilseed crops, some of the social and environmental impacts of the plantation sector have drawn international criticism. The introduction and promotion of sustainable plantation development is essential to realise benefits. Since 2014, FFI and partners have assessed and actively engaged with Myanmar's palm oil sector with the aim to promote dialogue and practice to ensure palm oil production in Myanmar is legal, environmentally responsible, socially acceptable and profitable in line with international best management practices and sustainability principles. This report contributes to that aim by assessing the productivity and sustainability, as generally defined by the RSPO P&C, of the plantation establishment and operations.

It is assessed that although climatic conditions in the region (4-5 months annual drought and 4-5 months very heavy rainfall) are not ideal for maximising the crop yield potential of this cultivar, some very reasonable yields are being obtained from early plantings established on flat to undulating terrain with good soils along the coastal belt, and that with enhanced input a productive industry can be sustained.

However there are many aspects of the plantation establishment, management and operation in the Tanintharyi Region that currently preclude efficient production of sustainable palm oil and optimisation of oil palm crop yields. These aspects are presented in this report.

# 2 KEY FINDINGS AND RECOMMENDATIONS

The productivity and sustainability of oil palm plantations established in Myeik and Kawthoung Districts, southern Myanmar were assessed through site visits, observations and where possible primary data collection. The RSPO P&C were used as a reference for assessment. There are a total 44 oil palm plantation companies in Myanmar, 12 of these were visited representing the largest plantations in terms of area planted. These plantations varied greatly in size, productivity, and in standards of sustainable production.

It can be positively concluded from the assessment that the Tanintharyi Region could well support a sustainable, efficient and effective palm oil industry.

However, because of Myanmar's past isolation, it is observed that their current palm oil industry is relatively underdeveloped in its planning and technical resources, thus resulting in many unsustainable and inefficient agricultural production practices.

Managing plantations to a much higher level of sustainability will definitely result in higher palm oil yields per unit land area, at reduced cost/ton of production, and with greater social and environmental capital accruing from those sustainable practices. With increased production per unit of land, there should also be a resulting reduced pressure for new land extension to meet production targets and supply demands.

Factors that are especially impinging upon the efficiency and sustainability of the palm oil industry in Myanmar are:

- Government policies
- Environmental conditions
- Social concerns
- New planting and land preparation
- Planting materials
- Plantation management
- Milling and logistics
- Documentation
- Palm oil production and land requirements

## 2.1 Government policies

It has been variously stated that past Government policy aimed at rapid expansion of the evolving oil palm industry in the Tanintharyi Region commencing in the year 1999. The stated purpose for expansion was the need for Myanmar to become self-sufficient in palm oil supply, to substitute imports, to improve rural industrial and social infrastructure and to create inflow of Foreign Direct Investment (FDI) into the industry. At present the country imports some 400,000 tons/annum of palm oil and

the Government's target was initially to plant 500,000 ac (202,343 ha), later increased to 700,000 ac (±283,280 ha), of oil palms by 2030 in order to offset increasing home demand with local production. Domestic production of edible oil from peanuts is some 500,000 tons/year, whilst the country's edible oil consumption is around 900,000 tons.[2]

Land areas have been granted by the government to large Myanmar corporations (and some foreign investors) for the purpose without much regard to land occupation by local populations, land suitability, conservation of forest reserves, water sources or endangered species. Logging operations and expansion into former ethnic Karen controlled areas may be part of the intention and the problem. There appears to have been no attempt at land use planning. The land was to be developed at a rate determined by the government rather than in accordance with logistics and careful planning. If the government determined rate of expansion on the granted land was not met by a developer, that land could be forfeited.

Government policy has thus imposed upon the industry, not only social, environmental and practical complications, but also the basis for an unsustainable and enduring poor performance of the industry.

### Recommendations

The government should reassess its self-sufficiency targets for edible oils in light of sustainability challenges over land use in the country.

It is strongly recommended that an in depth marketing research exercise is conducted on the whole Myanmar edible oil industry in order to ascertain actual requirements for edible oils and fats within the economy. With current low palm oil prices hovering between USD 500 – USD 600 per metric ton, it may not prove economic to extend oil palm cultivation into more marginal land areas where low yields can be expected. It may prove more economical to continue importing low cost palm oil from neighbouring countries in preference. A consideration of the impacts on health related to any policy and market decisions on edible oil should also be included in any survey.

Government Departments at both central and local level must also be prevailed upon to undertake comprehensive land use planning prior to granting land for oil palm development, and not to place time limit requirements on plantations to develop land beyond their capacity or capability to develop the land sustainably.

[2] Edible Oil Dealer's Association, as reported in Shanghai Daily, 2015.

Companies who are expanding their areas should be allocated more land only if existing plantation areas have proven well managed. Land that has been allocated should be subjected to comprehensive Social and Environmental Impact Assessments (SEIA), High Conservation Value (HCV)[3] assessments and Free Prior and Informed Consent (FPIC) studies before the land is developed.

A technically competent team should be set up by government to set standards for the industry, standardise assessment requirements, assess land suitability in advance of granting land areas to individual companies, and to monitor and evaluate management of allocated land, ensuring proper management and revoking land where necessary.

## 2.2 Environmental conditions

Rainfall/soils: The climatic conditions experienced in this region are less conducive to the cultivation of oil palms than in most other producing countries. A five month dry period each year is detrimental to maximising the yield potential of this cultivar. Soils in the lowland coastal belt are assessed to be generally suitable for palm growth. However, plantations visited are giving very little attention to the need for soil amelioration, protection of water sources and moisture retention measures.

Recommendations: The local oil palm industry should intensify research and agronomic consultation, possibly through an industry funded oil palm Research Centre, to monitor and recommend important soil/moisture conservation measures to individual plantations.

Terrain: Terrain in this region varies widely from coastal swamplands to flat, undulating, and to very steep forested slopes. The government, by providing companies wishing to enter, or expand, their plantation businesses with blanket new land areas without taking into account terrain, environmental or social aspects, and expecting those areas to be fully planted with oil palms, are driving deforestation and ensuring future environmental, social and managerial problems in addition to sub-standard productivity and profitability. Without enlightened government intervention it is uncertain that the industry will take the necessary measures to conform to important social and environmental requirements.

### Recommendations

Enhanced government land use planning and enactments, research, and managerial training to ensure that slopes over 25° are not cleared and planted – rather that forest is retained on steep slopes and ridge tops. Lower slopes should be terraced to conserve moisture, prevent soil erosion and provide easy access for future harvesting. Riparian buffer zones and water sources must be protected according to best practices. Logging should not be permitted before development plans have been drawn up, land and soils surveyed, and social/environmental impacts and HCV assessments completed. In order to achieve these requirements input and extensive training by competent consultant companies will be necessary.

[3] See the HCV Resource Network for information on best practices https://www.hcvnetwork.org/

## 2.3 Social concerns

Labour relations: Plantation workers are for the most part transient. The reasons for this, as clearly exhibited by most plantations, are very obvious. Those prepared to work on the plantations migrate from the north of the country but salaries and living conditions are extremely poor. Many of the workers move on to find work over the border in Thailand.

A poorly treated, shifting work force is very detrimental to efficient operation of the plantations; there is little loyalty to the company, no opportunity for proper training and less incentive to excel. Under such conditions, production losses are inevitable.

Conversely, those few plantations that do provide reasonable salaries, a good standard of housing and other social amenities maintain a workforce that is stable and well trained. The excellent agricultural conditions observed on the few such plantations bear this out.

### Recommendations

Plantations that lag in provision of reasonable wages, basic social benefits, good housing and reasonable living and working environments would do well to understand the great advantages that accrue from a stable, well trained, efficient and committed workforce who will repay outgoings handsomely in improved productivity and increased production.

Local stakeholders: On the plantations there appears to be very little attention given to the surrounding populations. On some of the smaller plantations, no attention is given. Some larger plantations do implement ad hoc and rudimentary Corporate Social Responsibility (CSR) and smallholder programs. South Dagon Plantation, at the other end of the scale has a CSR program which includes aid in establishment of village smallholder blocks. Overall it would seem that very few local villagers are employed in the plantations, preferring to cultivate their own lands, or take to fishing. Future troubles over land rights (as reportedly already experienced by at least one large plantation company) will multiply if local populations are not fully recognised and engaged.

Smallholder schemes: Discussions at plantation level do not indicate much enthusiasm for the establishment of large smallholder schemes. The contention is that local villagers prefer to plant rubber and areca palms as these crops are easier to harvest and sell to local buyers rather than be committed to sell to a local palm oil mill with no guarantee of price - a lack of trust exists. However, the government and some companies have initiated modest individual smallholder projects.

### Recommendations

Company CSR programs should be strengthened and local populations embraced. As in neighbouring countries, smallholder schemes require government initiatives, promotion and funding to be successful.

## 2.4 New planting and land preparation

The need for proper land use planning, the avoidance of destruction of forests and high conservation value areas, and social and environmental assessments, are again stressed with regard to new and extension oil palm plantings.

Due to the annual long dry weather months, the importance of all measures that can possibly promote soil moisture conservation and retention, including the protection of water sources and riparian buffer zones, must be planned and implemented from the earliest stage of land preparation in order to achieve enhanced yields of palm oil. Of particular concern is the observed trend (prompted by government policies noted earlier) of planting on steep hill slopes (often forested) without any attention given to the degree of slope or to soil and moisture conservation. Some of the larger plantation companies have commenced contour terracing on their most recent plantings.

However, at most plantations the general consensus is that contour terracing is too expensive. What is little understood (because few steep land areas are yet in harvesting) is that on steep hill slopes without terracing, rainwater runs off without penetrating the soil. In dry weather, these soils dry out very quickly and oil palm yields can thus be 30%-40% lower than in the flat lands and render the land unprofitable.

### Recommendations

Expert planning is required of areas being considered for planting. Soil suitability studies, social and environmental assessments completed, and terrain surveyed and assessed in advance of any clearing works. Slopes exceeding 25° should not be cleared or planted. Forest and bush cover should be retained on these slopes and hill tops. Slopes between 10° and 25° must be contour terraced in order to conserve moisture, prevent soil erosion, prevent fertiliser loss, and facilitate future harvesting operations. Water sources must be protected and riparian buffer zones established.

Plantation company management (at headquarter level) must be convinced of, and agreeable to, these expensive requirements before embarking on new developments in hilly areas. The perceived high costs will be offset in future by increased yields and savings on costly fertilisation.

It should be well noted that the specific requirements of RSPO Certification are that new plantings have not replaced primary forest or areas of HCV, and that use of fire in the preparation of land is avoided.

## 2.5 Planting materials

One of the most important, and manageable, requirements for enhanced oil palm yields is the use of planting materials best suited to the climatic and environmental conditions existing at the locations to be planted. International oil palm breeding centres are now able to offer a range of site specific planting materials.

Most, but by no means all of the planting materials established in this region have been sourced from one seed supplier. If maximum oil palm yields are to be achieved it is important that the planting material that best suits the climatic and soil conditions of southern Myanmar are selected based on the results of research trials.

### Recommendations

The government Research Station at Myeik must be supported by the industry (by way of a research cess/levy) in order to conduct well supported and comprehensive planting material suitability trials utilising a range of planting materials available on the international market, and including locally selected germplasm. Such trials could also be established by the larger plantation companies.

## 2.6 Plantation management

The highest cost factor incurred in the field production of Fresh Fruit Bunch (FFB) is on fertilisation. In a well-managed company in Indonesia, fertilisation cost amounts to some 40% of the total production cost/ton of the fruit delivered to the mill. At many of the visited plantations it was assessed that fertiliser applications were almost double

of what would be considered a normal dose. Applying excess fertilisers is not only costly, but a wasted input and damaging to the environment.

On several plantations, the standard of field upkeep and harvesting was generally very reasonable. On all other plantations observed, poor upkeep and harvesting standards are resulting in crop losses to varying degrees and extent, some very significant.

### Recommendations

It is strongly recommended that plantations should implement routine leaf diagnosis to better monitor nutritional status of the palms, and to tailor fertiliser recommendations according to palm needs, in order to limit the economic and environmental impacts of wasteful fertiliser practice.

As noted, a stable and well trained workforce is an essential ingredient to the establishment of good agricultural conditions in the plantations and to the efficient harvesting and collection of all crop produced by the palms.

## 2.7 Milling and logistics

Yuzana 1 and Yuzana 2 Plantations have three large and modern oil mills with a total milling capacity of 165 tons FFB/hour (hr). Two of the mills are constructed with a view to increasing capacity by a further 105 tons/hr. South Dagon Plantation has a recently upgraded oil mill of 60 tons FFB/hr. Currently, all these mills are reported to have surplus processing capacity, even during the peak yield months.

### Recommendations

A number of smaller plantations in the region operate technically very outdated palm oil processing units with resultant poor oil extractions and high production losses. Rather than accept the losses, the logistics and price structure for delivering FFB from these plantations to the modern efficient mills should be explored further.

## 2.8 Documentation

Accurate records and documentation of plantation and milling processes are almost without exception, either non-existent, or extremely difficult to obtain.

As it stands, it is very unlikely that any of the plantations visited could fulfil all requirements for RSPO Certification, especially due to the criteria pertaining to development of new plantings.

### Recommendations

For the efficient management of the plantations, and to ensure that the plantations are meeting all regulatory requirements, adequate records of management operations and documentation of social and legal issues should be properly maintained and readily available when required. The process of working towards obtaining ISO 9001 Certification would go a long way to improving plantation documentation.

## 2.9 Palm oil production and land requirements

The Myanmar palm oil sector can only meet the Government's requirement to offset the importation of palm oil by expansion of the industry.

It is a given fact that higher yields/ac mean less land area is required to meet total production targets. It can be demonstrated[4] that yield improvements also produce higher profits per unit area in production as a result of greater efficiencies in the production process. In order to reduce the amount of expansion, particularly into less suitable areas for palm cultivation as is ongoing currently, it is imperative that palm oil yields in areas already planted should be maximised.

There are many varied and competing requirements on the use for land. The amount of land that is suitable for the sustainable production of palm oil in Myanmar is quite limited. The requirement for land can be considerably reduced by improving the productivity of land already under cultivation, or by ensuring that extension plantings are restricted to land that is the most suitable for high yielding, sustainable palm oil production.

Furthermore, the economies of scale achieved by maximising crop yield per unit of land does certainly result in a significant increase in social and environmental benefits, as well as enhanced profitability of the plantation operations.

[4] Baskett *et al*, 2008.

Oil palm nursery, betel palms and cleared land for rubber or palm in Tanintharyi. © Ollivier. 2015.

# 3 APPROACH

This report is based on the results of three separate visits to oil palm plantations and government offices in Myeik and Kawthoung Districts in Tanintharyi Region, between Kawthoung at the southern tip of Myanmar, and Myeik situated in central Tanintharyi (Figure 1).

The first visit by the author and FFI was in September 2014, the second by CIRAD and FFI in March/April 2015, and the third by the author in August 2015. There are a total 44 plantation companies in Myanmar, 12 of these were visited (Annex 1) representing the largest plantations in terms of area planted (±85% of the total planted area). Oil palm plantations situated in Dawei District were not visited.

A separate visit, together with Myanmar plantation managements, was made in February 2015 to two oil palm research and breeding stations near Krabi in southern Thailand. In addition, several high level meetings were held in Yangon with various stakeholders after those visits, and also at the RSPO RT12 in Kuala Lumpur in 2014.

The initial results of the three field assessments were presented to an introductory workshop on sustainable palm oil held in Myeik in September 2014, and to a technical seminar, also held in Myeik, in August 2015, both directly following the respective plantation visits.

As there are many complexities involved in the management of sustainable oil palm crop yields and production, these visits are considered to be too brief an undertaking to provide anything more than an informed overview of the situation based on time limited on-site discussions and observations, but with very little basis on the analyses of difficult to obtain longer term operational and production data.

However, overall, the outcome of FFI's initiative has proved extremely useful and positive in opening up the Myanmar oil palm industry to the need for improved sustainability of operations, and in imparting informed methods to achieve those improvements in the production of their palm oil with optimisation of cropping potential the aim.

The results presented in this report are based on the findings of the visits, on expert observations, primary data obtained from companies and the Department of Industrial Crops (DICD)[5] and on Global Information System (GIS) analysis by FFI.

Sustainability of the oil palm industry as stated in this Report is considered to be based on the RSPO P&C.

[5] At the time of writing the DICD has undergone a reform and is now the Department. of Agriculture (Industrial Crops) (DoA (IC)). It will be referred to as DICD in this report.

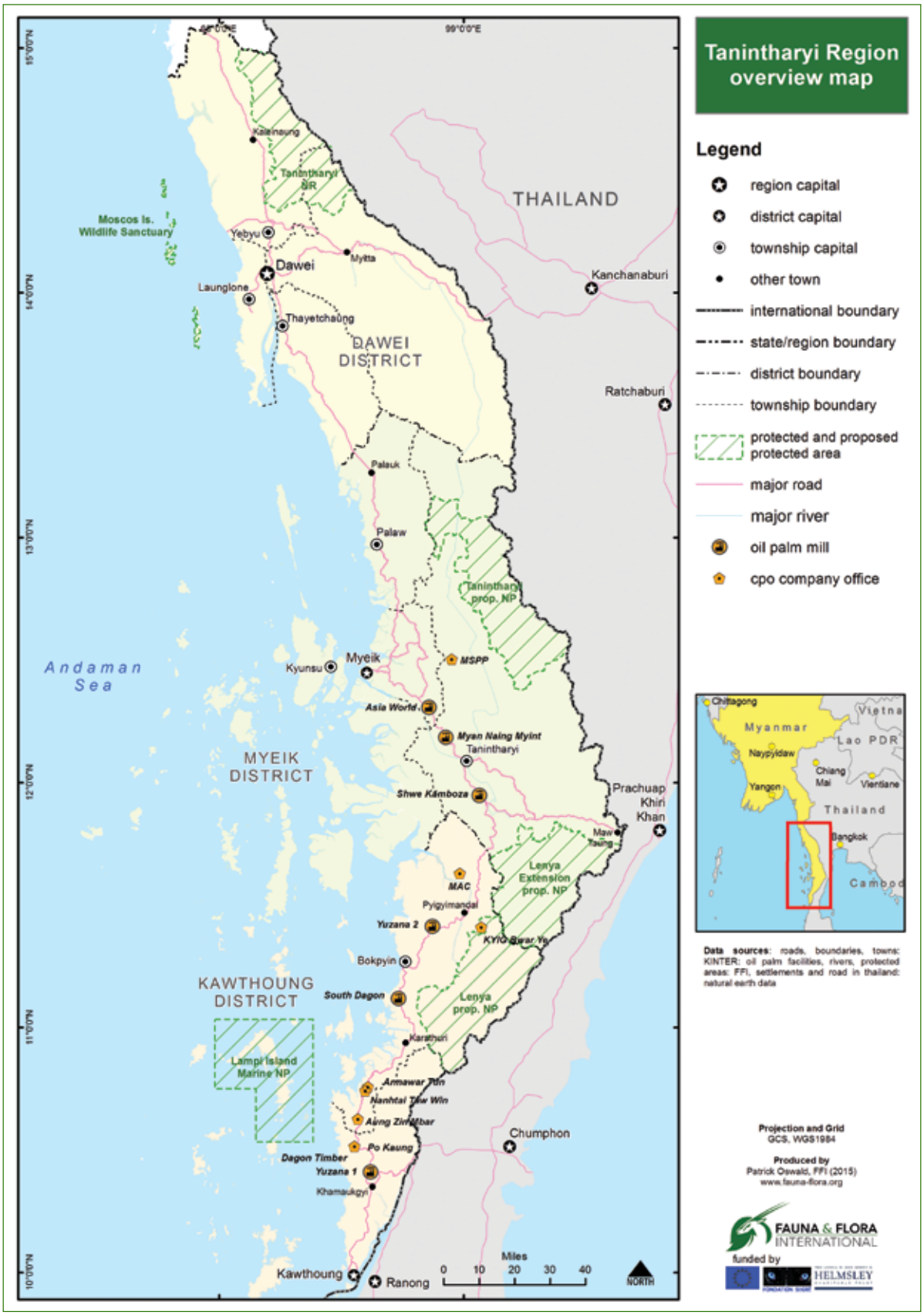


Figure 1: Map of focus area.

Source: Oswald/FFI, 2015.

Data limitations and usage: The data availability and reliability in Myanmar is poor, there are gaps in data and large discrepancies between different sources; this makes analysis challenging. For that reason, it is the general picture presented in this document rather than actual numbers that is most important, but does not detract from the substance of the content.

The issue is well recognised and the One Map Myanmar initiative, a government initiative ultimately aimed at rationalising land management and record keeping is addressing this. The Myanmar Information Management Unit (MIMU) also supports standardisation efforts and this report uses geographical datasets and place name spellings used by the MIMU.

Concession boundaries: The Regional Settlements and Land Records Department (SLRD) provides concession boundaries in the Township Reports of Oil Palm Cultivation, the 2014 data is the most up to date. Concession boundaries were obtained from the companies visited, however these were of varying quality some provided Global Positioning System (GPS) information but for most the boundary was digitised from maps on walls and photocopies, satellite imagery also shows land clearance in the company vicinity. There are large discrepancies between the three sources.

Forest cover and deforestation: The forest cover data used is from Hansen/UMD/Google/USGS/NASA, who caution the potential for inconsistencies following recent improvements to datasets.[6] During analysis assumptions have been made regarding what constituted deforestation from rubber and oil palm and the exclusion of smallholdings. There is also a difference in Reserved Forest (RF) boundaries in use by the Ministry of Environmental Conservation and Forestry (MoECAF), District and Township levels with concessions using the latter.

Oil palm productivity: The data provided by companies and government frequently differs, the company data is taken as the most representative when provided.

Finally, Myanmar has not yet adopted the International System of Units (SI). The data gathered included acres for area, occasionally inches for length, and tons, which were confirmed to be metric tons (1000 kg) for mass; this report where possible states both acre and hectare measurements.

[6] Hansen *et al*, 2013.

Palm oil fruit. © Baskett, 2014.

# 4 HISTORY OF THE OIL PALM IN MYANMAR

## 4.1 Early development of the oil palm industry in Myanmar

It has proved difficult to obtain exact historical details, but information suggests that the Oil palm was introduced into Myanmar in 1921-22, brought in all probability from Indonesian *Deli dura* stock and test planted by the Government of the time. The first commercial plantation of some 300 ac was established at Yebyu in the Tanintharyi Region in 1926.[7]

Oil palm extension was implemented by the Ministry of Agriculture and Irrigation (MoAI) as a government project at various locations from 1970s to 1980s. Privatisation of the expanding industry commenced in 1993 when government estates were leased to private companies. In 1999 the then Government initiated a military sponsored industrial oil palm development as part of its national self-sufficiency plan.[8] By 2000, some 50,000 ac (±20,200 ha) of oil palms had been established.[9] The plantations are principally found within a narrow belt of coastal lowlands in Myeik and Kawthoung Districts, and to a lesser extent in the drier Dawei District.

## 4.2 Existing situation

Data from DICD for 2014 provided (Annex 2) indicates that a total of almost 1,000,000 ac (almost 405,000 ha) have been allocated by the Government of Myanmar to 44 Oil Palm Plantation companies to develop plantations in the Kawthoung, Myeik and Dawei Districts of the Tanintharyi Region. Of that land area, almost 350,000 ac (±142,000 ha) have been planted, some 283,000 ac (±115,000 ha) in Kawthoung, 46,000 ac (±19,000 ha) in Myeik, and 17,000 ac (±7,000 ha) in Dawei Districts. Of the 44 companies concerned, apparently 43 are Myanmar owned (three foreign companies have Joint Venture Agreements (JVA) with local companies), and one is the result of FDI.[10]

## 4.3 Government strategy and objectives

Myanmar imports 400,000 tons of palm oil annually to fulfil domestic demand for edible oils. Domestic consumption of edible oils amounts to 900,000 tons annually,

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[7] Zaw Win, 2015. Director (rtd), DICD, MoAI. Email to FFI on the history of oil palm. 22 March. Personal communication.
[8] Woods, 2015.
[9] Zaw Win, 2015. Director (rtd), DICD, MoAI. Emailed attachment to FFI on the history of oil palm. 22 March. Pers. comm.
[10] Saxon and Sheppard, 2014.

the balance mainly met by sesame and peanut oil production.[11] In 2012 the cost of importing 330,000 tons palm oil from Indonesia and Malaysia was USD 376 million.[12]

The Government's strategy is to increase palm oil production in Myanmar to:

- Fulfil the needs of growing local edible oil consumption
- Substitute the cost of importation and capital outflow
- Improve rural industrial and social infrastructures
- Create inflow of FDI into the oil palm industry[13]

A thirty year long-term development plan, enacted in 2000, to initially plant 500,000 ac (202,343 ha) of oil palms by 2030. The target was later extended to 700,000 ac (283,280 ha). However, in certain circumstances, Government led policies for oil palm expansion in the region have proven not practical, are poorly planned, and difficult or impossible to achieve. Unfortunately, attempts to follow some of these policies and guidelines will not lead to high yielding and sustainable oil palm cultivation.

### 4.4 Establishment of smallholder schemes

Official data for oil palm smallholders in the region sourced from the regional DICD is provided below (Table 1). Productivity of these smallholdings appears extremely low, but many may well be new plantings not yet in production. These smallholders sell their produce to local plantation company mills, either independently or through a relationship with the company. The size of a smallholder is not officially stated but cultivation of 50 ac (20 ha) or less is considered as a smallholding. It is worth noting that the majority of smallholdings in Myeik and Dawei Districts are owned by Military Units.[14]

Table 1: Land area occupied by oil palm smallholders in the Tanintharyi Region.

| District | Planted ac (ha) | Harvested ac (ha) | Yield FFB tons / ac (ha) | FFB Production (tons) |
|---|---|---|---|---|
| Dawei | 4467 (1808) | 1920 (777) | 0.63 (1.55) | 1209 |
| Myeik | 2107 (853) | 802 (325) | 0.15 (0.37) | 121 |
| Kawthoung | 3297 (1334) | 300 (121) | 0.44 (1.09) | 132 |
| Total | 9871 (3995) | 3022 (1223) | 0.48 (1.19) | 1460 |

Source: DICD, 2015.

[11] Edible Oil Dealer's Association, as reported in Shanghai Daily, 2015.
[12] Saxon and Sheppard, 2014.
[13] Zaw Win, 2015. Director (rtd), DICD, MoAI. Email attachment to FFI on the history of oil palm. 22 March. Pers. comm.
[14] Zaw Win, 2015. Director (rtd), DICD, MoAI. Email to Lyons, A., FFI, 15 November. Pers. comm.

Discussions at plantation level do not indicate much enthusiasm for the establishment of large smallholder schemes. The contention is that local villagers prefer to plant rubber and areca palms as these crops are easier to harvest and sell to local buyers rather than be committed to sell to a local palm oil mill with no guarantee of price - a certain lack of trust exists between smallholder and mill and vice versa. At current oil palm fruit purchase prices, it is reported that more income can be gained from betel nut palm (*Areca catechu*) cultivation.

In Indonesia, as a company CSR programme, local village oil palm schemes have proven popular where the villagers provide their land to the company to develop to maturity. Thereafter the land is returned to the smallholders who sell their fruit to the company mill. South Dagon plantation, as part of its CSR programme, has commenced a similar smallholder scheme with eight smallholders totalling 229 ac (93 ha) varying from 10 to 100 ac in size. They have identified a further 16 farmers with 629 ac (255 ha) of land wishing to join the scheme in 2016.

Large block smallholder schemes of thousands of acres subdivided into 5-10 ac (2-4 ha) smallholder allotments established on a nucleus/plasma basis have proven very successful in other parts of the world but these require government initiatives, promotion and funding to be successful.

# 5 ENVIRONMENTAL FACTORS THAT SUPPORT OIL PALM CULTIVATION IN THE TANINTHARYI REGION

## 5.1 Land availability

According to opinion received during the visits,[15] land areas that are suitable for oil palm extension planting are available in this Region. However, it is not clear the criteria for deciding the suitability of land, but it is likely they do not include conservation and social parameters.

As of 2015, it is believed that nearly 1,000,000 ac (±405,000 ha) of land have been allocated for oil palm cultivation with some 350,000 ac (±142,000 ha) already planted. However, there is limited data to support the presumption that one million acres of land suitable for establishment of oil palms that will provide sustainable yields actually exist in the region, and this objective is very questionable.

A 2014 study[16] on land suitability in Myanmar concluded that the most suitable areas for oil palm plantations consisted of cleared land or severely degraded forests on wet coastal lowlands.

Detailed land use planning of the Tanintharyi Region is urgently required to confirm the total amount of suitable land available for oil palm establishment, and to verify the suitability of all lands already allocated for extension planting.

## 5.2 Terrain and soil fertility

Terrain in this region varies widely from coastal mangrove swamplands, to flat and undulating cultivated land and grassland, and to very steep forested slopes.

Disturbingly, during the visits it was noted that many very steep hill slopes have either been felled and cleared (by log extraction and burning) for planting, or already planted without due attention to contour terracing and other sustainable agricultural measures. In the long dry conditions of this region, steep hill slopes and hill tops cannot be expected to be productive without, at the very least, special attention paid to moisture conservation.

Limited observations in the plantations, at new cuttings along roadsides between Kawthoung and Myeik, and from some soil sampling analyses and discussions on the plantations and at the Research Centres visited, indicate that the lowland soils are generally deep, fertile and suitable for oil palm cultivation. Plantations advised that the majority of their soils fall into the Class I and Class II categories on the simplified Olivin table[17] reproduced below (see Table 2).

[15] Zaw Win, 2014. Director (rtd), DICD, MoAI. Conversation with author during site visit. September. Pers. comm.
[16] Saxon and Sheppard, 2014.
[17] Corley and Tinker, 2003.

Table 2: Grading of soils classes defined in terms of suitability for oil palm cultivation, based on texture, stones, drainage and chemical status (I, good; IV, poor).

| Characteristics | | | | |
|---|---|---|---|---|
| **Soil Class** | **Texture** | **Gravel & stones** | **Drainage** | **Chemical status** |
| I | Sands to clay | None | Good | Organic matter: good<br>Exchangeable cations: good |
| IIa | Sands to clayey sands | None or very little | Good to 90 cm | Organic matter: medium<br>Exchangeable cations: medium |
| IIb | Sands to clays | Some gravel | Good to 60 cm | Exchangeable cations: medium |
| III | Sands to clays | Gravelly | Poor | Organic matter: medium<br>Exchangeable cations: poor |
| IV | Leached sand or very heavy clay | Very gravelly | Deep peat or very bad drainage | Poor |

Source: based on Hartley,1988.

However, soils are variable and complex. Soil sampling and analysis is very important to ensure that oil palms are only planted where the soils are suitable for the purpose. Palm growth and oil yields will depend on the fertility of the soils. Soil sampling is also required to monitor the changes that take place over time in soil structure and fertility due to cultivation of the palms, and additionally, to hone fertiliser applications based on palm requirements.

At South Dagon Plantation near Bokpyin, there is an observed wide diversity of soil types. Soil analysis results were provided that indicate alluvial, loamy, clay and sandy loam, and acid soils that are all considered suitable for oil palm cultivation.[18]

At Myanmar Stark Prestige Plantation (MSPP) north-east of Myeik, limited samples indicate acid soils with relatively high organic carbon, and low in phosphate, but suitable for oil palm cultivation with correct fertilisation.[19]

## 5.3 Climate

The ideal climatic requirements for oil palm cultivation[20] are:

- Annual rainfall of 2000 mm or greater, evenly distributed, and preferably 100 mm in each month
- A mean maximum temperature of about 29° - 33 °C and a mean minimum temperature of about 22° - 24 °C
- Sunshine of 5-7 hrs/day in all months, and solar radiation of 15 MJ/m$^2$ per day

[18] Ollivier, J. 2015. Researcher in oil palm and coconut agronomy, CIRAD. Skype conversation with author. September. Pers. Comm.
[19] Ollivier, J. 2015. Researcher in oil palm and coconut agronomy, CIRAD. Skype conversation with author. September. Pers. Comm.
[20] Hartley, 1988.

Average meteorological data obtained from government sources for Myeik, centred in the coastal belt of the Tanintharyi Region, indicate that these climatic conditions are mostly fulfilled but with the notable exception of the wide deviation in rainfall distribution.

Figure 2 indicates a total annual rainfall of some 4,000 mm which is more than sufficient – perhaps excessive – for oil palm cultivation. However the distribution of the rainfall, some four months of very dry conditions and five months of very wet conditions each year, does impose limitations to maximising oil palm crop yields.

Very little information was available on temperatures and sunshine hours. Local mean monthly temperatures would not pose growth limitations at lowland levels which are considered to be the most suitable areas for oil palm establishment. However, solar radiation can have an effect on cropping but, without meaningful measurements available, it is difficult to predict what effect the very wet months of the year have on solar radiation, and thereby any adverse effects on cropping levels.

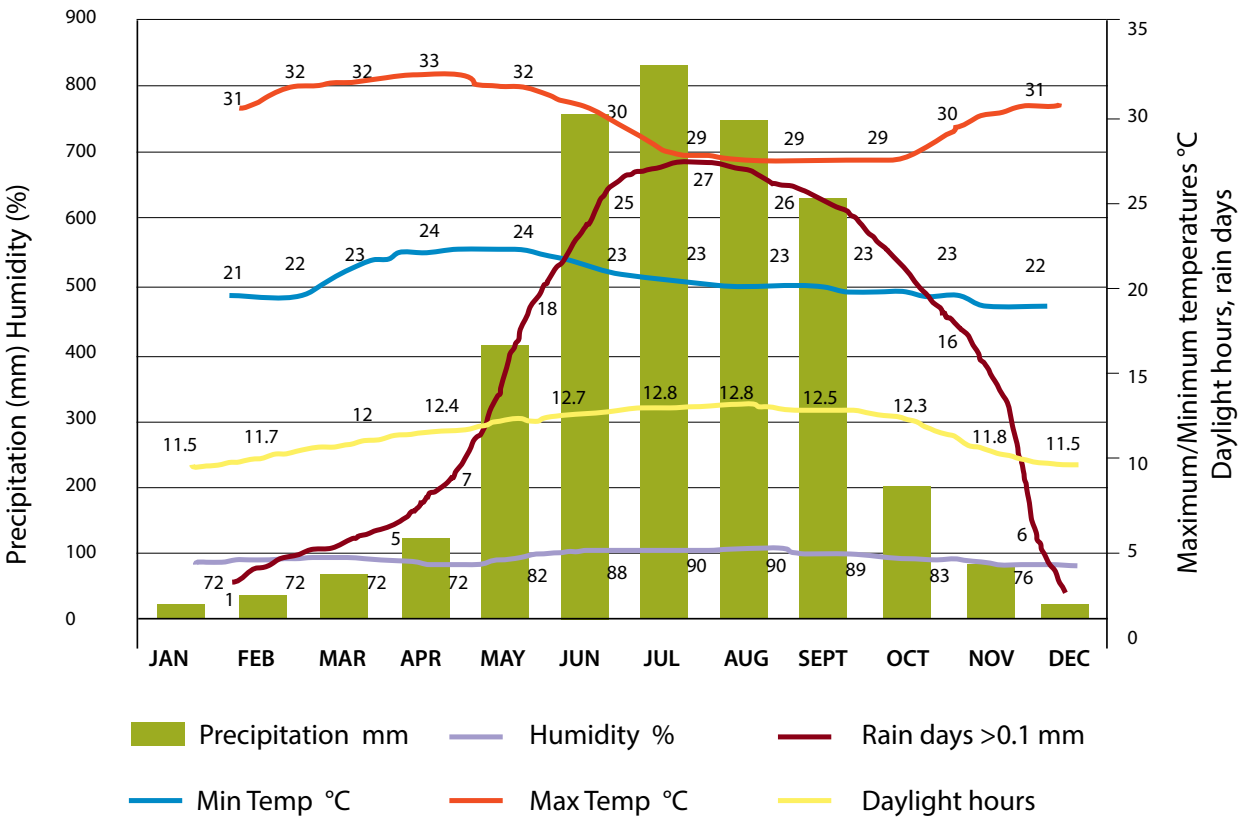


Figure 2: Meteorological data for Myeik Town.
Source: www.tanintharyi.climatemps.com (2015)

Figure 3 shows the total annual rainfall pattern, and Figure 4 the monthly rainfall distribution (highlighting the mid calendar year dry season) for Yuzana 1 Plantation, close to Kawthoung at the southern tip of the Tanintharyi peninsular. From these graphs it appears that the ideal climatic conditions specified above are met, but (as noted earlier) with the exception of the rainfall distribution of four to five very dry months each year with rainfall below 100 mm/month, and four to five extremely wet months with rainfall averaging between 4,000 mm to 5,000 mm per annum. Sunshine hours and solar radiation are not recorded at Yuzana 1, but it is suspected that they would be insufficient to meet the ideal requirements over at least the five very wet months of the year.

Figure 5 shows the comparative rainfall patterns on a five year average basis for Yuzana 1 Plantation located close to Kawthoung and South Dagon Plantation located close to Bokpyin. This indicates South Dagon receives a greater quantity of rain in the wet season, and less in the dry than at Yuzana 1.[3]

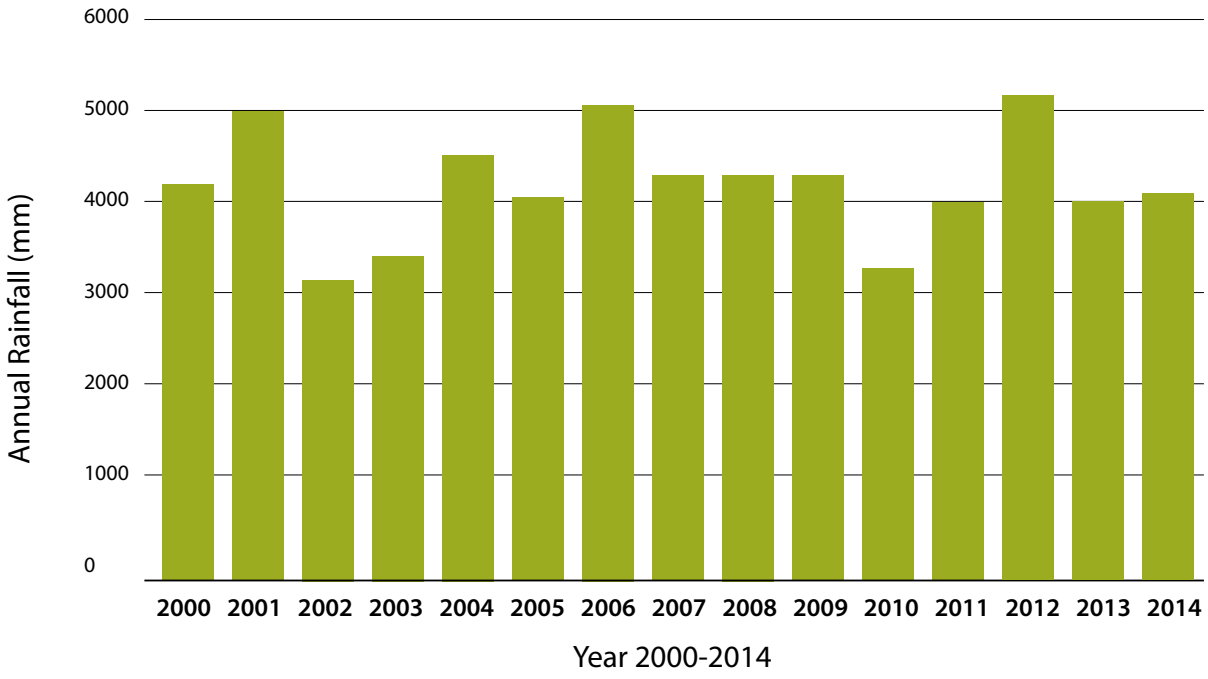


Figure 3: Yuzana 1 Plantation annual total rainfall (mm).

Source: Data from Yuzana 1, 2015

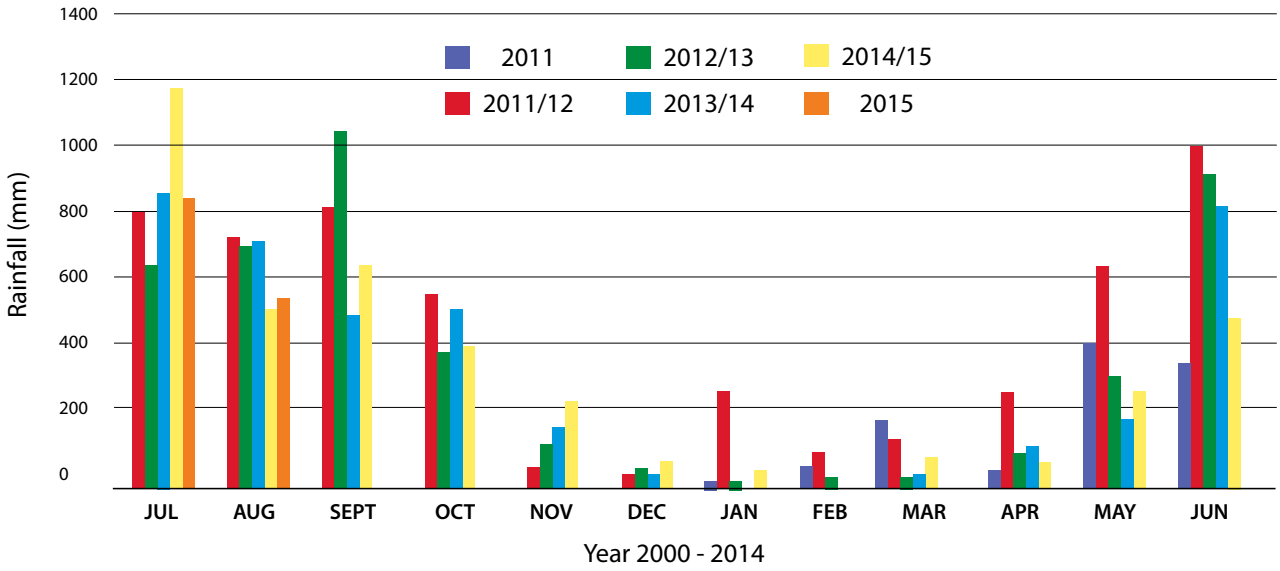


Figure 4: Yuzana 1 Plantation monthly rainfall distribution (mm).

Source: Data from Yuzana 1, 2015

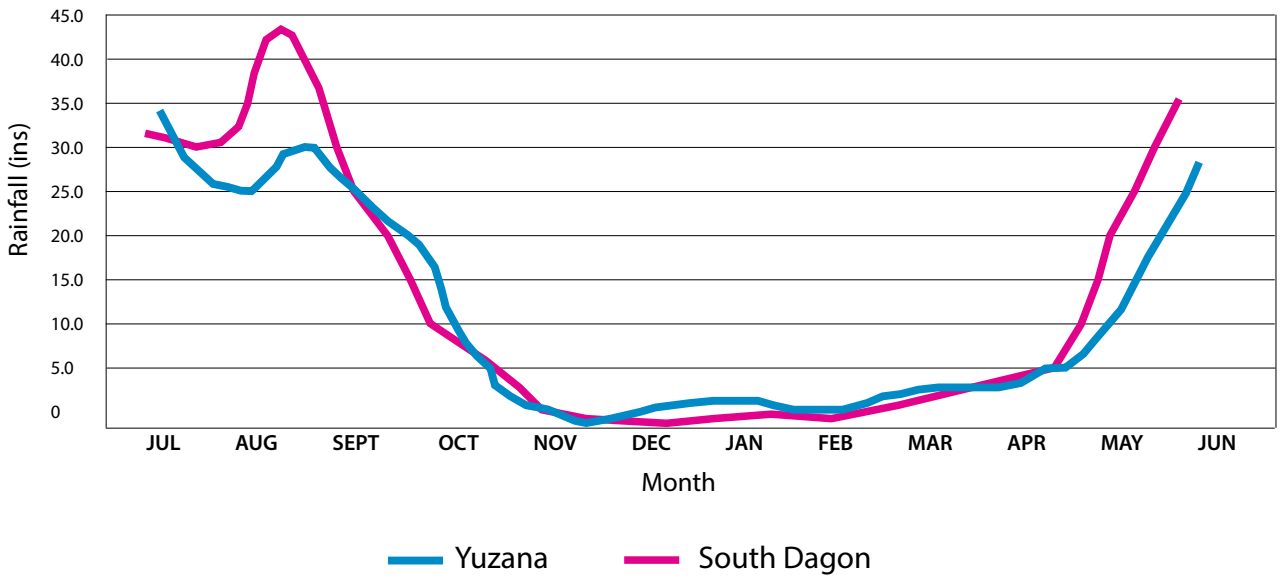


Figure 5: Yuzana 1 and South Dagon Plantations comparative average rainfall patterns over the past 5 years (2011 – 2015).

Source: Data from Yuzana 1, 2015; South Dagon, 2015.

It has been reported[21] that since 1978, weather observations show significant reductions in length of the wet season, by up to 40 days, and increased variability in its start and end dates. With escalating deforestation taking place, this is not surprising. This trend is even more reason to establish good moisture retention measures at the plantations.

[21] Saxon and Sheppard, 2014.

In addition to total quantity of rainfall, the distribution of the rainfall, the relative humidity, and the holding capacity of soil moisture are important factors that determine oil palm fruit development, cropping patterns and yields.

## 5.4 Water deficits

A confounding factor linked to rainfall water supply is water retention capacity of the soil. This can affect water deficits (WD) in the very dry months; soils with good water retention capacity will reduce, to a certain extent, the need for rainfall in the earlier dry months. Top soils of >60 cm depth will retain more moisture and allow deeper rooting of the palms. Heavy rainfall, as experienced between the months of May to October, will result in water loss due to runoff on the surface.

A simple calculation can be made of the soil moisture deficits that can be the result of annual long dry periods, usually lasting between November to April in the following year. The simplified method of calculation is to consider an evapotranspiration of 150 mm/month when there are 10 days or less rain per month, and 120 mm when there are more.[22]

Based on this method of calculation, and on the rainfall data available at Yuzana 1 Plantation, indicative water deficits could be calculated. Annual water deficits range from 565 mm experienced in 2004 to no water deficit in 2012, the mean being 333 mm deficit/year (Figure 6).

Various field studies on the effects of soil moisture stress on FFB yields indicate that a deficit of 100 mm in a single year decreases FFB yield by 8-10% in the first following year, and by 3-4% in the second year.[23] **Annual** water deficits of over 400 mm in a single year as indicated above (Figure 6) will have a very much larger depressive effect (up to 30%) on annual crop production in successive years.

Figure 7 indicates the relationship between **monthly** soil moisture deficit (in mm) and the rainfall pattern (in inches) for the past five years at Yuzana 1 Plantation. Note that the soil moisture deficit graph is deliberately enhanced against rainfall for illustrative effect.

It is clear that weather pattern in the Tanintharyi Region, with 4-5 very dry months, followed by 4-5 extremely wet months, and high annual water deficits each year, is nearing the limit for the sustainable cultivation of oil palms as an economically viable crop. Therefore all water conservation measures that can be taken to mitigate the effects of drought should be vigorously researched and implemented. Planting into sub-standard soils and steep hilly land areas is not recommended in these weather related circumstances.

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[22] Ollivier, J. 2015. Researcher in oil palm and coconut agronomy, CIRAD. Email communication with author on calculation methods. September. Pers. comm.

[23] Corley and Tinker, 2003.

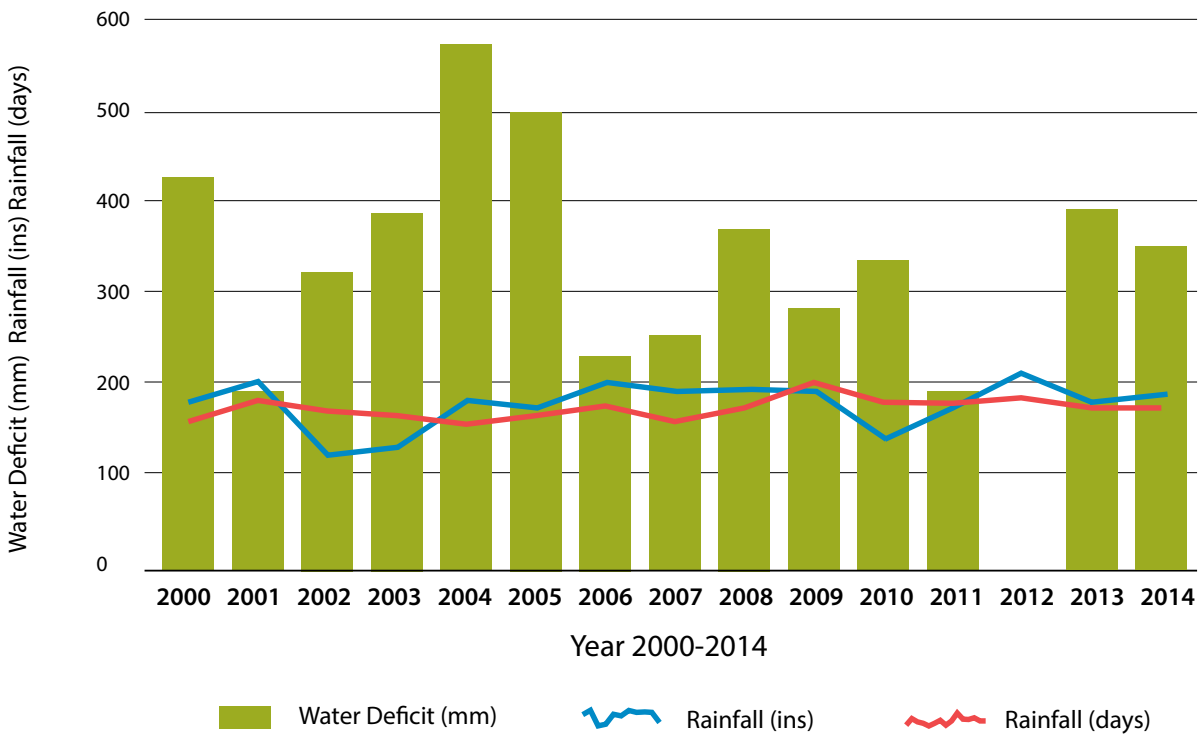



Figure 6: Yuzana 1 Plantation annual cumulative water deficits, rainfall and rainfall days.

Source: Data from Yuzana 1, 2015.

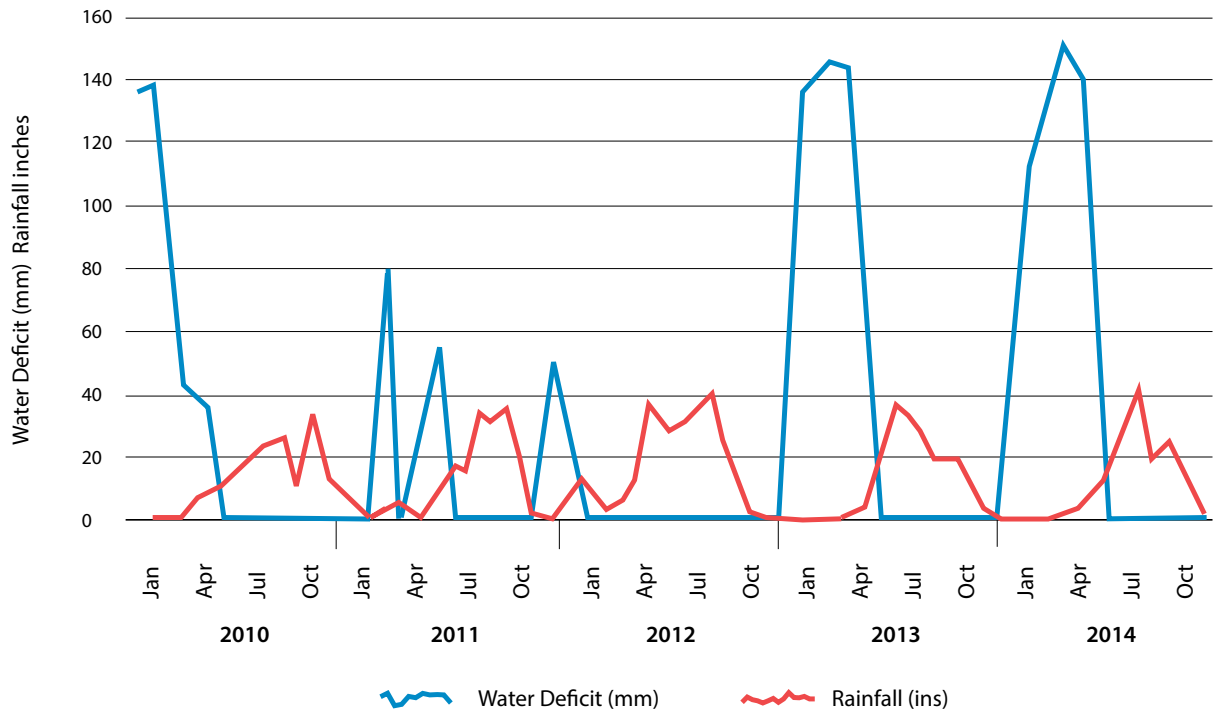



Figure 7: Yuzana 1 Plantation monthly water deficits (WD) with rainfall pattern.

Source: Data from Yuzana 1, 2015.

# 6 OIL PALM FRESH FRUIT BUNCH YIELDS AND PLANTING MATERIALS

## 6.1 Oil palm Fresh Fruit Bunch yield trends

From the visits to various company plantations in the Tanintharyi Region, and from analysis of the sparse and imprecise production data that was provided to the visitors, it would appear that:

- On one large plantation, the FFB yields/ac of older oil palm plantings (blocks field planted between 1999 and 2003) are reasonable at 9-11 tons FFB/ac/annum (22 to 26 tons FFB/ha/year) considering the pre-existing less than ideal environmental conditions for oil palm cultivation (Figure 8). On a second large plantation, yields up to 11.5 tons FFB/ac (28.5 tons FFB/ha) were harvested from palms of the same age (Figure 9), although it should be noted that these higher yields were obtained from a large area (800 - 1,000 ac) of lowland fields irrigated during dry weather months from a river and by free-flow from a waterfall.

- Later plantings, established on steeper slopes, in poorer soils, and often damaged in the developmental stages by pests, unsurprisingly indicate somewhat poorer yield potential.

- Due to the uneven rainfall patterns, and long dry periods with significant soil moisture deficits, total bunch development on the palms is also uneven through the year. This results in high and low cropping months. Over the past 4 years at one plantation during the average peak yield month, 14% - 15% of the total year's production is harvested in one month, whilst 3% - 5% of the total annual production is harvested in the lowest production month. Over the past 5 years at another plantation, during the average peak yield month, 11% - 14% of the total year's production is harvested in one month, whilst 2% - 3% of the total annual production is harvested in the lowest production month. [If production was even throughout the year 8.3% of the annual production would be harvested every month.] This situation gives rise to serious difficulties in managing labour, transport, and milling requirements.

- In order to overcome these logistical difficulties, it is recommended that the plantations undertake quarterly block by block bunch count censuses to ascertain estimated future monthly cropping potential in order to plan harvesting, extraction and milling requirements accordingly.

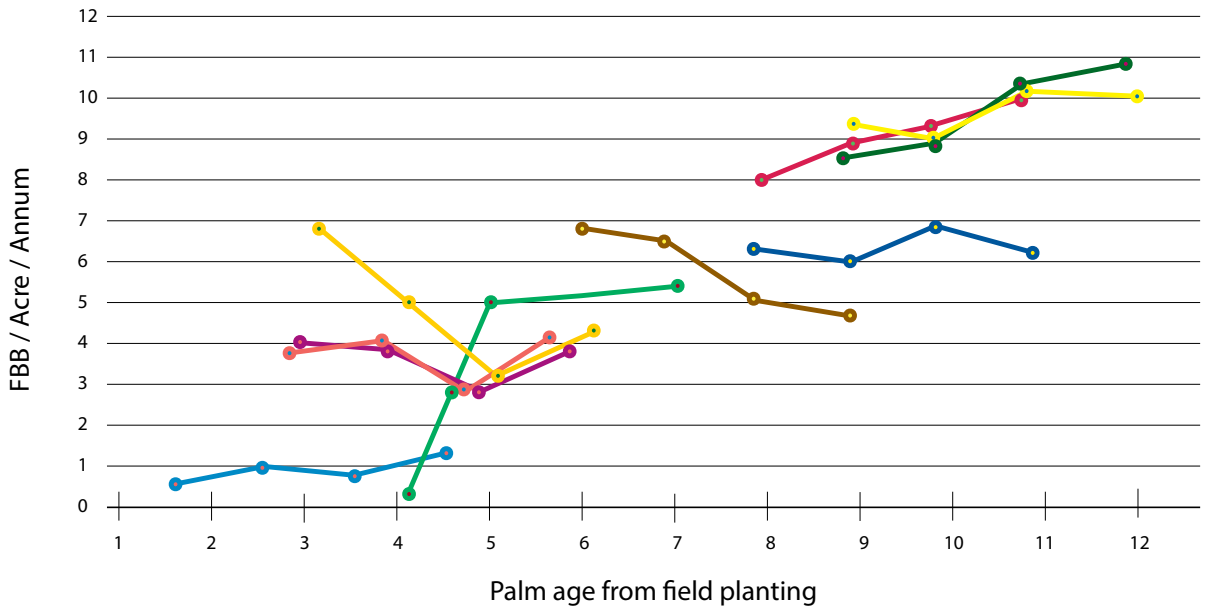



Figure 8: Yuzana 1 Plantation representation of palm yields according to mean age of different field blocks (2011-2014 period) in tons FFB/ac/year by age of palms.

Source: Data from Yuzana 1, 2015; Ollivier, 2015[25].

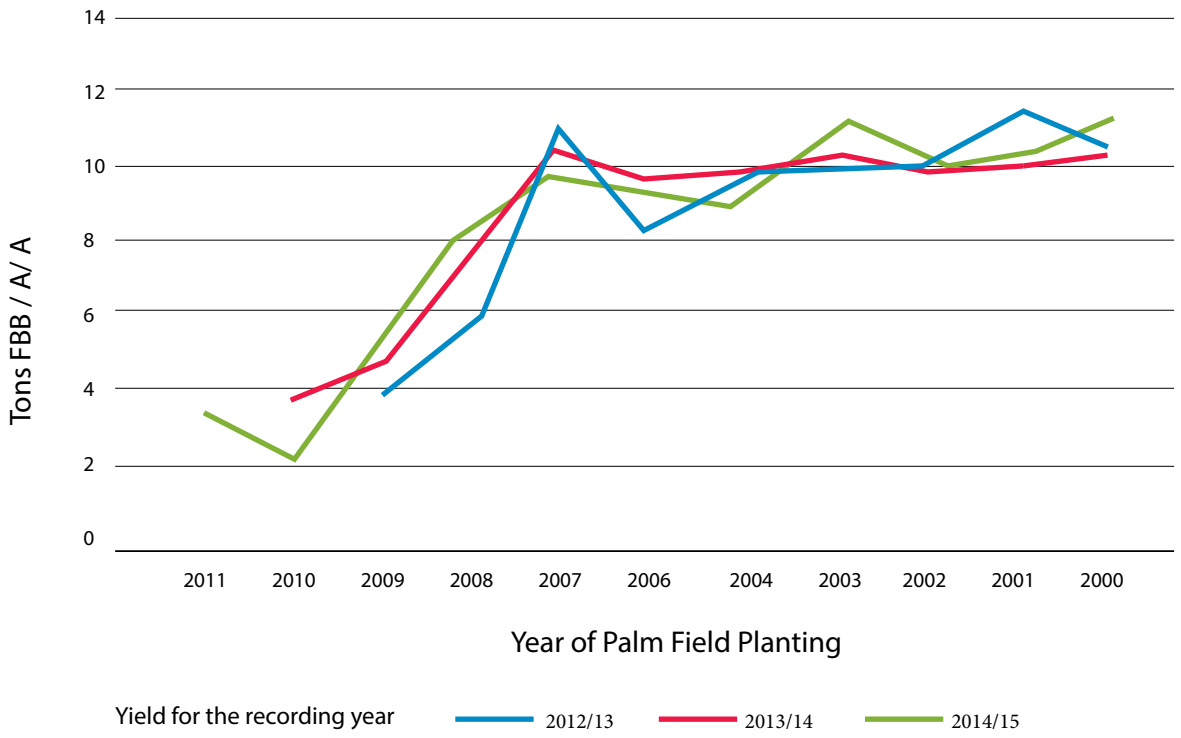



Figure 9: South Dagon Plantation yields in tons FFB/ac/year by year of planting.

Source: Data from South Dagon, 2015.

[24] Ollivier, J. 2015. Researcher in oil palm and coconut agronomy, CIRAD. Notes to author on Yuzana 1. April. Pers. comm.

At the time of the first visit to the plantations in September 2014, there was excellent crop potential and fruit set on the palms in almost all planted areas observed, likely due to the lower water deficit conditions of 2011 and 2012 during the formative stage of a resulting high female sex ratio. However, by the dry season visit in March/April 2015, it is reported and observed that the effects of the 2013 drought and extreme water deficits (on Yuzana 1 the 2013 and 2014 total annual water deficits were over 400 mm) led to a very poor sex ratio with an abundance of male flowering in all areas visited.[24] At the time of the third visit during the rainy season in August 2015, crop production was still lower than normal, and in view of the poor bunch development on the palms, it was predicted that 2015 crops would be much lower than harvested in 2014.

Overall, as could be foreseen from the environmental conditions existing in the Tanintharyi Region, oil palm yields would not be expected to match those of the more suitable growing conditions of Malaysia or Indonesia where commercial yields of up to 15 - 16 tons FFB/ac/annum (37-40 tons/ha/year) are quite common. This is due in good measure to the annual long dry period and water deficits experienced each year, but also to the lower standards of agricultural and processing management currently practiced on the plantations.

The trend to lower yields in the newer steep land areas of Yuzana plantation can already be determined from the production figures supplied (Figure 8). The heterogeneity of growth and loss of young palms observed on steep slopes and hill tops without terracing in many locations are also indicative of future low yields.

Furthermore, harvesting of the palms, especially as they grow taller, becomes exceedingly difficult, and fruit loss certain, unless paths are constructed along the contours for ease of harvester access, and unless wide platforms are built around the palm base to ensure all fruit can be collected.

Plantation yields could be considerably enhanced by implementing, where practical, irrigation during dry weather months, and improved moisture retention measures, and best management practices in plantation and mill operations.

### 6.2 Oil palm planting materials

In Myanmar, small acreages of *Deli dura* oil palm planting materials were established in trial plots from as early as the 1920s, and extended to Government estates in the 1970s. From the 1980s[26] until to date, commercial areas were mainly planted using Costa Rican *Deli* x *Pisifera* seeds. Some plantation companies have also sourced planting materials from research/oil palm breeding centres in Thailand, Malaysia, and from Papua New Guinea.

[25] Ollivier, J. 2015. Researcher in oil palm and coconut agronomy, CIRAD. Notes to author on Yuzana 1. April. Pers. comm.

A problem could exist where the majority of the planted material is sourced from one seed supplier. Although the research station concerned has access to potentially very high yielding germplasm (they have sourced their germplasm from multiple breeding stations in Africa, Malaysia, Indonesia and Papua New Guinea) their genetic improvement programs and trials are mainly centred in southern Costa Rica where annual water deficits are low and rainfall/dry weather patterns much less pronounced than in the Tanintharyi Region.

In February 2015 a visit was paid to two oil palm research and breeding stations near Krabi, southern Thailand. In this region, the rainfall pattern more closely follows that of the Tanintharyi Region, thus there is a possibility that planting materials sourced from those plant breeding stations might be better suited to the local drought conditions.

The Myanmar Government also runs an oil palm breeding programme at their Myeik Research Centre; the germplasm used has mostly been selected from old *Deli dura* stock taken from palms planted in the Region in the 1920s and 1970s. For plant breeding, technical assistance from large international research/plant breeding stations is highly recommended.

The larger plantation companies are also conducting their own comparative observation trials utilizing diverse planting materials obtained commercially from the various seed suppliers. However it is considered that it would be more advantageous for those companies to establish formal comparative planting material research trials in order to select, in the longer term, the best materials to plant under local conditions. Research trials of this nature are necessarily very long term, but if established early, useful information should be available before the next replanting cycle.

More and more, international oil palm plant breeders are focusing their programmes on the provision of genetic materials better suited to differing environments and conditions. These materials are now commercially available.

It is important that planting materials that best suit the environmental conditions of southern Myanmar are selected based on the results of formal research trials if commercial oil palm yield potentials are to be maximised.

[26] Zaw Win, 2015. Director (rtd), DICD, MoAI. Email attachment to FFI on the history of oil palm. 22 March. Pers. comm.

# 7 MAIN FACTORS CONTRIBUTING TO LOW PALM OIL YIELDS

It is quite obvious that, if annual oil palm crop yields can be enhanced from an average of say 3 tons palm oil /ha to 5 tons /ha (an increase of 50%) through better crop management, there would be a corresponding 50% reduction in the requirement for land extension to meet production targets.

There are many and varied reasons why the oil palm crop yields for the majority of plantations are lower than potential in this region. Several are due to climatic factors and steep terrain (outlined above) that can be ameliorated to a certain extent, but are otherwise beyond the control of the plantations. Other reasons fall squarely on some of the poor standards of plantation management and milling that were observed during the various visits.

## 7.1 Climatic factors

As noted earlier, very dry, low rainfall conditions over a 4-6 month continuous period can result in a severe soil moisture deficit situation which will debilitate oil palms and result in a yield decline (up to and exceeding 30%) over the subsequent three year period. Low humidity levels, strong winds during dry weather, and low sunshine hours during the wet season, can all have detrimental effects on cropping patterns. Field observations during the dry period in March/April 2015 provided visual indications of the debilitating effects of drought on palms with some petiole plasmolysis frond break on older palms, and up to 4-5 unopened frond spears in the younger plantings.[27]

The very high rainfall pattern through the five months of May to September will undoubtedly mean a reduction in the quantity of solar radiation available to the palms, and result in less than optimum growth and crop production. As accurate meteorological data for Tanintharyi Region were hard to obtain, and in order to better determine these effects, records of sunshine hours and solar radiation should in future be maintained at plantation level.

High rainfall will also affect the activities of the pollinating weevil *Elaeidobius kamerunicus* and hence the fruit set of the subsequent crop some five to six months later.

In addition, heavy rainfall disrupts the management of the plantation, especially for field and road upkeep, and for infield harvesting and fruit collection, whilst transport of the crop to the mill becomes difficult due to poor road conditions, all of which will result in crop loss.

Furthermore, the accentuated rainfall/dry season distribution within the year affects the crop production cycle, with resulting high peak/low trough production months that affect harvesting labour, transport requirements, and milling efficiencies.

[27] Ollivier, J. 2015. Researcher in oil palm and coconut agronomy, CIRAD. Notes to author on Yuzana 1. April. Pers. comm.

Figure 10: Petiole plasmolysis on older palms the result of moisture stress.
© Lyons/FFI, 2015

## 7.2 Landscape and terrain

Most of the plantations have planted a (sometimes large) percentage of hilly and steep land, some with contour terracing, and many without. It did appear that slopes in excess of 25° had been planted too. Slopes in excess of 25° should not be planted with oil palms, but left as forest or woodland cover to maintain moisture, prevent soil erosion and to improve biodiversity within the plantation.

The observed absence of planting along contour terraces in many hilly/steep land areas will certainly affect future yields. Rainwater runs off the hill slopes causing erosion of the topsoil and runoff of fertilisers and nutrients. Harvesting of palms is rendered very difficult, especially as the palms grow taller, and crop losses will certainly occur. Yields can be up to 40% lower on un-terraced slopes (mostly due to lack of moisture retention and nutrient leaching) than on flat and undulating terrain.

In order to conserve moisture and nutrients, and to ensure ease of harvesting/crop collection, it is imperative to construct functional contour terraces on slopes greater than 10°. On slopes of between 6° and 10°, platforming can be considered, but terracing is still preferred.

A lack of funding has been put forward as an excuse for planting on slopes without terraces – but this is committing the plantings to >20 years of low yields. Over the medium term, the cost of terracing will be easily recouped from higher yields and fertiliser efficiencies. Functional terraces will also be retained for future replanting cycles. There is also a need for greater attention to the protection of water sources and maintenance of riparian buffer zones along river banks. Table 3 provides recommended minimum riparian buffers for various river widths. The minimum width refers to each side of the river bank. All permanent watercourses, wetlands and water bodies should retain naturally occurring local vegetation on all banks.

The protection of water courses will aid in the retention of moisture during dry weather months.

Table 3: River width and width of riparian reserves.
Source: Barclay, 2014.

| River width (metres) | Minimum width of riparian reserve (metres) |
|---|---|
| 1-5 | 5 |
| 5-10 | 10 |
| 10-20 | 20 |
| 20-40 | 40 |
| 40-50 | 50 |
| >50 | 100 |
| All other permanent water bodies | 100 |

## 7.3 New land and extension plantings

It was frequently observed that there are some major problems involved with the land preparation for planting in, especially, forested and hilly land. In many cases the land had been logged over and denuded by burning. It would appear that little attention had been paid to any form of planning for environmental factors or the future cultivation of oil palms. In one particular case it was verbally advised that the main problem for plantation management was that logging and clearing operations were contracted out in advance, a situation over which they had no control. This ensures that future establishment of oil palms on this land would, in all likelihood, never be considered as sustainable cultivation.

In advance of land clearing, a comprehensive SEIA must be completed. Soil surveys and topographical information must be used for site planning. Primary forest and HCV

areas must be surveyed and not included within the felling operations. Steep terrain with slopes exceeding 25°, or marginal and fragile soils should also be excluded from the area to be felled or prepared for planting. Riparian buffer zones must be planned along water courses. There should be no new plantings on local people's lands without documented FPIC. Where consent is given, the local people must be duly compensated for any land acquisitions. The use of fire in the clearing operations should be avoided. Figure 11 show the use of fire to clear jungle, the lack of clear communication between companies and local people also drives panic land clearance by villagers.

Where elephants are known to exist in an area, it is essential that prior to any plantation development, efforts are made with expert input to identify elephant routes and measures should be taken to avoid where possible, and then minimise impacts on these areas. This will benefit both the business and the elephants, minimising potential for human-wildlife conflicts. For the plantation which can suffer extensive damage caused by elephant incursions, this problem is particularly expensive and difficult to address, the trenches shown in Figure 12 rarely work in practice.

Figure 11: Jungle clearing using logging and burning (top and bottom). Land is burned by villagers to stake a claim so as not to lose it to the company (top).

Figure 12: Periphery barrier trench to stop elephants adjacent to a field of palms destroyed by elephants. © Lyons/FFI, 2015.

After clearing operations have been completed, the land must be properly prepared, with roads that allow easy access to terraces for harvesting and collection of fruit, drainage, and on hill slopes contour terracing, constructed well in advance of the planting operations (Figure 13). Preferably legume cover crops (LCC) should be established to prevent soil erosion, conserve moisture, control weed growth, and for the fixation of nitrogen from the atmosphere (Figure 14). In this region, all measures that can be taken to conserve moisture through the dry months are crucial and should be included at the planning stage.

Figure 13: Land preparation with contour terracing, roads cutting contour terraces, and drains (Left), and severe soil erosion where slope was too steep (Right). © Baskett, 2015.

Figure 14: Legume or mixed cover crops established to prevent soil erosion and to conserve moisture. © Baskett, 2015.

## 7.4 Agronomic, technical and management practices

On almost all the plantations visited, the agronomic, technical and management standards and practices variously employed by the plantations fall far short of the standards required to ensure maximisation of crop production. Very visible signs of crop loss and potential loss due to poor management practices were apparent during the visits. By extension, the plantations do not meet the majority of the best management practices (BMPs) required by the RSPO P&C for the production of sustainable palm oil, or for that matter, by any other sustainability standard.

A summary of the most notable of these observed shortfalls is provided in Annex 3. It must be stressed that by no means all of these factors are present on every plantation. Some of the plantations such as South Dagon and Po Kaung are obviously better managed than the others.

The maximisation of a palm or a field's yield potential commences on the day that the seed is planted in the nursery. As a prelude to this, it is important to ensure that the best planting materials for the local environment are selected and sourced for the plantings. Nursery husbandry and a rigorous selection of the nursery seedlings is necessary to ensure that only well grown, healthy and the highest yield potential palms are planted in the field (Figures 15 -16). Rigorous culling of off-type palms is essential – field planting commits off-types to 25 years of very little production at the expense of fertilisers and upkeep costs. Planting should only take place at commencement of wet weather, not during the dry season.

A major problem reported concerning immature plantings (< 4 years from field planting) is the very large number of palms lost to pest attacks and to fire damage during the droughts. The pests involved (as reported) are rats, porcupine, pangolin, and wild boar. Elephants have caused extensive damage in new plantings and nurseries, especially at Yuzana 2 Plantation. Appropriate measures must be put in place to control these pests, with badly damaged or lost palms replaced at the earliest opportunity.

All other aspects of good palm and field husbandry, such as field upkeep and fertiliser applications must receive due attention to ensure that palms reaching maturity are well grown, healthy, and that full and even growth palm stands are well established at maturity.

Field upkeep standards and good palm husbandry are also very important in mature palm areas. Woody growths can compete with the palms for nutrients and moisture. Overgrown palm circles and harvesting paths restrict access for harvesting, and result in losses of loose fruit (fruit detached from the bunch during the ripening process). Loose fruit contain some 45% oil and the palm kernel, thus negligence in their collection will certainly result in a significant reduction in palm oil yield.

Figures 15 (Above): Well established oil palm seedling nurseries – early stages.
Figures 16 (Below): Well-maintained nursery plants with mulching (Left), very poor nursery standard (Right). © Baskett, 2014.

In situations where there are extended dry seasons, as in the Tanintharyi Region, close attention to moisture conservation is an essential component to enhancement of palm crop production. Effective moisture retention techniques such as; preventing rainwater runoff with contour terracing, platforms and silt pits, use of legumes and light grasses as ground cover, cut frond placement along hill contours, mulching with organic waste such as empty fruit bunches, protection of water courses, and efficient irrigation during dry weather wherever possible (where sufficient water supply is available to meet agricultural, environmental and social needs), must be promoted (Figures 17 and 18).

Figure 17: Irrigation from a waterfall (Left and Centre), frond placement along hill contours (Right). © Left to Right – Lyons / FFI, 2015; Ollivier, 2015; Baskett, 2014.

Figure 18: Mulching with empty fruit bunches (EFB) and good field conditions. © Baskett, 2014.

Under normal circumstances, the use of commercial fertilisers for optimum palm growth and yield is the highest cost component of oil palm cultivation. Soil sampling, foliar analysis, and visits to the fields by agronomists conversant with palm nutrient requirements are essential. The programmed timing of applications (during light rains pre- and post-wet season) and the correct placement of the fertilisers are also extremely important. Close attention to these matters is essential if costly losses on excessive usage of fertilisers, or an insufficiency of nutrients for the palms resulting in lost yield potential, are to be prevented.

Potentially large losses of fruit are also incurred if access for harvesting is restricted, or there is a shortage of harvesting labour and harvesting rounds become extended beyond 10 days (likely in the wet peak cropping months), or the workers are insufficiently trained and monitored to harvest bunches at the time of optimum ripeness, or loose fruit is not properly collected from the fields. Poor standards of road access for harvested fruit collection, with resulting delays of transport of the fruit to the mill, will also result in rotten bunches received at the mill, and very low quality, high free fatty acid (FFA) oils after processing.

It was noted that on most of the larger plantations, transport of fruit from fields to the mills was made using the company's own transport fleets. This is preferable as greater control over the harvesting cycle and fruit collection can be exerted by the companies concerned. The list of shortfalls in the quality of plantation agronomy, processing technology and management in general provided in Annex 3 is compiled based on observations made during the course of the visits to the plantations. It is reiterated that those observations do not apply across the board; Yuzana, Po Kaung and South Dagon Plantations are operating sufficiently well to produce fairly reasonable oil palm crop yields, but standards observed on the more numerous other plantations are poor to extremely poor. What the list in Annex 3 does indicate is that quite considerable palm oil yield improvements are certainly possible with better agronomic and management practices in place in the field.

## 7.5 Processing facilities and practices

Yuzana 1 and 2 Plantations have three large and modern oil mills with a total milling capacity of 165 tons FFB/hr. Two of the mills are constructed with a view to increasing capacity by a further 105 tons /hr. South Dagon has a recently upgraded oil mill of 60 tons FFB/hr. All four mills also have kernel crushing plants to produce palm kernel oil (PKO) and palm kernel cake (PKC). Currently, these four mills are reported to have surplus processing capability.

Official figures indicate that there are 11 small inefficient mills (not all in operation) (Annex 4) on various other plantations with a combined processing capacity of 48 tons FFB/hr.

The crude palm oil (CPO) extraction from FFB at the three Yuzana mills averaged 19% - 21% over the past three years, whilst at South Dagon mill the extraction rate has recently averaged between 19% and 23%. Palm kernel (PK) extraction rates were reported as between 4-5% at all those mills. These are reasonable results considering the standard of FFB delivered to the mills. PKO recovery from palm kernels at reportedly some 49% is excellent.

However, the small inefficient mills are processing fruit bunches with a considerable loss of CPO and PK during the process. The largest of these mills processed FFB with a CPO extraction rate averaging only 13% - 15% over the past four years. At some of these old mills nuts (shell containing the kernel) were discarded with loss of a valuable product. It was reported by plantation personnel that those mills continue to operate because the more efficient mills are too distant from their plantations incurring very high transport costs to offset against (what they consider) rather low prices offered for the fruit sold to them. No funding was provided to upgrade or build new processing plants. Rather than accept the losses, the logistics and price structure for delivering FFB from these plantations to the modern efficient mills should be explored further.

At the time of the first visit to the region (September 2014), oil and kernel extraction rates at the then two large mills were lower than would have been expected during the very high cropping season at that time in progress. Crop development and production during the two subsequent visits (March and August 2015) was much lower than normal and milling standards in the four large mills was much improved. These four mills now appear to operate to a reasonably high level of efficiency and cleanliness (but more attention does need to be given to health and safety standards).

### 7.6 Palm oil shipment and distribution

CPO and PKO Production from the four large mills - Yuzana 1 (2 x 60 tons FFB/hr), Yuzana 2 (1 x 45 tons FFB/hr), and South Dagon (1 x 60 tons FFB/hr) is transported from the storage tanks at the companies' mills in their own tankers to their own small ports on nearby river inlets, and shipped in their own ships to their own downstream processing facilities in Yangon. Thereby these companies keep full control of their produce from mill to factories in Yangon thus minimising losses during the distribution process.

It is not clear how the distribution of oil from the small inefficient mills is currently organised, but storage of palm oil is mostly in 45 gallon (205 litres) oil drums and depending on the length of time between shipments, FFA content of the oil will be increased significantly.

# 8 STRUCTURAL CONSTRAINTS AFFECTING YIELDS

## 8.1 Manpower

It was frequently reported that one of the most important constraints on efficient plantation operation in this region concerns the (at times acute) shortage of suitably qualified staff and workers to meet individual plantation management requirements. It appears that migrant labour sourced from the north of the country is transient, preferring to move on to neighbouring countries for higher pay and better working conditions.

Transient manpower also results in a situation where staff and workers do not receive adequate on the job training to the detriment of efficient, productive work practices. With the exception of South Dagon which provides excellent housing and social facilities and reportedly retains a stable and well trained workforce, the staff and workers housing seen at other plantations was well below normal standards. Wages are also reported to be low and variable. Only with improvements in staff and labour working and living conditions will the issue of transient manpower be resolved.

## 8.2 Adequate milling capacity

As noted earlier, Yuzana 1 and 2 have three large and modern oil mills with a total milling capacity of 165 tons FFB/hr. Two of the mills were constructed with a view to increasing capacity by addition of a further 105 tons /hr. South Dagon has a recently upgraded oil mill of 60 tons FFB/hr. Currently, these four mills are reported to have surplus milling capacity, even in the peak yield months. However, one plantation company complained at the time of the first visit that a portion of their production could not be delivered to Yuzana mills in the peak yield months due to those mills already operating to full capacity. Checking monthly mill production figures for 2014, this is unlikely to be the case, but could have been so in 2013 before Yuzana 1 line 2, and Yuzana 2 mills were commissioned.

The cropping pattern, or yield cycle, in this region is producing more acute peak yield months than normal (13% - 15% of annual production in the peak yield month) due to the long dry season each year. A reasonable forward view estimate of crop receipt potential for the next 4 month period can be gained by conducting field bunch count censuses, and mill planning for the peak yield months can be made in advance accordingly.

More information is required to determine the percentage of total annual crop that should be accounted for in the peak yield months of the region so that calculations to determine adequate milling capacity can take this peak percentage of total annual production into account. The logistics of transport from field to an efficient milling capacity should also be taken into account.

## 8.3 Funding

On a number of plantations, it was reported that funding is in short supply for operational revenue expenditure requirements, and for capital improvement works and extensions. Advice received at the Yangon office of one large plantation company was that they were seeking foreign investment in their company.

## 8.4 Research

It is obvious that government oil palm research centres are short of qualified research officers, generally under-staffed, lack the necessary facilities, and are short on funding.

The Research Centre near Myeik has established:

- Oil palm breeding and selection unit
- Soil services unit
- Plant protection unit
- Agronomy unit
- A support and administration unit

Due to the shortage of qualified staff and research facilities, this Centre appears to be only 'scratching the surface' of the oil palm growers' research requirements.
Government should be requested to provide funds to enable the Research Centre to, at the very least, set up a fully equipped (and staffed with qualified personnel) soil and leaf analysis laboratory. It is essential that fertiliser applications are planned in accordance with analyses of soil and foliar samples rather than on speculation as is currently the case at many of the plantations.

It might prove possible to source International or Government funding for such research projects or to establish some form of cess to be paid by the plantations.

# 9 SUMMARY OF THE MAIN CONSTRAINTS TO YIELD ENHANCEMENT

In summary, the main constraints to achieving improved and sustainable oil palm yields are:

- Water deficits during the dry season
- Low sunshine hours in the wet season (monthly average sunshine hours to be determined)
- Disruption to operations in the wet season
- A shortage of trained staff and labour to achieve a good standard of agricultural practice
- No local research station providing soil and leaf analysis, or advice to plantations on correct applications of fertilisers.
- Antiquated mills at some plantations and the excessive distance from field to mill for many other plantations.
- On new plantings developed from forest land there is considerable destruction of palms due to pest damage. This results in low palm stands per acre at maturity
- Poor senior management planning, and funding constraints, at a number of plantations
- Research is under-funded, and short on qualified staff and facilities
- Government programmes requiring plantation expansion into new areas that are difficult or impossible to achieve.

There are of course further constraints to achieving sustainability which do not have such a large or direct impact on yield but need consideration if production is to be considered sustainable. In Myanmar, deforestation and potential for social conflict are two major constraints.

Tanintharyi Region is home to around 2.5 million ha of largely intact Sundaic lowland forests; the largest extent remaining in the Indo-Burma Biodiversity Hotspot. The vegetation and fauna here is unique lying in a transitional zone between lowland wet evergreen forest on the Malay Peninsula and the Monsoon forests to the north. It features endemic species such as the endangered Gurney's pitta and endangered large mammals typical of Sundaic lowland forests such as tigers, elephants, tapir, and Malayan sun bear. Although most of the area features large intact forests, heavily logged-over forests and secondary forests from shifting cultivation do exist which may hold more potential for conversion to agriculture.

Figure 19 below shows the location of the main active palm oil concessions in Kawthoung and Myeik Districts and total deforestation in Tanintharyi Region since 2000 shortly after the government palm oil project began.

Deforestation from the rubber and oil palm sector (assumed to be areas > 50 ac to exclude smallholdings in analysis) is a major contributor to forest loss in Myeik (43%) and the dominant contributor in Kawthoung District (76%). Figure 20 below shows the annual oil palm and rubber driven deforestation by District. Annual deforestation rates are very high in Tanintharyi and the highest deforestation rates are in areas with many oil palm concessions. The concessions may also be displacing communities inland to forested areas.

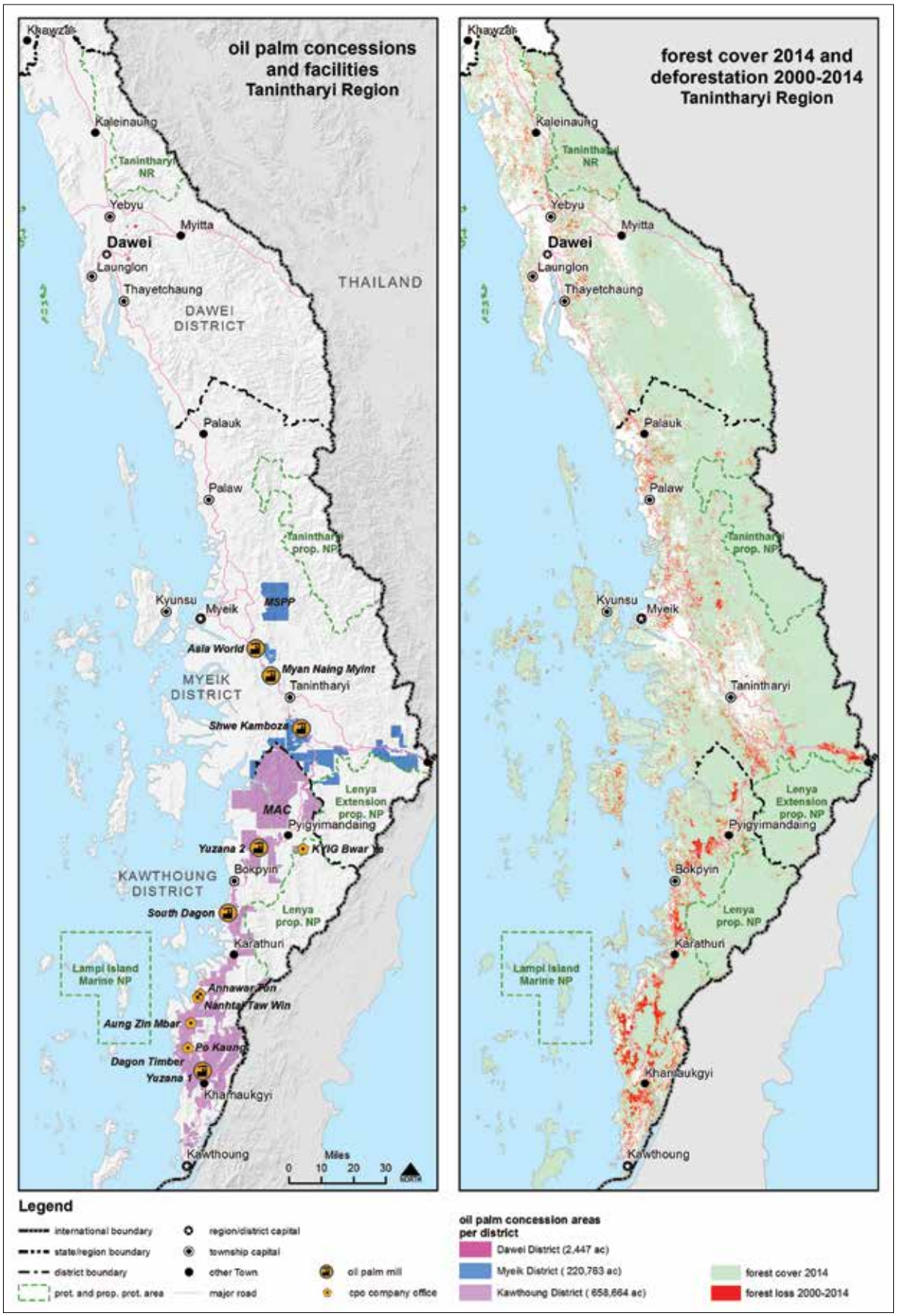
Only one-third of the plantation licenced areas have so far been developed. Worryingly, if these areas were to be developed as planned it could lead to extensive future deforestation (see Figure 21 below). Under the palm oil licence agreement whoever receives permission must fully implement land clearance according to an annual schedule within four years of the start date of the licence issue letter. If the land is not cleared accordingly, it will be taken back and a premium fee charged.[28] The annual targets drive deforestation and land is cleared even in the absence of management capacity. In practice the company can give a reason for none compliance and the land is retained by the company.[29]

Figure 19: (Overleaf) Oil palm plantations, 2014 forest cover and deforestation between 2000-2014.

Source: Oswald / FFI, 2015 based on data: Forest cover loss - Hansen/UMD/Google/USGS/NASA; roads, boundaries, towns – MIMU, 2015; oil palm facilities and concession area, rivers, RF, prot. areas – FFI, 2015.

[28] From a translation of the oil palm concession licence document in 2015.

[29] Zaw Win. 2015. Director (rtd) DICD, MoAI. Conversation with Lyons, A. relayed to author. March. Pers. comm.


oil palm concessions and facilities
Tanintharyi Region
forest cover 2014 and deforestation 2000-2014
Tanintharyi Region
Khawzah
Kaleinaung
Tanintharyi NR
Yebyu
Myitta
Dawei
Launglon
Thayetchaung
THAILAND
DAWEI DISTRICT
Palauk
Palaw
Tanintharyi prop. NP
Kyunsu
Myeik
MSPP
Asia World
Myan Naing Myint
MYEIK DISTRICT
Tanintharyi
Shwe Kamboza
MAC
Lenya Extension prop. NP
Pyigyimandaing
Yuzana 2
KYIG Bwar
Bokpyin
KAWTHOUNG DISTRICT
South Dagon
Lenya prop. NP
Karathuri
Lampi Island Marine NP
Annawar Pon
Nanhta Taw Win
Aung Zin Mbar
Po Kaung
Dagon Timber
Yuzana 1
Khamaukgyi
Kawthoung
Miles
0 10 20 30
Legend
international boundary
state/region boundary
district boundary
prot. and prop. prot. area
region/district capital
township capital
other Town
major road
oil palm mill
cpo company office
oil palm concession areas per district
Dawei District (2,447 ac)
Myeik District ( 220,783 ac)
Kawthoung District ( 658,664 ac)
forest cover 2014
forest loss 2000-2014

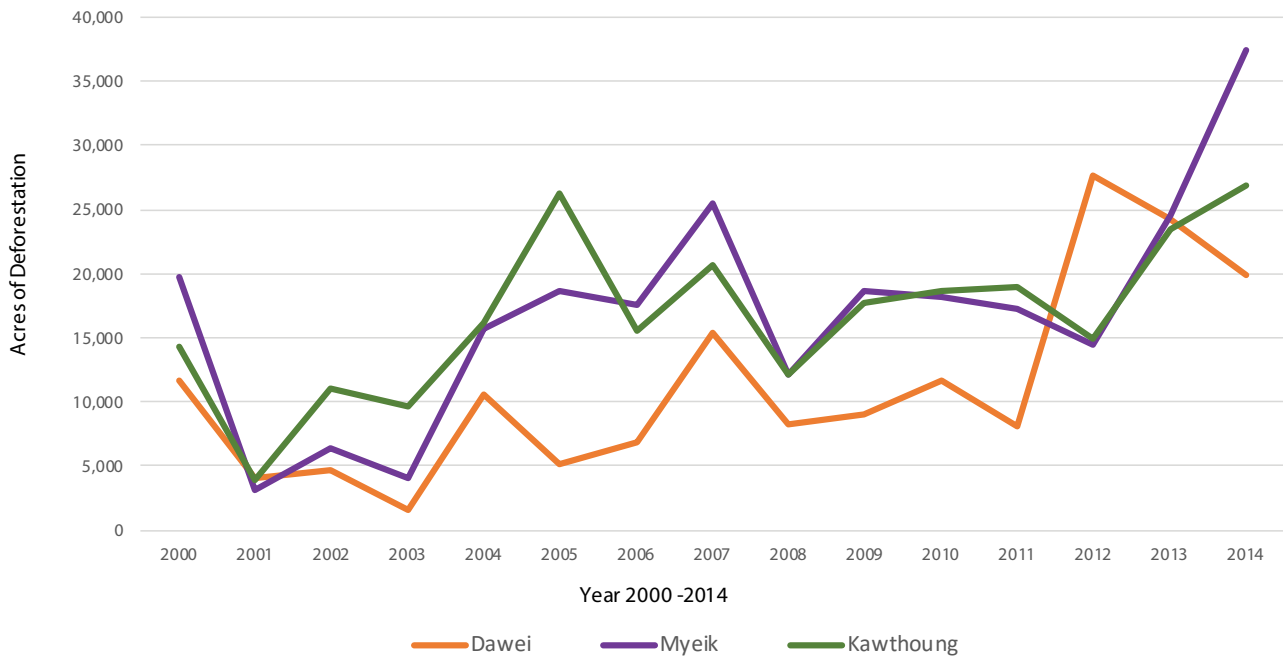



Figure 20: Annual deforestation for oil palm and rubber plantations.

Source: Oswald/FFI, 2015 based on data from Hansen/UMD/Google/USGS/NASA.

However, according to FFI,[30] the Forest Department (FD) has in 2015 cancelled inactive concessions on reserved forest land with intact forest cover using the vacant farm land law and has made significant progress on securing remaining HCV in collaboration with FFI (Myeik/ Kawthoung Districts) and Wildlife Conservation Society (Dawei District) through a recent 10 year District forest management planning process. This process has defined plantation and production forest and protection forest working cycles for reserved forest, and ensured that large contiguous remaining old growth/primary forests remain permanent production and protection forests.

The report did not look in detail at social conflict[31], however, it was expressed as an issue by a number of plantation companies. One particularly case relating to MSPP is well reported in the local media.[32, 33] Conflict is felt more in the north were there are more villages compared to the largely uninhabited south.

Figure 22 shows the proximity of settlements to plantations in the two Districts. There are 557 villages within 5 km of a plantation boundary, and 70 villages within a plantation. It is not known whether the villages have a legal, customary or user right to the land, many refugees and internally displaced people are now returning to Tanintharyi Region making a complex and dynamic situation. It is clear that tools such as FPIC are essential to help mitigate potential conflict between villages and companies.

[30] Momberg, F., 2015. Country Programme Director, FFI Myanmar. Comments for the report documented by Lyons, A. and shared with author, 11 November. Pers. comm.

[31] See Chao, 2013 for an analysis of agribusiness large-scale land acquisitions and human rights in Myanmar.

[32] S'Phan Shaung, 2014.

[33] Wa Lone, 2015.

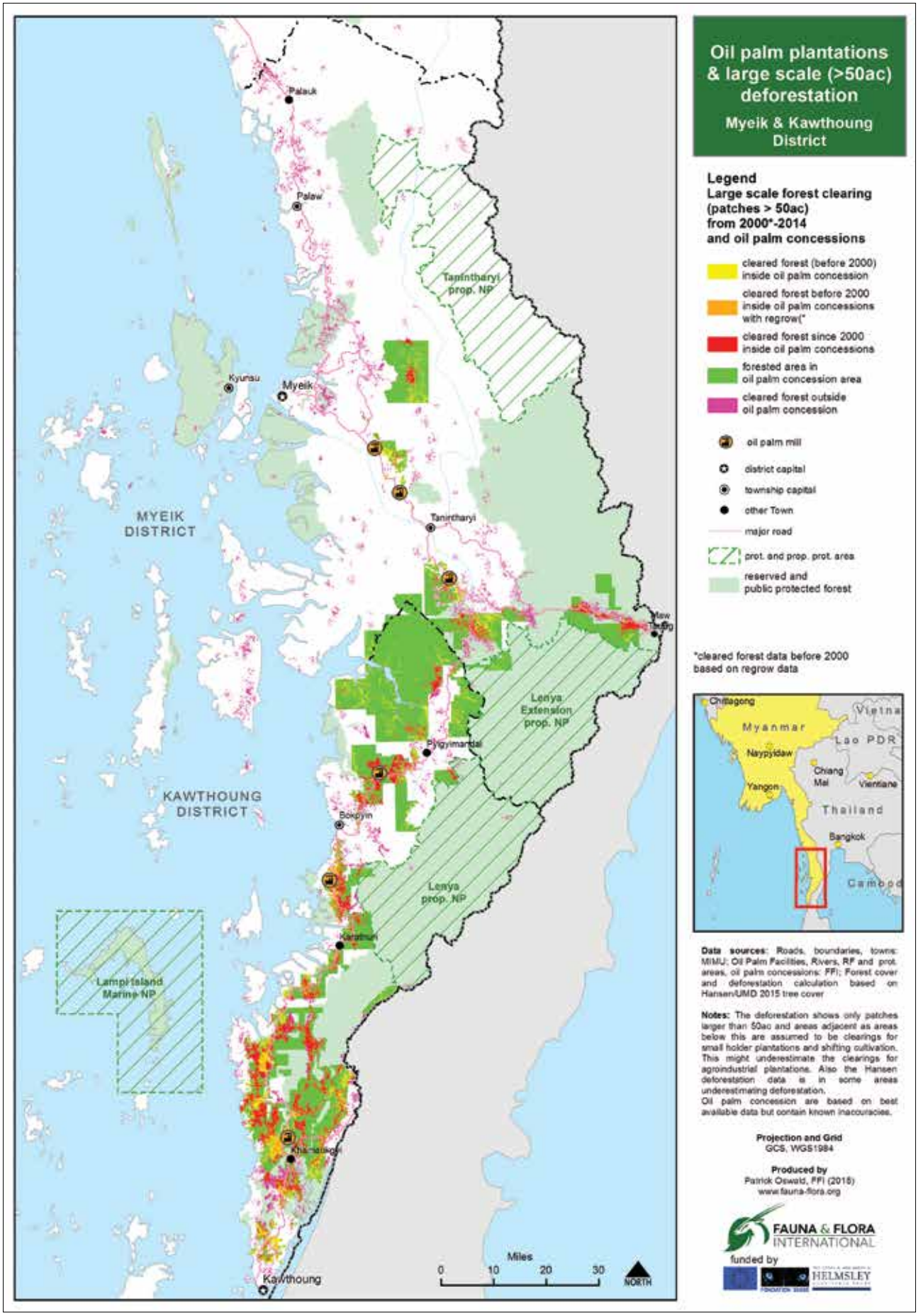



Figure 21: Oil palm plantations and large scale deforestation.

Source: Oswald/FFI, 2015.

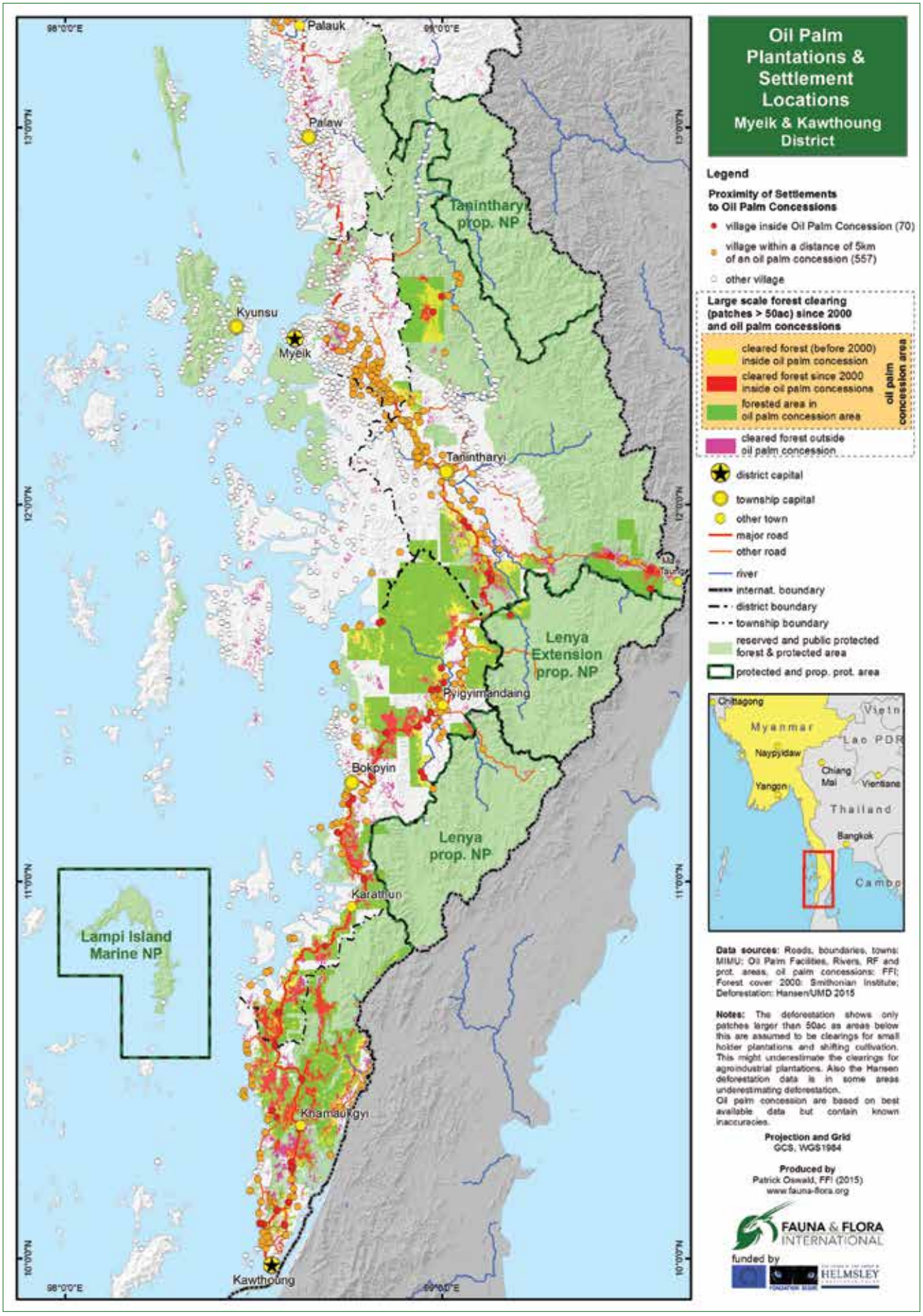



Figure 22: Oil palm plantations and settlement locations.

Source: Oswald/FFI, 2015.

View over oil palm plantation in Myanmar. © Ollivier 2015.

# 11 INTRODUCTION TO RSPO AND SUSTAINABLE PALM OIL PRODUCTION

A national level workshop was convened in June 2014 by Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI), with the support of FFI Myanmar Programme, on the topic of developing sustainable plantations in Tanintharyi Region.[34] the concept of sustainability is not well understood by the sector, therefore, an open 'learning group' was formed comprised of palm growers, and government and non-government stakeholders who wished to learn more about the RSPO and its relevance for Myanmar, and sustainability in general.

The RSPO Certification standard is internationally recognised and widely considered to be the most credible sustainability standard for palm oil.

## 11.1 Summary of RSPO Principles and Criteria

For ease of reference, a brief summary of the 2013 RSPO Principles & Criteria for the Production of Sustainable Palm Oil[35] is provided below:

P.1 **Commitment to Transparency**
Growers/ millers provide adequate information and documents that are publicly available, and commit to ethical conduct

P.2 **Compliance with Applicable Laws and Regulations**
Compliance, evidence and documented systems. Right to use land can be demonstrated. Legal or customary rights of other users are not diminished

P.3 **Commitment to Long-Term Economic & Financial Viability**
Implementation of management plans, budgets, and for replanting

P.4 **Use of Appropriate Best Practices**
Implement: Standard Operating Procedures (SOPs), practices to maintain soil fertility, control of erosion and soil degradation, quality of surface and ground water, management of pests and diseases by Integrated Pest Management (IPM) techniques, control of agrochemical usage, occupational health and safety plans, training of staff, workers and contractors

P.5 **Environmental Responsibility and Conservation of Natural Resources & Biodiversity.** Management aspects with environmental impacts are identified (EIA), and plans are made and implemented to mitigate the negative impacts demonstrating continuous improvements, status of rare, threatened or endangered (RTE) species and HCV habitats identified and conserved, waste is reduced, recycled and disposed in an environmentally /socially responsible manner, energy used efficiently, renewable energy maximised, use of

[34] Zau Lunn *et al*, 2014.
[35] RSPO, 2013.

fire for waste disposal & replanting is avoided, and plans to reduce pollution and emissions, greenhouse gases (GHGs), are developed, implemented and monitored

P.6 **Responsible Consideration of Employees, Individuals & Communities**
Including: aspects of management with social impacts identified and mitigated, open and transparent communication with affected parties, an acceptable documented system for dealing with complaints, negotiations and documentation of compensation for loss of legal or customary rights, pay and conditions always meet at least legal or industry minimum standards, employees rights to form or join trade unions, children are not employed, discrimination of any sort, sexual harassment and violence against women is prohibited, management deal fairly with smallholders and other businesses, and growers/millers contribute to local sustainable development, no forms of forced or trafficked labour used, and human rights are respected

P.7 **Responsible Development of New Plantings**
A comprehensive SEIA is undertaken prior to establishment or extension of new plantings, soil surveys and topographical information is used for site planning, new plantings since 2005 have not replaced primary forest or HCV areas, extensive planting on steep terrain, or marginal and fragile soils is avoided, no new plantings on local peoples lands without documented FPIC, local people are duly compensated for agreed land acquisitions, use of fire is avoided. New plantation developments are designed to minimise GHG emissions.

P.8 **Commitment to Continuous Improvement in Key Areas of Activity**
Growers/ millers regularly monitor and review their activities and develop/ implement action plans that allow demonstrable continuous improvement in key operations.

## 11.2 RSPO standards in Tanintharyi plantations

As a result of these visits to the plantations, it can be confidently stated that the local oil palm industry has, for the most part, a long way to go in order to meet the full RSPO P&C for the production of sustainable palm oil.

The visits to the plantations were too short to fully comprehend their individual situations vis-à-vis fulfilling any one of the eight RSPO Principles, but it is almost certain that they would all fall short of compliance with Principles three to eight.

Needless to say, in the long term, managing plantations to a much higher level of sustainability (as advocated by the example of the RSPO P&C) than at present will definitely result in higher yields/acre of palm oil, at reduced cost/ton of production, and with greater social and environmental capital accruing from those sustainable operations.

The effective introduction of those P&C, and by extension the resulting improvements to palm oil yields/acre, will require considerable changes; in the administration of the plantations and mills, in agronomic practices, in processing technologies, where applicable, on all but three of the plantations visited, and in senior level managements' understanding and perceptions of sustainable plantation operations and funding requirements.

Additionally the RSPO Compensation Mechanism required for compensating historic land clearance without a HCV assessment will cause challenges for all Myanmar oil palm plantation companies.

Given the current barriers and limited interest to RSPO by these companies, this does not mean that more sustainable plantation practices in line with those of RSPO Standards cannot be achieved – it is not all or nothing. There is a possibility that other alternatives could be considered. For example, other countries such as Indonesia and Malaysia have formulated national standards which, although not as stringent as RSPO Standards, are mandatory.

Unfortunately, if palm oil production in Myanmar is only destined for local consumption, there may be little incentive to meet any very stringent certification requirements. Working towards ISO Certifications (ISO 9001, ISO 14001, and ISO 18000) might be a useful starting point. Working to these certifications will certainly result in much improved efficiencies, lower costs, and greater sustainability measures in the production process.

# 12 PRACTICAL STEPS TOWARDS IMPROVING STANDARDS AND RECOMMENDATIONS FOR SUSTAINABLE ENHANCEMENT OF YIELDS

## 12.1 Top-level commitment to sustainable plantation practices

In order to effect change in any organisation, it is absolutely essential to obtain the owner/senior management's full understanding of, and commitment to, the changes that are being proposed, recommended or implemented. They must be able to see and assess the full benefits to the company of the changes recommended. Change can mean a greater requirement on funds now for longer term gains.

For an industry, such as the oil palm industry in Myanmar, exactly the same can be said of the Government. It is essential that Government leaders and officials fully appreciate and commit to the support of improved sustainability programmes, and to the provision of enabling conditions, such as land-use planning based on suitability for oil palm cultivation, whilst bearing in mind all social and environmental considerations. The possibility of obtaining Government agreement to only contractually allot new concessions on the basis that the plantations are established in accordance with RSPO guidelines should be explored. Also to allow conversion of rubber land in the Tanintharyi Region to oil palm cultivation in preference to destruction of forests. There is a need for consolidation of the industry, not rapid expansion.

Without the full commitment of industry leaders and government, implementation of internationally recognised sustainable practice will inevitably be considerably delayed. The need for change, and the requirements to meet the changes agreed upon, must be communicated in full to all line managers, to the staff, and to the workers so that all are fully aware and familiar with the requirements of them. Managers, staff and workers must also be made aware of the reasons for change, and the benefits that would accrue from those changes.

With full senior management understanding and support, availability of sufficient funds, improved research facilities, and sufficient well trained manpower, implementation of programmes to make significant improvements to the sustainability of the industry could be relatively rapid. Without these essential inputs, change will be a lot slower.

## 12.2 Funding

Without senior managements' full support of the need for change, the necessary funding required to effect those changes will not be forthcoming.

## 12.3 Manpower

The employment of sufficient staff and workers to complete all tasks programmed is essential. On the majority of plantations visited, much crop production is lost due to a shortage of permanent, adequately trained, staff and workers.

It is reported that there is an insufficient pool of manpower resources in the Tanintharyi Region. Therefore migrant workers are employed. To retain those workers, adequate salaries and benefits must be paid, good standards of housing with clean water supplied, and other social facilities provided. Regular on the job and formal training sessions are also essential. Extra funding to meet these requirements will be necessary on all plantations visited.

Owners/senior management must be made fully aware and understand this situation – profits are being lost due to the lack of attention to recruitment and retention of adequate labour on their plantations.

## 12.4 Research

There is an assessed requirement for greater technical expertise and funding for oil palm selection and breeding, and for agronomic research and extension services for the industry. Selection of the best oil palm varieties and sources of planting materials to meet the needs of this region's environmental conditions, and breeding for improved varieties locally, will certainly enhance yields in the long run. Improvements in agronomic extension services will result in fertiliser applications more attuned to actual palm requirements.

It is recommended that initially an international oil palm research organisation visit and make recommendations on how this could be achieved and funded.

## 12.5 Agronomic improvements

The observed shortfalls in agronomic conditions in the plantations are more than likely due to a shortage of manpower and to poor management planning rather than to ignorance of basic agronomic principles.

However, further visits to the region by experienced plantation advisors are considered necessary to assess exactly the requirements to enhance yields sustainably on an individual plantation basis.

## 12.6 Processing improvements

Apart from the four large palm oil mills on Yuzana and South Dagon plantations, all the other small oil mills operating on other plantations are woefully outdated and inefficient. Even at Yuzana and South Dagon (unless there is an unrecognised environmental impediment involved) the stated extraction of oil and kernel rates are considered low for the standard of fruit set and ripeness observed.

A major commitment to injections of capital for building new mills and mill extensions, and funding for upgrade of machinery, will be required by some companies if enhanced yields and profitability of their operations are to be sustainably achieved.

# 13 CONCLUSIONS

The principal specific observations and recommendations resulting from the visit can be summarised as follows:

- The Tanintharyi Region is assessed to be suitable for oil palm cultivation despite the extended annual dry season and large quantity of rainfall in the wet season. However, low solar radiation in wet months may be a limiting factor on yields.
- It is essential that there is senior management and governmental understanding of, and commitment to, the establishment and continuous improvements in sustainable business practices at plantation level.
- There is a shortage of suitably qualified staff, and of workers. Employment conditions, facilities, and social aspects must be improved to attract migrant workers and to ensure permanent workers are retained.
- It is assessed that oil palm yields could be considerably enhanced with the input of improved management, agronomic, and processing techniques, and with adequate manpower and funding.
- There is a requirement for a programmed increase in capacity of new, well equipped oil mills, with a view to reducing suppliers' road transport distances from field to mill, cutting out the use of inefficient old small mills and to fulfil capacity requirements during peak yield months. This programme will require specific funding arrangements.
- There is an urgent requirement for upgrading and extending oil palm Research and Extension Services in the region.
- For oil palm planting extensions, there is a need for improved Land use Planning, and effective SEIA, and HCV Assessments.
- It is strongly recommended that technical experts who have considerable experience working in the different fields covered by this report are brought in to provide greater technical assistance and to ensure that action is well directed. A dedicated working group could be set up for the purpose.
- There is quite some way to go in order to achieve RSPO Certification requirements by most plantations. However, the provision of advice on how meeting the requirements of the RSPO P&C for Sustainable Palm Oil Production can be achieved will help the oil palm industry in the Tanintharyi region, to not only increase the average yields and the total CPO production of the region, but will also help this to be achieved with operations that are far more sustainable than at present.
- Implementation of enhanced sustainability aspects in the plantations will not only improve efficiency of operations, reduce operating costs, increase yields and augment profitability, but will also enhance public and stakeholder perceptions of the industry, not only in Myanmar, but also internationally.

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# ANNEX 1: OBJECTIVES OF THE VISITS AND LOCATIONS VISITED

The objectives of this report are to provide:

- An update on the current status of the palm oil sector in Myanmar in relation to relevant sustainable practices

- Recommendations for improvements in sustainability practices relevant to plantation managers and decision-makers (government and companies)
  Three visits were made by road to a number of oil palm plantations and District Government Offices, the first in September 2014, the second in March/April 2015 and the last in August 2015.

The objectives of the site visits were to assess the general situation vis-à-vis plantation productivity and yield, and to assess current plantation management practices in relation to the introduction of improved sustainability procedures. The objective was also to raise awareness of sustainable plantation practices at plantation management level.

The following oil palm plantations were visited:

- Yuzana 1 and 2 Plantations and Oil Mills
- Dagon Timber Plantation
- Po Kaung Plantation
- Aung Zin Mar Plantation
- South Dagon Plantation and Oil Mill
- Annawar Tun Plantation
- Myanmar Auto Corporation Plantation
- Shwe Kamboza Plantation
- Myan Naing Myint Plantation
- Asia World Plantation and Mill
- Government Oil Palm Research Centre

Three Government Township Offices were also visited:

- Kawthoung District Office of Department of Industrial Crops Development
- Tanintharyi Township Office of Industrial Crops Development
- Myeik District Office of Industrial Crops Development

# ANNEX 2: TANINTHARYI OIL PALM PLANTATION AREA STATEMENT 2015

| | Company | Allocated acre | Allocated hectare | Planted acre | Planted hectare | % Planted |
|---|---|---|---|---|---|---|
| **A** | **Myeik District** | **233,695** | **94,573** | **46,260** | **18,721** | **20** |
| 1 | Vantage | 1,920 | 777 | 1,120 | 453 | 58 |
| 2 | Asia World | 10,200 | 4,128 | 10,200 | 4,128 | 100 |
| 3 | Myan Naing Myint | 2,308 | 934 | 2,308 | 934 | 100 |
| 4 | Shwe Kamboza | 39,314 | 15,910 | 8,705 | 3,523 | 22 |
| 5 | Tet Nay | 1,500 | 607 | 1,413 | 572 | 94 |
| 6 | CKB | 2,000 | 809 | 1,876 | 759 | 94 |
| 7 | Pyet Phyo Tun | 31,895 | 12,907 | 10,485 | 4,243 | 33 |
| 8 | Shwe Than Lwin | 1,463 | 592 | 1,438 | 582 | 98 |
| 9 | Mg Weik | 1,020 | 413 | 1,020 | 413 | 100 |
| 1 0 | Htoo Trading | 30,000 | 12,141 | 2,075 | 840 | 7 |
| 11 | Myanmar Avea | 775 | 314 | 775 | 314 | 100 |
| 12 | Thein Khong Development | 500 | 202 | 405 | 164 | 80 |
| 13 | Sein Lann Htar Nay | 5,400 | 2,185 | 290 | 117 | 5 |
| 14 | MSPP | 42,200 | 17,078 | 2,020 | 817 | 4 |
| 15 | Southern Golden Rays | 7,200 | 2,914 | 680 | 275 | 9 |
| 16 | Advance Seafood | 17,000 | 6,880 | 1,150 | 465 | 7 |
| 17 | Sein Pyete Hlain Aung | 10,000 | 4,047 | - | - | - |
| 18 | Dawei Co. Ltd. | 20,000 | 8,094 | 300 | 121 | 2 |
| 19 | Royal Golden Pearl | 9,000 | 3,642 | - | - | - |
| **B** | **Dawei District** | **17,777** | **7,194** | **17,001** | **6,880** | **96** |
| 1 | Steel Stone | 3,000 | 1,214 | 2,247 | 909 | 75 |
| 2 | Annawa Soe Moe | 6,000 | 2,428 | 6,000 | 2,428 | 100 |
| 3 | Shew Padon Ma | 1,200 | 486 | 213 | 86 | 18 |
| 4 | MEC | 6,539 | 2,646 | 6,539 | 2,646 | 100 |
| 5 | Po Kaung | 1,038 | 420 | 2,002 | 810 | 100 |
| **C** | **Kawthoung District** | **741,430** | **300,046** | **283,296** | **114,646** | **38** |
| 1 | Po Kaung | 27,550 | 11,149 | 21,807 | 8,825 | 79 |
| 2 | Yuzana | 283,094 | 114,564 | 191,348 | 77,436 | 68 |
| 3 | Annawar Tun | 32,455 | 13,134 | 23,127 | 9,359 | 71 |
| 4 | Shwe Myei Yadana | 25,000 | 10,117 | 8,100 | 3,278 | 32 |
| 5 | Dagon Timber | 18,601 | 7,528 | 14,378 | 5,819 | 77 |
| 6 | Golden Oil Palm | 4,535 | 1,835 | 1,035 | 419 | 23 |
| 7 | Super One | 750 | 304 | 750 | 304 | 100 |
| 8 | South Dagon | 13,245 | 5,360 | 11,763 | 4,760 | 89 |
| 9 | Aung Zin Mar | 10,000 | 4,047 | 5,690 | 2,303 | 57 |
| 10 | Aung Yee Phyo | 200 | 81 | 200 | 81 | 100 |

| | Company | Allocated acre | Allocated hectare | Planted acre | Planted hectare | % Planted |
|---|---|---|---|---|---|---|
| | | | | | | |
| 11 | Arm Strong | 1,500 | 607 | 375 | 152 | 25 |
| 12 | Shwe Ahone | 49,600 | 20,072 | 400 | 162 | 1 |
| 13 | Myanmar Naing | 70,000 | 28,328 | - | - | - |
| 14 | Coastal Development | 2,000 | 809 | 1,657 | 671 | 83 |
| 15 | RGP | 1,000 | 405 | 150 | 61 | 15 |
| 16 | MRPP | 30,000 | 12,141 | 593 | 240 | 2 |
| 17 | Myanmar Awba | 18,500 | 7,487 | - | - | - |
| 18 | Southern Golden Rays | 12,800 | 5,180 | - | - | - |
| 19 | Auto Electric Group | 133,600 | 54,066 | 1,923 | 778 | 1 |
| 20 | Ever Green | 7,000 | 2 ,833 | - | - | - |
| | **Total** | **992,902** | **401,814** | **346,557** | **140,247** | **35** |

Source: Data from DICD,2015. Note: spellings of companies are as given.

# ANNEX 3: PRACTICES THAT MAY BE CONTRIBUTING TO LOW YIELDS

This list is compiled based on observations made during the visits to plantations in the Tanintharyi Region. The list is not all inclusive, and the individual observations certainly do not apply to all plantations. However, it must be pointed out that shortfalls in any one of these operational areas will have lowering effects (some greater than others) on the subsequent crop yields of the palms.

- Poor standards of field upkeep

  - Competition for nutrients and moisture by woody growths (Figure 23).
  - Crop collection, especially for loose fruit, is affected due to inattention to palm circle upkeep (Figure 24).

Figure 23: Competition for nutrients and moisture (Left), optimum conditions (Right).[36]

Figure 24: Unkempt palm circles (Left) results in crop loss; germinated uncollected loose fruit (Right).

[36] All photos in Annex 3 © Baskett, 2014 unless shown otherwise.

Figure 25: Un-terraced steep slopes loose moisture, topsoil and fertilisers to rainfall runoff. Stunted growth of palms on the hilltop is evident (Left). © Ollivier, 2015 (Left).

- Lack of moisture retention measures

  ‡ Terracing and platforms not constructed on hill slopes (Figure 25).
  ‡ Cut fronds are often placed facing up the slopes. To conserve moisture they should be placed along the hill contours.

- Palm fertilisation

  ‡ Some financial constraints are resulting in withheld or reduced fertiliser applications
  ‡ Randomised and excessive applications without reference to soil or leaf sampling
  ‡ Fertiliser application timing and placement - if not correct can result in expensive loss of fertiliser in addition to depressed yields

- Pest damage (Figure 26)

  ‡ Severe pest damage in immature new plantings will result in future crop losses due to:
    * Very low palm stands per acre in young fields
    * Little attention to resupplying to maintain full palm stands at maturity
    * Uneven stands and poor palm growth will depress yields
    * And total decimation of plantings in some situations requiring replanting of the whole field

  ‡ Pests identified as responsible for damage to young oil palms are:
    * Rats, pangolin, porcupine, wild boar and elephant

Figure 26: Palm stand severely damaged by pests (Left), and totally decimated (Right). © Ollivier, 2015 (Left).

- Poor standards of harvesting and pruning
  - ‡ Labour and supervision constraints result in poor ripeness standards and missed fruit bunches
  - ‡ Restricted field access in observed areas results in unharvested palms

- Poor standards of loose fruit collection (see Fig. 24 above)
  - ‡ Labour and supervision constraints result in significant losses in uncollected loose fruit which contain 45% palm oil, and the kernel
  - ‡ Absence of circle weeding – grassy palm circles also result in missed loose fruit

- Poor standards of road access for harvested fruit collection and transport to the mill result in rotten bunches and high FFA oils after processing

- Processing: Lower than normal CPO and PK extraction rates from FFB noted as achieved throughout the Region's mills are resulting in significantly lower yields of CPO and PK per acre than the expected potential, judging by the generally good fruit set observed. Reasons for this are:

  - ‡ A very variable quality of FFB is received at the Mills (Figure 27)
  - ‡ A noticeably low percentage of loose fruit was received at the Mill than should be expected from the ripeness standards
  - ‡ Reports indicate an insufficient milling capacity in the region during peak yield months resulting in crop loss
  - ‡ Apart from the mills at Yuzana and South Dagon, the other small mills utilise outdated and inefficient extraction technologies resulting in high oil and kernel losses (Figures 28 and 29)

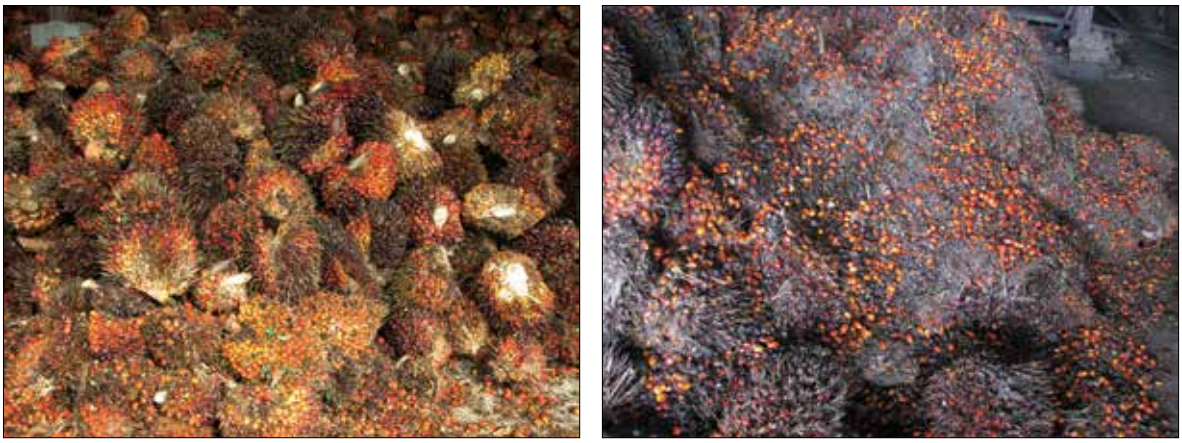

Figure 27: Very reasonable quality of FFB delivered to a mill (Left), over-ripe and rotten bunches delivered to an older mill (Right).

Figure 28: Two small and inefficient mills with old technology. © Lyons/FFI, 2015 (Left).

Figure 29: Two large modern mills.

- ‡ The very long distances some FFB has to be transported to a mill result in uncollected crop
- ‡ Poor quality control, cleanliness and safety measures in the mills
- ‡ Losses due to high FFAs and in sludge oil.

- Structural constraints:

  - ‡ Labour is reported to be transient and in short supply
  - ‡ Labour wages are variable and probably too low to compete with neighbouring countries to attract workers to remain on the local plantations

- Staff and labour training is essential to ensure improved plantation management systems are implemented

  - ‡ Staff and worker's housing and social standards appear very poor (with the exception of South Dagon and Po Kaung). (Figures 30-33)

Figure 30 (Above): Poor standard of worker accommodation.

Figure 31 (Below): Reasonable standard of worker accommodation.

Figure 32 (Above): Good standard of worker accommodation.

Figure 33 (Below): CSR projects; two schools built by plantation companies. Teachers are supported by the plantations concerned.

- It was reported that funding is in short supply for capital and revenue expenditure on a number of plantations
- Some plantations are still recovering from previous access problems due to insurgency in some areas

This list indicates the poor quality of plantation agronomy, processing technology and management in general. It does not indicate that some of the plantations do not operate sufficiently well to produce reasonable oil palm yields. However, what the list does indicate is that quite considerable yield improvements are certainly possible provided better agronomic, and management practices were put in place in the field and technological and management practice improvements were made to the processing of the fruit into CPO and PK in the mills.

# ANNEX 4: OIL PALM MILLS OPERATING IN TANINTHARYI REGION

| 1 | Company | Owner | Quantity | Capacity (tons FFB/Hr) | Condition |
|---|---|---|---|---|---|
| 1 | Yuzana | U Htay Myint | 1 | 60 | Operational |
| 2 | Yuzana | U Htay Myint | 1 | 60 | Operational |
| 3 | South Dagon | U Aung Htwe | 1 | 60 | Operational |
| 4 | MEC | Army | 1 | 10 | Operational |
| 5 | Golden Palm Oil | Dr Ko Ko Htwe | 1 | 5 | Operational |
| 6 | Ministry of Industry | Ministry of Industry | 1 | 5 | Operational |
| 7 | Shwe Kamboza | U Htay Aung Kyaw | 1 | 3.5 | Operational |
| 8 | Asia World | U Tun Mying Naing | 1 | 3 | Operational |
| 9 | Shwe Pandonma | Daw Yee Yee Win | 1 | 3 | Operational |
| 10 | Myan Naing Myint | U Maung Maung Myint | 1 | 1 | Operational |
| 11 | Ministry of Industry | Ministry of Industry | 1 | 7 | Closed |
| 12 | Aung Zin Mar | Daw Hla Kyi | 1 | 3 | Closed |
| 13 | Ministry of Industry | Ministry of Industry | 1 | 3 | Closed |
| 14 | Annawa Soe Moe | U King Sein | 1 | 2.5 | Closed |

Source: DICD, 2015.

Note: The information was provided by DICD in 2015 but may not be up to date. From observation and discussion with the companies, Yuzana 1 and Yuzana 2 Plantations have three mills with a total milling capacity of 165 tons FFB/hr. Two of the mills are constructed with a view to increasing capacity by a further 105 tons FFB/hr. The table is primarily presented to show the number of small operations.

# ABOUT THE AUTHOR

Patrick Baskett is an independent plantation management advisor, employed by FFI to assess constraints and opportunities for the introduction of sustainable palm oil principles in existing plantations in southern Myanmar. He has over 45 years of experience in the plantations industry, including managing plantations in Malaysia and 20 years as Managing Director of four major plantation companies in Papua New Guinea and Indonesia. He has also had oversight of four of the most important Oil Palm Research Stations in the region. Latterly Patrick Baskett was a reviewer on the RSPO Audit Review Panel.

# ABOUT FAUNA & FLORA INTERNATIONAL

Fauna & Flora International protects threatened species and ecosystems worldwide, choosing solutions that are sustainable, based on sound science and take account of human needs. Operating in more than 40 countries worldwide – mainly in the developing world – FFI saves species from extinction and habitats from destruction, while improving the livelihoods of local people. Founded in 1903, FFI is the world's longest established international conservation body and a registered charity.

Since 2007 FFI has been an active member of the RSPO, an international multi-stakeholder organisation and certification scheme. RSPO members come from along the whole supply chain, and are committed to transforming the market to make environmentally, socially and economically sustainable palm oil the norm.

FFI has implemented projects in Indonesia, Malaysia and Liberia focused on identifying and managing important environmental and social values within production landscapes, supporting government and companies on a path to sustainable palm oil through better management, policy development and land use planning, and through facilitating dialogue between stakeholders.

In Myanmar, Tanintharyi Region is the focus of Myanmar's palm oil industry. The Region has 2.5 million ha of largely intact unique Sundaic lowland forest. FFI's Myanmar Programme established the Tanintharyi Conservation Programme in 2014. An initiative implemented in collaboration with the Myanmar Forest Department and a number of local, national and international collaborators and stakeholders. FFI Myanmar operates the programme under a MoU with the Forest Department specifically for conservation of marine and terrestrial biodiversity and sustainable development in Tanintharyi Region. As part of this landscape-level programme, FFI is motivated to work with the palm oil sector and government to ensure the sector expansion does not adversely impact these biodiversity rich areas and development is planned to take place in degraded areas with more potential for conversion to agriculture.

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