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Proposed visit to Grupo Palmas

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1. PROPOSAL

The GRUPO PALMAS have requested assistance from Tropical Crop Consultants to identify ways by which oil extraction rates can be improved in the company's estates and to identify the underlying causes of sub-optimal extraction rates.

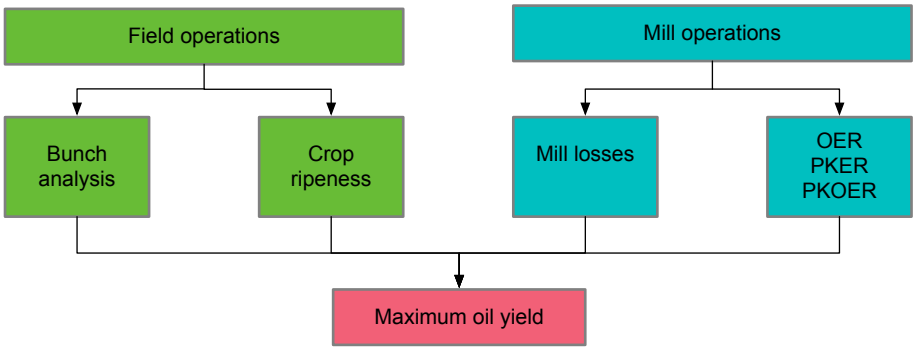

Figure 1. *Data from the field and mill should be brought together to determine where there are opportunities for further improvement.*

Sub-optimal oil extraction rates can have many causes and sometimes there are many interventions that can be made that will lead to improvements. High extraction rates are always due to optimizing every stage from planting material selection to field upkeep, harvesting standards and mill operations.

We have therefore outlined a plan to investigate all aspects in order to identify areas where improvements can be made. It will also be possible to partition the impact of improvements in terms of the effect on oil extractions rates.

Perhaps the most pragmatic approach is to arrange an initial one week visit to visit one site in detail and set up activities that can be replicated at other locations? Alternatively, all sites can be visited but this obviously requires more manpower from TCCL. See Table 1.

Some activities can be started prior to a visit so that more data is available when we visitn the plantations and mills.

As with all our clients, we find that one-off visits do not often achieve significant impact. Instead, we prefer to work on six monthly visits to monitor implementation of proposed activities and make necessary adjustments to the programme.

In between visits, we keep in touch with our clients by a WhatsApp Group and by Teams calls every month or as required.

Large plantation datasets are unwieldy and difficult to analyse in a spreadsheets. It makes sense to organize data in a database structure. We strongly advocate for the use of the OMP software, supplied by AgriSoft Systems with whom we collaborate closely on data analytics.

Table 1. *Grupo Palmas fruit production, milling capacity and days required for thorough analysis (based on data obtained from the internet).*

Plantation	Grupo Palmas					TCCL visit			
	Fruit bunches			Area	Mills	Plantation	3rd party	Mill	Total
	Own	3rd party	Total		Capacity				
	,000 tonnes			,000 ha	tph	days			
Palmawasi	256	45	301	12.8	66	3	1	1	5
Nuevo Horizonte	18	66	85	0.92	18	1	1	1	3
Shanusi	274	23	297	13.68	65	3	1	1	5
Tulumayo	0	59	59	0	13	-	1	1	2
Grupo Palmas	548	192	741	27.47	162	7	4	4	15

2. ACTIVITIES

We have listed all the activities required to determine possible causes of under performance in terms of oil extraction rate (Table 2). The client should decide how many of the activities will be required and at how many locations.

Table 2. *List of activities, sub-activities for a thorough investigation of oil extraction rates.*

#	Activity	Sub-activity*	Details
1	Data analysis	Analysis of current yields and OER, site yield potential (SYP), maximum economic yield (MEY), potential OER, actual OER.	SYP based on: • factorial fertilizer trial data; • published data on yield potential; • seed producer's trial data for planting material; and • climatic data: rainfall, solar radiation. MEY based on: • estate yield records for well-maintained plantings (noting differences in soil type, planting material, terrain, density); and • climatic data: rainfall, solar radiation. OER based on: • monthly OER for each site; • bunch analysis data (if available); • seed producer's trial data for planting material; and • peer data.
2	Palm nutrition	Leaf and rachis analysis M-17, M-18	Leaf analysis: N, P, K, Mg, Ca, B, Cu, Cl, Mn, S. Rachis analysis: N, P, K, Mg B and/or Cu deficiency affecting pollination and fruit set? Are there any constraints to yield and OER? Is leaf and rachis analysis data reliable?
		Vegetative measurements A-25, A-40	Leaf area index, palm height annual increment, petiole cross section. Is vegetative growth normal? Are there any constraints to yield and OER?
		Visual deficiency symptoms A-28	Visually assess deficiency symptoms of six palms around leaf sample palms for N, K, Mg, B using standard scoring method (0 palms deficient scores 0; 1-2 scores 1; 3-4 scores 2; 5-6 scores 3). Are there any constraints to yield and OER?
		Soil sampling A-26	Soil analysis: pH, organic C, total N, available P (Bray I), exchangeable cations (K, Ca, Mg, Na). Are there any constraints to yield and OER? Is soils analysis data reliable?
		Fertilizer M-15, M-21, A-2, A-23	Plantation fertilizer programme: what have been the fertilizer recommendations for the last five years? Have they been followed diligently? Excessive KCl application depressing bunch oil content because of Cl content? Unbalance supply of N, P, K, Mg, B?

#	Activity	Sub-activity*	Details
3	Field	Yield gap analysis A-16	Are yield gaps (YG) caused by: • Moisture stress (total rainfall, rainfall pattern) (YG1); • Plantation establishment (YG2); • Incorrect nutrient diagnosis (YG3); • Poor agronomic management (YG4), or • Incomplete crop recovery and incorrect minimum ripeness standard (YG5)?
		Field audits to determine causes of yield and OER gaps M-26, A-14	Use TCCL score sheets (yield making and yield taking) and scoring system to determine constraints to MEY and OER.
		Access to block M-30	Roads, bridges, and culverts – are there constraints to crop transport?
		Access to palms M-31	Harvest paths. Correct width, straight, and clear? Footbridges over in-field drains, bodies of water. Palm circles: Correct radius, circles clear of debris? On hilly land, are there contour paths? Drainage. Are there access problems after heavy rain?
		Access to bunches M-9	Frond removal at harvesting: what is the standard? Is it being followed? Pruning: what is the standard? Is it being followed?
		Harvesting M-2, M-32, M-33, M-34	Minimum ripeness standard (MRS): what is the standard? Is it being followed? Harvest interval: what is the standard? Is it being followed? Determine field harvest losses: • Ripe FFB not harvested; • FFB cut but not carried to roadside; • Loose fruit not collected and carried to roadside; • FFB not collected from roadside • Loose fruit not collected from roadside
		Pests and diseases M-22, M-23, M-24, M-25, A-20, A-21	What are the pests and diseases that limit production? What are the pests and diseases that limit OER (e.g. rats, bunch borer)? Early warning system (EWS) including patrols/census, thresholds for action, and controls. What is current practice? Is there an integrated pest management (IPM) programme?
		Pollination I-35	Pollinating insect density. Male flower density.
		Other	Identify human and other constraints to yield and OER: harvester incentives, labour supply, transport, housing etc.

#	Activity	Sub-activity*	Details
4	FFB grading in field	Crop quality M-34	FFB • Unripe (no loose fruit sockets). • Under-ripe (<10 loose fruit sockets). • Ripe (≥10 loose fruit sockets, <50% fruits detached). • Over-ripe (50-90% fruits detached). • Empty (>90% of fruits detached). • Rotten (whole bunch is rotten). • Long stalks (bunch stalk ≥5 cm). Reporting and use of information. Refer to MPOB (2008) Oil palm fruit grading manual. Malaysian Palm Oil Board (MPOB), Malaysia.
5	FFB grading at mill	Crop quality M-34	Grade fruit bunches into the following categories: • Unripe • Under-ripe • Ripe • Over-ripe • Empty • Rotten • Long stalks • Freshness (Day 0, Day 1, Day 2, etc.). • Loose fruit as % of total delivery (10–20% is optimal). Dirt & impurities %. Freshness (Day 0, D1, D2 etc.). Sampling rate, skill of graders. Reporting and use of information. Verify any differences between field and mill grading.
6	Mill	Data analysis	Review of process flow, including processing constraints. Review of innovations to improve OER. Audit of production parameter measurements that determine OER. Reporting and use of data. Mass balance analysis. Analysis of mill capacity at each station. Is it balanced?

#	Activity	Sub-activity*	Details
7	Mill lab	Full audit (sampling, sample preparation, analysis, data capture, reporting) of procedures to determine losses:	• Oil losses to fruit on empty bunches; • Oil losses on empty bunches; • Oil losses to press fibre; • Oil losses to three-phase decanter solids; • Oil losses to effluent; • Oil losses on nuts. • Kernel losses.
		Full audit (sampling, sample preparation, analysis, data capture, reporting) of CPO process controls:	• Steriliser condensate (oil in condensate); • Crude oil dilution (centrifuge); • Sludge analysis (entrance of three-phase decanter) (centrifuge); • Water phase analysis (exit of three-phase decanter) (centrifuge); • Oil phase analysis (exit of three-phase decanter) (centrifuge);
		Full audit of other relevant process controls:	• Sterilisation process (pressure, peaks); • Determination of number of unstripped/ hard bunches; • Clarification tank retention times and temperatures.
8	Bunch analysis	Determine the CPO content of bunches	Use of bunch analysis of perfectly ripe bunches (i.e. harvested at the policy minimum ripeness standard). • CPO content of a perfectly ripe bunch in the first instance. • Then do the same for other categories of bunch (unripe, under-ripe, over-ripe) • Refer to Bunch and Oil Analysis of Oil Palm, A Manual, Widodo et al, 2019. • Calculate OER based on weighted average potential OER using crop grading and bunch analysis data. • Examine seasonality of bunch oil content in relation to fruit set
9	Climate	Analyse climatic data	• Rainfall and rain days • Water deficit (mm/year) • Seasonality of rainfall and water deficit. • Use of tensiometers to estimate water stress. • Relationship between climatic seasonality, pollination/weevil activity, fruit set and OER.
10	Reporting	Mill and field	• Bring together all aspects in an integrated format. • Use control charts to monitor parameters that should not vary over time (i.e. mill losses) • Use of Pareto charts to determine the most significant oil losses.

* Refers to TCCL handbook section