INTER-FIRM VARIANCE, INDUSTRY STRUCTURE AND PUBLIC POLICY: AN APPROACH TO IMPROVING THE COST COMPETITIVENESS OF THE PALM OIL MILLING SECTOR

KEYWORDS: Palm oil milling; Standard cost format; Variance analysis; Industry structure; Public policy.

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This article proposes an industry-level approach towards improving the competitiveness of the palm oil industry with reference to the fresh fruit bunch (FFB) milling sector. The approach can be described as a cross-sectional inter-firm cost variance analysis, which evaluates the cost performance of a firm by comparing its costs with the average or standard in the industry. The approach also analyses the structure and policy environment of the industry, and their effect on costs, as a means of identifying and instituting policies and policy instruments that would improve the structure and competitive base of the industry.

INTRODUCTION

In ensuring competitiveness, individual firms in the Malaysian palm oil industry play an important role in relentlessly improving the efficiencies of the production units and in managing their costs and profits. For the Malaysian palm oil industry as a whole, appropriate public policies and instruments can contribute significantly to enhancing its comparative advantage.

This article proposes an industry-level approach towards improving the competitiveness of the fresh fruit bunch (FFB) processing sector. The approach can be described as a cross-sectional inter-firm cost variance analysis, as a means of monitoring and sustaining the competitive advantage of the palm oil milling industry.

The approach intends to achieve this in two ways:

- Evaluate the cost performance of a firm by comparing its costs with the average or standard in the industry, identify probable causes for the cost variances, and where possible institute remedial measures within the firm.

- Analyse the structure and policy environment of the industry and their effects on costs, as a means of identifying and instituting policies and policy instruments that would improve the structure and competitive base of the industry.

This approach was developed from the results of an investigation of production costs undertaken at PORIM. Three case studies on mill FFB processing cost were undertaken under this project (Gopal, 1989; Gopal and Ahmad, 1992a, 1992b).

THE APPROACH TO INTER-FIRM FFB PROCESSING COST ANALYSIS

The approach is similar to the firm-level standard cost variance analysis that is used in many commercial production environments (Wald, 1984). Essentially, it estimates a set of well defined constituents of the cost of FFB processing in individual mills and that in the industry as a whole (average or standard cost) using a cross-sectional or technical basis. It then evaluates the variances of the constituent costs of FFB processing in the individual firms from the industry standard. With additional information that identifies the structural features of mills, the approach can also evaluate the effects of the milling industry's structure and policy environment on FFB processing costs.

Sources of Data

Since our objective is to establish the actual costs of a firm and the cost variances from the industry standard or average, the appropriate primary source of cost data would be the financial accounting system established within the firm. From the case studies, it was established that the best source would be the general ledger trial balances of the mill firms. Additional sources of data and information would be production and technical reports, cost accounting management and budget reports; and discussions with finance and production staff on cost definitions, classification and allocation, and on relevant structural features of the production unit and the firm.

Standard Cost Format

As with any cost and variance analysis, the first step would be to establish a relevant and practical standard cost format for mill FFB processing. From an inter-firm perspective, there are several difficulties in realizing the milling industry standard format for cost and variance analysis.

First, the financial accounting system, the costing structure and the treatment of costs are different from firm to firm. This gives rise to inconsistencies and lack of uniformity at various levels, with consequent problems. The financial accounting system of the firm determines the cost boundary, cost classification and definitions, and cost itemization and allocation. The accounting system itself would be dependent on the philosophy, organization and structure of the company, and the general and specific purposes for which the financial system is used.

For instance, a mill belonging to a publicly-listed agency house with a British colonial background, integrated with plantations and a refinery, would classify and treat certain costs and overheads of management and supervision, as well as some management and professional expenses, differently from a local family-owned independent mill. Similarly, where a mill is treated as a profit centre rather than as a cost centre, the classification and apportionment of the costs would be different.

Second, it was recognized that in developing this cost format, there is also a need to identify various features of the mill firm in relation to those structural characteristics of the milling industry that have effects on the costs. These features could explain some of the firm's major cost variances from the industry standard.

For instance, taking the previous example again, the publicly-listed company mill is likely to have higher costs of management and supervision and higher fixed general charges than the family-owned proprietary mill. The reasons for this are related to the philosophy, outlook, and organizational structure of the companies.

In the development of a uniform and meaningful cost format, these problems and issues were resolved by:

i) identifying a uniform cost boundary;

ii) identifying a uniform, appropriate and well-defined format for the classification and itemization of costs, and appropriate criteria for the apportionment and allocation of costs where necessary;

iii) identifying a set of structural characteristics that have significant effects on costs and cost structure.

Cost Boundary: Definitions

The cost boundary has to define what costs are to be included in, and excluded from, the computation of the overall cost of an activity. The major cost boundary definitions and guidelines are:

- costs should be on the basis of a calendar financial year;
- pricing of process inputs should be based on delivery at the factory gate, and pricing of output products as ex-factory gate;
- interest on working capital should be included, and interest on loan capital excluded;
- capitalization should include, besides plant and machinery, all capital expenditure on the installed cost of fixed investment;
- directors' fees, and secretarial, accounting and audit fees should be included and appropriately considered as management and professional expenses under fixed general charges;
- bonuses and commissions should be included and appropriately considered as management and staff incentives under management and supervision costs and overheads;
- indirect taxes should be included and reflected in input and output prices for the financial analysis, but where possible should be identified separately; direct taxes on profits should be excluded;
- the PORIM and PORLA cesses should be considered entirely under FFB mill processing costs, and not as estate FFB production costs;
- other revenue and costs : all revenue and costs from the mill firm's activities related to FFB processing should be appropriately apportioned and included, for example, the recovery and utilization of by-products or wastes. Similarly, all revenue and costs from activities unrelated to FFB processing should be appropriately apportioned and excluded.

In practice, it was difficult to satisfy all the above guidelines.

Classification of Costs: Basis and Definitions

The classification and itemization of costs needed to be relevant to our purpose, while being simple and practical. The definitions for the classifications had to be straight forward and the consolidation of costs from the financial records into these well-defined classifications had to be easy. The classifications and definitions for a uniform cost format were made bearing these requirements in mind.

First, the main classification was on the basis of fixed and variable costs. This is essential in evaluating one major cause of variance in FFB processing costs – FFB throughput and mill capacity utilization.

The second basis was to separate, as far as possible, the costs of human resources from those of material inputs. The nature of these costs is different, and hence managerial and public policy considerations towards them are different.

The third basis was the magnitude and significance of the costs for the cost and variance analysis. This basis was used to reduce the problems of inconsistencies and non-uniformity by consolidating the minor cost items.

Using these three criteria, the following classifications were made:

Fixed Costs

Management and Supervision Costs, Overheads and Welfare

- includes all costs incurred as a consequence of the employment of executive and subordinate staff.

Labour Costs, Overheads and Welfare

- includes all costs incurred as a consequence of the employment of labour for production, maintenance, and the laboratory.

General Charges and Other Overheads – Fixed
- includes office and administration costs, management and professional expenses, general maintenance, upkeep and utilities.

Depreciation of Production and Production Related Capital
- excludes facilities and amenities meant for the staff and labour force.

Variable Costs

Human Resource Costs – Variable
- includes overtime payments to staff and labour, and charges for piece-rate labour.

Production Maintenance and Repairs
- includes plant, machinery and the laboratory.

Production Material Inputs and Utilities
- includes kernel bagging, chemicals, fuel, lubricants.

General Charges and Other Overheads – Variable
- includes such items as the PORLA and PORIM cesses, *etc.*.

Some of the items consolidated and classified above are, strictly, semi-variable in behaviour (*e.g.* maintenance, labour and 'fixed' general charges). To simplify the very complex behaviour of cost items for analysis, only two main categories were used – fixed and variable costs. A more detailed discussion of cost behaviour is given in *Appendix I.*

In cases where different treatment of costs results in non-uniformity, it is necessary to apportion the costs using an appropriate criterion, such as by crop area, or as human resources or capital costs, and allocate them according to the classifications defined above. In attempting to be uniform and consistent, there may be some loss of accuracy.

Structural Characteristics and Effects on Costs

The significant structural features of the mill firm were identified by a broad qualitative assessment of their effects on costs. Significant characteristics that affect costs are:

General Location and Infrastructure of Mill
- location in relation to soil conditions, public infrastructure, utilities and urban centres.

Organization Type, Ownership and Integration
- company philosophy, outlook and history; organizational structure; financial and management accounting structure; integration and affiliations with palm oil related and other activities of the firm or company and its business or trade partners.

Age of Mill
- the number of years the mill has been operating.

Mill Organization
- organization of the mill's staff, labour and operations and its productivity.

Processing Technology
- the major technological differences in processing unit operations by comparison with a standard conventional mill.

FFB Supply and Quality
- sources and quality of FFB supplies; and interactions with FFB suppliers.

Capacity and Processing Performance
- operating hours and days, rated and actual capacities, crop throughput and capacity utilization, oil and kernel production, extraction rates and quality.

Figure 1 broadly relates the effects and significance of these structural characteristics to FFB processing costs. For example, processing technology and the organization of production are affected by the broader corporate organization and the integration of the firm with other palm oil-based activities of its own, or of related firms. The processing technology is also affected by the age of the mill and its location. A mill's processing technology and the organization will have effects on almost all the processing costs.

Public Policy and Structural Characteristics

The significance and effects of the public policy environment on the structural characteristics of FFB processing, and in turn for FFB processing costs and cost structure are indicated below:

Research and Development Policy
Promotion of dynamic public and private R&D would affect processing technology and the organization of the mill.

Capacity and Investment Policy
This would have an effect on optimal number, installed capacity and capital investment; location, infrastructure and crop availability; crop supply, throughput and capacity utilization. This can be achieved either by direct regulation or by the provision of relevant, reliable and timely information and services to allow market forces to work.

Quality and Standards Policy
Quality and standards for FFB, processing inputs and products would have an impact on processing technology, processing performance and costs.

Price and Marketing Policy
Price intervention or price distortion by import, excise and sales duties or by subsidies would affect the cost of process material inputs; control of marketing channels would have an effect on crop and product prices, availability, supply, demand and distribution.

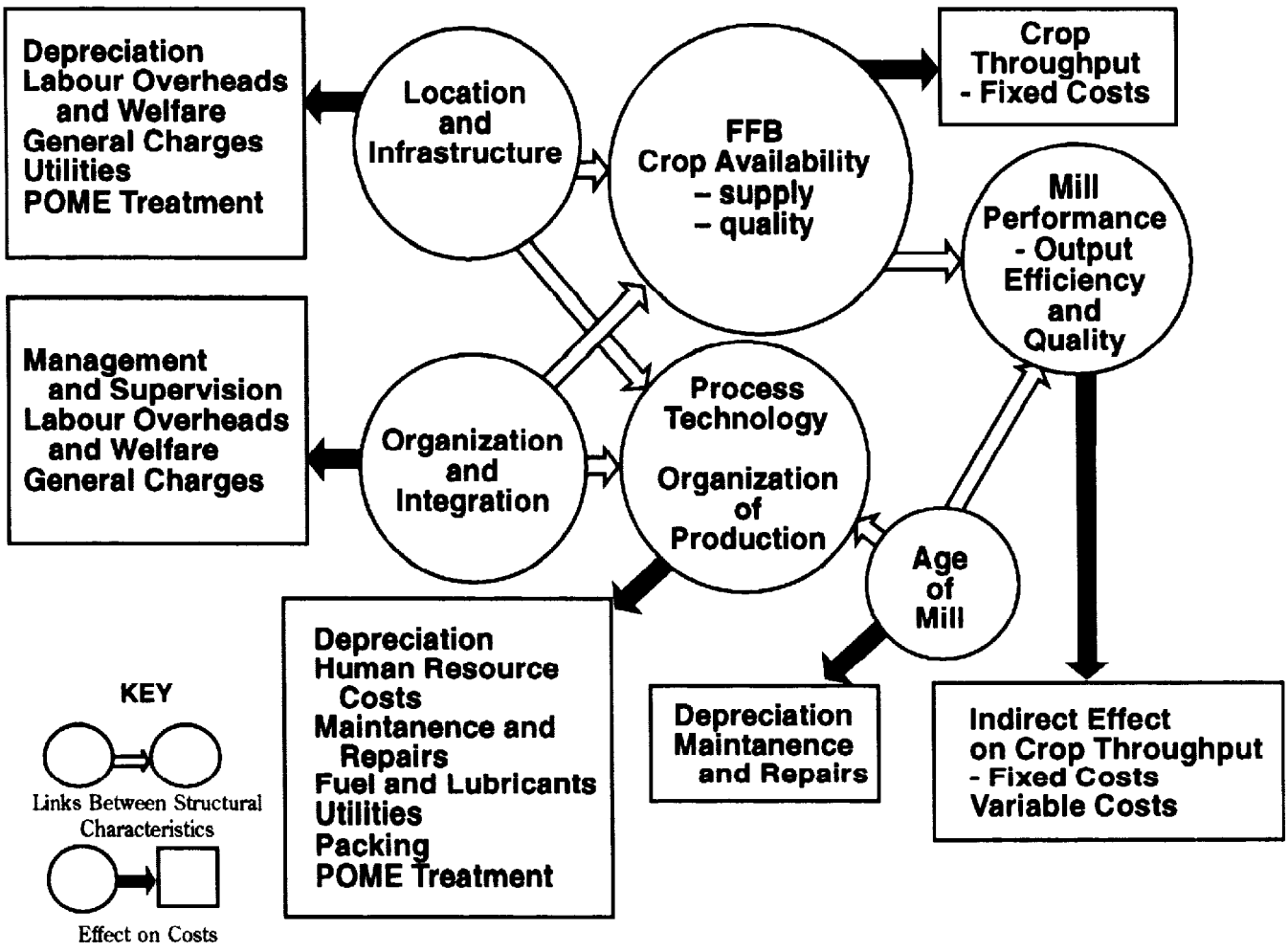

Figure 1. Effect of Structural Features on FFB Processing Costs

Labour Policy
This would have an effect on the supply and cost of labour and possibly also on the capital intensity of processing techniques adopted and the demand for labour.

Tax and Capital Policy
This would have an effect on investment, ownership, organization and integration with other activities of the firm, the accounting structure, processing technology, depreciation and maintenance and the age of a mill.

CASE STUDIES

From the case studies undertaken, an example of inter-firm cost and variance analysis for three mills for one year is shown in *Table 1*. The standard or average costs for the industry were based on the results of a postal survey on palm oil mills belonging to a major plantation association. There were several limitations in using the results of this survey in our analysis. Only the costs per unit FFB of 14 consolidated items were given. Other pertinent information, such as capacity, crop throughput, age of mill, human resources employed, processing performance, and type of organization and ownership were not available. In our case studies too, while efforts were made to follow the costing format and guidelines set out earlier, not all the problems of uniformity and consistency were resolved satisfactorily. This limited the depth of the analysis of the cost variances.

Table 1 shows the costs per tonne of FFB in 1986, for the industry as a whole (standard costs), and for three mills Y1, Y2 and X, based on our cost format. For the sake of uniformity, the variable human resources cost item was excluded from the format and all human resource costs were considered as fixed. The variances of these cost items from the assumed industry standard for the mills are also shown in the *Table 1*. It should be noted that the analysis of fixed cost variance may be more appropriately undertaken on the basis of total annual cost or on cost per unit installed capacity, if crop throughput is ignored.

Analyzing the variances of the mills for 1986, we note the following:

- Capacity utilization had a large effect on FFB processing cost because of high fixed costs, which ranged from 60-80% of the total costs. Assuming the average utilization of capacity in the industry was about 65%, the high positive variances for unit fixed costs at mills Y1 and X can be explained mostly by their low capacity utilization of 30% and 43% respectively. (The reason for the low variance in labour costs may be the lack of uniformity in the allocation of labour cost items.) It is estimated that a 10% increase in the FFB throughput would reduce total FFB processing cost by about 5 per cent.
- The age of the mill or the number of years the mill has been operating also had an effect on depreciation and maintenance costs. This is evident when comparing mills Y1 (third year) with Y2 or X (ninth year).
- Comparing mill Y2 with X after adjusting for differences in capacity utilization, economy of scale is also evident in depreciation costs.

The classification of the structural features of mills, such as organization type, integration, technology, location, *etc.*, into simple, practical and meaningful categories would improve the usefulness of the analysis.

Several reports for policy analysis can be generated from the collation of cost and structural data from a wide cross-section of mills. These reports also could assist to some extent in remedying large positive variances at the firm level. The frequency of such an extensive analysis need only be once every five years. A more limited cost survey for monitoring aggregate costs could be done annually.

CONCLUSIONS

The method of cost and variance analysis described can monitor and analyze the structure and policy environment of the palm oil milling industry and their effect on processing costs. The results of the analysis could serve as inputs in formulating policies and policy instruments that would improve the structure and competitive base of the industry.

The usefulness of this method of cost and variance analysis for monitoring FFB processing costs at the mill, and its implications for other sectors of the industry should be discussed as

TABLE 1. VARIANCE ANALYSIS OF FFB PROCESSING COST FOR MILL Y1, MILL Y2 AND MILL X WITH RESPECT TO THE INDUSTRY AVERAGE, 1986

MILL CODE:	STANDARD COST	MILL– Y1	MILL– Y2	MILL– X
FINANCIAL YEAR:	1986	1986	1986	1986
MILL CAPACITY (FFB tonnes/HR):	?	54	54	30
ANNUAL FFB THROUGHPUT (tonnes):	?	68481	175445	54196
CAPACITY UTILIZATION (%):	?	30.4	78.0	43.4
AGE OF MILL (YEARS):	?	3	9	9
HUMAN RESOURCES (PERSONS):	?	70	119	86
PRODUCTIVITY (tonnes/PERSON/YR):	?	978	1474	630
EXTRACTION RATE PO (%):	?	19.7	19.8	20.8
EXTRACTION RATE PK (%):	?	4.7	5.1	5.9

COST ITEM	**UNIT COST**	**UNIT COST**	**% VARIANCE**	**UNIT COST**	**% VARIANCE**	**UNIT COST**	**% VARIANCE**
FIXED COST							
MANAGEMENT & SUPERVISION	$3.00	$3.91	30%	$2.20	-27%	$4.58	53%
LABOUR, LABOUR OVERHEADS & WELFARE	$3.68	$3.82	4%	$4.00	9%	$3.66	-1%
GENERAL CHARGES– FIXED	$3.24	$17.14	429%	$3.24	-0%	$3.58	10%
DEPRECIATION	$6.71	$16.86	151%	$5.42	-19%	$8.77	31%
SUB-TOTAL	**$16.63**	**$41.73**	**151%**	**$14.85**	**-11%**	**$20.58**	**24%**
VARIABLE COSTS							
PROCESS INPUTS & UTILITIES	$1.38	$2.04	48%	$1.33	-4%	$1.86	35%
PROCESSING MAINTENANCE	$5.02	$4.23	-16%	$5.53	10%	$5.25	5%
GENERAL CHARGES – VARIABLE	$1.35	$1.40	4%	$1.60	19%	$1.48	10%
SUB-TOTAL	**$7.75**	**$7.67**	**-1%**	**$8.47**	**9%**	**$8.59**	**11%**
TOTAL	**$24.38**	**$49.40**	**103%**	**$23.32**	**-4%**	**$29.18**	**20%**

Notes:

1. Depreciation for Mill X is only for plant, machinery and equipment
2. Maintenance and Repair for Mill X includes labour costs.
3. There are rounding off errors in the summation of costs and variances.
4. A separate classification for variable human resource cost was not possible for the Standard Cost and Mill X and hence this cost was consolidated into the fixed labour cost item.

widely as possible. PORIM would need the collaboration of the industry and other palm oil organizations and agencies to carry out successfully this effort.

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Views expressed, and any errors are solely those of the author.

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APPENDIX I

Fixed and Variable Costs

The Fixed and Variable Cost Format classifies cost inputs according to their behaviour or variability in relation to the throughput of the main raw material (FFB) or product (CPO).

Conceptually, there are three main classifications :

i) Fixed Costs – costs which do not vary with crop throughput but which accrue in relation to the passage or period of time (time here can be mill operating time or both operating and idle time); examples are depreciation (or fixed capital investments), management and supervision costs, and labour and overheads.

ii) Variable Costs – costs which vary over the operating period as a proportion of the crop throughput; examples are production utilities, packaging, PORIM and PORLA cesses.

iii) Semi-Variable Costs – broadly, these may include (a) costs which increase in steps in relation to the level of crop throughput; (b) non-linear variable costs (*i.e.* unit costs that vary depending on the crop throughput and capacity rate); and (c) costs which have both fixed and variable components.

For practical reasons, we classify cost items into only variable and fixed, on the basis of the use purpose of the cost inputs, the observed behaviour of the total and unit cost values for 1985 and 1986, and the behaviour of the cost inputs from mill engineers' experience.

ERRATUM

In Elaeis Vol.4 No.2 page 57, the legend of *Figure 1* should read:

Carbon budgets for oil palms in the third year after planting on dry and wet sites. For simplicity, all data are in tonnes of assimilates (CH_2O) ha^{-1} $annum^{-1}$. (Amounts of respired CO_2 are obtained by multiplying amounts of assimilate by 44/30). Hatched areas represent dry matter produced and opened areas, amount of assimilates lost in respiration (R). GA = gross assimilation. Downward arrows represent inputs and upward arrows outputs from the system.