MALCOLM J. PURVIS*

THE NIGERIAN PALM OIL INDUSTRY: A COMMENT†

This paper deals with a number of points raised by Dr. Kilby in his recent article on the Nigerian Palm Oil Industry (*4*) which appear to the present author to be incorrect interpretations of the information presented in that article, contradictory to alternative sources of information or based solely upon conjecture. Dr. Kilby primarily addresses himself to the question of the economics of alternative processing techniques used in Nigeria for extracting palm oil from harvested bunches—his treatment of other facets of the industry such as the harvesting of the fruit, marketing and consumption of oil and kernels or the role of the industry in the general agriculture of Southern Nigeria is very brief.[1] Consequently, this comment is restricted to matters relating to oil palm processing and in particular to the "explanatory hypothesis" advanced as a solution to the present economic superiority of technically inferior processing methods. Specifically three topics are considered: (1) the difference in quality of the raw material; (2) the occurrence of a price differential due to differences in the quality of output; and (3) the economic interpretation and policy prescriptions for alternative oil palm processing methods made in the original article.

Differences in Raw Material Quality

It is asserted that small-scale processors are able to acquire fruit of higher oil content than their large-scale competitors (*4*, p. 195):

> If average oil content is put at 20 per cent—the conventional aggregate for the East—the Pioneer extraction rate of 17.2 per cent represents an extraction efficiency of 86 per cent and the 15.2 per cent of the screw press technique is equal to a 76 per cent extraction efficiency.
>
> The apparent discrepancy between this recorded performance differential and the 85–65 per cent test differential reported by WAIFOR is in fact a reflection of the small-scale operator's advantage in obtaining fruit

* Assistant Professor, University of Minnesota.

† The author gratefully acknowledges assistance from the Nigerian Institute of Oil Palm Research for supplying information on fruit quality, to the Nigerian Institute for Social and Economic Research and to the Consortium for the Study of Nigerian Rural Development (CSNRD) under whose auspices research was conducted in Nigeria. At this time the author was employed by Michigan State University, a member of CSNRD, under USAID contract Aid/afr 264.

[1] A little over 5 pages, out of the total of 26 pages, deals with these aspects of the oil palm industry.

> of higher oil content. . . . This logical presupposition is supported by all investigators' reports that the small-scale processors do get the premium fruit, and by Miller's findings that these two small-scale technologies have more than doubled the excess capacity of the other two techniques.

On the contrary, this is not a logical presupposition; neither investigators' reports (none of which are cited in Kilby's paper) nor Miller's findings (*6*) of increased excess capacity necessarily support this argument. The use of 20 per cent oil-to-fruit ratio, "the conventional aggregate," is not supported by any hard data. A more realistic figure might be 22–24 per cent. If the average content is 23 per cent, the extraction efficiency of the Pioneer Oil Mills is reduced to 74.8 per cent and the screw presses to 66.1 per cent. The problem then becomes one of explaining why the (ENDC) Pioneer Oil Mills obtained a lower extraction rate than that obtained by WAIFOR, not why the screw press technique obtains such a high extraction rate (76 per cent using a 20 per cent oil-to-fruit ratio). Due solely to administrative and management problems, it seems more plausible that ENDC would be generally less efficient than the WAIFOR mill (which from 1954–58 averaged an extraction efficiency of 79.9 *9*, see also discussion in *4*, pp. 191–93)[2] rather than more efficient (at 86 per cent according to Kilby). ENDC has not been renowned for its managerial efficiency (*1, 3*).

It must be admitted that there is very little empirical evidence of actual oil-to-fruit ratios in wild palms. The available information is only indicative rather than conclusive.[3] Most of the published data refer to ratios obtained from plant breeding and agronomy experiments or from aggregate milling figures from WAIFOR (which processes a motley of *dura* and *tenera* fruits of widely varying oil-producing ability). Even the most complete published surveys of wild oil palm groves contain very little data on oil ratios (*10, 11*). This problem is further compounded since the mid-1950's by WAIFOR's adoption of oil-to-bunch ratios rather than oil-to-fruit ratios for their published research.

Considerable variability is also reported by the ENDC mills in their extraction rates (Table 1), so not all Pioneer Oil Mills are getting unfavorable extraction rates. It is plausible that geographical (and hence climatic) differences are important in determining these extraction rates. The extraction rates reported by Miller for both hand squeezing and the screw press were substantially higher in Abak than in Okigwi. Abak has a much more favorable climate than Okigwi for oil palm growth.[4] Any differences in fruit quality in Miller's sample may be a reflection of geographical differences rather than differences in the relative ability of one or other process to acquire superior fruits. Even more important are the seasonal fluctuations in oil extraction rates. A recent study of the ENDC oil mills states (*1*, p. 14):

> It was found that the 12 year average for the E.N.D.C. mills for oil extraction rate varied by over 2.1 per cent from the low Month (Sept.)

[2] After December 1958 the WAIFOR Pioneer Oil Mill was replaced by a Stork Major Mill and used only for research purposes.

[3] The information summarized in (*10*) indicates an oil to fruit ratio of 21 per cent but it is highly variable. These data refer to grove yields; harvested yields may be higher as a result of selectivity in harvesting.

[4] For a discussion of effects of weather on oil palm yields and on Marketing Board purchases of oil and kernel see (*7*) and (*8*).

TABLE 1.—EASTERN NIGERIA DEVELOPMENT CORPORATION: PERFORMANCE OF SELECTED PIONEER OIL MILLS, 1963/64*

Name of mill	Fruit milled (*tons*)	Oil extracted as per cent of fruit milled	Special grade oil as per cent of total oil
Average all mills	1,350	17.0	87.7
Ugep[a]	2,898	17.8	84.0
Umodogia[b]	1,928	15.3	88.4
Ugiri[c]	1,684	18.9	86.0
Akpap[d]	1,831	17.3	85.5
Okijaokwu[e]	529	17.6	93.7
"Composite"[f]	529[e]	11.3[g]	20.0[h]

* From S. Bahiri, "Report on the E.N.D.C. Pioneer Oil Mill Scheme and Oil Palm Processing," *School of Management Development and Productivity, Institute of Administration, Enugu* (Enugu, 1965), mimeo.

[a] Double Pioneer Oil Mill, with largest tonnage milled.
[b] Ordinary Pioneer Oil Mill, with largest tonnage milled.
[c] Ordinary Pioneer Oil Mill, with largest profit.
[d] Pioneer Major Mill.
[e] Pioneer Mill with lower tonnage.
[f] Composite of worst mills for each item.
[g] Nduja Mill.
[h] Arochukwu Mill.

to the high Month (May). It was found that (with 95 per cent confidence limits) these figures were constant to within 0.5 per cent oil extraction rate.

The time at which Miller's survey was carried out would materially affect the oil extraction rates he obtained for the screw presses if they too followed a similar pattern.[5] Finally, the primitive technologies are responsible for about 90 per cent of all the oil produced in the former Eastern Region including oil for domestic consumption.[6] It is hard to imagine that 90 per cent of the oil is produced from "better quality fruit" and that the advanced technology oil mills only get the 10 per cent or so of the worst fruit. This implies a *degree* of selectivity by sellers of fruit to the advanced processing units which is beyond the experience of the present author or of other writers.[7]

In conclusion it is not denied that variations in fruit quality do occur and that better quality fruits may be used by small scale processors, particularly home processing for domestic consumption. However, there is insufficient evidence to support the hypothesis that the prime cause of estimated differences in extraction efficiency above the normally tested rates for small-scale processors is due to

[5] Miller's data for the Pioneer Oil Mills were taken from annual averages for the 67 Mills then operated by ENDC, so were unaffected by seasonal factors. The only criticism that can be made of an otherwise outstanding piece of work by Miller is that insufficient information was included on the methodology, timing and sampling aspects of the study. Much of this information was on file at the Economic Development Institute, Enugu, but is temporarily inaccessible or destroyed by the civil war in Nigeria; it is not known whether duplicate copies exist.

[6] Total oil production by advanced technologies 1961–64 was 25,828 (see Table 2). Total oil *production* estimated from 1961–64 palm kernel purchases x 1.3 (*4*, Table 4, p. 188) was 252,700 tons.

[7] The only detailed research on marketing of palm products is contained in (*2*) and (*5*). Neither of these studies would support such a premise.

fruit quality differences. This conclusion, if correct, undermines the whole construct of policy recommendations which followed from this hypothesis.

Price and Quality Differentials

In his accounting equations, which determine which technology will prevail under given conditions, Kilby includes a "Z factor" which is a quality differential giving rise to differences in revenue per unit of output. This quality differential is spurious, despite Miller's reported differences in oil revenues ranging from a low of 31/9 per hundredweight of oil for the native methods to a high of 38/1 for the Pioneer Oil Mills (see *4*, Table 8, p. 194). Quality of oil purchased by the Marketing Boards in Nigeria is determined by three criteria—the free fatty acid, water and dirt contents. However, differences in grades are judged only by free fatty acid; the water and dirt standards are minimum standards common to all grades. Hence, price differentials are effectively determined by the acid content.[8] It is true that middlemen may pay a premium for clarified oil or oil of very low acid content in order to mix this with other inferior oils to bring the entire batch up to Marketing Board standards. However, the quantity of clarified oil produced (by Stork presses) is so small that almost all the oil purchased must meet these water and dirt standards. As Kilby points out, the bulk of oil purchased by the Marketing Boards since the mid-1950's is of Special Grade (SPO)—84.9 per cent average for 1961–64 (see Table 2 below). The remainder was mainly

TABLE 2.—EASTERN NIGERIA: CONTRIBUTIONS FROM ALTERNATIVE TECHNOLOGIES TO TOTAL PURCHASES OF PALM OIL AND IMPLIED QUALITY DIFFERENTIAL

Processing method	Sales to Marketing Board		Quality differential over primitive methods[a] (*shillings per cwt*)
	Total (*tons*)	Per cent special grade (SPO)	
E.N.D.C. Pioneer oil mills	16,353[b]	89.7[c]	0.38
Private Pioneer oil mills	9,000[b,d]	95.0[e]	0.70
Stork presses	474[f]	100.0[e]	1.00
Primitive methods	114,145[g]	83.4[h]	0
TOTAL	139,972[b]	84.9[i]	–

From data in Peter Kilby, "The Nigerian Oil Palm Industry," *Food Research Institute Studies*, Vol. VII, No. 2, 1967; W. L. Miller, *An Economic Analysis of Oil Palm Fruit Processing in Eastern Nigeria* (unpublished Ph.D. dissertation, Michigan State University, 1965), and S. Bahiri, "Report on the E.N.D.C. Pioneer Oil Mill Scheme and Oil Palm Processing," *School of Management Development and Productivity, Institute of Administration, Enugu* (Enugu, 1965), mimeo.

[a] Based on difference in price per cwt of 6 shillings between SPO and TPO Grade 1 and difference in proportion of SPO produced: Eastern Nigeria Marketing Board, *Oil Palm Produce Marketing Schemes, Producer Prices for 1967* (Port Harcourt, 1967), mimeo. Price differential of 6s per cwt has been constant since 1962.

[b] From data in Peter Kilby, "The Nigerian Palm Oil Industry," *Food Research Institute Studies*, Vol. VII, No. 2, 1967, Table 7, p. 193, p. 189, and Appendix Table I, p. 203.

[c] Actual; from S. Bahiri, "Report on the E.N.D.C. Pioneer Oil Mill Scheme and Oil Palm Processing," *School of Management Development and Productivity, Institute of Administration, Enugu* (Enugu, 1965), mimeo.

[d] Includes allowance for the output of plantations including the one Stork Major Mill in operation in 1964 assuming entire output sold to Marketing Board; if less than entire output is sold this

[8] Quality for the domestic market is determined by color and taste. Rather high acid contents are not disapproved of by domestic consumers.

Technical Grade I (TPO); negligible amounts of Technical grades II and III were purchased. Using Kilby's own production figures it is possible to estimate the average quality of the primitive and advanced technologies from the weighted averages of Pioneer Oil Mills, Stork presses and (residual) primitive technologies. At a difference of 6 shillings per cwt between SPO and TPO, the value of actual quality differentials can be calculated (Table 2). The maximum possible value of the quality differential between the advanced and primitive methods is 0.7 shillings, not Kilby's 6.1 shillings difference.

There is a far simpler and more probable explanation for the average revenue differences reported by Miller which led Kilby to the erroneous conclusion that important price differentials existed between the output of the advanced and primitive technologies. The 67 Pioneer Oil Mills in Miller's sample were all ENDC mills and the ENDC is itself a Licensed Buying Agent. Hence, the value of the oil it sells to the Marketing Board, unlike that of the privately owned primitive presses, includes the LBA bulk buying allowances which were 7.4 shillings in 1964. Other explanatory hypotheses can also be advanced for the differences observed by Miller in average oil revenue. For example, differences in location, the time of year at which the processes were sampled, as well as differences in the markets to which they are selling (for internal consumption or for export), or level of the marketing chain are all factors which could lead to differences in price per unit of output. The contribution of any or all of these factors is idle speculation without further information than that which is available in Miller's thesis or elsewhere.

Thus Kilby, although previously recognizing in his paper that "the Pioneer Mill's contribution to the transformation in the quality of Nigerian oil has been negligible" (p. 186), imputes an excessive difference in average revenue per unit of output between the different technologies due to quality. In switching from primitive to advanced technologies it cannot be assumed that existing price differentials will remain unchanged.

The Economic Interpretation of Differences in Processing Technologies

Apart from the interpretation of data which has been opposed above and which threatens to destroy the whole basis of Kilby's analysis, serious objection can also be made to the economic analysis and resulting policy prescriptions made in the final pages of the article (pp. 198–201). The model presented by Kilby cannot determine the optimum pricing policy to achieve economic efficiency since it is largely unspecified and ignores the dynamic effects of changing the price structure. It is not denied that a rise in producer prices may permit an increase in technically more efficient and capital intensive forms of processing with a

---

will further decrease the quality differential. Estate sales to Marketing Board 1961–63 averaged 4,782 tons.

[e] Generous estimate—higher than achieved by any documented Mill or press.

[f] Maximum possible from 24 presses in operation by March 1964 and average output of 2.8 cwt per day, for 141 days per annum.

[g] Residual from total Marketing Board Purchases.

[h] Residual implied quality.

[i] From Eastern Nigeria Marketing Board, *Eighth Annual Report 1st January 1962–31st December 1962* (Port Harcourt, 1964) and Federal Nigeria, Department of Statistics, *Digest of Statistics* (various dates).

gain to the economy, particularly in foreign exchange earnings. The analysis presented by Kilby suggests that the present processing economy is in an unstable equilibrium, which can be shifted to an economic optimum solution by a short-run price increase. This "infant industry" type of argument whereby an economically inefficient industry is rendered efficient by short-run subsidization depends on economies of scale, well-known arguments which will not be discussed further in this paper. In the case of the oil palm processing it is argued that these economies are realized by the process of acquisition of raw material of better quality. However, his article contains no analysis of the dynamics of the scale effects and how the parameters may change with various levels of output. The model is based on single-valued parameters.

Also no account is taken of the changing resource requirement of this switch to more advanced processing methods, e.g., the increased investment required, the change in wage structures or the additional foreign exchange expenditure in making the investment. It is also not apparent that the author has considered the extreme seasonality of oil palm processing requirements. The ENDC mills 1953–64 average produced 68 per cent of their output in the first six months of the year and 32 per cent in the final part of the year. Without the primitive methods which easily can shut down and take up the slack during the off-season these seasonal fluctuations might be even more marked.

For these reasons alone, the analysis presented by Kilby on economic efficiency and optimal solutions is not appropriate. The determination of efficient optimal solutions depends upon more complete specification of production functions and supply responses.

CONCLUSIONS

This paper does not seek to establish more reliable estimates or explanations than those advanced by Dr. Kilby, but only to suggest that contradictory evidence has been ignored, that conclusions were reached on inadequate information and that the policy implications derived from such analysis can be widely off the mark. It is obvious that far more research is needed, besides that supplied by Miller's excellent thesis, before a proper understanding of the production and processing of oil palms can be acquired. The data assembled by Dr. Kilby, notwithstanding the review of the literative suggested by his citations, are still fragmentary and unreliable. It is the author's belief that such work is useful but does not create the basis for elaborating on "explanatory hypotheses" which should first be tested by research in the field.

CITATIONS

1 S. Bahiri, "Report on the E.N.D.C. Pioneer Oil Mill Scheme and Oil Palm Processing," *School of Management Development and Productivity, Institute of Administration, Enugu* (Enugu, 1965), mimeo.

2 S. M. Essang, *The Marketing of Palm Oil in a Rural Community* (M.Sc. Thesis, University of Ibadan, 1967).

3 G. K. Helleiner, "The Eastern Nigeria Development Corporation: A Study in Sources and Uses of Public Development Funds, 1949–62," *Nigerian J. Economic Social Studies,* March 1964.

4 Peter Kilby, "The Nigerian Palm Oil Industry," *Food Research Institute Studies,* Vol. VII, No. 2, 1967.

5 Anne Martin, *The Oil Palm Economy of the Ibibio Farmer* (Ibadan, Nigeria, 1956).

6 W. L. Miller, *An Economic Analysis of Oil Palm Fruit Processing in Eastern Nigeria* (unpublished Ph.D. dissertation, Michigan State University, 1965).

7 Malcolm J. Purvis, "Yield Variation in Oil Palm: Marketing Board Purchases in Eastern Nigeria 1955–66," *J. Nigerian Institute for Oil Palm Research* (forthcoming).

8 L. D. Sparnaaij, A. R. Rees and L. C. Chapas, "Annual Yield Variation in Oil Palm," *J. West African Institute for Oil Palm Research,* October 1963.

9 W.A.I.F.O.R., *Annual Report, 1954/5, 1955/6, 1956/7, 1957/8, and 1958/9.*

10 A. C. Zeven, "Oil Palm Groves of Southern Nigeria, Part I: Types of Groves in Existence," *J. Nigerian Institute Oil Palm Research,* August 1965.

11 ———, "Oil Palm Groves of Southern Nigeria, Part II: Development, Deterioration and Rehabilitation of Groves," *J. Nigerian Institute for Oil Palm Research* (forthcoming).