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# **KENANA: A LARGE-SCALE SUGAR PROJECT IN THE SUDAN**

## **An Economic Evaluation\***

### **COMMERCIAL AND SOCIAL APPRAISAL OF THE KENANA SUGAR PROJECT**

#### **1. INTRODUCTION**

Usually appraisal studies for development projects are carried out for a future project to decide on the viability and feasibility of an investment within the framework of an optimal allocation of resources. But in this case the projected measures are often mere guesses. However, an ex-post analysis does not necessarily indicate which decisions have to be taken for future allocation of resources; nonetheless, it can lead to a wider insight into the factors which are crucial for the success or failure of the project under consideration. With regard to Kenana at least three factors are responsible for this reappraisal. Firstly, little is known about the effect of the project on savings and the consumption of poorer groups which is a linking theme of plans to date. Secondly, there is lack of knowledge about the contribution of each of the quantitative development measures in the package to the success or failure of the project. Thirdly, as will be seen in this paper, the major base of the export effort, the Kenana complex, was negotiated around a commitment by the Sudan government to a guaranteed price for part of the output. As foreign interests are involved in the plant itself, a serious attempt to clarify the "costing" of this guarantee is required both to assess the project and even, possibly, for renegotiation of the guarantee. Moreover, for proper evaluation studies, reliable statistical data are often lacking in the Sudan. This study will certainly not only stimulate the discussion on methodological problems, but will also point out the data deficiencies and the sensitivity regarding certain assumptions which had to be taken in any systematic calculation.

The study will highlight the importance of reliable statistical data and the importance of the price guarantee for its social viability. A brief background is provided immediately highlighting relevant considerations, followed by an assessment of the viability of the project. The overall appraisal analysis which follows is based on the UNIDO (1972) approach.<sup>1</sup>

#### **2. THE PROJECT BACKGROUND**

The industrial production corporation was established by the Sudan government to co-ordinate efforts for industrial development. It controls six subsidiary corporations. One of them is responsible for sugar and under its auspices sugar factories owned by the government are managed: Gunned (1963), Girba (1965), Sennar (1977), Assalaya (1978), Melut and Mongella (construction stopped in 1982).

The seventh, Kenana, is an exception in both respects and is the subject of the appraisal which follows.

In addition to the new sugar development projects (including Kenana), the already existing factory at Girba is having its capacity extended by 50% and two additional sites (Setit and Rank) are under consideration for development.

Comparison of experience between Girba based on plantation organisation and Gunned where tenant farming was relied upon for supplies has suggested the superiority of the plantation method in terms of productivity. Accordingly, the above mentioned mills are based on plantation.

Nonetheless the recent expansion, in comparison with the two earlier mills, has been a major leap in capacity, leading to complaints of staff about maintenance inadequacy.

Kenana, on the other hand, possibly the world's largest sugar project, is aimed essentially at export markets and both ownership and management have been organised along different lines. The estate consists of 84,078 acres and the factory is designed to crush 17,000 tons of sugar-cane daily throughout the 218-day season. This would suggest a capacity for producing 330,000 tons of white sugar per annum. The scale of this operation is indicated with reference to the other Sudanese projects in Table 1. (It should be noted that this large land area was previously land covered with scrub used at most for camel, cattle and sheep grazing by nomadic tribes.)

**Table 1: Working Sugar Factories Designed Capacity**

(metric tons per annum)

| Factory  | Capacity |
|----------|----------|
| Gunned   | 60,000   |
| Girba    | 75,000   |
| Sennar   | 110,000  |
| Assalaya | 110,000  |
| Kenana   | 330,000  |

**Source:** Sudan Sugar Corporation

The history of the project from preparatory work in 1972 by Lonrho, the British trading firm which was to manage Kenana to its actual operation, was characterised by two developments: firstly, the widening of participation in the ownership and financing of the project, and secondly, partly necessitating the former, a rapid cost escalation. As to the shareholdings, the registration of the company (completed on 6th March 1975) indicated that the Sudan Government held 61% of the equity. Of this 61%, 10% was provided by the Sudan Development Corporation, whereas 51% was to be financed by a loan from Lonrho to be repaid at commercial rates. Lonrho itself would hold a further 12%. Gulf Arab interests were to hold the bulk of the remainder.

A few days after the initial registration of the company with these shareholdings, an agreement was signed by the Sudan government and the Kenana Company stipulating that 150,000 metric tons of white sugar was to be purchased annually by the government at a guaranteed price of \$665.3 per ton, compared with the then market price of \$664 per ton.

By 1977 it was clear that the factory costs were rising rapidly above those suggested by Lonrho's initial feasibility study as Table 2 indicates.

**Table 2: The Cost of the Factory**

(in million dollars)

| Item  | Feasibility Study | Actual Cost | % increase | Contractor                              |
|---|-------------------|-------------|------------|---|
|   | 1972              | 1977        |            |   |
| Manufacture and Ocean Freight to Port Sudan | 43.5              | 170         | 290        | Technic (\$130m)<br>Nissho-Iwai (\$40m) |
| Preparation of the Factory Site             | 11.9              | 19.5        | 64         | McAlpines                               |
| Erection and Commissioning                  | 8.2               | 42.5        | 418        | Capper-Neill                            |
| Transport from Port Sudan to the Site       | 2.2               | 2.0         | Nil        | Robert Wynn                             |
| Escalation allowance                        | 5.0               |             |            |   |
| Total                                       | 70.8              | 234.0       | 230        |   |

**Source:** Sudanow, August 1977

Similar cost increases were experienced in the land irrigation work. Fortunately, it proved possible to interest the Kuwait government in the project and an agreement of participation was signed on 19th February 1976.

As a result of the Kuwait participation, the share of the Sudan government fell to 50%. Kuwait interests took 25%. The share of Lonrho fell to 5.5% and criticism regarding the firm's role in the cost escalation was made clear in a report commissioned by the Kuwait government.

In money terms, the Kuwait government was to provide \$46 million, half as equity and half as loans, and this represented the enthusiasm at the time for "triangular" co-operation in the post-OPEC environment. Western technology was to be combined with OPEC money to expand productive potential in the Arab world. This view of a joint Arab interest in the food potential of Sudan was fortunate since, as costs continued to rise, Saudi Arabia was induced to provide (in

autumn 1978) a further \$29 million of equity and a similar loan. Final shareholdings at the time of inauguration of the plant (March 3, 1981) are as displayed in Table 3.

**Table 3: Total Shareholdings**

(in million S£)

| Equity-holder   | M.S£  | % of Total |
|---|-------|------------|
| Sudan Government  | 112.5 | 34.2       |
| State of Kuwait   | 109.3 | 33.2       |
| Kingdom of Saudi Arabia   | 39.1  | 11.9       |
| Arab Investment Co.   | 39.1  | 11.9       |
| Sudan Development Corporation (State-owned)                           |       |            |
| El-Nile in Bank (State-owned, Sudan)                                  | 6.8   | 2.1        |
| Lonrho Ltd. (U.K.)  | 2.6   | 0.8        |
| Nissho-Iwai (Japan)   | 0.9   | 0.3        |
| Gulf Fisheries (A Subsidiary of Gulf International Based in Khartoum) | 0.9   | 0.3        |
| Total   | 300   | 100        |

**Source:** KSC (1981) Green Gold at Kenana

These shareholdings are connected with the remaining sources of finance in Table 4 while Table 5 displays the assets to which they relate. The latter table breaks down the local and foreign currency component of the expenditure for later references.

**Table 4: Kenana Sugar Project: Sources of Finance**

(in million S£)

|                          |           |
|--------------------------|-----------|
| Authorised share capital | S£ 330.00 |
| Supplier credits:        | S£ 47.52  |
| (i) France               | S£ 22.80  |
|                          | S£ 9.12   |

(iii) Japan

(iv) Austria

Infrastructure Loans                      S£ 80.00

(Kuwait and Saudi Arabia)

Total    S£479.44

**Source:** Kuwait Arab Fund for Economic Development, A Report on Kenana Sugar Project, Jan. 1978, Khartoum, and Kenana Sugar Company, Green Gold at Kenana, Feb. 1981.

It may be further noted at this stage, that part of the reason for the severe costs escalation for the project was attributed to the boom in the Arab oil states which had drawn away skilled Sudanese labour in considerable numbers. In addition, bottlenecks caused by acute shortage of foreign exchange within the Sudan were significant factors (cf. *Financial Times*, February 27, 1981). An example for the latter type of difficulty is illustrated by the supplies of cement for the project. The local factory (at Rabak) had been an added inducement for selection of the Kenana site.

Unfortunately, capacity was inadequate and whereas a costing of \$38 per ton had been employed in the feasibility study, most of the Kenana requirements had to be imported at \$175 per ton. The critical nature of the foreign exchange implications of the project will clearly need to be taken into account in the social cost-benefit analysis to follow.

On the more positive side, the net result has been that Sudan has acquired a "state of the art" sugar complex, including "long furrow" irrigation and a single factory with a 17,000 ton per day crushing capacity. This is intended to obtain maximum economy of steam use and optimum power generation from the available bagasse. These advantages are said to be considerable in comparison with the alternative of two or more smaller mills serving the same plantation. Whether optimum results will be achieved and maintained by this unique production strategy or not, it is too soon to say. But "Experience has shown that optimum results are achieved with a combined plantation and factory having a production and processing capacity of about 2,000 tons of cane per day for a production run for about 150 days" (OECD, 1968 Vol. 1, p. 93; see also Hagelberger, 1979 p. 894 and 897; Robson, 1977, p. 13 as quoted by Oesterdiekhoff, 1982).

Certainly, initial operating experience appears to have been favourable for this concept. At full capacity the plant could supply 40% of the 1980 consumption requirements of the Arabian peninsula or 25% for the Arab countries as a whole.

### **Table 5: The Structure of Capital Cost Estimates in Jan. 1978**

(in million S£)

| Item | Domestic | Foreign | Total |
|------|----------|---------|-------|
|------|----------|---------|-------|

|                            | Currency  | Currency  |        |
|----------------------------|-----------|-----------|--------|
|                            | Component | Component |        |
| Factory                    | 24.96     | 189.44    | 214.40 |
| Infrastructure             | 76.16     | 77.84     | 154.00 |
| Agricultural Works         | 11.2      | 24.16     | 35.35  |
| Administration             | 10.72     | 9.68      | 20.40  |
| Total                      | 123.04    | 301.12    | 424.16 |
| Renewal & Replacement Cost | 1.36      | 3.28      | 4.64   |
| Working Capital            | 6.88      | 16.00     | 22.88  |
| Interests During Execution | 8.24      | 19.44     | 27.68  |
| Total                      | 139.52    | 339.84    | 479.36 |
| Total in US Dollars Terms  | 174.4     | 424.8     | 599.2  |

**Source:** Kuwait Arab Fund for Economic Development, A Report on Kenana Sugar Project, Khartoum, Jan. 1978.

Appraisal of this major project commences below from the commercial viewpoint where existing market prices and forecasts are utilised. The social appraisal will make significant adjustments to the prices used in the initial examination.

### 3. COMMERCIAL APPRAISAL

Data on the initial capital cost together with estimated fixed and variable costs of production are present in Tables 7 and 8.

In addition to these figures, the land has been rented for about 12 US cents per acre per annum over a period of 30 years, liable to extension. Irrigation water is given free of charge throughout the project lifetime. Furthermore the company is exempted from income

tax for a period of ten years from the start-up date, i.e. 1979; thereafter, an income tax of about 50% of net profit (see Appendix 1) will be in operation.

Additional costs are transport to the port and debt servicing. As shown in Table 4, despite the 1980 capital raising operation which converted a large amount of shareholders' loans into equity, about S£ 150 million of capital costs was still accounted for by supplier's credits and relatively cheap loans from Kuwait and Saudi Arabia. Terms are shown in Table 9. Assuming that equal annual instalments are to be paid over the full terms of amortisation of each loan, repayments of these loans are given in Table 6. The table also shows the transport costs from Kenana to Port Sudan estimated after the completion of the 30 km railway spur by Kuwait Arab Fund.



**Table 6: Debt Servicing and Transport Costs**

(in million S£)

| Year      | Debt Servicing | Year      | Transport Costs |
|-----------|----------------|-----------|-----------------|
| 1978      | 6.24           | 1980      | 1.92            |
| 1979      | 2.24           | 1981      | 4.64            |
| 80-81     | 11.39          | 1982      | 6.32            |
| 1982      | 17.56          | 1983      | 7.6             |
| 1983-91   | 18.11          | 1984-2004 | 8.16            |
| 1992      | 8.87           |           |                 |
| 1993-2000 | 7.72           |           |                 |

On the revenue side, the agreement between the government and the company (mentioned earlier) stated that 150,000 metric tons of white sugar was to be sold to the government (for consumption or export) at a guaranteed *basic price* of US\$137.5 per metric ton (S£110 per metric ton). The rest of the production (180,000 metric tons) will be exported by the company to the world sugar market. After addition of cost estimates to the *basic price* the company estimated the guaranteed price as follows: 378.2, 399.4, 445, 489 and 532.4 Sudanese pounds per metric ton for 1979, 1980, 1981, 1982 and 1983-2004 respectively.

In dollar terms, the guaranteed price is equivalent to the 1974 world record price of sugar which was around 654 US dollars per metric ton.

**Table 7: Total Project Capital Costs** (in thousand S£)\*

| Item  | Domestic<br>Currency | Foreign<br>Exchange | Total   |
|---|----------------------|---------------------|---------|
|   | Component            | Component           |         |
| <b>A. The Factory</b>                         | 0,800                | 118,150             | 118,960 |
| 1.a Factory Equipment (from France and Japan) | 1,600                | 16,000              | 17,600  |
| 2.a Civil Engineering Works                   | 8,000                | 25,000              | 33,600  |
| 3.a Erection Works                            | --                   | 11,200              | 11,200  |
| 4.a Electrical Equipment                      | 4,000                | 2,400               | 6,400   |
| 5.a Additional Works in the                   | 6,400                | 3,840               | 10,480  |

|   |        |         |         |
|---|--------|---------|---------|
| Factory (Including Grease, Oil & Lubricants)        | 0,800  | 2,320   | 3,120   |
| 6.a Transport Costs from Port Sudan to the Site     | 1,600  | 9,120   | 10,880  |
| 7.a Various Tools & Light Equipment                 | 1,360  | 0,800   | 2,160   |
| 8.a Consultants' Fees                               |        |         |         |
| 9.a Contingencies (Inventory Accumulation)          |        |         |         |
| Total   | 24,960 | 189,440 | 214,400 |
| <b>B. Infrastructure</b>                            | 25,840 | 49,040  | 74,880  |
| 1.b Civil Engineering Works for Irrigation          | -      | 11,200  | 11,200  |
| 2.b Pump Stations Equipment                         | 0,960  | 0,160   | 1,120   |
| 3.b HQ Buildings                                    | 27,680 | 6,240   | 33,920  |
| 4.b Welfare and Housing                             | -      | 0,240   | 0,240   |
| 5.b Water Purification Plants                       | 0,320  | 1,600   | 1,920   |
| 6.b Electrical Engineering Works                    | 2,000  | -       | 2,000   |
| 7.b Construction of 30km Railway Spur               | 11,520 | 2,400   | 13,920  |
| 8.b Civil Works for Transport of Cane               | 1,200  | 0,400   | 1,600   |
| 9.b Miscellaneous Works                             | 0,640  | 5,360   | 6,000   |
| 10.b Consultants' Fees                              | 6,000  | 1,200   | 7,200   |
| 11.b Contingencies (Inventory Accumulation)         |        |         |         |
| Total   | 76,160 | 77,840  | 154,000 |
| <b>C. Agriculture</b>                               | 0,400  | 1,640   | 16,800  |
| 1.c Harvesting & Cane Transport Vehicle & Equipment | -      | 2,320   | 2,320   |
|   | -      | 5,400   | 5,440   |
| 2.c Maintenance Works                               | 5,840  | -       | 5,840   |
| 3.c Trucks, Tractors and Workers Transport Vehicle  | 4,960  | -       | 4,960   |

|  |         |         |         |
|--|---------|---------|---------|
| 4.c Survey & Land Preparation Works          |         |         |         |
| 5.c Pilot Scheme & Nurseries                 |         |         |         |
| Total  | 11,200  | 24,160  | 35,360  |
| <b>D. Administration</b>                     | 0,880   | 1,120   | 2,000   |
| 1.d Cars, Office Furniture and DC 3 Aircraft | 0,080   | 0,720   | 0,800   |
| 2.d Sugar Storage at Port Sudan              | 9,360   | 7,280   | 16,640  |
| 3.d Preliminary Expenses                     | 0,400   | 0,560   | 0,960   |
| 4.d Contingencies                            |         |         |         |
| Total  | 10,720  | 301,120 | 424,160 |
| Total of A,B,C and D                         | 123,040 | 339,840 | 479,360 |
| <b>E. Renewal &amp; Replacement Cost</b>     | 1,360   | 3,280   | 4,640   |
| <b>F. Working Capital</b>                    | 6,880   | 16,000  | 22,880  |
| <b>G. Interests During Execution</b>         | 8,240   | 19,440  | 27,680  |
| Grand Total                                  | 139,520 | 378,560 | 534,560 |

\* All data in the table given in Sudanese pounds (£) were derived from US dollar equivalents.

**Source:** Kuwait Arab Fund for Economic Development, A Report on Sugar Project, Khartoum, Jan. 1978.

### **Table 8: Total Costs of Production**

(in Sudanese pounds)

| Cost Item                      | Cost/metric ton |
|--------------------------------|-----------------|
| <b>Variable Costs</b>          | 5,904           |
| <b>A. Agriculture</b>          | 0,816           |
| 1.a Land Preparation           | 34,080          |
| 2.a Nurseries: Crop Husbandry  | 8,055           |
| 3.a Plantation: Crop Husbandry | 3,750           |
| 4.a Irrigation                 | 1,072           |

|  |         |
|--|---------|
| 5.a Electricity                                    |         |
| 6.a Materials (Transport included)                 |         |
| Total  | 53,688  |
| <b>B. Harvesting &amp; Cane Transport</b>          | 10,944  |
| 1.b Harvesting Cost                                | 11,168  |
| 2.b Transport Cost                                 | 0,304   |
| 3.b Materials                                      |         |
| Total  | 22,335  |
| <b>C. The Factory</b>                              | 15,448  |
| 1.c Materials & Transport Cost                     | 4,880   |
| 2.c Salaries & Wages                               |         |
| Total  | 20,328  |
| Total Variable Costs                               | 90,352  |
| <b>Fixed Costs</b>                                 | 7,472   |
| 1. General Expenses (Agriculture)                  | 6,520   |
| 2. General Expenses (Factory)                      | 3,895   |
| 3. Administration                                  | 3,680   |
| i. Salaries & Wages                                | 8,448   |
| ii. Civil Works                                    | 5,632   |
| iii. Materials & Transport                         |         |
| iv. Other Expenses                                 |         |
| Total Fixed Costs                                  | 35,648  |
| Total Costs of Production (Excluding Depreciation) | 132,000 |

**Source:** Kuwait Arab Fund for Economic Development, A Report on Kenana Sugar Project, Jan. 1978.

**Note:** The base of data is Kenana Sugar Company - Project files (1978). For the rest of the paper, all statistical infirmations are taken from this source unless stated otherwise.

**Table 9: Kenana Sugar Project: Terms of Credits and Loans**

(in millions S£)

|  | Date<br>of<br>Agreement | Loan<br>(milli<br>on<br>S£) | Rate<br>of<br>Intere<br>st | Grace<br>Perio<br>d<br>(Year<br>s) | Recove<br>ry<br>Period<br>(Years) |
|--|-------------------------|-----------------------------|----------------------------|------------------------------------|-----------------------------------|
| <b>Supplier's Credits</b>                  | 14/5/76                 | 47.52                       | 7.5                        | 4                                  | 12                                |
| France                                     | 8/11/76                 | 22.80                       | 8.5                        | 4                                  | 12                                |
| Japan                                      | 10/7/75                 | 9.12                        | 8.0                        | 5                                  | 13                                |
| Austria                                    | 1/4/78                  | 4.40                        | 8.0                        | 5                                  | 13                                |
| U.K.                                       | 1/10/78                 | 80.00                       | 6.0                        | 4                                  | 19                                |
| Infrastructure                             |                         |                             |                            |                                    |                                   |
| Loans<br>(Kuwait &<br><br>Saudi<br>Arabia) |                         |                             |                            |                                    |                                   |

**Source:** Ibid and personal communication.

Taking the average world sugar price over the period (1970-1987 394.4 Sudanese pounds per metric ton) for our projections, the guaranteed price seems to be considerably higher than the expected world market prices. The difference between the guaranteed price and the expected market price, which we shall refer to as the "potential subsidy" from the government to the company, appears to be substantial.

The technical feasibility study and the subsequent reports on Kenana estimated that with proper maintenance the major factory equipment would last for 30 years. Assuming a linear depreciation allotment of 4% per annum<sup>2</sup> on the major factory and agricultural equipment, the terminal value of this fixed capital could be about S£83.5 million, whereas buildings and structures are assumed to collapse, at the end of the period, with no residual value. Terminal value of working capital estimated at around S£22.88 million has been included in Table 5. This gives a terminal value of around S£106 million.

Table 10 gives the cash flow account for each year of the project. In the first five years, there is a net cash outflow from the project. The excessive delays in the construction stage which led to the loss of two cane-crushing seasons clearly compounded the problem of cash outflow. The net outflow was particularly high in 1977 and 1978. From 1980 onwards a net cash inflow is forecast. During the period 1981-1987, a reasonable net cash inflow is forecast partly because of the exemption from income tax. In the year 1989, when the income tax begins, the net cash inflow is expected to decrease from an average of S£85 million to around S£60 million and stay around this level till the end of the period.

**Table 10: Kenana Sugar Project: Cash Flow Account (Part 1)**

(in million S£)

|         | Capital<br>Costs* | Total<br>Costs | Transport<br>Cost to<br>Port Sudan | Renewal &<br>Replacement<br>Cost | Debt<br>Servicing | Income<br>Tax | Total |
|---------|-------------------|----------------|------------------------------------|----------------------------------|-------------------|---------------|-------|
| 1975 1  | 6.4               |                |                                    |                                  |                   |               | 6.4   |
| 1976 2  | 70.4              |                |                                    |                                  | 6.24              |               | 70.4  |
| 1977 3  | 139.6             |                |                                    |                                  | 2.24              |               | 139.6 |
| 1978 4  | 119.4             | 11.76          | 1.92                               | 4.64                             | 11.39             |               | 137.4 |
| 1979 5  | 72.88             | 14.8           | 4.64                               | 5.12                             | 11.39             |               | 91.84 |
| 1980 6  | 36.8              | 21.8           | 5.12                               | 5.6                              | 17.55             |               | 79.3  |
| 1981 7  |                   | 44.4           | 5.6                                | 6.09                             | 18.11             |               | 67.23 |
| 1982 8  |                   | 47.2           | 6.09                               | 6.08                             | 18.11             |               | 77.96 |
| 1983 9  |                   | 50.8           | 6.08                               | 6.08                             | 18.11             |               | 83.19 |
| 1984 10 |                   | 50.8           | 6.08                               | 6.08                             | 18.11             |               | 83.15 |
| 1985 11 |                   | 50.8           | 6.08                               | 6.08                             | 18.11             |               | 83.15 |
| 1986 12 |                   | 50.8           | 9.08                               | 6.08                             | 18.11             |               | 83.15 |
| 1987 13 |                   | 50.8           | 6.08                               | 6.08                             | 18.11             |               | 83.15 |

|         |      |      |      |       |       |       |
|---------|------|------|------|-------|-------|-------|
| 1988 14 | 50.8 | 6.08 | 6.08 | 18.11 |       | 83.15 |
| 1989 15 | 50.8 | 6.08 | 6.08 | 18.11 | 26.6  | 109.7 |
| 1990 16 | 50.8 | 6.08 | 6.08 | 18.11 | 109.7 |       |
| 1991 17 | 50.8 | 6.08 | 6.08 | 18.11 | 26.6  | 109.7 |
| 1992 18 | 50.8 | 6.08 | 6.08 | 8.87  | 32.1  | 106.0 |
| 1993 19 | 50.8 | 6.08 | 6.08 | 7.72  | 32.8  | 105.6 |
| 1994 20 | 50.8 | 6.08 | 6.08 | 7.72  | 32.8  | 105.6 |
| 1995 21 | 50.8 | 6.08 | 6.08 | 7.72  | 32.8  | 105.6 |
| 1996 22 | 50.8 | 6.08 | 6.08 | 7.72  | 32.8  | 105.6 |
| 1997 23 |      |      |      |       |       |       |
| 2000-26 | 50.8 | 6.08 | 6.08 | 7.72  | 32.8  | 105.6 |
| 2004 27 |      |      |      |       |       |       |
| -30     | 50.8 | 6.08 | 6.08 |       | 32.8  | 97.8  |
| 2005 31 |      |      |      |       |       |       |

\* including working capital

**Table 10: Kenana Sugar Project: Cash Flow Account Receipts(Part 2)**

(in million S£)

|        | Equity<br>Capital<br>and Loan<br>Allocation | Domestic<br>Sales | Foreign<br>Sales* | Terminal<br>Value +<br>Reclaimed<br>Working<br>Cap. | Potential<br>Subsidy | Total<br>(incl.<br>subsidy) | Net cash<br>Flow<br>with<br>Subsidy |
|--------|---|-------------------|-------------------|---|----------------------|-----------------------------|-------------------------------------|
| 1975 1 | 2.35  |                   |                   |   |                      |                             | -4.05                               |





|             |      |       |      |       |       |
|-------------|------|-------|------|-------|-------|
| 1997-<br>23 |      |       |      |       |       |
| 2000-<br>26 | 79.8 | 60.3  | 21.0 | 140.0 | 40.6  |
| 2004<br>27  |      |       |      |       |       |
| -30         | 79.8 | 60.3  | 21.0 | 140.0 | 42.4  |
| 2005        |      |       |      |       |       |
|             |      | 106.4 |      |       | 106.4 |

\* sugar sales to the Government

Further detail on the exact status of the subsidy to be provided by the Sudan government is unfortunately not available and two calculations have been conducted in relation to the data in Table 10. These are the internal rate of return on the project with and without the subsidy and are approximately 12% and 8% respectively. It should be emphasised that these figures refer to the expected market return on the project as a whole.

The calculation for the private cash flow of the project in Table 10 suggests that the subsidy is rather crucial in order to generate a reasonable rate of return.

To explore further the merits of this project from the standpoint of the economy of the Sudan, the remainder of the paper concentrates on a social cost-benefit appraisal.

#### **4. SOCIAL APPRAISAL OF THE KENANA PROJECT: INTRODUCTORY POINTS**

The project was undertaken in the context of continuing attempts by the Sudan government to promote economic growth through the agency of development planning. A ten-year plan was initiated in 1961-62 followed by a five-year plan for 1970-75, introduced in 1969. This five-year plan was amended by the Interim Programme of Action (1972/73-1976/77) and it was this programme which contained provision for the Kenana scheme.

A linking theme of the plans to date, in common with most other LDCs, has been the need to promote economic growth and the (possibly) conflicting objective of more equitable distribution of wealth.

These concerns imply that the project's contribution to savings and to the consumption of poorer groups, be given direct expression in the analysis. In this appraisal we adopt the 'numeraire' advocated in the UNIDO (1972) manual of aggregate consumption benefits. The technique involves the 'weighting' of consumption by different groups.

One of the important decisions to be made in the analysis concerns the treatment of the capital costs of the project. Since a substantial part of these costs is to be met by foreigners' equity investment (cf. Table 3), these capital funds will be treated as if they had no opportunity cost for Sudan. This would be the usual assumption for foreign direct investment, since the alternative for the foreign firms of the project in question would be to invest in another country and not another project in the same country. A complication in this case, however, is that the political conditions of the time suggest that the Arab governments may well have been willing to invest similar amounts in other projects in the Sudan. If the volume of funds could be regarded as freely available to the Sudan, it would be sensible, from Sudan's viewpoint, to channel them to the relatively lower yielding public sector projects with Sudan taking a larger share of the most profitable ones. This would be analogous to the situation where a country is contemplating the alternatives of a purely foreign-owned direct investment and the possibility of doing the same thing from its own financial resources. It is argued, for instance, by Little and Mirrlees (1974, p. 121; 1990) that in these circumstances the government would choose the latter if the expected rate of return on the foreigners' equity participation appeared to be higher than the country's own accounting rate of interest (by which it discounts returns on their public sector projects). In the Sudan's case, this suggests that the project should be penalised if it is expected to produce such a premium for foreign shareholders since they would be receiving a higher return on their funds than the implied cost of capital for the Sudan economy.<sup>3</sup> This appears unlikely given the acute shortage of foreign exchange faced by the country, to which further reference will be made when foreign exchange premia are introduced.

Before conducting the full analysis the following points may be noted:

1) In addition to the value of the 'conventional' output from the project a further indirect benefit of some significance is generated by housing and welfare facilities for about 11,600 Sudanese employees.<sup>4</sup> In assessing these benefits we impute a 16% rate of return on investment of S£ 33.92 million in these facilities. This in turn suggests an annual 'social' return of around S£ 5.2 million.

2) Table 11 provides further details of the information given in Table 10 in the form of local and foreign currency costs which will be the foundation of the analysis. Of further importance is the breakdown provided regarding skilled and unskilled labour. The former refers to engineers, surveyors and all employees with higher education. Semi-skilled workers, such as drivers, are regarded as unskilled since the error of undervaluing their opportunity cost is probably small and since some will receive 'on-the-job' training<sup>5</sup> for which the project should receive credit.

Unfortunately, full details of the breakdown of labour skill and domestic and foreign exchange cost of materials used in production were not available and assumptions have had to be employed.

The principle being followed here is to give approximate breakdowns to all social costs and benefits and to use the overall percentages throughout the project life-span in the hope that pluses and minuses cancel or nearly so (a point of view also expressed in the UNIDO, 1972, and by Little and Tipping, 1972, in their case study of the Kulai Oil Palm Estate).

Luckily the foreign exchange component of capital costs, which represents about 70% of the total investment cost, proved to be relatively easy to split between imported materials and foreign personnel. Also costs of production have been reported in a helpful manner by putting expenditure on materials and on wages and salaries separately. In the absence of any relevant information, we guessed the

**Table 11: Benefits, Costs and Cash Transfers of Kenana Sugar Project(Part 1)**

(in million S£)

|  |     |    |    |    |    |
|--|-----|----|----|----|----|
| <b>Price<br/>(FOB<br/>Port<br/>Sudan<br/>)</b>           | 0.1 | 20 | 26 | 28 | 27 |
| 2.<br>Repatriated<br>Profit<br><br>(Foreign<br>Exchange) |     |    |    |    |    |
| 3.<br>Repatriated<br>Equity<br><br>(Foreign<br>Exchange) |     |    |    |    |    |
| 4.<br>Scrap<br>Value<br><br>(Foreign<br>Exchange)        |     |    |    |    |    |

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|-------------------------------|------|------|------|------|------|
| Labour                        |      |      |      |      |      |
| 8.d<br>Unskilled<br>Labour    |      |      |      |      |      |
| 9.                            | 1.92 | 4.6  | 6.3  | 7.6  |      |
| Transport to<br>Port<br>Sudan | 1.4  | 3.2  | 4.4  | 5.4  |      |
|                               | 0.4  | 1.0  | 1.2  | 1.6  |      |
| 9.a<br>Foreign<br>Exchange    | 0.2  | 0.46 | 0.54 | 0.8  |      |
| 9.b<br>Unskilled<br>Labour    |      |      |      |      |      |
| 9.c<br>Skilled<br>Labour      |      |      |      |      |      |
| 10.                           | 4.64 | 5.12 | 5.6  | 6.08 | 6.08 |
| Renewal &                     | 3.50 | 3.8  | 4.2  | 4.6  | 4.6  |
| Replacement<br>Cost           | 1.16 | 1.28 | 1.4  | 1.52 | 1.52 |
| 10.a<br>Foreign<br>Exchange   |      |      |      |      |      |
| 10.b                          |      |      |      |      |      |

|                              |  |  |  |  |      |     |      |      |      |
|------------------------------|--|--|--|--|------|-----|------|------|------|
| Skilled<br>Labour            |  |  |  |  |      |     |      |      |      |
| 11.<br>Cash<br>Transfers     |  |  |  |  | 11.8 | 7.0 | 13.8 | 21.8 | 29.2 |
| 11.a<br>Income<br>Tax        |  |  |  |  |      |     |      |      |      |
| 11.b<br>Potential<br>Subsidy |  |  |  |  |      |     |      |      |      |
| (Foreign<br>Exchange)        |  |  |  |  |      |     |      |      |      |
| 12.<br>Working<br>Capital    |  |  |  |  | 16.0 | 6.9 |      |      |      |

**Table 11: Benefits, Costs and Cash Transfers of Kenana Sugar Project (Part 2)**

(in million S£)

|   |     |     |     |     |     |     |     |     |   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|---|
| 1.<br>Output<br>at<br>World<br>Sugar<br>Price | 112 | 110 | 112 | 115 | 108 | 110 | 110 | 110 | - |
|---|-----|-----|-----|-----|-----|-----|-----|-----|---|





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| 6. | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | - |
|----|-----|-----|-----|-----|-----|-----|-----|-----|---|

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|-----------------------------|------|------|------|------|------|------|------|------|---|
| 10.                         | 6.08 | 6.08 | 6.08 | 6.08 | 6.08 | 6.08 | 6.08 | 6.08 | - |
| Rene<br>wal &               | 4.6  | 4.6  | 4.6  | 4.6  | 4.6  | 4.6  | 4.6  | 4.6  | - |
| Repla<br>ceme<br>nt<br>Cost | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | 1.52 | - |

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|                       |      |      |      |    |    |      |      |      |   |
|-----------------------|------|------|------|----|----|------|------|------|---|
| 11.                   | 29.8 | 28.8 | 27.8 | 27 | 27 | 26.6 | 26.6 | 32.8 | - |
| Cash<br>Trans<br>fers |      |      |      |    |    | 27   | 27   | 27   | - |

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breakdown of wages and salaries, but this is a very minor item. When it came to a domestic currency component, matters become somewhat more complex and consequently our procedure is a rough-and-ready method. We believe that little damage was done to our evaluation by this procedure since the capital expenditure in terms of local currency was rather small (29% of the total). Moreover, the disaggregation process will hopefully minimise the errors.

The last items which deserve some explanation are the breakdowns of rail transport and replacement costs. Following Little and Tipping (1972, p. 84), where their calculations were based on a Malaysian input-output table, we have put transport costs from Kenana to Port Sudan into the following proportions:

60% foreign exchange (e.g. fuel and spare parts)

30% unskilled labour and 10% skilled labour.

With regard to renewal and replacement cost, an attempt was made to separate the cost of equipment from that of buildings. In the end, we have settled for the assumption that maintenance and repairs of buildings is rather insignificant since about 78% of Kenana's work-force (i.e. semi-skilled and unskilled employees) live in grass cottages and huts. Renewal and replacement of equipment is obviously a heavy consumer of fuel and spare parts and a user of skilled manpower. The split between them was guessed as follows:

75% foreign exchange (imported materials)

25% skilled labour.

3) It should be noted finally with regard to Table 11 that foreign equity participants are assumed to repatriate their share of anticipated future profits. This is shown as item 2 in the table.

Moreover, capital costs under item 7 will be reduced by 60% of S£ 330 million being the foreign equity contribution of the project in line with the discussion above.

## 4.1 Evaluation of Aggregate - Consumption Benefits

Our evaluation will be in successive stages of approximation. The first step is to assess the social benefits and social costs under the assumption that market prices adequately reflect the consumption benefits and cost involved. On this basis the benefits of Kenana consist of items (1), (4), (5) and (6) in Table 11 and the consumption costs (i.e. sacrifice of consumption possibilities) include items (2), (3), (8), (9), (10) and (12).

All these cost items represent payments for resources that could have been used elsewhere in the absence of the project.

The first approximation of net aggregate-consumption benefits in any given year will be measured as follows:

$$A = (1) + (4) + (5) + (6) - (2) - (3) - (7) - (8) - (9) - (10) - (12) + 0.6 (\text{S£ } 330 \text{ m}) (1)$$

To proceed to the second approximation, we have to relax our assumption of prices truly reflecting scarcity. We introduce market distortions which necessitate the adjustment of the market prices of specific resources wherever these prices do not represent the real contribution of the resources to our objective of aggregate-consumption benefits. Since imperfect market prices can occur in a number of ways, for simplicity and clarity we shall assume that all resources other than foreign exchange, skilled labour and unskilled labour are correctly priced by the actual market prices.

With regard to foreign exchange, Sudan has had a two-tier exchange rate system since June 1978 to encourage inflow of foreign exchange remittances. Arrears of unpaid commercial debt amounted to \$ 3.6 billion and since the summer of 1978, the development programme has been slowed down due to balance of payment problems. Sudan has exercised strict quantitative import controls and export subsidies to maintain the dollar value of its pound. As the Sudanese pound is clearly overvalued we apply a positive foreign exchange premium which will be represented by . The opportunity cost of foreign exchange relative to the official exchange rate of the pound can be denoted by (1 + ).

Skilled labour is fully employed in the Sudan. However, the fact that 1988 alone witnessed a number of strikes over payment disputes by Engineers, Doctors, Accountants, University Teachers and Agriculturalists Trade Unions may point to a wide recognition of underpayment. Therefore, we assume that the marginal skilled worker contributes more to aggregate-consumption benefits than the salary he/she commands. The social premium on the market wage of skilled labour can be denoted by x.

Finally we come to the case of unskilled labour which is assumed to be surplus in the Sudan. Obviously the case of surplus unskilled labour is opposite to the two previous cases. The social premium on unskilled surplus labour, which is negative, can be symbolised by and the opportunity cost -- relative to the market wage rate -- will be denoted by  $(1 + )$ .

Before we proceed to the formula of the second approximation we have to make one more correction. Foreign exchange in our case falls into materials and salaries to foreign personnel as part of capital costs. It is sensible to assume that foreigners will consume part of their salaries in the Sudan and repatriate the rest. For the part consumed in the Sudan there is no need for correction, since the dollar value of this part is converted at the official exchange rates and thus Sudan does not lose the extra value of the foreign exchange. We shall denote the portion of the salary consumed in the Sudan by  $\alpha$ . This parameter is between zero and one and the repatriated portion is  $(1 - \alpha)$ .

Assuming that all the correct factors (opportunity cost premiums) will remain constant throughout, we can have our second approximation as follows:

$$B = A + F + L + \alpha W \quad (2)$$

where

$$F = (1) - (2) - (3) + (4) + (5.a) - (7.a) (1-) (7.b) - (8.a)$$

$$- (9.a) - (10.a) - (12.a) + 0.6 (S£ 330 m) \quad (2a)$$

$$L = -(7e) - (8.d) - (9.b) \quad (2b)$$

$$W = -(7.d) - (8.c) - (9.c) - (10.b) \quad (2c)$$

The term  $F$  corrects  $A$  for the opportunity cost of foreign exchange by multiplying benefits and costs component of foreign exchange by the positive foreign exchange premium  $\alpha$ . The term  $L$  corrects  $A$  for the opportunity cost of unskilled surplus labour,  $L$ , by the negative labour premium,  $\beta$ ; and the last terms,  $\alpha W$ , corrects  $A$  for skilled labour with the positive premium  $\alpha$ .

We now come to the third and final approximation which is to account for the fact that in developing countries development is normally given a priority to the extent that the value of funds devoted to investment exceeds the social value of the same amount of funds devoted to consumption. This phenomenon is clear in the Sudan. The fact that Sudan has accepted in principle the terms of assistance dictated by the IMF which includes severe cuts in public expenditure, lifting of subsidies on petrol, sugar and some other food items and devaluation of the Sudanese pound may all point to the inability of the government to bring about optimal savings deemed necessary for development (see also Wynn, 1980; World Bank, 1990). Moreover, it can be assumed that aggregate savings in the Sudan will remain suboptimal in the near future.

This requires the adjusted net benefits in equation (2) above to be 'allocated' to the groups that will gain or lose from them. For this purpose, three sectors are assumed, the government (GO), the private sector (V) and unskilled labour (L) for which the net effects have to be specified.

The 'government' (including El-Nilein Bank and the Sudan Development Corporation) controls the foreign exchange market so that the net benefits of the project may be allocated to the three sectors as follows:

$$B = B^{GO} + B^L + B^V \quad (3)$$

where

$$B^{GO} = A + F - (6) \quad (3a)$$

$$B^L = [(7.e) + (8.d) + (9.b) + (6)] \quad (3b)$$

$$B^V = -xW \quad (3c)$$

The important points here are that unskilled labour gets two benefits. First its 'excess' payment over marginal product (the proportion  $x$ ) and the further benefit of the investment in housing (6). The private sector, however, loses the 'surplus' it has previously enjoyed from the underpayment (by proportion  $x$ ) of skilled labour drawn to the project.

$B^{GO}$ ,  $B^L$  and  $B^V$  must now be amended to adjust for the proportions which each group will consume or save (since savings are assumed to be at a premium).

For instance, if the marginal savings propensity of unskilled workers is  $S_L$  then the social value of net consumption benefits flowing to unskilled labour is as follows:

$$C^L = [(1-S_L) + S_L P^{INV}] B^L \quad (4)$$

where  $P^{INV}$  = the shadow price of investment.

The same equation applies if  $S_{GO}$  and  $S_V$  are the marginal savings propensities of (GO) and (V) respectively.

Based on the preceding information we may write the final approximation as follows:

$$C = C^{GO} + C^L + C^V \quad (5)$$

## 4.2 Benefits to the Sudan

In order to throw light on the question of how profitable Kenana could be for the country, we have to establish numerical values for the various national parameters which we have been specifying throughout the course of the discussion in the preceding section. Obviously the parameters we have been discussing are essential for the assessment of the desirability of

proposed public sector projects in the light of the national interests. Consequently, in estimating them, information that pertains to the state of the economy and the policies of the government are essential.

Naturally, the required information is of both factual and normative nature. Presumably this is the main reason why the two manuals presented by UNIDO in 1972 and that by Little and Mirrlees in 1974 for evaluation of industrial projects in developing countries suggested some specific roles for a central office for project appraisal and planning as part of the Ministry of Economy. Unfortunately this office has no counterpart in the Sudan. Accordingly, we have to resort to some reasonable assumptions about these parameters based on the available information on the country and the economy. On this basis, we put forward the set of assumptions in numerical values. The range of values given is believed to be appropriate to the Sudanese economy. A few comments are in order.

In view of the fact that Kenana is making use of land which was bare savannah a few years ago and where "... people used to live the same nomadic lives which their forefathers had followed for centuries" (KSC, 1980, p. 33), it may not be unreasonable to regard the opportunity cost of unskilled labour as equal to zero. A further support to this point of view can be gained from the fact that Kenana province is one of the relatively densely populated regions in the country; thus it is not expected that local production will be adversely affected by the project. On the contrary, it is almost certain that the nomads of the area will find a lucrative market in the township of Kenana for their milk, meat, etc. In any case it is to be noticed that unskilled labour costs represent a surprisingly small proportion of the total costs (7% of capital costs and 15% of the total costs of production).

In contrast, the opportunity cost of skilled labourers is estimated at between one-and-a-half and twice the market wage rate. We have already mentioned that a number of strikes took place.

In discounting the social costs and benefits we adopted the fairly safe assumption of the Social Discount Rate,  $i$ , being 0.08 and 0.13. With regard to the marginal propensity to save,  $S$ , and the marginal rate of return to investment,  $q$ , we followed the rule of upper and lower limits. Namely  $q > i$  and  $i > Sq$  which is consistent with the UNIDO (1972) procedures. Within these limits and in the absence of any information, we regard our set of values for  $S$  and  $q$  as a reasonable guesses. Having numerical values for  $i$ ,  $S$  and  $q$ , the shadow price of investment is calculated by the aid of the following formula:

$$P^{INV} = \frac{(1-S)q}{i-Sq} \quad (6)$$

$i-Sq$

As for propensities to save, it is assumed that while the government may devote its savings to investment, the unskilled labourers will consume all their wages. Also, it is tentatively assumed that the private sector will consume between 40% and 50% of its profit.

As for the foreign exchange premium, the formula for estimating the Shadow Exchange Rate (SER) suggested by the UNIDO<sup>6</sup>(p. 215 onwards) is considered by many including the authors



themselves as possibly, but certainly not necessarily, correct, especially if the traded goods in question are intermediate products subject to varying tariffs or quotas or both. In the absence of any reliable operational procedures on the issue we have guessed as 0.2. This is a very conservative guess suggesting a 20% implicit premium on foreign exchange. Our narrative so far indicates that this is probably a considerable underestimate. For foreign personnel we have assumed that they will consume between 40% to 60% of their salaries in the Sudan. We have guessed these last two percentages with the high rate of inflation in mind.

All the parameters listed in Table 12 are assumed to be constant. Consequently the time flows shown in Table 11 are converted into their present value in the base year (Table 12) since that is equivalent to making separate calculations for each year of the project. Having the values in Tables 12 and 13, we set in the equations given earlier. The results are given in Table 14.

**Table 12: Values of National Parameters: Assumptions Set**

|   |                           |
|---|---------------------------|
| (1) Foreign Exchange Premium                                  | = 0,2                     |
| (2) Domestic Skilled Labour Premium                           | $x = 0.5$                 |
| (3) Unskilled Labour Premium                                  | = 1,0                     |
| (4) Marginal Rate of Return to Investment                     | $q = 0,20$                |
| (5) Marginal Rate of Savings                                  | $S = 0,25$                |
| (6) Social Discount Rates                                     | $i = 0,08; 0,1; 0,13$     |
| (7) Shadow Price of Investment                                | $P^{INV} = 5,0; 3,0; 1.8$ |
| (8) Marginal Propensities to Save (MPS):                      | $S^{GO} = 1,0$            |
| (a) Government  | $S_L = 0,0$               |
| (b) Unskilled Labour  | $S_V = 0,6$               |
| (c) Private Sector  |                           |
| (9) Proportion of Foreign Personnel Salary Spent in the Sudan | = 0.6                     |

**Table 13: Present Value in Year 1 of Items in Table 12**

(in million S£)

| Item | Social Rate of Discount |     |     |
|------|-------------------------|-----|-----|
|      | 8%                      | 10% | 13% |

|  |        |        |        |
|--|--------|--------|--------|
| 1. Output (Foreign Exchange)               | 801.40 | 620.80 | 439.1  |
| 2. Repatriated Profit (Foreign Exchange)   | 123.20 | 97.45  | 70.3   |
| 3. Repatriated Equity (Foreign Exchange)   | 17.60  | 9.97   | 70.3   |
| 4. Scrap Value (Foreign Exchange)          | 7.70   | 9.97   | 4.3    |
| 5. Reclaimed Working Capital               | 2.10   | 1.20   | 0.52   |
| 5.a Foreign Exchange                       | 1.50   | 0.83   | 0.4    |
| 5.b Domestic Materials                     | 0.6    | 0.37   | 0.12   |
| 6. Welfare & Housing (Domestic Materials ) | 53.4   | 44.2   | 34.3   |
| 7. Capital Costs                           | 320.5  | 302.7  | 276.1  |
| 7.a Foreign Exchange                       | 145.2  | 137.12 | 125.07 |
| 7.b Foreign Personnel                      | 80.1   | 75.67  | 69.58  |
| 7.c Domestic Materials                     | 55.3   | 52.06  | 47.49  |
| 7.d Skilled Labour                         | 23.15  | 21.79  | 19.88  |
| 7.e Unskilled Labour                       | 16.07  | 15.13  | 14.08  |
| 8. Costs of Production                     | 363.71 | 280.75 | 199.33 |
| 8.a Foreign Exchange                       | 56.37  | 43.52  | 30.89  |
| 8.b Domestic Materials                     | 82.20  | 63.45  | 45.05  |
| 8.c Skilled Labour                         | 57.10  | 44.08  | 31.29  |
| 8.d Unskilled Labour                       | 167.31 | 129.14 | 91.69  |
| 9. Transport Cost to Port Sudan            | 49.7   | 39.34  | 27.00  |
| 9.a Foreign Exchange                       | 29.82  | 23.60  | 16.2   |
| 9.b Unskilled Labour                       | 14.91  | 11.80  | 8.1    |
| 9.c Skilled Labour                         | 4.97   | 3.93   | 2.7    |
| 10. Renewal & Replacement Cost             | 42.3   | 32.74  | 26     |
| 10.a Foreign Exchange                      | 31.72  | 24.55  | 19.5   |
| 10.b Skilled Labour                        | 10.57  | 8.18   | 6.5    |
| 11. Cash Transfers                         | 94.93  | 64.7   | 32.7   |

|                         |       |        |       |
|-------------------------|-------|--------|-------|
| 11.a Income Tax         | 184.5 | 142.06 | 99.06 |
| 11.b Potential Subsidy  |       |        |       |
| 12. Working Capital     | 15.25 | 13.82  | 11.99 |
| 12.a Foreign Exchange   | 10.89 | 9.93   | 8.68  |
| 12.b Domestic Materials | 4.35  | 3.89   | 3.31  |

**Table 14: Present Value of Net Benefits in the Base Year Under Assumptions in Table 12**

(in million S£)

|               | Item     | Equation | Social Rate of Discount |             |               |
|---------------|----------|----------|-------------------------|-------------|---------------|
|               |          |          | 8%                      | 10%         | 13%           |
|               |          |          | $P^{INV}=5$             | $P^{INV}=3$ | $P^{INV}=1.8$ |
| A             | (10.1)   | +130.34  | +91.73                  | +58.80      |               |
|               | (10.2a)  | +112.35  | +89.50                  | +67.30      |               |
| (n.b. < 0)    | (10.2b)  | +198.29  | +156.07                 | +113.87     |               |
| xW (n.b. x.0) | x(10.2c) | -47.89   | -38.99                  | -30.18      |               |
| B             | (10.2)   | +393.09  | +298.31                 | +209.79     |               |
| $B^{GO}$      | (10.3a)  | +189.29  | +137.03                 | +91.80      |               |
| $B^L$         | (10.3b)  | +251.69  | +200.27                 | +148.17     |               |
| $B^V$         | (10.3c)  | -47.89   | -38.99                  | -30.18      |               |
| C             | (10.5)   | +1035.32 | +525.58                 | +286.74     |               |

The final row of the table represents the effect of adjusting the net receipts in row 1 for foreign exchange premia (row 2), unskilled, and skilled labour scarcity indices (rows 3 and 4). These add to the total benefits in row 5. The allocation of these benefits to the three sectors is shown in rows 6, 7 and 8.

The final adjustment for each of these benefits is that for the investment premium attached to saving (e.g. equation (4)). Thus for the government, the value  $B^{GO}$  is multiplied by 5 (i.e.  $P^{INV} = 5$ ), since all government benefits are assumed available for saving. The consumption equivalents so derived add to the final C in row 9. At each discount rate used the project appears from these calculations to be socially worthwhile.

## 5. SUMMARY AND CONCLUSIONS OF THE ANALYSIS

Although certain of the assumptions employed and shown in Table 12 are undoubtedly favourable towards the project, most notably the government's MPS of unity, the modest foreign exchange premium must be regarded as an adequately offsetting factor.

The conclusion we draw from Table 14 is therefore a relatively optimistic one suggesting that if the productive potential of the plant at Kenana is in fact realised then the social return will be very satisfactory. Of course, this underlying assumption is critical. Fortunately, however, with the viability indicated, some room is available either for output, *or indeed world price*, not to realise the forecasts being used here. It also permits the (likely) eventuality that the government will not in fact save all the marginal income received from the project.

If recent experience with the world sugar price reflects, however, a substantial price fall which will be sustained significantly in the future, the optimistic conclusion will be weakened. Table 15 reproduces the exercise for a world price of 5 cents/lb (well below average) throughout the remainder of the project life. The profitability of the project becomes much more marginal at the interest rates used.

**Table 15: Present Value of Net Benefits in the Base Year Under Assumptions in Table 12**

(output at 5 cents/lb - in millions S£)

| Item           | Equation<br>Number | Social Rate of Discount |             |               |
|----------------|--------------------|-------------------------|-------------|---------------|
|                |                    | 8%                      | 10%         | 13%           |
|                |                    | $P^{INV}=5$             | $P^{INV}=3$ | $P^{INV}=1.8$ |
| A              | (1)                | +79.8                   | -74         | -121.15       |
|                | (2a)               | +101.7                  | +86.5       | +74.5         |
| (n.b < 0)      | (2b)               | +198.3                  | +153.1      | +113.9        |
| xW (n.b x > 0) | x(2c)              | -47.89                  | -38.9       | -30.2         |
| B              | (2)                | +331.9                  | +129.7      | 37.05         |
| $B^{GO}$       | (3a)               | +207.9                  | -31.7       | -80.95        |
| $B^L$          | (3b)               | +251.69                 | +200.3      | +148.2        |
| $B_V$          | (3c)               | -47.9                   | -38.9       | -30.2         |
| C              | (5)                | 1128                    | 19.62       | -42.9         |

## POSTSCRIPT

We have assessed in Table 15 the effect on the social benefit cost analysis of a sustained 5 cents/lb price of sugar in the world market. On this more gloomy prediction the project becomes marginal for society as a whole.

In this context, the fears expressed in the concluding section concerning the efficiency with which capacity is utilised becomes absolutely crucial. While export marketing should not be a problem given the evolution of net import demand in the Arab World (Gumma, 1988), the social profitability of the activity may be small or even negative.

On *a priori* grounds, this would be an odd outcome given Sudan's evident comparative advantage as a sugar producer in this part of the world. Global supply-demand mismatch would be indicated unless Sudan's costs turn out to be substantially greater than her underlying endowments suggest should be the case.

Capacity utilisation and plant breakdowns would be the most obvious potential culprits. How has the plant operated so far?

The latest status report available was dated January 31, 1988. The general tone of it is optimistic concerning the achievement of planned output though by that time the full level of capacity utilisation had yet to be achieved.

## NOTES

1. Other project appraisal methods include Little & Mirrlees (1974), Bruno (1975), Harberger (1977), Sjaastad & Wisecarver (1977), Helmers (1979), Squire and van der Tak (1975), Hansen/UNIDO (1986) and UNIDO/IDCAS (1986). For a critical review, see Little & Mirrlees (1990).

2. This rate is in use by KSC in its *Annual Status Report*.

3. For distribution of bargaining power between the foreign owners of capital and the government of Sudan, see Wohlmuth (1983).

4. For non-economic assessment of Kenana's social costs (slums, drugs, ecological devastation,...), see, for example, Hassaballa (April 1987 and Nov. 1987).

5. In a recent report by KSC (Summary of Training Department Activities for Crop Year 1989/90), it is stated that in 1989/90 alone 60 semi-skilled employees had on-job training in boilers operations, hand tools, sugar boiling, evaporation, switchgear, etc., and 20 employees attended training courses abroad.

6.

$$SER = \sum_{i=1}^n \frac{f_i P_i^D}{P_{i,cif}} = \sum_{i=n+1}^{n+k} \frac{x_i P_i^D}{P_{i,fob}}$$

where  $f_i$  = the fraction of foreign exchange allocated to imports of the  $i$ th of  $n$  commodities at the margin,  $X_i$  = the domestic currency amount by which each of  $h$  exports falls in response to earnings of foreign exchange,  $P_i^P$  = the domestic market clearing prices of imports and exports that is inclusive of trade taxes and subsidies and  $P_{i,cif}$  and  $P_{i,fob}$  are border prices of imports and exports respectively.

## REFERENCES

- Balass, B. & Schydlosky, D.M. (1972), Domestic Resource Costs and Effective Protection Once Again, *Journal of Political Economy*, Vol. 80, Jan-Feb., pp. 63-69.
- Bruno, M. (1975), The Optimal Selection of Export Promoting and Import Substituting Projects. In *Planning for External Sector; Techniques, Problems and Policies* (UN publications Sales No. 67.11.B.5).
- Dasgupta, P. (1972), A Comparative Analysis of the UNIDO Guidelines and the OECD Manual, *Bulletin of the Oxford University Institute of Economics and Statistics*, Feb.
- Dréze, J. and Stern, N.H. (1987), The Theory and Cost-Benefit Analysis. In A. Auerbach and M. Feldstein, (eds.), *Handbook of Public Economics*. Amsterdam: North Holland.
- Gumaa, Y. T. (1988), The Regional Arab Market for Sugar and its Implications for the Sugar Industry in the Sudan, Congress for Economics and Agricultural Development in Egypt and Arab Countries, 2-4 Fe. Vol. I.
- \_\_\_\_\_.(1990), International Demand for Sugar with Reference to the Sudan, *Sudan Agricultural Journal*, Vol. 13.
- \_\_\_\_\_.(1990), *An Appraisal of the Kenana Sugar Project: The UNIDO Method Applied in the Sudan*, Khartoum University Press.
- Hagelberger, G. B. (1979), Appropriate Technology in Sugar Manufacturing: A Rebuttal, *World Development*, Vol. 7.
- Harberger, A. C. (1977), On the UNIDO Guidelines for Social Project Evaluation: In Schwartz & Berney (eds.) *Social and Economic Dimensions of Project Evaluation*, Washington D.C., Inter-American Development Bank, pp. 227-253.
- Helmers, F. L. C. H. (1979), *Project Planning and Income Distribution*. Boston: Martinus Nijhoff.
- Hansen, J. R./UNIDO (1986), *Guide to Practical Project Appraisal, Social Benefit-Cost Analysis in Developing Countries*, ID/SER H/3, Vienna.
- Hassaballa, H. O. (April 1987), *Kenana Projects in the Context of Settlement Schemes in the Sudan*, Economic and Social Research Council (ESRC) Bulletin 137, Khartoum.
- \_\_\_\_\_. (Nov. 1987), *Socio-Economic Characteristics of Kenana Community*, ESRC Bulletin 139, Khartoum.
- International Sugar Organisation (I.S.O), *Sugar Year Books* (various issues), London.

Kuwait Arab Fund for Economic Development (1978), *A Report on the Kenana Sugar Project*, Khartoum, Jan (Commissioned).

Kenana Sugar Company (KSC) (1981), *Green Gold at Kenana*.

Lal, D. (1971), When is Foreign Borrowing Desirable?, *Bulletin of Oxford University Institute of Economics and Statistics*, 33, 197-206.

Little, I. M. D. & Mirrlees, J. A. (1974), *Project Appraisal & Planning in Developing Countries*. Heinemann Educational Books, London.

Little, I. M. D. and Mirrlees, J. A. (1990), Project Appraisal and Planning Twenty Years on. *Supplement to the World Bank Economic Review and the World Bank Research Observer*, pp 351-391.

Little, I. M. D. and Tipping, D. G. (1972), *A Social Cost-Benefit Analysis of the Kulai Oil Palm Estate, West Malaysia*, OECD Development Centre Studies, Case Study 3, Paris.

OECD (1968), *Manual of Industrial Project Analysis in Developing Countries*, Annex to Vol. 1, Industrial Profile.

OECD (1969), *Manual of Industrial Project Analysis in Developing Countries*, Vol. II, *Social Cost-Benefit Analysis* by Little & Mirrless.

Oesterdiekhoff, P. (1982), Problems with Large-Scale Agro-Industrial Projects in the Sudan: A Case Study of the Kenana Sugar Corporation. In Gunter Heinritz (ed.), *Problems of Agricultural Development in the Sudan*, Gottingen, F. R. G.

Oesterdiekhoff, P. & Wohlmuth, K. (eds.), *The Development Perspectives of the Democratic Republic of the Sudan - The Limits of the Breadbasket Strategy*. Wettform-Verlag, GmbH, Munchen, Koln.

Pohl, Gerhard and Mihaljek, Dabrarko (1989), *Project Evaluation in Practice: Uncertainty at the World Bank Economic Advisory Staff*. W. B. Washington, D.C., Processed.

Robson, R. (1977), *Recent Development in the World Sugar Industry*, UNIDO, ID/WG. 247/8.

Sjaastad, L. A. & Wisecarver, D. L. (1977), The Social Cost of Public Finance, *Journal of Political Economy*, Vol. 85, No. 3, May, pp. 513-547.

Scott, M. F. G. et al (1976), *Project Appraisal in Practice: The Little/Mirrlees Method Applied in Kenya*. Heinemann.

Squire, L. (1989), Project Evaluation in Theory and Practice. In Hollis Chenery & T. N. Svinivasan (eds.), *Handbook of Development Economics*, Vol. II. Amsterdam, North Holland.



Squire, L. & van der Tak, H. G.(1975), *Economic Analysis of Projects*. Baltimore, Md. John Hopkins University Press.

UNDP/IBRD (1982), *Planning Project, Study of Cost of Production and Comparative Advantage of Crops in the Sudan*, Khartoum.

UNIDO, (1972), *Guidelines for Project Evaluation*, written by Dasgupta, P. S., Marglin, S. A., and Sen, A. K. United Nations, New York.

UNIDO/IDCAS (1986), *Manual for Evaluation of Industrial Projects*, ID/244, Vienna.

World Bank (1988), *Price Prospects for Major Planning Commodities*.

\_\_\_\_\_ (1990), *Sudan: Reversing the Economic Decline*, Report 8414 - SU, CEM, July.

Wohlmuth, K. (1983), The Kenana Sugar Project: A Model of Successful Trilateral Cooperation? In Oesterdiekhoff & Wohlmuth (eds.), *The Development Perspectives of the Democratic Republic of Sudan: The Limit of the Breadbasket Strategy*, Welf-form-Verlag, GmbH, Munchen, Koln.

Wynn, R. F. (1980), Foreign Capital, Trade and Savings: The Sudan 1955-71, *Malayan Economic Review*, Vol. XXV No. 2).

## Appendix 1

### Estimates of Profit and Income Tax (Part 1)

(in million S£)

|          | 1975 | 1978 | 1979  | 1980  | 1981   | 1982   | 1983   | 1984  | 1985  |
|----------|------|------|-------|-------|--------|--------|--------|-------|-------|
|          |      |      |       |       |        |        |        |       |       |
|          | 1977 |      |       |       |        |        |        |       |       |
|          | 1-3  | 4    | 5     | 6     | 7      | 8      | 9      | 10    | 11    |
| Domestic | -    | -    | 18.80 | 59.90 | 66.70  | 73.40  | 79.80  | 79.80 | 79.80 |
| Sales    |      |      |       |       |        |        |        |       |       |
| Foreign  | -    | -    | -     | 31.40 | 52.08  | 63.30  | 61.76  | 60.80 | 60.10 |
| Sales    |      |      |       |       |        |        |        |       |       |
| Total    | -    | -    | 18.80 | 91.30 | 119.50 | 136.50 | 141.60 | 140   | 141   |
| Revenue  |      |      |       |       |        |        |        |       |       |
| Variable | -    | -    | 1.92  | 25.60 | 28.80  | 31.60  | 35.20  | 35.20 | 35.20 |

|                    |   |         |       |       |       |       |       |       |       |
|--------------------|---|---------|-------|-------|-------|-------|-------|-------|-------|
| Costs of           |   |         |       |       |       |       |       |       |       |
| Production         |   |         |       |       |       |       |       |       |       |
| Fixed              | - | 11.76   | 12.96 | 14.24 | 15.60 | 15.60 | 15.60 | 15.60 | 15.60 |
| Cost of            |   |         |       |       |       |       |       |       |       |
| Production         |   |         |       |       |       |       |       |       |       |
| Pre-<br>production | - | 0.8     | 1.6   | 1.6   | 1.6   | 0.8   | -     | -     | -     |
| Expenses           |   |         |       |       |       |       |       |       |       |
| Depreciation       | - | -       | -     | 4.0   | 19.6  | 25.60 | 26.90 | 26.90 | 26.90 |
| Total costs        | - | 12.96   | 16.50 | 43.80 | 64.80 | 71.80 | 77.60 | 77.60 | 77.60 |
| of Production      |   |         |       |       |       |       |       |       |       |
| Profit(Loss)       | - | (12.56) | 2.4   | 47.40 | 54.70 | 64.80 | 64.00 | 63.20 | 62.40 |
| Debt               | - | 6.24    | 2.24  | 11.39 | 11.39 | 17.56 | 18.11 | 18.11 | 18.11 |
| Servicing          |   |         |       |       |       |       |       |       |       |
| Net Profit         | - | (18.80) | 0.16  | 36.01 | 43.31 | 47.24 | 45.89 | 45.10 | 44.30 |
| Before Tax         |   |         |       |       |       |       |       |       |       |
| Income Tax         | - | -       | -     | -     | -     | -     | -     | -     | -     |
| Net Profit         | - | (18.80) | 0.16  | 36.01 | 43.31 | 47.24 | 45.90 | 45.10 | 44.30 |
| After Tax          |   |         |       |       |       |       |       |       |       |

## Appendix 1

### Estimates of Profit and Income Tax (Part 2)

(in million S£)

|          | 1986  | 1987  | 1988  | 1989  | 1990  | 1991  | 1992  | 1993  | 1994  |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|          | 12    | 13    | 14    | 15    | 16    | 17    | 18    | 19    | 20    |
| Domestic | 79.80 | 79.80 | 79.80 | 79.90 | 79.80 | 79.80 | 79.80 | 79.80 | 79.80 |
| Sales    |       |       |       |       |       |       |       |       |       |
| Foreign  | 61.20 | 62.60 | 58.70 | 60.30 | 60.32 | 60.32 | 60.32 | 60.32 | 60.32 |

|                   |       |       |        |        |        |        |        |        |        |
|-------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| Sales             |       |       |        |        |        |        |        |        |        |
| Total             | 142   | 142   | 138.60 | 140.20 | 140.20 | 140.20 | 140.20 | 140.20 | 140.20 |
| Revenue           |       |       |        |        |        |        |        |        |        |
| Variable Costs of | 35.20 | 35.20 | 35.20  | 35.20  | 35.20  | 35.20  | 35.20  | 35.20  | 35.20  |
| Production        |       |       |        |        |        |        |        |        |        |
| Fixed             | 15.60 | 15.60 | 15.60  | 15.60  | 15.60  | 15.60  | 15.60  | 15.60  | 15.60  |
| Cost of           |       |       |        |        |        |        |        |        |        |
| Production        |       |       |        |        |        |        |        |        |        |
| Pre-production    | -     | -     | -      | -      | -      | -      | -      | -      | -      |
| Expenses          |       |       |        |        |        |        |        |        |        |
| Depreciation      | 26.90 | 26.90 | 26.90  | 26.90  | 26.90  | 26.90  | 26.90  | 26.90  | 26.90  |
| Total Costs       | 77.60 | 77.60 | 77.60  | 77.60  | 77.60  | 77.60  | 77.60  | 77.60  | 77.60  |
| of Production     |       |       |        |        |        |        |        |        |        |
| Profit(Loss)      | 63.30 | 64.80 | 60.80  | 62.40  | 62.40  | 62.40  | 62.40  | 62.40  | 62.40  |
| Debt              | 18.11 | 18.11 | 18.11  | 18.11  | 18.11  | 18.11  | 18.11  | 8.87   | 7.72   |
| Servicing         |       |       |        |        |        |        |        |        |        |
| Net profit        | 45.30 | 46.70 | 42.70  | 44.30  | 44.30  | 44.30  | 53.50  | 54.70  | 54.70  |
| Before Tax        |       |       |        |        |        |        |        |        |        |
| Income Tax        | -     | -     | -      | 26.60  | 26.60  | 26.60  | 32.10  | 32.80  | 32.80  |
| Net Profit        | 45.50 | 46.70 | 42.70  | 17.70  | 17.70  | 17.70  | 21.40  | 21.90  | 21.90  |
| After Tax         |       |       |        |        |        |        |        |        |        |

## Appendix 1

### Estimates of Profit and Income Tax (Part 3)

(Million S£)

|      |      |           |           |      |
|------|------|-----------|-----------|------|
| 1995 | 1996 | 1997-2000 | 2001-2004 | 2005 |
| 21   | 22   | 23-26     | 27-30     | 31   |

|                   |        |        |        |        |   |
|-------------------|--------|--------|--------|--------|---|
| Domestic Sales    | 79.80  | 79.80  | 79.80  | 79.80  | - |
| Foreign Sales     | 60.32  | 60.32  | 60.32  | 60.3   | - |
| Total Revenue     | 140.20 | 140.20 | 140.20 | 140.20 | - |
| Variable Costs of | 35.20  | 35.20  | 35.20  | 35.20  | - |
| Production        |        |        |        |        |   |
| Fixed Costs of    | 15.60  | 15.60  | 15.60  | 15.60  | - |
| Production        |        |        |        |        |   |
| Pre-production    | -      | -      | -      | -      | - |
| Expenses          |        |        |        |        |   |
| Depreciation      | 26.90  | 26.90  | 26.90  | 26.90  | - |
| Total Costs of    | 77.70  | 77.70  | 77.70  | 77.70  | - |
| Production        |        |        |        |        |   |
| Profit (Loss)     | 62.40  | 62.40  | 62.40  | 62.40  | - |
| Debt Servicing    | 7.72   | 7.72   | 7.72   | 7.72   | - |
| Net Profit        | 54.70  | 54.70  | 54.70  | 62.40  | - |
| Before Tax        |        |        |        |        |   |
| Income Tax        | 32.80  | 32.80  | 32.80  | 32.80  | - |
| Net Profit        | 21.90  | 21.90  | 21.90  | 21.90  | - |
| After Tax         |        |        |        |        |   |