DRAFT DISCUSSION PAPER

CENTRE FOR DEVELOPMENT STUDIES UNIVERSITY OF CAPE COAST CAPE COAST, GHANA

AND

DAVID LIVINGSTONE INSTITUTE UNIVERSITY OF STRATHCLYDE GLASGOW, SCOTLAND

CDS/DLI PROGRAMME IN CHOICE OF TECHNOLOGY
THE NATIONAL INVESTMENT BANK AND THE CHOICE OF TECHNOLOGY - A CASE STUDY

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Cape Coast, December 1983

ACKNOWLEDGEMENTS

The CDS/DLI Programme in Choice of Technology is jointly financed by a grant from the European Economic Community and the Ghana Government. The author is grateful for valuable comments on a preliminary draft of this paper given by Mr. C.A. Doku, Mr. Edwin Wood, and Dr I.A. Omane of the National Investment Bank. In addition, thanks are due to a number of other members of staff of the Bank for their help and advice in compiling the information on which this paper is based. The author is, of course, responsible for any remaining errors of fact or interpretation.

THE NATIONAL INVESTMENT BANK AND THE CHOICE OF TECHNOLOGY – A CASE STUDY

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INTRODUCTION

One of the objectives of the Research and Training Programme in Choice of Technology at the Centre for Development Studies, University of Cape Coast, is the generation of background material relevant to courses which focus on the issue of technology selection within the framework of project appraisal. The preparation of case studies based not on the analysis of individual investment projects, but rather on the institutions which provide investment finance, is part of the research element of the programme. The intention of this paper (which at this stage is in draft) is-inter alia, to look at the procedures through which investment projects pass within the National .Investment Bank (NIB) from initial "identification" (either internally within the institution, or as a loan application) to loan approval, with a view to assessing:

a) the amount of freedom in existing procedures allowing for consideration of technological alternatives;
b) the extent to -which explicit attention is paid to technological alternatives in the analysis of projects;
c) the influence of the NIB over the choice of technology in the Ghanaian economy.

The National Investment Bank is perhaps Ghana's foremost specialised development bank, advancing funds for productive projects in manufacturing, agro-industrial and agricultural sectors. Set up in 1963, the experience gathered over the years should give a reasonable basis for the assessment of its impact on the choice of technology.

Through its evaluation procedures the NIB is in a position to influence the choice of technology in the industrial and agro-industrial sectors of the economy. This influence will be the less if:

a) no specific attention is paid to the.-choice of technology in the evaluation procedures;
b) the evaluation procedures are inflexible, so that the technology/technique selections are made at an early stage in the process;
c) information stocks and flows do not place sufficient emphasis on: technological alternatives;
d) the volume of investment financed by the NIB represents a small proportion of investment in the industrial and agro-industrial sectors so that its impact is restricted.

This paper consists of a brief review of the objectives and structure of the NIB; an outline of the types of loans agreed and disbursed year by year; a review of the project procedures; an outline of the scope for alternative technologies; and some conclusions. Two appendices set out a list of the joint venture projects supported by the NIB since its establishment, and the main elements of the evaluation procedures.

THE NATIONAL INVESTMENT BANK

The NIB was set up by statute following a feasibility study prepared for the Ghana Government by a U.S.-financed firm of consultants and dated November 1952. The Act of Parliament establishing the Bank (Act 163) was dated 22nd March 1963 and the NIB was to be "an autonomous joint state-private development financial institution, to promote and strengthen the productive capacity and efficiency of the national economy, especially in industry and agriculture. In furtherance of this objective, the Bank is to mobilize internal and external funds and channel these resources into productive sectors of the economy. The Head Office of the NIB opened for business on June 17 1963. The eight months which had elapsed from the completion of the report to the opening of the Head Office perhaps indicates that the Bank's establishment was regarded as a high priority. By the end of 1963 the NIB had accepted 27 loan applications for examination, and had completed analysis of 16, of which 9 were found to be feasible. Of the applications made 3 were recommended to "withdraw their applications temporarily and first become clients of the Development Service Institute (see below) for technical assistance to improve their operations."[2]

"The main objectives of the Bank are to:

a) assist in the establishment, expansion and modernization of enterprises;

b) encourage and facilitate the participation of internal and external capital in such enterprises;

c) counsel and encourage Ghanaian business concerns;

d) identify emerging investment opportunities;

e) bring together capital, capable management and technical expertise to establish viable new enterprises.

Apart from providing financial assistance, the role of the Bank is primarily promotional and catalytic ..... With the commencement of commercial banking operations on 2nd April 1975, the Bank also caters for the short-term loan requirements of the clients and corporate bodies."[3]

Table 1 – Foreign Exchange Credit 1970-1981
(Million ₵)[(a)]

Year	1976	1977	1978	1979	1980	1981
Lending Institution						
W. German KFW loan	9.5	10.3	24.2	23.9	23.4	19.5
African Development Bank	2.6	4.1	5.6	17.7	15.8	14.3
World Bank (IBRD)	-	3.3	17.5	20.4	21.4	22.0
World Bank (IDA)	-	-	-	-	0.1	0.4
EEC	-	-	-	-	-	1.9

Source: Annual Reports of the National Investment Bank
Note: (a) Data refer to outstanding balances at the end of the year.

From the outset an integral part of the Bank has been the Development Service Institute (D.S.I), largely responsible for the preparation of feasibility studies for projects which are the subject of loan applications. A more elaborate explanation of the D.S.I.'s role and activities will follow later in this report. The fact that for some years the D.S.I carried out evaluation of applications for concessions made to the Capital Investment Board (C.I.B)[4]; and that other 'client studies' have been undertaken fairly regularly,[5] gives some indication firstly of the need for a strengthening of the .project appraisal leaps-city of Ghanaian institutions in the mid-1960s, and secondly of the contribution of the NIB to fulfilling that role.

The principal source of funds has been the Ghana Government, but this does not directly cover the foreign .exchange component of investment costs. In the first ten years of operation, apart from normal allocations of foreign exchange through the import licence and exchange

control system, some aid arrangements were made with the West German Aid Programme, which involved the supply of West German Consultants and technical aid together with the extension of credit from the Kreditsanstalt Für Weideraufbau (KFW).[6] From 1976 the IBRD has had a line of credit (since renewed twice and due for renewal again in 1983**).** The African Development Bank (ADB.) has also extended foreign exchange resources, joined-by the EEC since 1981. More details of some of the conditions surrounding the credit appear in a following section, and Table 1 gives details of the funds involved from 1970 to 1981. It will be seen from the table that it is the IBRD, the West German KFW Bank and the African Development Bank which have been most important, with the EEC developing its involvement more recently.

It is significant, and the point will be returned to at a later stage in this paper, that "the selection of projects for financing under our external lines of credit are based on agreed investment criteria, and projects approved by the Bank for assistance must have the concurrent approval of the external financial agency whose credit is being tapped."[7]

The loans from international bodies have been associated with particular programmes. The main World Bank loan has aimed at assisting larger-scale agro-industrial enterprises. The KFW loan was related to several Ghanaian-West German joint ventures. Two African Development Bank loans were provided for large scale rice and cotton projects. The most recent World Bank loan is for small-scale agro-industrial enterprises, while the EEC's credit covers the small and medium scale sectors. These programmes themselves restrict the types of technologies likely to be selected.

Although the wording of the investment criteria or priorities varies *a* little from one Annual Report to another there is some consistency in the meaning of the phraseology. The 1975 Annual Report stated that:

> "The Bank will, in addition to the normal criteria aimed at establishing the financial, commercial and economic viability, give priority consideration to:
> a) projects that make the minimum demand for foreign resources, and
> b) those that contribute significantly to the foreign exchange earnings of the country.
>
> "Projects that will satisfy these criteria are considered to be those that have linkage effects in the economy and these include:
> a) Wood, clay, mineral and fishing industries;
> b) Basic industries for the manufacture of capital goods;
> c) Agro-business."[8]

The 1976 Annual Report expanded these points slightly:

> "Priority areas for development are:
> A. Industry
> i) Industrial projects based mainly on the utilization of locally produced raw materials;
> ii) Projects that are likely to earn foreign exchange as a result of high domestic value added in production,
> iii) Projects that will effect reduction in essential imports or act as import substitutes with a net gain in foreign exchange resource cost;
> iv) Projects that can be regarded as ancillary to such basic industries as textiles, food processing, footwear and Pharmaceuticals etc.;
> v) Projects that will promote tourist development such as hotels and restaurants;
> vi) Existing industries with potential for export;
> vii) The development of industrial estates.
>
> In this regard, the possibility of siting such estates, preferably in dying towns in the rural areas rather than Accra or Tema in an attempt to rehabilitate such towns and also diversify the location of industries in Ghana, would be critically investigated;

B, Agriculture
i) Food crops: - maize, rice, groundnuts, plantain and soya beans;
ii) Livestock: - pigs, sheep, goats and cattle;
iii) Raw materials - cotton, oil palm, coconut, cashew nuts and citrus."[9]

The 1981 Annual Report stated that "in the face of the country's economic circumstances the NIB, in its resource allocation strategy gave preference to projects which maximise installed industrial capacity and are export-oriented, rehabilitation of viable enterprises and generally, projects utilizing substantial domestic raw materials."[10] A final quotation will suffice before brief discussion of the issues involved:

> "NIB is also looking at other issues such as the need to give greater weightage to economies of scale which would help contain unit cost of the end-products and keep them competitive. Considerations of economies in investment cost, a matter of prime importance when resources are as scarce as they are at present, may often warrant setting up of additional capacity by expansion of the existing units rather than by setting up new units."[11]

First, comparing the first three quotations from the 1975, 1976 and 1981 Reports the advantages of brevity may be apparent. The length of the quotation from the 1976 Annual Report does somewhat detract from a concise and precise definition of priorities. Second, the objectives of the maximisation of installed capacity [utilisation ?] and the rehabilitation of viable enterprises relate to the efficient operation of the stock of capital investment, manpower and accumulated skills which has been a particular problem in Ghana – the expansion of existing firms as mentioned in the 1979 Report also assists in this respect.[12]

Third, the elements of the objectives which relate particularly to the choice of technology as such include:

a) the conservation of foreign exchange, which affects the amount of dependence on imported equipment, spares and materials implied by a production technology, and/or implies the minimisation of licence fees and royalties in joint ventures;

b) the generation of foreign exchange, which implies the production of goods acceptable on the international market in respect of product design, quality and price, all of which can be related to technology selection;[13]

c) the issue of scale, which is related to production costs (e.g. minimum efficient scale), capacity utilisation, and to regional diversification of smaller scale manufacturing/processing activity.

Notably the issues of employment generation and of the use .of labour intensive technologies in endeavouring to minimise the utilisation of foreign exchange are not mentioned.

As of 1983, the regional distribution of loan activity was aided by the existence of eight regional offices, responsible for the initial and basic processing of loan applications, The eight are Accra (Greater Accra), Kumasi (Ashanti), Takoradi (Western), Ho (Volta), Tamale (Northern), Koforidua (Eastern), Sunyani (Brong-Ahafo), and Bolgatanga (Upper Eastern). The two regions not covered directly by these locations are dealt with by the Takoradi and Bolgatanga offices (Central and Upper-Western).

NIB SUPPORTED INVESTMENT

A number of problems arise in any attempt to make an estimate of the significance of the NIB in capital formation in Ghana. First, there is obviously a distinction between loan agreements and loan disbursements – it is the latter rather than the former which lead directly into capital expenditure. Data on loan disbursements are more difficult to piece together from the Annual Reports than that for loan agreements. Second, for a realistic view of the level of

capital formation financed by the NIB over the years the cedi figures need to be deflated (or inflated) by a relevant price index - i.e. a price index for capital formation. Given the significance of imported equipment in investment the rate of foreign exchange would clearly be a major factor in such an index. Third, the NIB data have then to be compared with data for Ghana's Fixed Capital Formation, and in some cases it may not be clear whether the comparisons should be with Net or with Gross Fixed Capital Formation statistics, particularly if rehabilitation projects are the subject of loan approvals and disbursements.

Table 2 presents data on Loan Approvals and Disbursements from 1963 to 1981 at current prices and at 1980 prices (based on a GDP deflator). The significance of concentrating on disbursements rather than approvals in assessing the investment role of the NIB is apparent from the Table. Taken over the entire period (at 1980 prices)., it would appear that approximately two-thirds of loans approved have been disbursed. (This figure will slightly understate the proportion since some loans approved towards the end of the period will not have been disbursed before the end of 1981). Thus, about one-third of the total loans approved have never been converted into real assets through expenditure on capital formation.

Table 2 – NIB Loan Approvals and Disbursements
(Thousand ₵)

Year	Value of Loans Approved		Value of Loans Disbursed	
	Current prices	1980 prices	Current prices	1980 prices
1963	970	32,119		
1964	1,820	54,819	1,750	55,205
1965	800	20,513	1,150	29,487
1966	360	8,295	400	9,217
1967	830	19,668	600	14,218
1968	4,290	88,272	1,330	27,366
1969	2,000	37,807	1,900	35,917
1970	4,800	84,358	4,950	86,995
1971	14,230	237,563	3,800	63,439
1972	24,250	350,941	7,300	105,644
1973	7,330	90,049	11,300	138,821
1974	15,330	148,691	14,300	138,700
1975	25,300	189,371	16,900	126,497
1976	23,310	136,316	26,300	153,801
1977	21,332	74,587	17,120	59,860
1978	7,736	15,606	11,649	23,500
1979	7,159	10,342	10,398	15,022
1980	23,900	23,900	7,532	7,532
1981	31,917	16,592	7,504	3,901

Sources and Notes:
i) Loan Approvals – 1963-1975 – Annual Report 1975 p. 14; 1976-1977 – Annual Report 1977 p. 10; 1978 – Annual Report 1978 p. 26; 1979 – Annual. Report 1979 p. 25; 1980 – Annual Report 1980 p. 6; 1981 – Annual Report 1981 p. 10
ii) Loan Disbursements – 1963-1970 – Annual Report 1970 p. 18; 1971-1974 – Derived from accounts of Annual Reports; 1975-1976 – Annual Report 1979 p. 7; 1977-1981 – NIB files
iii) Price Index - GNP deflator from (see footnote 14) – 1963-1969 – Economic Survey 1969 Table 2 p. 15; 1970-1973 – Economic Survey 1972-1974 Tables 1.2 and 1.3, p. 4 and 5; 1974 – Quarterly Digest of Statistics September 1982 Vol. 1 No. 6 Table 1, p. 1; 1975 – Quarterly Digest of Statistics March 1983 Vol. 1 No. 8 Table 67, p. 74; 1976-1981 – Quarterly Digest of Statistics June 1983 Vol. 1 No. 9 Table 68, p. 75

The pattern of activity over the years, however, is essentially the same for both loan approvals and disbursements (predictably) and is related in particular to the health of the economy, and to the overall degree of credit expansion decided upon by the Ghana Government. Thus, .the highest level of disbursements was achieved in 1976, with the amount being between ₡2,100m and ₡2,150m (at 1980 prices) over the period 1972 to 1976. After 1975 there was a very severe drop indeed, with the lowest level of disbursements occurring in 1981 at less than ₡4 million. In this sense the opportunity for the NIB to influence technology choice has been severely limited in recent years by the low level of investment activity. In previous years when the level of investment/disbursements was very much higher, the volume of work required to complete project appraisals was, in all probability, so great that it was not feasible to consider all alternatives with the limited man-power resources available (see below on the Development Service Institute). Thus, in many senses, the potential for the NIB to influence technology choice has probably not yet been fully realised for reasons which are completely plausible.

Table 3 – Yearly Loans Granted by Sector

Year	Agriculture	Industry	Total	Agriculture	Industry
	Current prices (₡ million)			Percentage	
1963	0.75	0.22	0.97	77.3	22.7
1963	0.21	1.61	1.82	11.5	88.5
1965	0.02	0.77	0.80	3.7	96.3
1966	0.22	0.14	0.36	61.1	38.9
1967	0.46	0.37	0.83	55.4	44.6
1968	1.05	3.24	4.29	24.5	75.5
1969	0.48	1.52	2.00	24.0	76.0
1970	0.58	4.24	4.80	12.1	87.9
1971	0.61	13.61	14.23	4.3	95.7
1972	6.15	18.10	24.25	34.0	66.0
1973	1.61	5.72	7.33	22.0	78.0
1974	2.98	12.36	15.33	19.4	80.6
1975	8.10	18.50	25.30	3.2	96.8

Source: NIB Annual Report 1975, page 17.

Table 3 shows the breakdown of loans granted between the agricultural and industrial (manufacturing) sectors. It can be seen that over the period 1963-1975 (for which data is available) about three quarters of all loans granted were for .the industrial sector, although there are some fluctuations from year to year. This is logical, given the separate existence of an Agricultural Development Bank which funds projects which are either fully agricultural in nature, or are agriculture-related. Of course, a good number of the industrial projects funded by the NIB are also agriculture-related, so that in many respects the distinction between the two sectors may be rather blurred.

Table 4 presents an attempt to adapt constant price data for fixed capital formation in the economy as a whole to 1980 prices for comparison with the constant price value of loans disbursed by the NIB. It can be seen that net fixed capital formation (new investment) in 1978 was less than half the level of 1969, being an indication of the seriousness of the economic crisis afflicting Ghana. However, this is not the central concern of this paper. More to the point is that the disbursement of loans granted by the NIB could be said to have accounted for an average of approximately 4.5 per cent of new investment over the period 1969 to 1978. For the gross fixed capital formation the average proportion works out at about 2.1 percent. To the extent that some of the NIB's loans cover rehabilitation projects, and re-equipment projects, both percentages are relevant. However, the percentage of investment funded by the NIB puts the operation into perspective. Despite this, the steadiness of the contribution makes the NIB a significant institution and, in this respect, with a role to play in technology selection in the

manufacturing/agricultural processing sectors of the economy. It is unlikely that any other bank lending to similar projects makes any larger contribution.

Table 4 – NIB Loan Disbursements in Relation to Ghanaian Capital Formation (1980 prices)

Year	NIB Loans Disbursed (₵ million)	Gross Fixed Capital Formation (GFCF) (₵ million)	Net Fixed Capital Formation (NFCF) (₵ million)	NIB Disbursement as percentage of: GFCF	NFCF
1963	55.205	7,218.5		(0.78)	
1964		6,988.0			
1965	29.487	6,948.7		(0.42)	
1966	9.217	5,668.2		(0.16)	
1967	14.218	5,047.4		(0.28)	
1968	27.366	4,609.1		(0.59)	
1969	35.917	3,691.9	(4,574.7) 2,013.2	0.97	(0.79)
1970	86.995	4,769.8	3,258.3	1.82	2.67
1971	63.439	5,182.0	3,472.5	1.22	1.83
1972	105.644	3,536.9	437.0	2.99	24.17
1973	138.821	3,289.9	1,223.6	4.22	11.35
1974	138.701	5,378.3	3,411.3	2.58	4.07
1975	126.497	4,594.3	2,615.3	2.75	4.84
1976	153.801	3,747.4	1,172.5	4.10	13.12
1977	59.860	3,608.0	2,424.8	1.66	2.47
1978	23.500	2,734.1	799.1	0.86	2.94
1979	15.022	2,141.6	144.8	0.70	10.37
1980	7.532	1,964.2	799.5	0.38	0.94
1981	3.901	1,353.2	322.8	0.29	1.21

Sources: NIB Loans Disbursed and Price Index as with Table 2. GFCF 1963-1970 – Old Series – Economic Survey 1969 Table 7, page 20. GFCF and NFCF 1969-1970 – New Series – Economic Survey 1972-1974 Table 1.9, page 12. GFCF and NFCF 1971-1975 – New Series – Economic Survey 1977-1980 Table 1.5, page 28. GFCF and NFCF 1975-1981 – New Series – Quarterly Digest of Statistics June 1983 Table 71, page 78.

In addition to the direct influence on technology: choice which can be exercised either implicitly or explicitly, there are also indirect effects which can be equally significant in affecting project and technology selection. Thus, although only about 2 percent of gross fixed capital formation is directly influenced by the NIB's project appraisal system, there are at least four ways in which the NIB can exercise an influence on the relevant decisions:

i) The Development Service Institute produces feasibility reports and other studies for quite a wide range of government departments and public corporations, and is therefore in a position to be very influential;

ii) The accumulated experience of the staff members of the Development Service Institute, and the accumulated materials in the NIB's library and information system, give scope for influencing investment decisions;

iii) The assets which result from NIB supported investment can be seen and appraised by other investors who obtain funds from elsewhere, so that certain key technology decisions may have an influence much more widespread than may be initially apparent through a kind of ‘demonstration effect’;

iv) Through the catalytic and technical assistance (counselling) roles (see above) of the Development Service Institute – described as ‘trouble-shooting’ below – it can exercise an influence on the selection and operation of- technologies, and build-up information stocks relevant to the choice of technology in future investment decisions. This point is similar but not

identical to that made in. ii); above.

Thus the statistical information in the Tables presented above can only illustrate a part of the overall picture

NIB PROJECT PROCEDURES

There has been close attention to project identification from the very start of the operations of the NIB.[15] In some senses this part of the procedures may be crucial in determining the technology to be selected at an early stage due to product specification. However, an internal view emphasised the difficulty in distinguishing between projects initiated outside the NIB and those initiated inside since an iterative process often occurs.

In many cases initial discussions may take place between an interested investor and a local officer at the nearest area office of the NIB. If the project satisfies the basic priorities of the NIB then a formal application will be made (this would also apply to rehabilitation or expansion: projects). Together with the application, supplementary information has to be added in the form of the audited accounts of the company (in most cases applications are made by existing companies), incorporation certificates, licenses, relevant proforma invoices, feasibility studies prepared prior to the application, and. agreements with technical partners. Once the preliminary report has been prepared the papers are forwarded to the Development Service Institute (DSI) for consolidation and checking.

After the preparation of the basic feasibility report it is submitted to the Finance Committee which has the power to approve loans of up to Ȼ250,000 (as of November 1983). The Finance Committee was set up in mid-March 1983 and held its first meeting in early-April, having taken over the powers of considering loan applications from the House Committee. The Finance Committee may refer a loan application/feasibility report back to the DSI, or to the Area Office, or to both for further study and/or revision. Thus, for loans of up to Ȼ250,000 the Finance Committee informs the Board of the NIB of its decisions, while for loans of over Ȼ250,000 it can only make recommendations to the Board.

The reports on the individual projects contain a full technical description of the process and of the equipment required, financial and economic analysis, as well as other elements such as manpower requirements. Using the Discounted Cash Flow technique the main criteria for the acceptability of projects are the Financial Internal Rate of Return (FIRR) based on market prices and taxes as incurred by the project, and the Economic Internal Rate of Return (EIRR) based on a set of social accounting (shadow prices). Shadow prices have been rather difficult to set with any confidence; at the time of the writer's initial enquiries the effective shadow price of unskilled labour was 50 percent of the daily rate paid (set at a low rate of Ȼ12-30 per day as of February 1983 for the ‘official’ sector – raised to Ȼ25-00 per day in the Budget of April 1983; the shadow rate of foreign exchange had been set at Ȼ10-00 to US $1-00 (official rate Ȼ2-75 to US$1-00 – Ȼ30-00 to US $1-00 effective with April budget) on the advice of the World Bank some time previously. Thus, the main effective reference is to the FIRR, which has .to be over 19 percent (the ruling rate of interest charged as from October 1983).

In addition to the Discounted. Cash Flow analysis a financial criterion is used in assessing the liquidity of an investment, and hence its ability to repay the loan principal and interest within the required period. This criterion is known as "Debt Service Coverage". Taking a loan life of 5, 6 or 7 years a ratio of 1.5 to 1 is required as a minimum for the average relationship between a) net profit, depreciation and amortisation allowances plus interest and b) loan repayment plus interest. Thus, this criterion attempts to ensure that projects can, theoretically at least, fully cover financial commitments comfortably. Some discussion of Discounted Cash Flow and Debt Service Coverage may be found in Appendix II, together with an outline of the remainder of the calculations regularly included in the NIB's feasibility studies.

The DSI also has a role as a "trouble-shooter", evaluating projects which may have difficulties through need for rehabilitation, debt re-scheduling, etc. In this respect it may operate in the context of coinciding interests: those of the project's owner in attempting to get the business operating well, and those of the NIB in ensuring regular repayment .of loans. The securing of continued work for employees and of additional value added for the economy, are also benefits which can arise from such "trouble-shooting" activities.

As of February 1983 the DSI, the principal appraisal section of the NIB, had a staff of 20 professionals. This was, at the time, unusually high, so that a figure of 12 to 16 has been more usual. Table 5 sets out the staffing situation systematically. It can be seen that there is a good representation of both economic and technical professions on the staff.

Table 5 – Professional Staff in Post – Development Service Institute, February 1983

Category	No.	Description/Notes
Engineers	4	2 mechanical, 1 chemical plus 1 chemical on a course
Chemical Technologist	1	Qualification in Industrial Management
Economist	6	3 senior, 2 recent appointees and 1 on leave abroad
Business Administrators	3	Finance/administration/accounting
Statistician	1	
Agriculture	5	1 animal science and 4 with agricultural first degrees (operates as sub-section of DSI with Divisional Head

Source: Interview notes, February 1983

The peak period for DSI prepared appraisals was in 1981 when the rate reached about 50 per annum. At any one time 8 to 10 staff are working on appraisals each of which takes about 2 man-months. Since the first World Bank line of credit was extended in 1976 there has been pressure to improve the quality of the reports, partly because the finished reports have to be submitted to the World Bank for approval (under the terms of the line of credit) after consideration and recommendation by the Board of the NIB. From 1980 a high proportion of completed reports have related to rehabilitation rather than to new projects (or to extensions to projects) which, of course, restricts the opportunity for adopting radically different technologies.

SCOPE FOR ALTERNATIVE TECHNOLOGIES

There are two particular types of project where there may be especial limitations on the freedom of choice in the selection of technologies. These are joint ventures and national projects. In both cases the technology may be supplied on the basis of either a turnkey contract in which the entire technology is handed over to the investor ready for operation at commissioning in a package deal arranged by the supplier, or of supplier's credits in which part of the attraction to the investor is the fact that the equipment supplier is prepared to provide credit finance (usually in foreign exchange) to cover the cost of the equipment. With both turnkey contracts and supplier’s credits the scope for consideration of alternative technologies may be extremely limited. The significance of this question of tied credit will be examined briefly for joint ventures and for national projects.

In the first years of its operations the NIB saw the problem of increasing investment, output and employment as largely a question of attracting foreign and local investors. The Bank had to build up experience in its operations, and technology choice was not seen as a crucial issue. Joint ventures, particularly with foreign technology suppliers, thus seemed to be

a particularly appropriate means of attracting investment. The 1978 Annual Report (page 24) set out the NIB's philosophy in entering into such agreements: "In the promotion and development of these joint-venture enterprises, the main objective of the NIB has been to bring together investment opportunities, domestic and foreign promoted capital and experienced management in collaboration with foreign technical partners; the flow of foreign capital into productive sectors of the economy is thus stimulated." It would be possible to initiate a critique of such joint venture arrangements, but this paper is not an appropriate place for such an exercise. Suffice it to say that these contracts tend to leave the choice of technology largely in the hands of the foreign partner, so that the selection of that partner becomes a basic element in the satisfactory outcome of the project. In addition to the choice of technology (including all elements such as product specification, derivation of material inputs and the supply of skilled manpower) negotiations behind such projects cover a wide range of topics such as the terms of licensing of production, the terms of management contracts and the pricing and availability of raw materials. One of the factors which has to be taken into account in such negotiations is whether the partner has experience in Africa, and whether the firm is interested in investing in Ghana. In more recent years this latter question would have become more crucial given the deteriorating economic conditions in the country.

Appendix I consists of a listing of joint ventures established by the NIB taken from the 1979 Annual Report, which is the most recent such list published. Table 6 sets out the NIB loan approvals for such projects (inflated to 1980 prices for comparability at constant prices) from 1970 to 1979. There is an additional element of NIB equity involvement which is not substantial. Clearly, the higher the percentage of available loan finance committed to joint ventures (or to "national projects" – see below) the smaller the amount of funds available for the domestic investors in the normal way. It can be seen from the table that from 1970 to 1979 joint ventures accounted for approximately half of loan approvals made by the NIB. It is possible that in the period before 1970 the proportion of joint venture loan approvals was higher than that shown in the table. This implies that a considerable element of the choice of technology was within the context of joint venture negotiations. Examples of joint ventures which have involved NIB finance and negotiation include Union Carbide (Ghana) Ltd (dry cell batteries); Kabel Metal (Ghana) Ltd (heavy duty electrical cables); Food Specialities (Ghana) Ltd (Nestles – beverages and food preparations).

Table 6 – Joint Ventures in NIB Loan Commitments

Year	Total Loans Approved (Thousand ₵ - 1980 prices)	Loans Approved for Joint Ventures (Thousand ₵ - 1980 prices)	Percentage of Loan Approvals for Joint Ventures
1970	84,429	24,467	31.4
1971	237,513	153,022	64.4
1972	350,883	113,994	32.5
1973	90,061	51,978	57.7
1974	148,720	77,924	52.4
1985	189,266	112,478	59.4
1976	136,287	53,877	39.5
1977	86,175	22,958	26.6
1978	15,606	619	4.0
1979	10,342	7,533	72.8

Sources and Notes for Table 6: Current price data supplied from NIB files, converted to 1980 prices employing the same deflators as Tables 2 and 4. There are some slight discrepancies compared with the data in Table 2 taken from published sources, but these are minor. Published data on loans approved for joint venture projects deviate substantially from the data in this table. The unweighted average percentage of joint venture loans is 48.1 percent.

An additional area of investment where the scope for technology choice may be limited is in what may be termed "national projects" where the NIB is part of a consortium of financiers for a project the design of which is not under the control of the NIB.

Since such projects may be relatively large, there is a possibility of them taking a fairly high proportion of NIB funds within the relevant financing period. For example, in 1971 hotel and transport investment accounted for 60.8 percent of loans processed.[16] In cases where the NIB is the consortium leader then the usual feasibility study procedures are followed, with NIB criteria and priorities being applied in principle. Referring to Appendix I the NIB was the leader of the consortia for the Hotel Continental and for the State Transport Corporation. However, in the cases of the Twifo Oil Palm Plantation and Farmers Services (Upper Region) the NIB provided some finance but did not undertake the relevant feasibility study. Thus, with these "national projects" in some cases the NIB's procedures were followed, and the DSI and the Bank's board had an opportunity to directly influence the project design including the selection of the technological characteristics. In cases where NIB procedures are not followed it is, of course, quite possible that the appraisals do ensure proper consideration of technological alternatives.

For projects which come to the NIB through its Area offices (and which do not, therefore, come into the category of joint ventures or national projects) the position taken by NIB staff was that in principle scope exists for the consideration and selection of alternative technologies at virtually any stage of the procedures through which projects pass before loan approval is given. Part of the reason for this position is that the procedures are less formal in practice than they might appear on paper.

Clearly one area where rigidities might occur is in the assembly of information by the potential investor which can then be used in the preparation of an application. It was seen in the previous section that one of the pieces of supporting evidence which may be requested at the time an application is made is a set of pro forma invoices. These would clearly relate to a particular set of equipment from a particular supplier.

Since the appraisal of alternative technologies can only be carried out on the basis of firm price information (inter alia) for specified equipment, the consideration of alternatives would require the gathering of several sets of pro forma invoices, as well as other essential information on material input requirements, technical performance, economic life, maintenance, and so on. This type of appraisal would, in general, be beyond the capacity of most of the small to medium scale enterprises which .seek loan finance from the NIB. Thus, if alternatives are to :be considered, then the appraisals (and information assembly) may be better handled by the DSI itself than by the individual applicants. It will be seen later in this section that this has been done in some cases.

A second area where rigidities might occur is suggested by the first – that is in limitations of data availability relating to technological alternatives. In general we might expect the NIB (or specifically the DSI) to find it considerably easier to assemble relevant information than for the individual investor to do this. In some senses this is done through the building up of a kind of data bank based in part on accumulated experience of undertaking appraisals of loan applications. For some particular activities (e.g. oil palm processing) there are a reasonable number of loan applications, and so it may make good sense for the NIB to keep up to date records on the economic performance of several alternative technologies. However, the NIB would not have the capacity to carry out a similar exercise for all the types of activities for which they might conceivably receive loan applications. In this respect the maintenance of good reference library facilities becomes..a crucial factor in providing information on which technology selection can be based. Clearly, if the bulk of the information is available only in. the library at the head office in Accra, this limits the amount of flexibility that might be expected

in first applications coming from area offices. Certainly, rigidities will be the greater the less effective the information stocks and flows relating to alternative technologies.

As an illustration of the NIB's projects four brief case-studies follow. In each case confidentiality has been assured by referring only to the salient facts.

Case 1 – Agricultural Processing

The original plan was accepted and an offer of funds made in June 1981 on the basis of a FIRR of 60 percent plus. The project included plantation production of the raw material. In October an internal memorandum questioned the yield per hectare, implying that sustainable operation was less than one third of processing capacity. The query was continued by World Bank staff, and evidence was produced that the original yield per hectare was a feasible figure. A new plan was produced in December 1981 with 60 percent of the original processing capacity working on a single shift basis for 150 days of the year with a FIRR of 55 percent. Four equipment suppliers had been approached – the one selected "was adjudged the best in terms of quality of machinery, suitability for tropical conditions, durability and after sales service." The World Bank pointed out that they calculated that the FIRR should be 32 to 33 percent which was still acceptable. Disbursement was agreed in April 1982.

Case 2 – Agricultural Processing

The original plan was accepted and an offer of funds made in June 1977 with a FIRR of 20 percent. After receiving the offer the applicant saw an alternative technique at one of the most significant sub-processes in a friend's factory elsewhere in Ghana. The applicant approached the NIB indicating his wish to switch to the alternative technique which, according to his estimates, involved fewer maintenance problems than the original, with lower skill requirements and lower manpower requirements. The change of technique involved a change of manufacturer. A re-appraisal produced a FIRR of 30 percent (EIRR of 21 percent) and the loan was approved in December 1977. Disbursement did not take, place before the August 1978 devaluation so a further re-appraisal was undertaken. Commercial operations started in June 1980. In January 1981 a supplementary loan was given to add some further equipment to improve the machinery balance.

Case 3 – Agricultural Processing

The original evaluation was dated February 1981 and included the same type of equipment as that in Case 2 above. Approval of the loan was held back until a satisfactory appointment of a General Manager acceptable to the NIB had been made, Disbursement was approved in December 1931 after the appointment had been made.

Case 4 - Building Materials Production

The original application in early 1977 was based on West German equipment and technical personnel. A suggestion was made by the NIB that Brazilian equipment should be used with a capital cost slightly over one-third of that for the West German equipment, giving a FIRR of 39 percent. A re-appraisal was carried out following the devaluation in 1978, when a question was put by the promoter on the comparative economic life of the two types of equipment. An updated .report in March 1980 produced a FIRR of 31 percent and agreement was signed in October 1981.

These four cases illustrate a number of points. First, that the consideration of alternative techniques and sources is something that is integrated into the NIB's project procedures and which is even encouraged. Second, the procedures themselves are fairly flexible, even allowing for reconsideration after the loan offer has been made formally. Third,

one of the factors that has to be considered is the balance between the scale of processing capacity and the level of assured supply of agricultural raw materials. Fourth, that technology is but one of the factors taken into account, and that project loan approval may be held back subject to acceptable management appointments being made.

CONCLUSIONS

These conclusions have been drawn together from the body of the paper and are set out point by point.

First, the NIB, through the operations of its Development Service Institute, has both direct and indirect effects on technology choice. Directly through the preparation of feasibility studies related to loan applications made to the Bank. Indirectly through the feasibility studies and other reports that the DSI prepares for outside bodies (including government Departments and Public Corporations); through availability of information from the NIB's library or staff to investors not necessarily seeking funds from the NIB; or through any "demonstration effect" that technology adopted for NIB funded projects might have or other potential investors (similar, but in the reverse direction to case 2 in the previous section).

Second, the volume of NIB investment has at all times been very limited relative to the total gross or net fixed capital formation in the economy – this of course is only to be expected. It means that, again predictably, the impact that the NIB's project appraisal system has on the choice of technology in the economy as a whole is limited (subject to the indirect effects mentioned is the previous paragraph).

Third, the volume of NIB investment has, together with that in the economy as a whole, been drastically curtailed in recent years limiting further the opportunity to influence the. choice of technology. Because of the element of rehabilitation in recent investment expenditure the opportunity for adopting alternative technologies has been even more restricted.

Fourth, there is evidence that the NIB has paid some attention to the choice of technology, but that this has been limited by the volume of work involved in completing a fairly large number of appraisals, by limitations in information stocks and flows, and by the restrictions imposed on technology choice by joint-ventures and "national projects".

the extent that joint ventures and "national projects" use NIB loan finance this may reduce funds available for projects where technological alternatives can more easily be considered and adopted.

Sixth, the loans from external financial agencies such as the World Bank, the African Development Bank, the Kreditsanstalt Für Weideraufbau, and the EEC have been related to specific purposes, some of which may encourage or require the consideration of small to medium scale operation where technical alternatives may be available (e.g. the recent World Bank and EEC loans).

Seventh, the appraisal procedures appear to be quite flexible, allowing for modifications at a very late stage, essentially up to disbursement. The procedures are least flexible when an investor approaches the NIB with a single set of pro forma invoices.

Eighth, the question of information stocks and flows is clearly of considerable significance, and in this respect the organisation of the NIB's accumulated experience, and of its library, are crucial. While this issue is not the explicit focus of this paper, it is sufficiently important for it to be suggested that the author's impression in gathering information was that there is room for improvement. However, in several respects any improvement in library facilities would require the availability of foreign exchange.

Finally, in recognition of the acute economic problems which relate to Ghana at present, and which have done so for several years, a quotation from the 1976 Annual Report is pertinent:

"In view of the continued foreign exchange constraints on the economy, most of the new projects for which loans were approved could not be started. Specifically, the main drawback was the lack of adequate foreign exchange allocation to bring in the necessary machinery, equipment and the required raw materials. Project implementation became a problem and many projects had to be unduly delayed while cost estimates kept rising as a result' of inflation, thus, having serious repercussions on the Bank's schedules, targets and financial programme. As these economic problems persisted, the existing establishments were also faced with a series of difficulties such as lack of spare parts for maintenance and repair works, raw materials and other agricultural inputs. Most of the establishments were compelled by circumstances beyond their control to operate far below their capacities and therefore were unable to achieve production targets or break-even. Poor climatic conditions also .affected our investments in agriculture. Consequently it had a diminishing effect on the overall industrial and agricultural production levels, thus affecting the value of the National Product. The rate of loan recovery became seriously affected and it became necessary to reschedule repayment of loans for most of the Bank's clients."[18]

FOOTNOTES

1. Quotation taken from the National Investment Bank Objectives and Functions.

2. NIB Annual Report 1963 page 11

3. NIB Objectives and Functions

4. NIB Annual Report 1966 page 24.

5. e.g. NIB Annual Report 1966 page 24 and 1973 page 15 – the latter refers to client studies.

6. NIB Annual Report 1966 page 23; 1967 pages 29/30 and 1971 (no pagination).

7. NIB Annual Report 1981 page 11.

8. NIB Annual Report 1975 page 17.

9. NIB Annual Report 1976 pages 20/21.

10. NIB Annual Report 1981 page 9.

11. NIB Annual Report 1979 page 14.

12. Capacity utilisation in manufacturing industry in Ghana has, on average, been rather low in recent years. Published data for "all manufacturing industries" give 40.4 per cent utilisation for large and medium scale factories in 1978; 33,1 percent in 1979 and 25.5 percent in 1980. (Quarterly Digest of Statistics, Vol.1 No. 9 June 1983 Table 8B page 10).

13. The impact of the overvalued exchange rate as a disincentive to exports prior to the implicit and explicit devaluations of April and October 1983 is a separate, but relevant

issue. This devaluation, of approximately 1000 per cent, will itself have a significant effect on technology selection and economic performance relative to the external trade and payments sector.

14. A separate short paper on the derivations of the deflator give *a* longer discussion of some of the issues and. problems involved. The paper is available on request.

15. NIB Annual Report 1963 page 13.

16. NIB Annual Report 1977 (no pagination).

17. This point is made in the full knowledge of the type of information assembly and analysis required for appraisal of alternative technologies since the author has himself been involved in this type of detailed work in the course of research in the David Livingstone Institute, University of Strathclyde.

18. NIB Annual Report 1976 page 26.

APPENDIX 1 – LIST OF NIB JOINT VENTURE PROJECTS AS AT DECEMBER 1979

Note: The following projects have been jointly developed and promoted by the National Investment Bank and technical-financial partners. The National Investment Bank has Equity Participation in each of these joint-venture projects, and has also provided substantial loan guarantee facilities in them. These projects are additional to enterprises for which the Bank has provided financial assistance (other than Equity Participation) to Ghanaian entrepreneurs in the Bank's usual lending operations.

No.	Name of Company	Date of NIB Promotion	Majority Ownership
1	Saltpond Ceramics	June 1965	Public
2	Union Carbide (Ghana) Ltd	November 1966	Foreign
3	National Tobacco Rehandling Co.	November 1966	Private Ghanaian
4	Kabel Metal (Ghana) Ltd.	April 1968	Foreign
5	Ghana Tobacco Co. Ltd.	May 1968	Private Ghanaian
6	Alfa Manufacturing Co. Ltd.	November 1968	Foreign
7	Pharco Production Ltd.	December 1968	Private Ghanaian
8	Food Specialities (Gh) Ltd.	November 1969	Public
9	Precast Spun Concrete Product (Gh) Ltd.	February 1970	Public
10	Universal Printers and Publishers Ltd.	February 1971	Private Ghanaian
11	Merchant Bank (Gh) Ltd.	July 1971	Public
12	Intravenous Infusion Ltd.	August 1971	Private
13	Novotex Ltd.	August 1971	Public
14	Oti Rice Mills Ltd.	July 1972	Public
15	Standard Bank (Gh) Ltd.	August 1972	Foreign
16	Accra Markets Ltd.	September 1972	Public
17	Pomadze Poultry Ent. Ltd.	September 1972	Public
18	Western Castings Ltd.	September 1972	Public
19	Fulgurit Asbestos (Gh) Ltd.	November 1972	Foreign
20	Rehbach Buffalo (Gh) Ltd.	November 1972	Foreign
21	Mencilo and Co. Ltd.	May 1973	Private Ghanaian
22	Bank for Housing and Construction	August 1973	Public
23	Nasia Rice Co. Ltd.	November 1973	Private Ghanaian
24	Quality Meat Processing Co. Ltd.	November 1973	Private Ghanaian
25	Bibiani Metal Complex Ltd.	April 1974	Private Ghanaian
26	Prampram Brick and Tile Ltd.	September 1974	Ghanaian
27	Super Blades and Metal Manufacturing Co. Ltd.	February 1975	Private Ghanaian
28	Vacuum Salt Production	April 1975	Private Ghanaian
29	Cotton Production Ltd.	August 1975	Private Ghanaian
30	B.P. (Ghana) Ltd.	June 1976	Public
31	DEMCO Ltd.	June 1976	Private Ghanaian
32	National Trust Holding Co. Ltd.	June 1976	Public
33	Ucar Plastic (Gh) Ltd.	June 1976	Public
34	Ashanti Oil Mills	July 1976	Private Ghanaian
35	Appiah Menka Complex Ltd.	December 1976	Private Ghanaian
36	Farmers Services Co. Ltd.	December 1976	Public
37	Franco Wood Processing Complex	January 1977	Private Ghanaian
38	ESQUIRE Ltd.	April 1977	Private Ghanaian
39	Ghana Fertilizer Co. Ltd.	April 1977	Private Ghanaian
40	Kwahu Dairy Farm Ltd.	April 1977	Public
41	Aloyumah Manufacturing	November 1977	Private Ghanaian
42	Adansi Sawmills Ltd.	July 1978	Private Ghanaian
43	Adansi Development Co.	October 1978	Private Ghanaian
44	Twifo Oil Palm Plantation Ltd.	January 1979	Public

Source: NIB Annual Report 1979 Table 4 pages 27-32.

APPENDIX II

As is pointed out in the text of this paper the basic evaluation procedures used in the NIB's feasibility studies are the Financial Internal Rate of Return and the Economic Internal Rate of Return, calculated using Discounted Cash Flow analysis. The full procedures, however, include seven elements as follows:

1. Pro-forma operating statement
This consists of a year by year analysis of direct and indirect costs (including all financial costs as well as taxes etc) with an assumed capacity utilization build-up over the first years of operation. Thus, the projected development of costs is not necessarily based on the achievement of full capacity utilization at any point in the life of the project.

Direct Costs include e.g.
Raw Materials
Salaries and Wages including SSF
Fuels and Lubricants
Contingency

Indirect Costs include e.g.
Administrative Expenses
Legal and. Audit Expenses
Insurance
Depreciation
Spares and Maintenance
Interest on Loans
Contingency
Income Tax

2. Projected Funds Flow Statement
This consists of a year by year balance of sources and applications of funds.

Sources Include
- Net Profit
- Depreciation
- Amortisation
- Equity
- Loan
- Increases in Liability – Trade Creditors
  – Income Tax

Applications Include
- Increases in Fixed Assets – Building
  – Plant and Machinery
  – Equipment and Tools
  – Spare Parts
  – Vehicles and Tractors
  – Office Equipment
- Increases in Current Assets
  – Trade; Debtors (1 month)
  – Stocks of Raw Materials (1 week)
- Loan Repayment

Debt Service is included as a separate item, and Debt Service Coverage (see text) is calculated as the average ratio over the life of the loan of a) net profit, depreciation and

amortisation allowances plus interest and b) loan repayment plus interest

3. Projected Balance Sheet
This is projected forward for about four or five years in the conventional way.

4. Loan Repayment Schedule
Showing the balance in the loan account, interest and principal repayment,

5. and 6. Financial Internal Rate o£ Return Calculations and Economic, Internal Rate of Return Calculations – These are calculated on the basis of the capacity utilisation assumed at the outset for the pro-forma operating statement.

7. Break-even Analysis
This gives the percentage of capacity utilisation at which it is necessary to produce in order for the project to break even financially. Unit variable cost is calculated by dividing to total variable cost at the anticipated level of capacity utilisation by the level of output.

Variable Costs are taken to include:
- Raw Material
- Salaries and Wages (variable)
- Allowances
- Utilities
- Contingency

Fixed costs are taken to include:
- Salaries and Wages (fixed)
- Other allowances
- Depreciation
- Maintenance
- Administrative Expenses
- Selling Expenses
- Interest Payments

By making the break-even level of output (on these financial criteria) an unknown (X), it is possible to calculate the value of the unknown so that:

Unit Variable Cost times X plus Fixed Costs equals Selling Price times X

i.e. Costs equal Revenue at the break-even level of output, which can then be taken as a percentage of normal maximum capacity utilisation.

Comments
The combination of financial and, economic calculations of the viability of a project can be supported on the grounds that if all of the criteria give a favourable indication the chances of success are fairly good. In addition, the use of break-even analysis represents an attempt to estimate the extent to which a project can operate with excess capacity but still be financially viable.
However, it is not clear whether, for example, consistent operation with considerable excess capacity (as has been common in Ghana – see footnote 12 to text) might seriously affect the Debt Service Coverage of the project. Equally, it is not clear whether the likelihood of excess capacity operation might better be taken into account through the use of sensitivity analysis in the calculation of the FIRR and EIRR. Such sensitivity-analysis could estimate, the effect on the rate of return of a few possible levels of capacity utilisation, rather than taking a single level of e.g. 80 percent.