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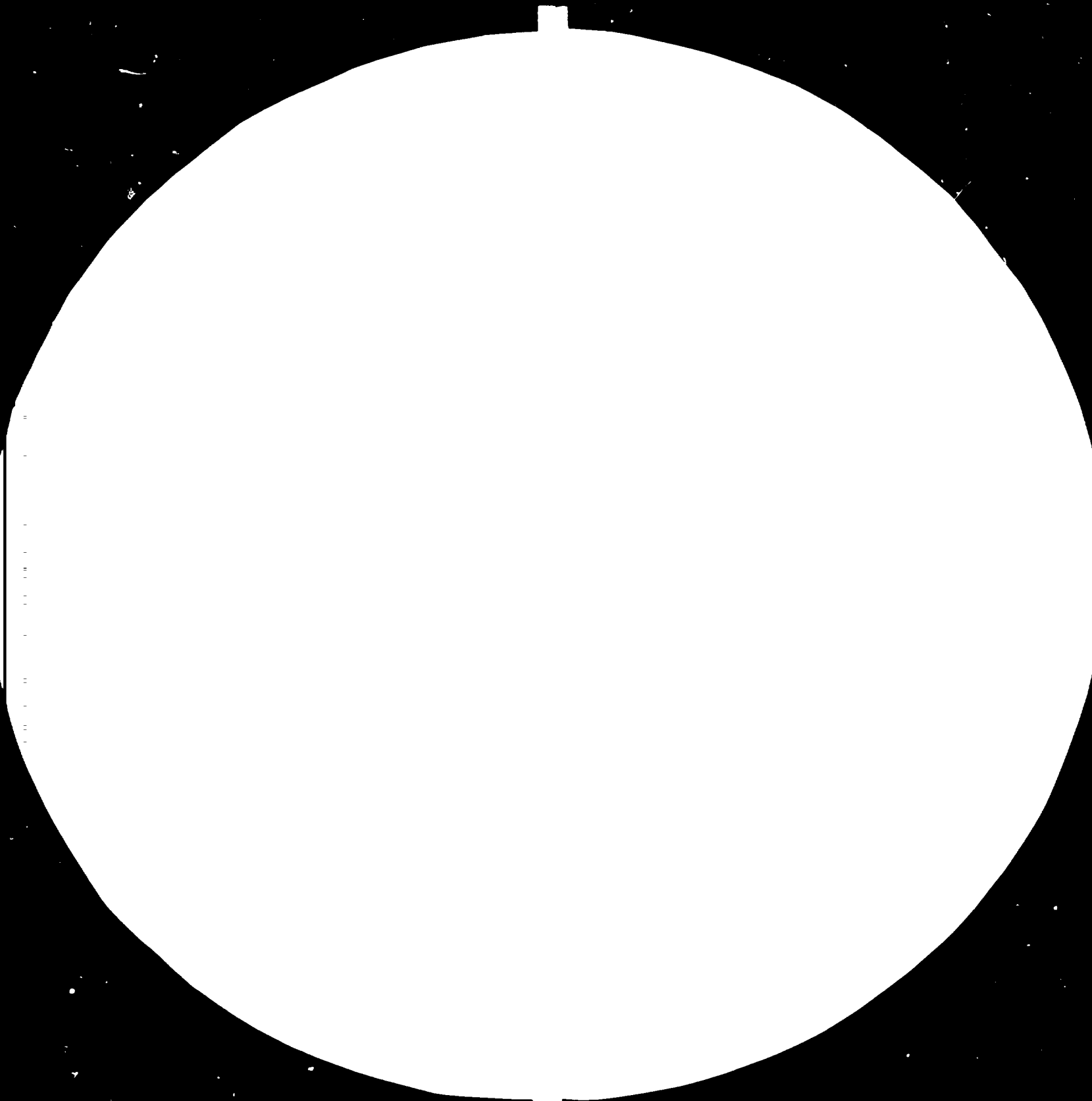

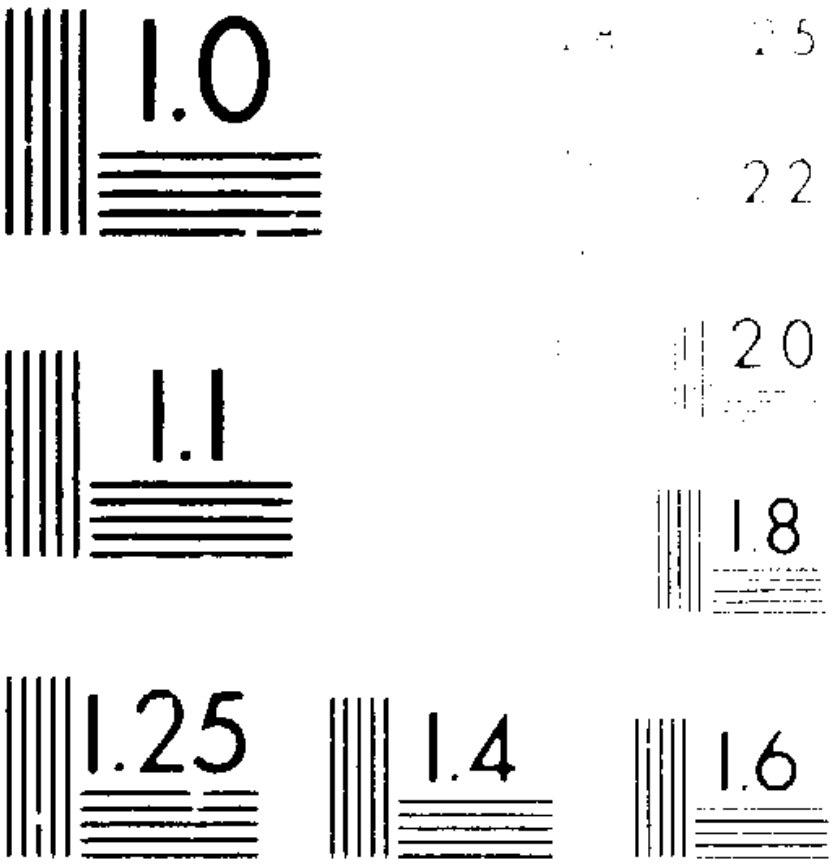
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CONSULTING SERVICES FOR IMPLEMENTING A FERTILIZER PLANT

Terminal report.

KENYA

DP/KEN/83/007/B/01/37

CARRIED OVER FROM

DP/KEN/75/009/H/01/37

TERMINAL REPORT PREPARED FOR

THE GOVERNMENT OF KENYA

BY

V S PILLAI – UNIDO EXPERT

FOR THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION ACTING AS EXECUTING AGENCY FOR THE UNITED NATIONS DEVELOPMENT PROGRAMME.

PROJECT TITLE	–	CONSULTING SERVICES FOR IMPLEMENTING A FERTILIZER PLANT.
PROJECT NUMBER	–	DP/KEN/83/007/B/01/37 CARRIED OVER FROM DP/KEN/75/009/H/01/37
DURATION	–	FROM OCTOBER 1983 TO OCTOBER 1984 & FROM 1978 TO OCTOBER 1983
PRIMARY FUNCTION	–	DIRECT SUPPORT
SECONDARY FUNCTION	–	INSTITUTION BUILDING
SECTOR	–	35 INDUSTRY
SUB SECTOR	–	3521 MANUFACTURING INDUSTRY
GOVERNMENT IMPLEMENTING AGENCY	–	MINISTRY OF AGRICULTURE
EXECUTING AGENCY	–	UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION (UNIDO)
GOVERNMENT INPUTS	–	K.SHILLINGS 413MILLION (IN KIND)
U.N.D.P. INPUTS	–	U.S. $96,400 & U.S.$504,910

C O N T E N T S

PAGES

A Brief background information on Kenya Government's Fertilizer Project

A joint venture fertilizer project called Ken-Ren Chemicals & Fertilizers Ltd (KEN-REN) was registered in 1975; with a total investment of U.S. Dollars 53,495,000/-; with Kenya Government contributing 65 per cent of the equity capital and guaranteeing the total loan capital and with N-Ren International Ltd (N-REN) of Bermuda contributing 35 per cent of the equity capital. According to the original fertilizer plant contract that was signed in April 1975 the fertilizer plant is to include, an ammonia plant, a nitric acid plant, a bagging plant and a complex fertilizer plant in single train that can manufacture, calcium ammonium nitrate (C.A.N) and a wide variety of N-P & N-P-K fertilizers that are needed in Kenya amounting to a total of 220,000TE of fertilizers per year. In November 1975, a modified sub contract was signed by N-Ren unilaterally, in which the original single train plant was replaced by a two-train plant which was designed to produce exclussively only four grades of fertilizer namely Di-Ammonium Phosphate (DAP), mono-ammonium phosphate (MAP), C.A.N. & 25-5-5. The two train fertilizer plant could not produce all the N, N-P-K grades that are needed in Kenya. This modified set up was not readily understood by the Kenya Government and was the cause of serious misunderstandings. Towards the end of 1975, the Kenya Government requested UNIDO for the services of a fertiliser advisor (UNIDO Expert) to assist them with the implementation of the fertilizer plant..Subsequently due to several disputes with N-Ren arising out of contractual and financial matters Ken-Ren had to be would up in the year 1978.

The National Agricultural Chemicals & Fertilizers Ltd (N.A.C.A.F) is a Company registered in Kenya in 1978 which is fully owned by the Government of Kenya. Its objective is to establish a fertilizer plant in Mombasa making use of the plants and equipments, that are already paid for and lying stored in Europe and Mombasa, belonging to the above joint venture fertilizer company that went into liquidation in the year 1978. The facilities proposed in modified Ken-Ren include an ammonia plant (capacity 172TE/Day), a C.A.N plant (capacity 300TE/DAY), A DAP plant(capacity 300TE), A nitric acid plant (capacity 227TE/DAY), off site plants etc.

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An Overseas Chemical Engineering Consultancy firm was commissioned by the Kenya Government in 1978, for conducting a techno-economic review of the proposed fertilizer plant. They recommended continuation of the fertilizer plant and confirmed the earlier recommendation of UNIDO Experts to abandon ammonia plant and instead use the cheaper imported ammonia as one of the main feed stocks.

The supplier contractors of the former fertilizer plant (two in number) had an obligation under the former contract, to supply, engineer, erect and commission their respective plants for which they received already ninety per cent of the total payment due to them.

However NACAF felt that it would be desirable to have an overall project consultant, who should take the responsibility for giving certificates of sufficiency for the process guarantees, do the necessary additional engineering supervise contruction, commission plants and prove performance guarantees in actual plant operation. Such a contract was entered into in December 1980 with Stamicarbon (STAC) of Holland, after calling for Global Tenders. STAC also is the supplier of the process know-how for the DAP plant which uses their patented pipe reactor. Unfortunately due to a number of problems the consultancy agreement had to be mutually terminated in July 1982.

In the light of information gathered and experiences gained working with the consultants NACAF is now convinced that an overal consultancy contract is no longer required. Instead it is only necessary, to negotiate with former supply contractors, who designed and manufactured the plants to complete the engineering of the offsites related to their respective plants and to erect and commission the fertilizer plant.

Meanwhile in 1982 and on termination of the STAC's contract, government set up an interministerial committee to re-appraise the fertilizer project, which submitted its report in time, giving its recommendations that included continuation of the fertilizer project. Upto the time of writing this Terminal Report, governments decision on the Interministerial Committee's recommendations has not been received.

B Objectives and logic of the Project

Development objectives:

(i) Increased food production with the aim of Kenya becoming self sufficient and possibly a net exporter of food.

(ii) Increased employment in the industrial as well as the Agricultural Sector.

(iii) Improved balance of trade
(a) by the reduction of imported agricultural inputs and
(b) elimination of the need to import food.

Immediate Objectives:

(i) Assist NACAF in establishing a viable fertilizer plant in Kenya that will meet the country's immediate requirements of fertilizers in the grades proposed to be manufactured and those which can be substituted by the manufactured grades.

(ii) Assist NACAF on the optimal utilisation of most of the fertilizer plant equipments that have been already paid for and lying stored in Europe and Mombasa from the year 1976.

(iii) Create capability in NACAF on fertilizer manufacturing aspects through
(a) advising the Managing Director appropriately and
(b) training of NACAF staff on various disciplines of fertilizer manufacture and factory maintenance.

Kenya has a potential for achieving self sufficiency in food provided satisfactory Agricultural inputs are supplied. Fertilizer is one of the key inputs which is now imported through private commercial agencies. The problems in connection with pricing of fertilizers, availability, distribution etc will be solved to a very large extent when local fertilizer manufacture starts.

Kenya has reasonably good infrastructure facilities such as required for the fertilizer manufacture, storage and distribution. In addition it is also improving its storage and transportation net works to meet the additional needs when the fertilizer factory goes into operation.

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NAAM works under the Ministry of Agriculture which coordinates the management of food production, supply of Agricultural inputs, distribution of fertilizers etc. Local manufacture of fertilizers is one of the long felt needs of the Ministry.

This is an ongoing project provided for the implementation of the fertilizer plant, which is included in the development plan of Kenya and which has the legislative sanction. Funds are also shown allocated in the development plan for the above purpose.

The fertilizer plant when installed and commissioned will meet the immediate and development objectives shown above.

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C. Activities carried out and out puts produced:

1. Output No:1

a) Submission of periodic reports on performance of agencies employed by NACAF for executing specific services.

b) Submission of periodic inspection and progress reports on works. This will be monthly when construction and erection works start in full swing.

Activities:

Some of the major agencies employed by NACAF were contractors for

(i) Site survey for new factory site

(ii) Soil analysis of factory's new site

(iii) Overall fertilizer plant consultancy

(iv) Shifting of about 300TE of machinery parts from a private go down to old factory site.

(v) Shifting of nearly 1200TE of machinery parts and equipments from old factory site to a temporary location etc.

Periodic reports were written on the performance of all contractors and final reports before final payment or termination of contracts. Above reports clearly highlighted quantity and quality of contractors performance to enable NACAF to take appropriate action on time. Out of the above all except the work done by STAC were done on time and according to a predetermined schedule.

In the light of experiences gained and information gathered NACAF is convinced that an overall consultancy contract is no longer required instead it is only necessary now to negotiate with former supply contractors who designed and manufactured the plants, to erect and commission the plants according to their former contract. Though a proposal for such an arrangement was given, action could not be taken up without government approval.

Again on termination of STAC's contract, Government set up an Interministerial Committee to re-appraise the fertilizer plant. This committee submitted its interministerial committee report (ICCR) on time recommending continuation of the fertilizer plant.

Periodic inspection and progress reports on all works taken up by NACAF Sugar were submitted in time which enabled NACAF to take appropriate action as called for. Construction and erection works of the factory has not yet commenced and hence monthly reports on such works were not written.

The delay that has occured which impeded the implementation of the fertilizer plant is beyond the control of the project management.

2. Output No.2

Submission of reports on investigation of factory sites considered and recommendation for final selection.

Target: To meet requirements of work plan.

Activities:

Since location of fertilizer plant at old site involves an additional expenditure of more than Kenya shillings 200 million for land and land development and infrastructure facilities, the site had to be abandoned and a new and satisfactory location found. Several sites were investigated before choosing a suitable one which has all the infrastructure facilities readily available. The land and land development cost at new location would have cost Kenya Shillings 20 million.

Reports were submitted showing justification for abandonment of old site and selection of the new site out of the several considered, for NACAF's decision.

All the above works were done to meet the requirements of the work plan.

3. Output No. 3

(a) Preparation of tender documents (T.D) as necessary for any services required by NACAF

(b) Evaluation of T.D and recommendations for award of contract

(c) Preparation of work plans and preparation of draft contract documents for discussion with Chief Executive of NACAF and Legal Advisors.

Activities:

Preparation of T.D evaluation of T.D and recommendations for award of contract were done for all the works so far undertaken by NACAF most important among them being:

i) overall fertilizer plant consultancy contract

ii) site survey

iii)Soil analysis

iv) shifting of factory machinery and equipments as necessary etc. All the above were done very satisfactorily according to the work plan.

Tender documents were also prepared for works yet to be tendered so as to save time for future works such as :

a) T.D for ammonia and acid terminals

b) T.D for factory's civil works

c) T.D for insurance cover for factory during construction and erection etc.

Before concluding an agreement with STAC, a draft contract document was prepared for discussion with Managing Director of NACAF, Legal Advisors and members of the tender committee. This resulted in drawing out a good term of reference in the consultancy contract, which enabled NACAF to clearly identify the shortcomings of STAC & take appropriate action on time.

A work plan for the factory construction, erection and commissioning was prepared to enable preparation of critical path networks as soon as Government's approval for continuation of NACAF is received.

All the above works were done satisfactorily and they have significantly facilitated the implementation of the project

4. Output No.4

a) submission of report on ancilliary facilities required for the fertilizer plant with estimation of cost and recommendation for procurement.

Target:

To meet the requirements of the work plan.

Activities

Report on ancilliary facilities required and estimation of cost along with procurent advice was submitted to NACAF on time to meet the requirements of work

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plan. These details were made use in the preparation of the total cost of the fertilizer plant. All such above details were also included in the Inter-ministerial Committee report.

5. Output No.5

a) Preparation of statement showing investment cost for completing the fertilizer plant.
b) Preparation of statement showing foreign currency requirements of the plant.
c) Estimation of capital formation and expenditure showing total cost and year-wise expenditure required for budget purposes.
d) Review report on expenditure, to show its conformity or otherwise with respect to the sanctioned budget to take corrective action as necessary.

Activities

Realistic investment cost for completing the fertilizer plant was prepared after collecting all important datas to reflect current prices and trend.

Foreign currency requirements for completing the fertilizer plant was prepared separately and submitted to NACAF. This statement also is realistic and reliable.
Interministerial committee report includes figures and statements contained in the above two statements.

Estimate of capital formation and expenditure was submitted to NACAF which showed total cost of fertilizer plant and yearwise expenditure required. Treasury based above figures for sanctioning NACAF's budget. Now that fertilizer plant implementation is delayed, it is necessary to update the figures.

A close scrutiny on expenditure was done to ensure conformity or otherwise with respect to sanctioned budget. So far this control went on very satisfactorily.

6. Output No.6

a) Periodic performance and inspection reports on the performance of the main supply contractors of the project.

. . . . .)

Activities:

The supply contractors are the ones who designed and manufactured the fertilizer plant. As per the former supply contract, they have received 90% of the total money due to them which includes, construction, erection and commissioning works of the fertilizer plant. The present proposal of NACAF, which is awaiting Government sanction is to utilize the former contractors to undertake all the rest of the works in the fertilizer plant. Since the contraction and erection works to be done by the supply contractors is yet to begin no performance and inspection reports were written.

7. Output No. 7

a) submission of reports on the utilisation of the supplied machineries and estimation of additional requirements of machineries and equipments.
b) periodic inspection of equipments stored in Mombasa and periodic inspection reports to ensure corrective action wherever called for.

Activities:

Several weakness in the design of STAC's DAP process came to light in the course of the consultancy contract with STAC. Some of the weaknesses are

i) The DAP plant will not meet the guaranteed capacity
ii) Pipe reactor process being unable to meet the strict limits of nutrient control called for in the final product manufactured
iii) The material specification of the equipments prevent the manufacture of any grades of N-D-K products containing ammonium nitrate
iv) Pipe reactor being unable to utilize satisfactorily the commercial grades of phosphoric acid commonly available in the market. The now recommended proposal is based on:
    i) information gathered and experiences gained
    ii) optimal use of the machineries and equipments so far supplied
    iii) avoiding any unnecessary and costly modifications, reworks or additional equipments etc. The report submitted showed optimal use of equipments and machineries already supplied, at the same time keeping the total cost of the fertilizer plant as low as possible. This proposal which is accepted by NACAF and was considered by the Interministerial Committee report includes:

i) Abandonment of ammonia plant and instead import ammonia as feed stock
ii) Installation of an ammonia and phosphoric acid terminal at Mombasa

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iii) Abandon pipe reactor and install in its place the commonly used and non patented pre-neutralizer

iv) Utilization of DAP plant as it is without any of the modifications suggested by STAC

v) DAP plant to be used only for the manufacture of DAP and not for any grades of N-P-K containing nitrates.

The plants and equipments stored at Mombasa were frequently inspected and several inspection reports were submitted. On the basis of these reports several corrective actions were taken to keep the machineries and equipments in a satisfactory condition such as, repainting, providing rain protection covers, inspect machinery and repack where necessary, putting permanent identification marks on all machineries and equipments etc. As a result of such inspection, the condition of the equipments at the time of writing this terminal report is good and they can be used satisfactorily in the fertilizer plant. It is estimated that not more than a maximum of 5% of the cost of machinery and equipments will be required to put them back to working order.

The fertilizer plant equipments stored in Europe were not inspected by NACAF's staff so far. But from progress reports prepared by STAC and other indications it can be realiably presumed that the condition of equipments stored there is also in a satisfactory condition.

8. Output No.8

a) submit organisation with duties and responsibilities, qualifications etc. for each categories of personnel.

b) submit interview reports of supervisory staff

c) conduct counterpart training and training of technical staff
   - project management (Managing Director)
   - engineers on fertilizer production and factory construction and maintenance

d) submit training programme (frame work) for technical staff for on the job training.

e) conduct classroom lectures and provide field assistance wherever called for

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Activities

Organisation chart for the whole factory showing duties and responsibilities and qualifications for each category of personnel, was prepared and submitted to NACAF. On the basis of this NACAF was authorised to recruit personnel as and when necessary. Assistance was given to NACAF, in advertising for personnel required, participating in selection committee, short listing of suitable candidates, preparation of interview reports etc.

Counterpart interation, regular contacts, discussion, training etc went on exceedingly well and the results produced is outstanding. The Managing Director (Counter-part) is in a position to take correct and timely action on all matters concerning the fertilizer plant confidently. He is also fully equiped and extremely competent to take similar actions in the future. The Managing Director is extremely competent, knowledgeable, dedicated, cost conscious and a person of exceedingly high integrity. Such a person is an asset to any public sector undertaking.

Training programmes (frame work) was prepared elaborately for the technical staff and on the basis of this, several classroom lectures were regularly conducted for NACAF's engineers on fertilizer manufacture, factory erection and maintenance, basic engineering disciplines used in equipment operation and maintenance etc. On the job training had to be limited to the opportunities so far provided, since full benefit of the training can be got only during the construction and erection and commissioning of the factory. The engineers have benefited extremely well by the training.
Training conducted so far, significantly facilitated the implementation of the project.

9. Output No.9

a) Prepare formulation tables and material balances for NACAF's fertilizer manufacturing programme
b) Preparation of project viability statements, including estimated fixed costs, variable costs, break even analysis profit and loss, cash flow and capital account, estimation of foreign exhange savings etc.
c) submission of reports on any specific issues that arise on technical subjects from time to time (e.g where to locate, the ammonia and phosphoric

acid terminal at harbour or at factory site 7 kilometers away from harbour.

Activities:

Formulation tables and material balances for NACAF's fertilizer manufacturing programme were prepared and submitted to NACAF. Viability statements of NACAF were prepared on this basis. Formulation procedures were included in the training programme for engineers and theyare now in a position to prepare formulation tables for any grades of N-P-K granulation or mixing products.

The parastatal advisory committee which was reviewing the I.M.C.R asked for several clarifications on details contained in it, which ultimately resulted in a full review of the report presenting it in simpler/fundamental terms for easier understanding, checking arithmetical errors, fixed and variable costs, cost of production, profitability, foreign exchange savings etc. This actually became a viability study in itself which confirmed and strengthened the recommendations contained in the interministerial committee report. Some of the highlights of the study are:

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i) When the fertilizer plant is installed and commissioned it will result in an annual foreign exchange savings of Kenya shillings 94 million

ii) The fertilizer plant will start generating surplus income in its fifth year of operation

iii) The Internal rate of return (I.R.R) after paying the normal tax of 45% will be 14.6%

Several technical issues that came for careful study and analysis for NACAF to take timely and appropriate decisions were examined and detailed reports submitted. Some such issues that came up are shown below for illustration:

i) Appropriate and economical location of ammonia and phosphoric acid terminal-Report on this issue was prompted by the recommendation of STAC to locate the terminal at the factory site nearly 7 kilometers away from the harbour. The report highlighted the detailed advantages and disadvantages of the two locations, which ultimately made STAC to accept the recommendation contained in the report namely locating the terminal at the harbour because of the impracticability of the STAC's recommendations.

ii) a proposal for the manufacture of ammonia from the raw material wood and manufacture of urea were engaging the serious attention of the Government of Kenya.
The report proposed, highlighted the unworkability of the manufacture of ammonia from wood, obsolete process used for the manufacture of ammonia, urea as a fertilizer is consumed only in negligible quantities in Kenya; the exhorbitant capital investment required for the project and its non viability etc. As a result of this report and recommendations the above proposal was subsequently dropped.
iii) Another proposal that came to the attention of the government was the manufacture of phosphoric acid after investigating the availability of rock phosphosphate and sulphur for manufacturing sulphoric acid. This proposal also recommended relocation of the fertilizer factory elsewhere inland away from the Mombasa harbour.
Above proposal, would be highly cost intensive, non viable, non practical and I therefore recommended against it.

10. Output No.10

a) preparationof bi-monthly reports showing status and progress of the fertilizer plant
b) preparation of self evaluation report on the performance of the fertilizer plant at periodic intervals as called for by UNIDO for the UNIDO executed technical cooperation field projects.
c) preparation of six monthly progress reports in accordance with UNDP procedures.

Activities:

Regular bi-monthly reports on status and progress of the fertilizer plant were written. So far till August, 93 such reports were written and submitted to UNIDO and UNDP.

Self evaluation reports on the performance of the fertilizer plant were written at periodic intervals as called for by UNIDO.

Six monthly progress reports were also written, but not so regularly since bi-monthly reports were written regularly and were being submitted to UNIDO AND UNDP.

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Attainment of immediate objectives

D. The three main immediate objectives of the project were:

i) to build a viable fertilizer plant in Kenya that will meet Kenya's immediate requirements of fertilizers;

ii) to advise NACAF on the optimal utilization of most of the fertilizer plant equipments that have already been paid for and lying stored at Mombasa and Europe and

iii) to create capability in NACAF on fertilizer manufacturing aspects through:

a) advising Managing Director appropriately and

b) training of NACAF staff on various disciplines of fertilizer manufacture and factory maintenance.

The fertilizer plant as originally contracted was not a viable one and in addition NACAF was not in possession of technical and design details of certain plants. Process owners of DAP plant namely STAC to whom the overall consultancy contract was given also withheld several important design details since their process and the plant as designed had several weaknesses. Inspite of the above and step by step and correct actions taken by NACAF so far, it is able to now see the total fertilizer plant with all its technical details and decide on what exactly it needs to make the whole complex a viable and successful one, fully set to achieve the immediate objectives of the project. The following were the recommendations made to make the fertilizer plant viable:

1) to abandon ammonia plant and import the far cheaper ammonia as one of the major feed stock.

2) to install an ammonia and phosphoric acid terminal at Mombasa harbour to receive and store the two main feed stocks

3) In D.A.P plant abandon the pipe reactor and install the conventional and non patented pre-nutralizer.

4) Install CAN plant, DAP plant and nitric acid plant as it is without any of major modifications suggested by STAC.

5) to manufacture out of the complex 60,000TE CAN; 30,000TE 20-10-10 and 90,000TE DAP or alternately 90,000TE CAN and 90,000TE DAP.

6) DAP plant cannot granulate any N-P-K grades containing nitrates as it is not properly designed.

7) to utilize the former supply contractors to do the remining of their engineering of the respective plants and to erect and commission the plants.

As per the above recommendations, the fertilizer plant will be capable of making a foreign exchange savings of K.Shs.91 million per year and an internal rate of return (I.R.R) of 14.6% after paying the normal tax. The plant will start generating surplus income after four years of initial operation. Alternately the foreign exchange savings and I.R.R will go up to K.Shs.140 million and 16.1% respectively when the plant makes 90,000TE CAN and 90,000TE DAP.

The abandoned skid mounted and compact ammonia plant can be sold in the open market. In 1982 there was a reasonable offer for the sale of the ammonia plant.
The report on the optimal utilisation of fertilizer plant is already with NACAF. The report recommends minimum alterations to the existing plants to reduce considerably the total cost of the fertilizer plant.

The secondary function of the project is institution building which is expected to be achieved by counterpart training and training of NACAF's Engineers. The Managing Director was thoroughly briefed in advance orally and in writing as the case may be on technical, commercial and management aspects of all important matters on the fertilizer plant, so that he has with him full information in advance on matters referred to in reports. This enabled him to make timely and correct decisions. NACAF after having solved all its difficulties regarding design aspects of the fertilizer plant is now in a reliable and safe position to commence construction and erection works of the factory. The Expert had no difference of opinion with the Managing Director on any of the decisions he has taken so far. Counter part training has produced outstanding results and the Managing Director is in a position to manage the affairs of the fertilizer plant excellently well and if necessary on his own.

The Expert prepared detailed training manual for the benefit of NACAF's engineers and conducted several classroom lectures on, fertilizer manufacture, formulation procedures, factory erection and maintenance, plant operation etc. On the job training had to be limited for want of opportunities. For getting the full benefit of the training, the engineers have to be trained on the job during construction, erection and commissioning of the fertilizer plant. But unfortunately such above activities are pending for a long time for want of Government decision.

If the Kenya Government had approved the recommendations contained in

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E.M.C.R all aspects of the immediate objectives would have been fully met. But this is a matter which is beyond the control of the Project Management.

E. Utilisation of Project Results

Though the activities of the project were carried out extremely well achieving most of the objectives, the development objectives can be fully met only when the fertilizer plant is constructed and commissioned. By the outputs so far produced, NACAF has reached a stage when it is ready to take off and execute the construction and erection works on a very tight work plan(which is also drawn) immediately on getting the government approval. Since the government approval has not come, even after such a long delay, the project management is constrained to curtail further activities in the fertilizer plant. However, in the near future, if such above approval comes, the local management is in a position to move ahead and execute activities that still result in establishing a viable fertilizer plant. Details of most of those that are of a technical or commercial nature for future decisions have also been worked out and are readily available to counterpart and technical staff.

It is essential to ensure satisfactory condition of the equipments that are stored from the year 1976 in the future also, before they are erected. At present all equipments are properly identified, tagged and maintained in satisfactory condition by frequent inspection. They are suitable for installation in plants. Similarly, equipments stored in Europe, from indication from inspection reports written by former consultancy contractor, are also in a satisfactory state for installation.

The site selected for building the fertilizer plant, has all infrastructure facilities readily available. The site has uniform and very good soil conditions that will reduce construction costs to the minimum. It has sufficient space for future expansions and the land and land development cost at this place will not exceed Rs.5m.2% million.

in only factor that is delaying the realisation of the development objective is the delay in the government's sanction to go ahead with the construction and erection works of the fertilizer plant.

F. Findings

Ammonia plant is the only one in the whole fertilizer complex that uses highly sophisticated technology which needs highly skilled personnel to operate and maintain the plants. Now that this plant is abandoned, the whole complex has become less sophisticated requiring only ordinary skill to operate them. In my observation and experiences so far I have no hesitation to say that there are sufficient management and technical personnel available in Kenya who can operate and maintain the fertilizer plants satisfactorily. It will of course be necessary to have specialised assistances during erection and the first six months to one year of the initial operation of the plants.

The fertilizer plants as recommended, importing the main feed stocks ammonia and phosphoric acid is the easiest and most profitable process if one is interested in setting up a fertilizer factory. The government is not taking any risks or chances in permitting the plants as received to be installed. In the course, after gaining experiences in operating such simple plants, if fuel situation eases, government may consider putting up the present ammonia plant, if the cost of production of ammonia also works out to be advantageous. Alternately the ammonia plant can be disposed off for which there will be bidders.

The management skill available in Kenya is as good as any in the whole world. The technical skill available is also good and they can be trained to undertake responsibilities in operating and maintaining fertilizer plants satisfactorily.

The cooperation and assistances, extended to UNIDO and UNDP by the government and the Chief Executive of NCAF was excellent.

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C. Recommendations

Though it will be possible to get a buyer for the abandoned ammonia plant, it will not be possible to locate a buyer for CAN, DAP and Nitric acid plants in the world market. Therefore, the equipments for the above plants will go to waste if the fertilizer plant is not put up.

If the decision to continue with NACAF is given, it is recommended that UNDP and UNEP give additional assistances to NACAF, indications of which assistances are already listed in the project document.

An inspection of equipments stored in Europe should be made immediately by NACAF's staff to assess and confirm their present condition. Equipments stored in Mombasa should be frequently inspected and corrective action taken as necessary till a final decision on the future of NACAF is decided by the government.

If government decision on the future of the fertilizer project is delayed much longer it may be necessary to repack machinery boxes lying in the open and move them under covered storage as early as possible.

As explained earlier, there is sufficient management and technical skill available in Kenya to operate this less sophisticated fertilizer plant satisfactorily and there should be no need whatsoever for management contract with private agencies.

V S PILLAI