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CREATING, EVALUATING AND ESTABLISHING SUCCESSFUL CHEMICAL FERTILIZER PROJECTS

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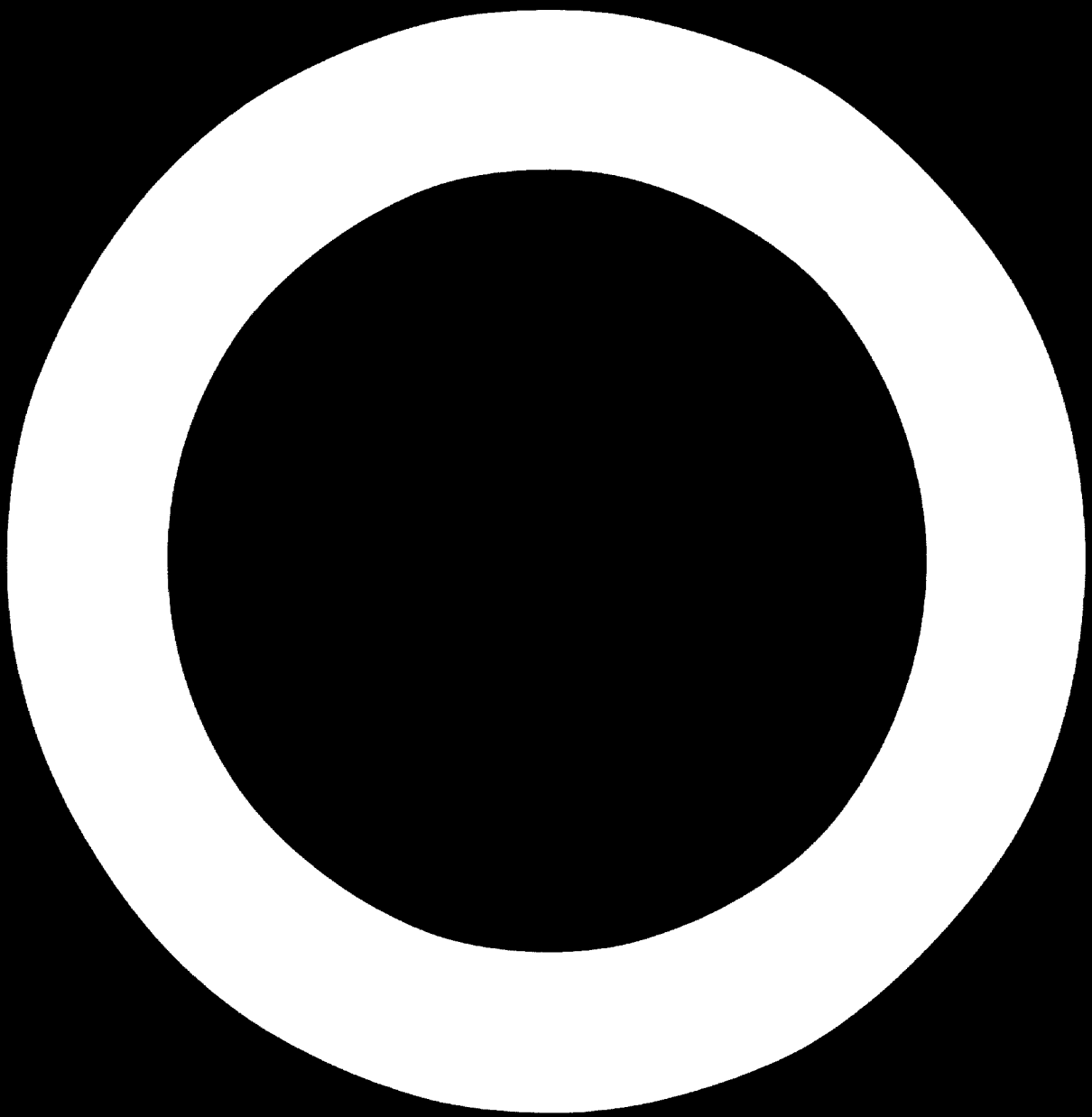

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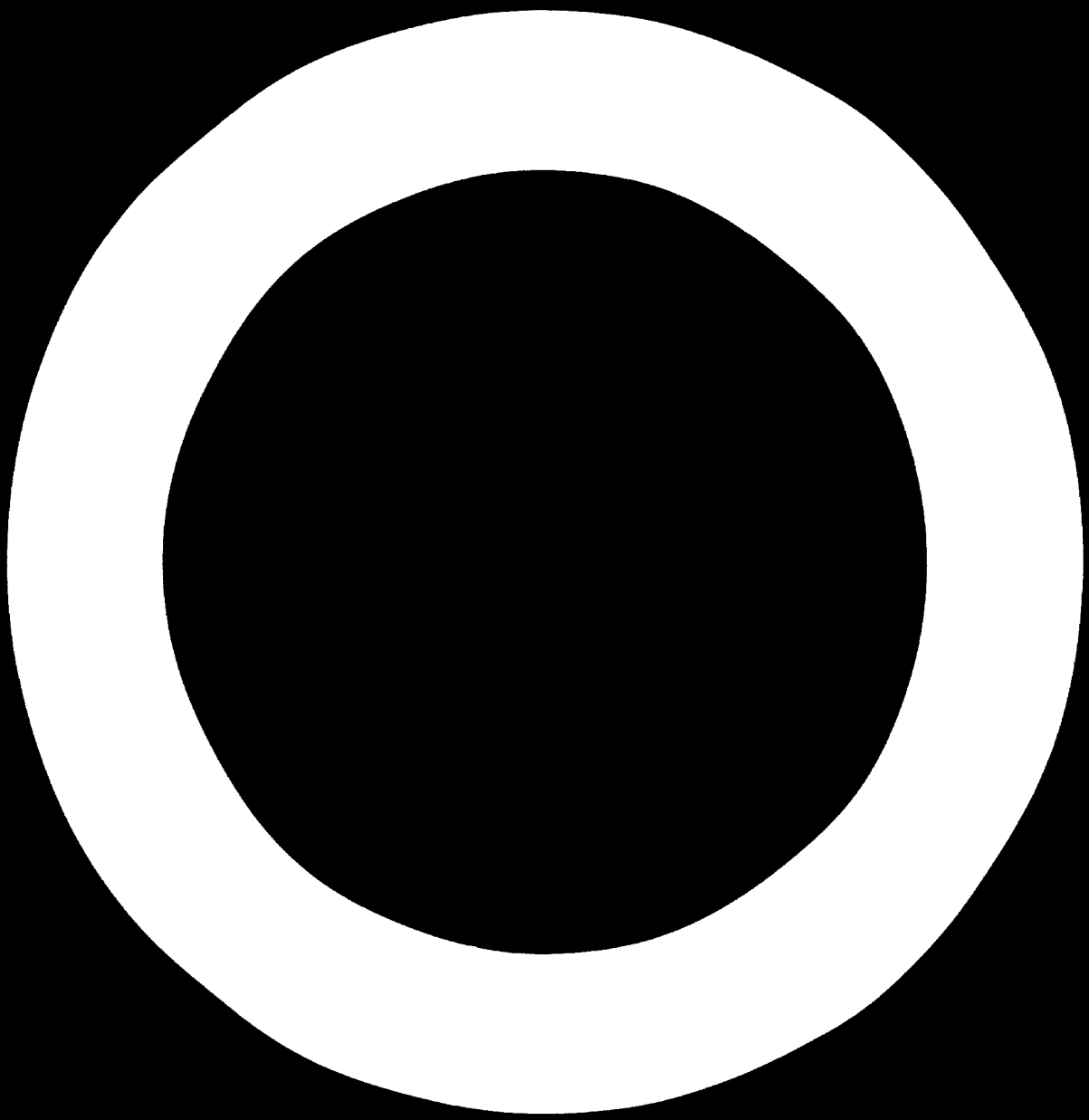
PREFACE

"The important thing is to encourage the habit of weighing benefits and costs. When that habit becomes ingrained, society is already most of the way to becoming development-minded."

Eugene Black:
Diplomacy of Economic Development
Harvard University Press,
pp. 29-31
1960



1. INTRODUCTION

During the United Nations/Ukrainian SSR Fertilizer Seminar held at Kiev in August/September 1965, it became evident that some modern guidelines for evaluating and establishing chemical fertilizer rojects would be of practical help to many - especially those developing nations anxious to increase their food supplies in the most propitious manner.

Accordingly, it was recommended at the conclusion of the Seminar that a study be undertaken to investigate the best ways of evaluating potential fertilizer projects and selecting the most suitable in terms of national interests, technical suitability and maximum economic benefit.

This Report has been prepared on the recommended lines and simultaneously reviews the whole spectrum of project work - from search and inception, to evolution and initial operation. In this way, the importance of thoroughly evaluating each factor can be better appreciated and understood.

2. SUMMARY AND RECOMMENDATIONS

2.1 Summary

Chemical fertilizer projects are usually large and costly undertakings which, in developing countries, can have a major impact on basic items such as the availability of foreign exchange, the resource/demand balance, and population, food and living standards.

Therefore, great care is needed to ensure that the optimum type and size of plant is installed at the best location, and is financed, built and operated in the manner most suited to the specific conditions. The best way of achieving these aims is to proceed on the basis of a thorough project study, which has been scruitinized in detail by an independent evaluation team and modified or improved where necessary. After approval, project construction can then proceed according to plan, with the confidence that transformation into an efficient undertaking will take place after construction is complete.

On this basis, this Study is divided into the successive phases of project development, evaluation, and implementation, plus the oft-neglected but no less important task of post-project appraisal (without which an accurate measurement of success cannot be made, and available mistakes are likely to be perpetrated on similar future projects.) To provide guidance when making these studies, separate but related Check Lists for project development and project evaluation have been developed and are appended.

The Study recognizes the importance of defining and fulfilling separate national and commercial aims in some developing countries, and suggests that promising bases for mutual assistance, and perhaps collaboration, be thoroughly

explored. In this way, the best joint use of available experience, finance, skills and natural resources can be made for the benefit of all, to an extent much greater than any imagined Pareto optimality.[1]

2.2 Recommendations

On the foregoing lines, the Study recommends that developing countries, private investors and others wishing to establish successful chemical fertilizer projects adopt the following procedure:

1. Establish a Project Development Team which jointly is thoroughly experienced in fertilizer marketing, manufacture, and corporate functions. (In cases where indigenous experience is not yet fully available, assistance can often be obtained from consultants and the United Nations experts.) Alternative projects can then be created, screened and developed, as indicated in this Report.

2. Establish an independent Project Evaluation Group capable of impartially and critically examining the proposed project, and of contributing improvements.

3. Include in the project plan adequate funds, facilities, and controls for project construction, implementation and post-project appraisal.

4. Use up-to-date, but not abstruse methods, of determining technical and economic feasibility and rates-of-return on invested capital.

5. Use detailed check lists such as those outlined and appended; modified and expanded where necessary to meet specific circumstances.

3. CREATING REALISTIC PROJECTS

3.1 National and Primary Goals

To be realistic and successful, a project must have valid reasons for its creation. For example, a venture established largely for purposes of national pride, needless self-sufficiency or a wish to take advantage of available capital, is likely to prove very costly to its sponsors and an ultimate handicap to the country in which it is built. Hence, a new undertaking must meet a real need which in the case of a chemical fertilizer project can be one or more of the following goals:

1. An increase in domestic food supplies.
2. Savings in foreign exchange.
3. Generation of foreign exchange by producing fertilizer materials for export, from indigenous raw materials.
4. Development of national strength and resources by indigenous efforts.
5. Development of regional and inter-regional strength[8] by means of shared resources, multilateral trade and joint economic gain.
6. Securing of raw material sources or new markets by a private investor, and/or expansion of corporate claims.
7. An adequate financial return on the investment made.

The latter holds true whether the capital has been supplied from private sources or from government funds. Private investors cannot be expected to support altruistic or doubtful enterprises when more realistic opportunities exist elsewhere. Similarly, a fertilizer project built with the aid of government funds should also benefit the people financially, e.g. by saving foreign exchange and/or by generating earnings which can be reinvested for the public good.

For this reason joint enterprises, whereby the skills of private industry can be harmoniously coupled with government funds and mutual aims, frequently offer excellent opportunities for the achievement of mutual aims, particularly in the developing areas. Sometimes, public investment can also be invited, thereby creating increased local participation and prosperity.

3.2 Secondary Benefits

Important secondary benefits can often be obtained from successful chemical fertilizer projects, such as:

1. Increased local employment,
2. Improved local skills,
3. Increased local purchasing power,
4. Increased tax revenues - local and national,
5. Additional amenities such as roads, houses, utilities, etc.
6. Greater attractions for other industries arising from available materials such as ammonia, sulphuric acid, and from services such as roads, water, power, etc.
7. Reciprocity between local areas, regions, and other countries, in terms of trade agreements, barters, taxes, transportation, etc.

It is evident, therefore, that project evaluation should not be limited merely to technical superiority or to maximum financial return. A short-sighted policy which does not view the project as part of a complex national-industrial-commercial balance is likely to generate future handicaps, regardless of technical excellence. Future growth - one of the best indicators of success - will also be restricted if national factors have not properly been taken into account.

3.3 Sponsorship

A project can arise from several different sources, and the merit accorded to it after evaluation is likely to be directly related to the reputation of its sponsor(s). For example, an application for funds to an investment house from a well-established experienced company is likely to receive greater initial consideration than one from a new concern or an unknown individual - even if the feasibility studies supporting each application were virtually identical. The same can be said for governments and ministries; a country with a reputation for integrity and cooperation will undoubtedly attract better projects and financial support than one with an inept, or unstable history, even if the latter country be larger or more powerful.

A government-sponsored fertilizer project will normally have as its aims the improvement of local food supplies and/or the savings or earnings of local foreign exchange, plus the increased well-being of its industry and people.[13] A project developed by private industry can be expected to be primarily oriented towards investment security and maximum return on invested capital.[14] Other aims might include the securing of additional raw materials supplies or the creation of new markets. These different goals are not necessarily conflicting (as is sometimes believed) and as previously indicated, projects sponsored jointly between governments and private industry can offer excellent opportunities for the fulfillment of multiple aims.

This particularly applies to some developing countries which possess fertilizer raw materials and perhaps a good potential market, yet lack the skill and capital to undertake a large project. Of course, to be successful, a joint government/private industry venture must be based on firm agreements which are fully understood

and accepted by both parties and which contain no inequities capable of being magnified into major grievances by opportunists at a later date. Furthermore, the responsibilities of each party must be well-defined and fully carried out.

Some of the principal advantages of a sound, joint project on these lines can include:

1. Government assistance with infrastructure and major services.
2. Reduced capital needs on the part of each owner, because of the joint investment program.
3. Increased protection to the private investors.
4. Less stringent taxation policies.
5. Efficient construction, production and marketing, based on the accumulated experience of the private investor.
6. Established export, commercial and technical links with other countries and markets via the private investor.[15]
7. Rapid development of local management and labor skills.
8. Strengthening of international relations and goodwill.
9. Opportunities for local public investment and corresponding domestic support.
10. "Pioneer Rights" and protection from unrestricted competition during the early years.

3.4 The Project Development Team

Whether the sponsor be a government, an industrial company, or a private promotor, each project must first be created, developed and presented in a form acceptable to others. Because of the different functions involved, e.g. marketing, technology, financing, legal, etc., it is preferable that a small team of specialists be assembled for project development instead of a promotor or sponsor trying to undertake all aspects of the work as

has sometimes been attempted. One consensus[4] considers the minimum team should consist of an engineer, an accountant, and an economist.

Some industrial corporations and government departments maintain permanent groups reporting to a Project Development Director for the specific purpose of discovering, creating, and developing projects within the corporate or national program. In other cases, experienced consultants are engaged whenever the need arises. The complexity of modern financing, technical, and marketing problems, especially if on an international basis, makes the use of an experienced group essential if a project is to be realistic in all aspects and capable of surviving a critical evaluation by other specialists on an impartial basis. The use of a competent team also minimizes the promotion of unsound projects which are largely based on emotional factors, such as a fervent belief in a new process; or a hoped-for market; or which fail to give proper consideration to inevitable competition.

In some instances, project teams are assembled on an ad hoc basis by drawing on members of government departments or corporate divisions who may have available time, or some relevant knowledge. In general, however, this method is unsuitable except for minor, short-term assignments, as it is not possible to undertake two full-time tasks simultaneously and both are likely to suffer. Furthermore, many individuals who are only occasionally exposed to the project universe tend to view new possibilities largely in terms of their own limited experience and problems. Accordingly, they may be biased against a promising new opportunity from the outset. However, the judgement of experienced people should complement the project evaluation team, even if limited to comment and advice only.

3.5 Project Search and Conception

In the case of a developing country wishing to establish a fertilizer project, a detailed search may be needed to find a suitable set of circumstances justifying the establishment of the desired facilities. For example, no ideal plant site may exist, or there may be several alternatives available. The size of the market for nitrogen, phosphorus and potassium materials, as well as market mix, growth, and competition may not be known. Similarly, the availability of raw materials and utilities may be doubtful, and imported materials or special processes may be needed - perhaps at too great a cost. Hence, numerous combinations of alternatives may have to be examined before a short list of potential projects can be developed and a final choice made.

To an industrial corporation or a private promotor looking for promising investment opportunities in the international fertilizer field, a search for the most suitable projects may be even more involved, because of the additional factors to be considered. Several national aims may have to be reconciled with the industrial and commercial requirements of the project international financing may become necessary and political considerations may intervene. Hence, to many potential investors, despite the growing need for fertilizer materials, the number of suitable project opportunities may appear to be relatively limited because of the numerous factors to be jointly considered.

Project searches can sometimes be greatly assisted by information available from the major international organizations such as the United Nations, the World Bank, and the U.S. Agency for International Development. The Ministries of Industry and Commerce of some countries are also able to furnish project data and in addition may give active assistance with field studies, legal and tax considerations, and the finding of suitable partners or other resources.

When promising markets, suitable raw materials and propitious financial and political circumstances can be seen to co-exist, the conception of a realistic project follows, for subsequent evaluation, and eventual approval and construction if found to be feasible. As mentioned previously, it is unwise to envisage a project largely in terms of one advantageous feature such as a cheap raw material or a favorable location, without full consideration of the other necessary factors.

The importance of conceiving and examining all aspects and alternative ways of carrying out a project has been stressed.[5] Similarly, the need and scope of a project should be given realistic consideration by its sponsors and developers, lest a later impartial evaluation shows it to be either too grandiose, or even not needed at all. Expansion, replacement and/or acquisition of existing operations should also be borne in mind as possible alternatives to new projects.

3.6 Project Priority and Sanction

An important item in project development and evaluation is priority. Fertilizer projects in developing countries can normally be expected to enjoy a high priority. Nevertheless, they can also be ranked by a government or supporting international agency in accordance with such factors as agronomic suitability, capital needs, foreign exchange considerations and benefits to the national welfare.

A private investor or corporation will normally view priority in terms of financial risk, profitability, growth, raw material needs, and market potential, compared to other potential investments. Such priorities will depend on specific circumstances, time factors, and policies; for instance a company wishing to strengthen its position in

basic material such as phosphate rock or potash might give such projects higher investment priority over a domestic project designed to expand its sales, even if the former indicated a larger immediate financial return.

Therefore, a project evaluation should take into account the priority likely to be accorded to it, in terms of the needs and policies of the country in which the plant will be built, as well as the importance given to it by its sponsor or owner. If it is intended to apply to an international finance agency or other sources of loan capital, then the corresponding priority, as far as the availability of funds is concerned, should also be checked beforehand. It is obviously futile to spend time and money developing and evaluating a project, however attractive to its creator, if permission to build and availability of funds will be withheld because of low priority compared to projects of greater urgency.

To determine real needs detailed field studies by experienced agronomists are usually mandatory, in absence of reliable data from local government and commercial sources. Assistance can often be obtained from the United Nations and the Food and Agriculture Organization regarding successful fertilizer usage and the establishment of sound agricultural programs.

When a realistic fertilizer program has been developed it must be supported by associated features such as a farmer credit system, an educational campaign, adequate transport and storage facilities, and assurances that the additional crops produced can be consumed or sold. These developments and programs may take several years to accomplish and the correaponding fertilizer plant and production program must be designed to grow in close accord with expanding needs. To build a plant which is much too large at the outset usually represents an initial excessive expenditure of capital, and may result in having to dispose of the fertilizer or the resulting crops at uneconomic prices.

In addition to measuring current and future needs, a private investor undertaking fertilizer market studies must also take into account probable supplies from domestic and overseas competitors. Other factors to be considered include seasonal sales and distribution patterns, trends in nutrient analysis, packaging and marketing, and also the development of new products and processes which might significantly affect an established market position.

Sales Contracts

A fertilizer project will be greatly supported by Letters of Intent from prospective purchasers such as cooperatives, dealers, farmers and where applicable exporters and other merchants. An assurance of sales gives realism to the project and inspires con-

4. PROJECT PLANNING AND DEVELOPMENT

4.1 Political and Economic Environment

A fertilizer project, whether intended to produce materials for export or to supply local markets needs a stable environment in which to operate and grow. Present-day plants usually represent multi-million dollar investments, especially for nitrogen fertilizers, and most corporations or lending agencies are reluctant to expose large sums to risk of expropriation or failure due to political instability. Similarly, an area with a poor economic structure is not likely to prove a satisfactory market until purchasing power has been increased by education, farm credits and a rise in living standards.

Accordingly, for a prospective investor in an overseas project, a thorough review of past and present political and historic events is advocated, as well as a study of such economic data as may be available. This should be followed by a projection of future political and economic trends, as realistically as possible for the next decade, to ascertain the probable investment climate during the initial life of the project. On these lines, a developing country wishing to establish or expand a domestic fertilizer industry with the assistance of overseas technology and capital is at a great advantage if it can support proposed agreements and intents by a stable political history and a progressive current economy.

4.2 Markets, Products, and Sales

When determining the nature and magnitude of a fertilizer market, care must be taken to distinguish between current usage and optimum needs. Even in developed areas, actual fertilizer consumption may be only a fraction of the desired quantity; moreover, the types of product used may be dictated by custom rather than modern technology.

fidence in material and equipment suppliers, other investors and financial sources, as well as in the sponsors of the project. Therefore, every effort should be made to obtain firm Intents to Purchase, after the market has been found to be large enough to support the project.

4.3 Raw Materials

After the markets and products for an envisaged fertilizer project have been determined, the corresponding raw material needs must be studied. In some instances, basic materials such as phosphate rock, sulphur or natural gas can be obtained from nearby sources. In other cases, imported materials must be used, which may make great demands on foreign exchange reserves and also may limit the return on the invested capital. Transportation costs represent a large part of the price of imported materials and every effort must be used to obtain the best delivered prices.

Sometimes, indigenous materials can be substituted for imported ones, e.g. domestic pyrites instead of sulphur, or natural gas can be used to produce ammonia and its derivatives, instead of relying on imported nitrogen salts. Perhaps nitrophosphates might be suitable for local crops in place of phosphate fertilizers derived entirely from sulphuric and phosphoric acids, thereby enabling sulphur needs and corresponding foreign-exchange requirements to be reduced.

When the requisite types and quantities of raw materials have been determined, the least-cost available sources (on a delive basis) must be found, in order to prepare close estimates of production costs. It is advantageous for later project evaluation and financing purposes if Letters of Intent from prospective suppliers can be obtained during project development, especially if raw materials are likely to rise appreciably in price or become in short supply in the foreseeable future.

4.4 Manufacturing Processes

The optimum choice of process and plant for a specific project is dependent on several factors and not on price alone.[2] More important is product cost, which is determined by raw material conversion efficiencies, utility and labor needs, maintenance costs and ancillary requirements. Possible obsolescence is another consideration, as well as the supply of spare parts and technical services.

In certain countries, foreign-exchange problems create payment difficulties, which may sometimes be overcome to a considerable extent by fabricating much of the plant locally, and importing a few key items such as compressors and control equipment. Some countries are able to assist their industrial plant constructors by means of insured credit systems, which enable customers in many developing countries to obtain most or all of the equipment and services needed for large industrial projects via medium-term loans. Hence, financing may also dictate the ultimate origin and choice of a process and corresponding equipment.

Because of the complexity involved in process and plant selection - especially if several different processes are needed in one project - the use of an experienced and impartial consulting engineering organization is often the wisest course, compared to an evaluation of several bids on a competitive basis by non-specialists or reliance on the "free" services of a plant contractor. The latter will naturally wish to secure the order, and impartiality cannot be expected under such circumstances.

When the optimum choice of process, plant, supplier and contractor has been made in each case, based on the appropriate detailed studies, it is advisable to obtain Letters of Intent for supply of these items which should be within a close range (say

plus or minus 10 per cent) of actual costs and firm for a definite period of time. Process guarantees should also be stated, and evidence of guaranteed performances obtained for similar plants elsewhere, should be furnished. In this way, sponsors, financial supporters and others associated with the project can be confidently assured that the intended operation is not likely to fail on technical grounds; nor will it cost a great deal more than the approximate price estimate given and so upset the calculated investment requirement and corresponding profitability.

It follows from these precautions that a developing country should not install radically new, untried processes in the interests of capital cost savings, or ultra-modernity. Neither should it be content with old, established processes which are on the way to becoming obsolete. For these reasons, impartial specialist advice is recommended. The United Nations Centre for Industrial Development is able to offer guidance on these lines, either via its own experts or with the assistance of others.

4.5 Utilities, Services, and Labor Needs

As mentioned in the previous section, the optimum choice of a process is closely related to utility and labor needs. In some cases, power, water and fuel rates may be relatively high and constitute an appreciable part of the total production costs, thus necessitating a careful study of alternate processes and plant in order to minimize operating charges. Water may also be in short supply, or skilled labor may be scarce, and provisions for housing and/or transportation may have to be made.

In extreme cases, a lack of suitable utilities, services, and labor may cause the project to be abandoned, or located on a different site. Because of the great importance of these items, it is advisable during project development to obtain pro-forma contracts for power, fuel, water, etc., from local suppliers which clearly specify tariffs and supply conditions. If local labor is unionized, then rates of pay for the various envisaged classes of labor should also be accurately established (perhaps by consultation with the local trade unions, if found to be expedient). When such charges and rates are known within close limits, production costs can be accurately estimated and confidently used in the corresponding feasibility studies.

4.6 Plant Location

Many factors enter into the determination of the best plant site for a specific project,[7] ranging from possible limitations on obtaining funds for certain areas, to the restriction of supplies and markets for political reasons or foreign exchange problems. Furthermore, once established and built, a fertilizer plant - especially a large basic installation for producing ammonia or phosphates - cannot readily be moved because of undesirable location factors subsequently revealed. Therefore, the optimum site must be selected in advance, to avoid such handicaps as:

- Excessive transportation costs for raw materials and finished goods.
- Inadequate utility supplies, waste disposal facilities, services.
- Inadequate manpower or labor unrest.
- Subsequent imposition of political, fiscal or other government restrictions.

Local and technical considerations, e.g. the climate, soil properties, plant accessibility, must also be studied and fundamental economic principles must be recognized to the best extent possible. Hence, a study involving several possible alternate locations may be desirable, especially if the proposed plant is large, and sensitive to local conditions. In some cases, logistics studies aided by computer programs and perhaps location specialists may be advisable.

Transportation availability, costs and alternate choices can also be decisive factors in the optimum choice of a plant site, since the delivered costs of fertilizer materials and products are greatly influenced by transportation charges. For example, long-distance shipping costs for phosphate rock can range from 100 per cent to 200 per cent of the ex-works cost.

4.7 Technical and Economic Feasibility

Investigations made in accordance with the preceding sections, 4.1 to 4.6, will enable technical studies of alternate and proposed production methods to be made in terms of stoichiometric requirements, heat balances, utility needs, etc., which can be translated into closely estimated production costs for comparative purposes.

If in line with, or lower than, conventional costs, then the envisaged project may be realistic and competitive. If estimated production costs are relatively high, then alternative raw materials and production techniques may have to be found, if the project is not to be abandoned. It is thus important at this stage to check the project for viability, otherwise much subsequent work in developing a corporate structure, pro-forma profit and loss statements, etc., and in trying to finance the whole venture will be wasted.

4.8 Corporate, Management and Supervisory Structures

Much of the future success of a project will depend on the choice and structure of the corporate and administrative personnel. The appointment of experienced, respected officers and directors inspires confidence in suppliers, customers, financing sources and staff. Similarly, the engagement of experienced managers and supervisors is an insurance against start-up delays and inefficient, high-cost operation.

When a project is in an advanced development stage and looks promising, it is greatly strengthened if it can be supported by copies of written offers and provisional letters of acceptance from prominent and experienced men regarding top-level corporate and management appointments. High-calibre people can be expected to attract other competent individuals and so contribute to the success of the project.

4.9 Sources of Funds

Funds will be initially required for developing the project and perhaps for finding the necessary fixed and working capital. Typical sources include private promotors and investors, corporations, investment houses, banks and international development and loan agencies. In some instances, the development expenses of the promotor or sponsor of a project can be capitalized. Government funds, as well as bond issues are increasingly used in some countries for industrial projects, especially those which develop the infrastructure of an area, and occasionally, fertilizer projects are included in this category.

Medium-term credits from equipment suppliers backed by government loans and insurances are also popular. Large, multi-million dollar projects may be financed by a combination of private and public subscriptions, plus loans from investment houses,

government and private sources. In some cases, developing countries can take advantage of special low-interest, long-term loans which are available from several international agencies for basic undertakings such as land improvement, hydro-schemes, ports and similar infrastructure needs.

A well-prepared project proposal obviously has a much greater chance of obtaining the necessary equity and loan capital than one which is ineptly or flamboyantly presented to prospective partners or sources of finance. Hence, the need for thorough project planning and development cannot be too strongly emphasized.

4.10 Financial Feasibility

In recent years, the measurement of financial feasibility has undergone several major refinements and the availability of computer techniques will probably lead to still more elaborate methods whereby inaccuracies due to future uncertainties can be minimised and their probabilities determined in advance.

Successive Approximation

Some of the financial methods outlined in this Section can be time-consuming and although capable of giving accurate results, may not be justified when initially examining or screening a variety of projects. Therefore, the principle of successive approximation should be borne in mind, whereby projects of interest are subjected to increasingly accurate evaluation under methods as described below. This principle can also be applied to certain other features of a project, e.g. capital costs and operating costs but only with great caution to items such as raw materials, sales volumes and revenues.

4.10.1 **Pay-Back Method**

Apart from undertaking a project on the basis of intuition (or hopeful guessing) the simplest method, which is still used in many instances, is the Pay-Back Method. This is defined as the time taken for the earnings from an investment to equal the initial capital outlay. While this technique is so simple that it even permits rapid mental calculation and comparison, it neither measures profitability nor does it take into account the time-value of money within the pay-back period. (The time-value concept is based on the principle that a unit of money available in the future is worth less than the same unit invested today, because of the interest earned in the meantime). Therefore, estimates and comparisons based on Pay-Back Methods can be misleading and are not recommended except for rough comparisons and screening purposes.

4.10.2 **Rate-of-Return Methods**

Several methods in wide use are based on the ratio of the net profit to the capital invested. For example, the "book" rate of return refers to the anticipated net profit expressed as a percentage of the average capital employed over the life of the project. The "engineers" rate of return is the anticipated profit calculated as a percentage of the initial capital investment. This can be calculated for typical future years when required, taking into account the depreciation charged during those years, to obtain a general picture of the anticipated profit stream and/or to compare relative profit streams from different projects.

However, because of possible allowances, taxation changes and other factors, anticipated profits may fluctuate appreciably during the project life. Also, because of variations in working capital, unforeseen capital expenditures and possible investment

allowances, it may become difficult to determine the real capital outlay. In addition, no effect of the time value of money on the rate of return is taken into consideration. Therefore, these methods do not give an accurate estimate of investment profitability over the working life of a project, nor can they be reliably used for investment profitability comparison purposes. They can, however, sometimes be applied to second-stage screening and comparative purposes, according to circumstances.

4.10.3 Discounting Methods

Based on the principle that a unit of money available now (and properly invested) is worth more than an equal and certain sum available at a future date, more realistic concepts of project comparison and financial feasibility can be developed.

One method which is coming into widespread use is the Discounted Cash Flow (DCF) principle; also known by other names such as the Internal Rate of Return, and the Investor's Method. This return can be considered as the highest interest an investor could pay without loss, if all funds were borrowed and all parts of the loan - principal and interest - were repaid by the earnings of a project.

Another method known as the Net Present Value (NPV) principle is based on discounting at a suitable interest rate all future net cash flows generated by a project. When cash flows are almost constant, it may be possible to charge depreciation on a sinking-fund basis, whereby the total capital invested is fully recovered at the end of the project life. This technique, known as the Annual Capital Charge (ACC) method enables a regular allocation of earnings to be made, provided cash flows are also regular. Other discounting methods, based on project replacement, future worth and associated factors have also been developed, but are not in general use.

Under certain circumstances, the DCF method may give more than one estimated return, should the outstanding capital become negative. Also, in project comparison the one giving the highest internal rate of return may not always yield the maximum overall profit. Hence, the NPV method is theoretically the most reliable basis for project economic comparison and feasibility purposes, provided the conditions of a perfect capital market are fulfilled. Under the more realistic conditions of capital availability and risk, however, the DCF method is generally considered to be more practical. Possible anomalies induced under condtions of outstanding negative capital normally become self-evident and maximum overall profit streams for different projects can be easily calculated and compared.

For guidance, the present values of future cash flows for typical interest rates and periods are given in Appendix 1. Numerous authoritative sources of investment comparison and accounting methods are also available.[9, 16, 17] DCF and NPV calculations are greatly assisted by the use of a computer in conjunction with standard programs, although manual methods can also be used and are quite satisfactory. A recent survey[5] indicated that in some cases, discounting methods were being incorrectly used, and recommends that a proper understanding of these techniques be first obtained before they are applied to project analysis. At the same time, abstract comparisons between the various methods available are likely to be less rewarding than selecting a proven method and using it correctly.

4.11 Risk Considerations and Sensitivity

Most projects are exposed to various degrees and forms of risk, which should be determined as closely as possible during the development stage and checked during project evaluation. The three principal factors to be considered are (1) the effect of changes of a specific input or output in the earnings of the project, i.e. the sensitivity, (2) the probability and effect of each specific change occurring separately and (3) the probability and effect of several specific changes occurring simultaneously "in toto", with consequent great harm to the project.

The sensitivity of the project towards changes in specific factors usually varies considerably with each factor. For example, relatively small increases in raw material prices on sales discounts might cause a much greater loss in earnings than larger relative increases in labor costs or capital costs. If simultaneous increases in more than one sensitive input were likely, the project might thus be exposed to considerable risk of failure.

To determine in advance and as closely as possible the effect of possible future variables, it is always advisable to calculate several cases of projected earnings (preferably in terms of DCFs) based in each instance on a range of values. Thus, if the main project case were based on a major raw material cost of $50 per ton, sensitivity cases based on $45, $55 and $60 could be developed and the corresponding earnings indicated. If subsequent independent checks during project evaluation showed that, indeed there was every possibility that raw material prices would increase, and that the project was sensitive to raw material price variations, the lower earnings case would have to be selected as being nearer to reality.

Similarly, sensitivities should be calculated and shown for variations in sales prices, operating capacities and capital costs. In some industries, raw material price increases can readily be passed on to the customer, in which case, even though a project might also be very sensitive towards variations in sales prices, the probability of a squeeze whereby raw material charges increased and sales prices simultaneously fell, would be relatively small. On the other hand, future economic or political events might eliminate a considerable portion of the market, leading to reduced output and greater amoritization charges on the remainder of the sales. A sensitivity calculation would show if the project could survive under such circumstances and what the reduced profitability would be. Of course, the probability of such an occurrence would have to be measured on the basis of political and business acumen.

A typical project sensitivity table, suitable for determining future policy and in accordance with the foregoing recommendations is shown overleaf:

TYPICAL PROJECT SENSITIVITY TABLE

Projected Percentage Earnings During Project Life

(DCF or other basis)

	-25%	-10%	Base Case	+10%	+25%
Sales Revenue	4	11	15	22	31
Raw Material Cost	30	21	15	11	7
Capital Cost	22	18	15	13	10
Fuel & Utilities	20	17	15	14	12
Operating Capacity	8	13	15	18	24

Such a project is obviously very sensitive to a fall in sales revenues and increases in raw material costs. Therefore, top priority should be given to obtaining firm, long-term contracts for sales and raw material supplies before the project is sanctioned. The importance of discovering and concentrating on the critical variables of a project cannot be too strongly stressed.

Various suggestions and methods for determining the probability of adverse changes in project inputs - separately and coincidental - have been proposed or developed. In some of these, the probability and extent of each likelihood for each factor is first assessed by consultation with experienced people and a distribution curve in terms of per cent probability and degree developed for each input factor. The overall probability case, in which the probable levels of each factor are most likely to exist simultaneously can be found by mathematical methods perferably aided by a computer.[11, 12] The future will undoubtedly see many developments and refinements in these techniques.

Cut-Off Rates

Money not invested in a specific project could either remain in the sponsoring organization or be invested in other activities. In either case, a reasonable rate of return would be anticipated. This gives rise to the concept of the opportunity cost of capital, which can be considered as the money that would be lost by not investing in sound alternatives, should a specific project fail, or be unable to provide any financial return. Hence, most organizations establish a cut-off rate for project profitability; and if a feasibility study shows this figure cannot be exceeded, the project is abandoned. Typical figures are in the 7 to 10 per cent range.[5]

4.12 Growth Possibilities

Every successful project can be expected to grow, either by way of expanded production or a wider product range, or both. To provide the means for growth, several needs must be anticipated. For instance, adequate land, preferably on the initial site or adjacent to it, should be secured in advance, by purchase, lease or option. Ancillary items such as docks, roads, utilities, and waste disposal facilities, should be installed in a manner which will assist and not cripple later expansion.

Although fundamental research is usually not justified, except in very large organizations even a medium-sized project should have provisions for, or access to, development facilities of an applied nature. In this way, opportunities for improved products and new markets can be found, better production techniques can be devised and continual contact maintained with the simultaneous technical growth of the industry, which in the case of fertilizers, has been very rapid in recent years and promises to become even more challenging.

Other indispensable growth considerations include a ready access to good financing sources, a vigorous management with a progressive outlook, and an established system of engaging and training able young technologists and executives, ready to assume the responsibilities of new and expanded activities as they arise.

4.13 The Feasibility Study and Project Presentation

Except in small owner-operated activities, the conception and development of an industrial project is a team effort, which has to be presented to others for consideration, approval and financing. Thus, the preparation of a Feasibility Study, wherein the investigations, and recommendations of each specialist are given, is a major feature of project work.

The Feasibility Study is normally prepared on the lines recommended in the preceding section, 4.1 through 4.12, and should be supported by all relevant data either contained in appendices or in a separate volume according to need. Since the average study represents the accumulated work of specialists, at a cost of several thousands of dollars, it is well worth spending an additional small sum for appropriate reproduction and binding. Although a lavishly produced study may invite criticism, a poorly made-up job can hardly be expect to attract the respect and attention of top officials in government, financing and corporate circles. Therefore, the proper attention must be given to style, format, printing and binding, for the best results.

When a study is to be presented to a new recipient of importance, it may be very advantageous to find out beforehand, the preferred style, format, and binding, as well as the number

of copies required. If the study is to receive the attention of an eminent person, it may be propitious to include in the forefront a special introduction, or letter of courtesy, personally addressed to the dignitary concerned.

5. PLANNING AND PROJECT IMPLEMENTATION

5.1 General

Project development is incomplete if the planning and organization work needed during construction and implementation has been omitted or insufficiently treated prior to project approval, as not infrequently happens. Innumberable and other excellent projects have gone astray during the critical period between approval and start-up, simply because (a) the optimum times and costs were not known beforehand; (b) the lack of predetermined, scheduled data prevented continual checks being made on the progress of the work and the monies spent; and (c) project management by the owner was ineffectual, thereby losing control of the contractor and other people on the job.

Simultaneous with construction, other needs must be planned, programmed and supplied, such as raw materials, "starter" products for the new market, labor, utilities, and other services. If the scheduled availability of these items has not also been checked during the project development stage, it may be difficult to implement the project in accordance with anticipated time and cost schedules.[6]

5.2 Construction Planning, Scheduling and Cost Control

During project development, it is advisable to check with an experienced contractor the estimated construction time and cost, so that realistic figures can be used in the Feasibility Study. In some cases, contractors are able to quote guaranteed times for completion, and firm, or maximum costs (which, however, may not be the minimum attainable, because of included contingencies). Present-day practice is

towards a negotiated contract with one experienced company on a cost, plus fixed-fee basis, as a means of minimizing the expensive preparation of competitive bids and also eliminating contingency allowances, and consequent higher capital costs.

Following approval and award, most projects of any appreciable size are now planned and scheduled on the basis of "critical path" and arrow diagram techniques.[3] Although this work is often developed and progressed entirely by the contractor's personnel, it is preferable that at least one trained man on the client's staff also participates in these functions in order to see that the contractor does not let the project fall behind schedule, in the hope of catching up at a later stage. Project costs must also be closely controlled, in accordance with regular billings against pre-determined schedules and approved deliveries and construction work in the field. Thorough pre-project planning will ensure that the necessary control procedures and staff are available to the client or sponsor immediately after project approval.

5.3 Pre-Production Planning and Other Needs

When a reliable construction schedule has been developed, the planning of the numerous factors needed to implement the project can be undertaken with confidence and phased in accordance with requirements. For instance, staff and supervisory personnel can be hired and sent for training at pre-determined intervals, raw materials can be ordered and shipped at the optimum times, utilities can be supplied as required, and new customers can be supplied with starter materials at appropriate periods. Much of this work can be anticipated, checked, and initiated during project development. This enables

detailed pre-production planning and implementation to be undertaken accurately and at minimum cost, following project approval.

5.4 Start-Up and Initial Operation

Project development must also take into account the needs of the project during start-up and initial operation. These requirements usually include fees and expenses of specialists, temporary extra labor, allowances for unavoidable material losses and low productivity, and rejected or reworked material. Experienced contractors and personnel starting up familiar processes can normally be expected to achieve guaranteed plant yields within the specified time. Nevertheless, performance guarantees should be carefully written into pro-forma and real contracts, and all responsibilities clearly defined.

During actual start-up and early operation, detailed records should be kept of all costs, yields performances, etc., and prompt comparisons made against pre-determined standards, to detect variances and bring them into line with requirements. Hence, effective control procedures should be developed and made available in time for the commencement of production.

5.5 Post-Project Appraisal

Project planning and implementation should always make provisions for a thorough appraisal, after the project as such, has ceased to exist and has become an operating reality. In many cases, however, this is undertaken only to the extent of determining the approximate cost over-run or under-run and much valuable data which could be of great help to similar future projects is irretrievably lost.

A thorough post-project appraisal should compare such factors as the actual achievement of national aims with those anticipated; detailed actual and estimated capital expenditures, actual and anticipated product costs, payrolls, production volumes, sales, and earnings. Detailed reports of production difficulties, plant and design problems and other troubles, together with actual or proposed remedies will provide invaluable feedback to project planners and designers, and enable avoidable mistakes to be eliminated in future projects of a similar nature.

Although these precautions seem elementary, they are all too often carried out in a perfunctory way, or omitted entirely, because of failure to provide the necessary personnel and procedures during project planning and implementation. Although it is difficult to define the best time to undertake a post-project appraisal, about three months after start-up is suitable, to be followed by a check after a further six months, to ensure that the required modifications have been made and the project has undergone successful metamorphosis into a highly efficient operation.

Check Lists

Detailed check lists for all phases of project development are given in Appendix 2. These should be coordinated with the check lists given in Appendix 3, during subsequent project evaluation.

6. PROJECT EVALUATION

6.1 General

Evaluation of a project primarily consists of measuring the degrees to which the following criteria can most probably be fulfilled:

(1) Achievement of national and primary goals.
(2) Achievement of secondary benefits.
(3) Ability to sell the products.
(4) Ability to make the products to desired specifications and prices.
(5) Ability to earn an acceptable return on the invested capital.
(6) Ability to survive and grow.

Thus, a detailed evaluation can be made by independently checking each item in the project spectrum covered in the preceding section 3,4, and 5. Of course, depending on the purpose and nature of different projects as well as their environment and ownership, different degrees of emphasis will be placed on the above criteria. For example, a government-sponsored fertilizer project would most likely regard items (1) and (2) of major importance, whereas a private company or public corporation would be primarily concerned with obtaining an acceptable return on invested capital; (5) together with surviving and growing (6) directly through successful fulfillment of (3) and (4) and indirectly by satisfying (1) and (2).

The Time Factor

The development of a large project, plus the presentation, study and evaluation usually takes months, or even years to

accomplish. In the present rapidly-changing world assumptions and events initially used in the project preparation may no longer be valid during or shortly after appraisal. Therefore, when evaluating a project all major external factors - as well as the future need - should be checked for validity in terms of actual circumstances.

6.2 The Project Evaluation Team

Projects are evaluated for approval, financing, and construction under various circumstances, e.g. for consideration by managements of private and public companies, for study by banks, investment houses and international lending agencies for possible financing, and by government departments for sanction and perhaps participation or ownership.

Because of the continually growing complexity of most industrial projects, evaluation is best undertaken by a small experienced team - the counterpart of the project development team - and, of course, quite independent from it. In some corporations, project analysis and evaluation is performed under the direction of the corporate financial department, as distinct from a more technically oriented project development team. Experienced outside consulting teams are also used by corporations, financial houses and government departments for independent evaluations and appraisals.

A typical fertilizer project evaluation group would comprise a marketing specialist, a chemical engineer and a corporate financial analyst, reporting to a senior official such as a vice-president responsible for commercial or corporate development, (but not to the same individual in charge of project development, in order to retain impartiality).

whereas in a project development team, the leader might be an engineer or marketing man according to the nature of the study being undertaken, a project evaluation group might be led by a financial analyst, in view of the emphasis on investment sources and yields, especially in commercial and industrial corporations.

6.3 Undertaking the Evaluation

As mentioned, a good basis for a project evaluation is the activity spectrum developed in earlier sections, and a corresponding check-list is given for guidance in Appendix 3. Discretion should be exercised regarding the basic data used for evaluation purposes and where possible, up-to-date reliable sources different to those use for project development should be sought. It would be ludicrous to base both project development and project evaluation on erroneous information derived from a single, unreliable origin, or to rely on information which was dangerously out of date.

Regarding evaluation methods to check economic and financial feasibility, organizations such as international lending agencies, banks and investment houses usually have their own established systems and techniques. These will frequently differ from the method used by others in project development, and so provide an independent check. In cases where project development and evaluation are undertaken in the same corporation or organization, one way of providing a dual approach to measuring financial feasibility for the project development department to calculate earnings by simpler, Rate of Return methods (see section 4.10.2) for various years to toal depreciation, using standard company tax deduction procedures. The project evaluation team can

later measure and check the earnings stream by more accurate discounting methods. Sensitivities can sometimes be determined to an adequate degree by Rate of Return calculations, but where fluctuations and extremes are likely, a discounting method covering the variable profit stream over the life of the project is advisable.

Evaluation Feedback and Project Improvement

An experienced evaluation team should do much more than undertake an impartial evaluation; otherwise much of its benefit will be lost. It should feed back to the project development team (in conjunction with sponsors and management) the results of its appraisal and criticisms, with helpful suggestions designed to improve the proposed project to the best possible degree. This feedback channel should be inatituted by the project sponsors in the early days of the project study but not implemented until evaluation has been completed.

The role of the project evaluator or "venture analyst" has become an increasing important one in recent years; he should have a sense of business strategy and find what his organization needs from him, rather than be merely a passive weigher of data submitted for review.[10]

7. CONCLUSION

In conclusion, it is evident that the creation and evaluation of chemical fertilizer projects are functions carrying great responsibilities. Failure to establish the best resource/demand pattern, especially in a developing country, can adversely affect the well-being of all its citizens and retard their prosperity. This means that the optimum combination of size, type, location and all other factors must be discovered and put to maximum use. Equally important to national interests and private investors alike is the need to obtain a satisfactory return on the investment made thereby creating new capital which can be re-invested and employed to generate further projects for the common good.

Hence, project evaluation must be undertaken with great thoroughness and impartiality; similarly, temptations to use questionable shortcuts or to be influenced by personal factors must be recognized and avoided.

Most projects are financially at their weakest just before start-up, i.e. when large fixed and working capital payments have been made, but sales revenues have not yet begun to be generated. Delays at this critical time may not only weaken the market position, but if prolonged, might necessitate the injection of fresh capital, leading in turn to some loss of control, or even loss of ownership in extreme cases. Therefore, project development work and evaluation must take into full account the thorough planning necessary to ensure that construction work and project implementation will proceed according to schedule.

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NOTE: For possible additional assistance on specific phases of project development and some case studies, refer to the Agenda Documentation for the U.N. Inter-regional Symposium on Industrial Project Evaluation, Prague, Czechoslovakia, 11-29 October 1965.

APPENDIX 1

PRESENT WORTH OF FUTURE CASH FLOWS

Per cent Interest

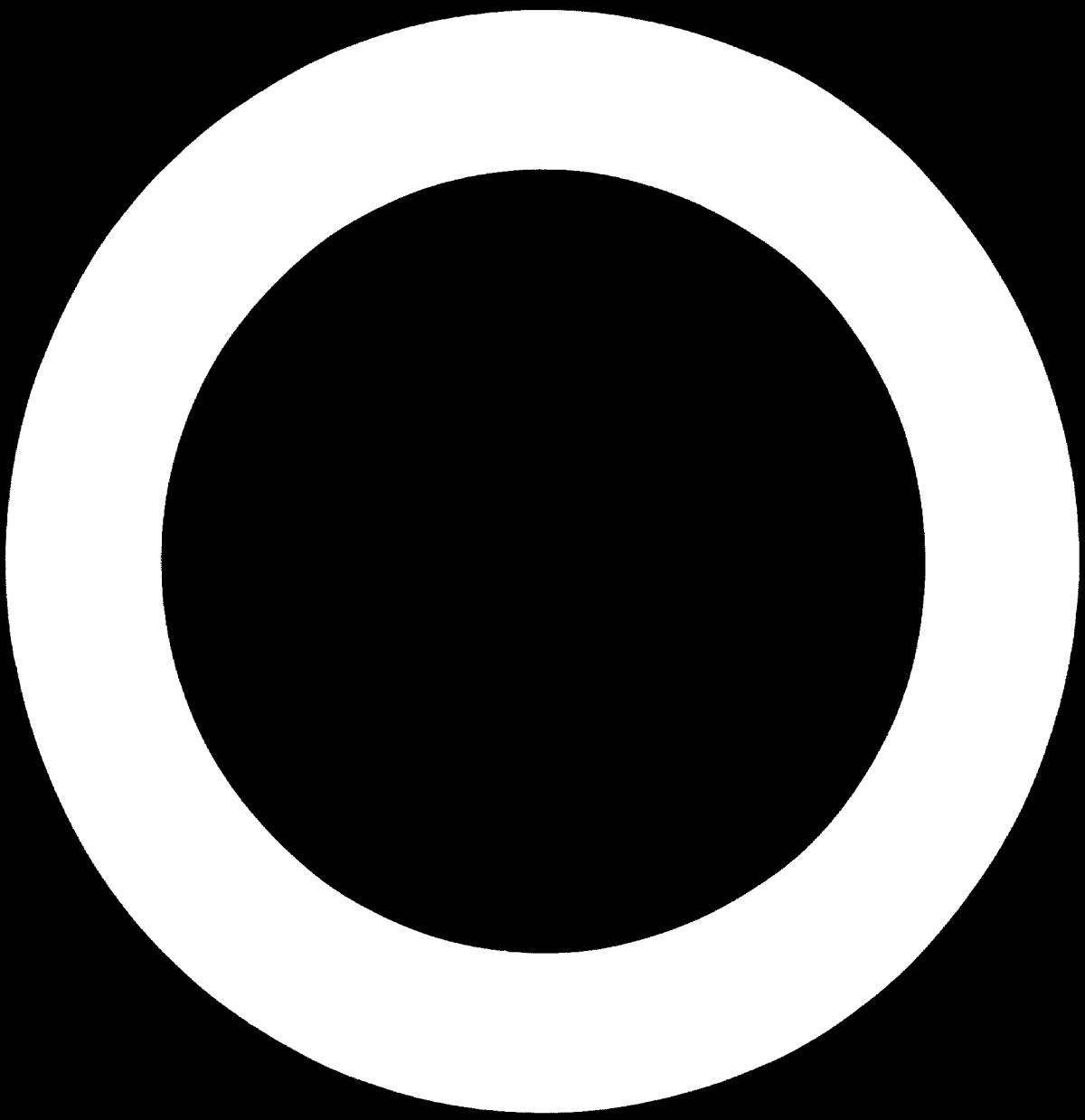
Year	4	6	8	10	12	14	16	18
1	.96	.94	.93	.91	.89	.88	.86	.85
2	.92	.89	.86	.83	.80	.77	.74	.72
3	.89	.84	.79	.75	.71	.67	.64	.61
4	.85	.79	.74	.68	.64	.59	.55	.52
5	.82	.75	.68	.62	.57	.52	.48	.44
6	.79	.70	.63	.56	.51	.46	.41	.37
7	.76	.67	.58	.51	.45	.40	.35	.31
8	.73	.63	.54	.47	.40	.35	.31	.27
9	.70	.59	.50	.42	.36	.31	.26	.23
10	.68	.56	.46	.39	.32	.27	.23	.19

$$Vn/r = (1 + r)^{-n}$$

Where V = Value

n = number of years

r = interest rate.



APPENDIX 2

CHECK LISTS

BASIC INFORMATION REQUIRED FOR FERTILIZER PROJECT STUDIES

No. 1 MARKET STUDY

Before a fertilizer project can be established, the type(s) of product, the sales volumes, the distribution patterns, the price structure and other related items must be known. This necessitates a detailed Market Study based on an analysis of pertinent information and official statistics, plus inquiries and investigations in the field, i.e. interviews with potential customers, government officials, distributors and others. In absence of such a study, it is often possible to make a preliminary market analysis with the aid of the following data, which should be confirmed by actual field studies if promising results are indicated.

1.1 Preliminary Market Data Required

1) Official soil, crop, climatic, population and geographic data for the last 10 years if possible.

2) Official past, current and projected fertilizer consumption patterns in the envisaged market area(s).

3) Seasonal trends, local preferences, prejudices, customs.

4) Existing suppliers and supply sources - fullest data.

5) Current prices, discounts, contract terms.

6) Past price histories, estimations of future trends.

7) Storage, distribution patterns, transport availability and customs. Shipping facilities, freight rates.

8) Existing fertilizer advertising, promotional and educational material.

No. 2 PRODUCT DATA

Following completion of the Market Study, the type(s) and quantities of fertilizer envisaged, together with price details can be developed on the lines given below, to enable a production pattern to be established.

2.1 Type(s) of Fertilizer

1) N (Nitrogen) only e.g. urea, ammonium nitrate
2) P_2O_5 (Phosphate) only e.g. triple superphosphate
3) K_2O (Potassium) only e.g. potash (potassium chloride)
4) N-P compounds e.g. diammonium phosphate (18-46-0)
5) N-P-K compounds e.g. 12-12-12 nitrophosphate
6) N, P and/or K mixtures
7) Liquid fertilizers e.g. ammonium polyphosphate (10-34-0)
8) Other

2.2 Fertilizer Specifications - (According to government or customer requirements)

1) Chemical - N, P_2O_5, K_2O percentages, solubilities, etc.
2) Physical - particle size range, coating, shape, etc.
3) Packaging and method of shipment - bag sizes, types, seals, etc.
4) Other specific data

2.3 Production and Shipping Programs

1) Units - e.g. metric tons, kilos, etc.
2) Anticipated annual shipments
3) Month-by-month shipping schedules
4) Principal consumers and locations
5) Other data

2.4 Pricing Structures

1) Current prices
2) Past and future trends
3) Competitive prices and discounts
4) Customary methods and terms of payment
5) Customer financing, insurances
6) Government subsidies, maximum and minimum price levels and other controls
7) Sales taxes
8) Other data

2.5 Sales Contracts or Letter of Intent

All data indicating actual or potential sales contracts should be furnished to support the proposed project.

No. 3 RAW MATERIAL SUPPLIES

Information regarding the availability of raw materials is necessary, on the following lines, according to the type(s) of fertilizer envisaged.

3.1 Nitrogen - as

1) Anhydrous ammonia from such feedstocks as:
   a) Gas - natural, refinery or other forms
   b) Liquid - oil, naphtha or other forms
   c) Solid - coal, lignite, or other forms
2) Aqua ammonia
3) Ammonium salts
4) From other sources

3.2 Phosphorus - as

1) Phosphate rock;
   a) in place
   b) mined and beneficiated (and calcined)
2) Phosphate slags and residues
3) Soluble phosphate - e.g. triple superphosphate
4) Phosphoric acid (give per cent P_2O_5)
5) Superphosphoric acid (give per cent P_2O_5)
6) Ammonium polyphosphate
7) Other forms

3.3 Potassium - as

1) Potash (muriate of potash, potassium chloride, or KCl)
2) Potassium sulphate
3) Other forms

3.4 Sulphur - as

1) Native sulphur
2) By-product sulphur
3) Pyrites
4) Other minerals
5) Sulphuric acid (virgin)
6) Sulphuric acid (by-product)
7) Waste gas
8) Other forms

3.5 Other Raw Materials and Supplies

1) Secondary nutrients, e.g.
2) Calcium, sulphur, as calcium sulphate (gypsum), magnesium, as dolomite, etc.
3) Lime for calcium needs and pH control
4) Trace elements, e.g. Boron, Copper, Manganese
5) Coating agents
6) Paper and plastic bags, seals, labels
7) Fillers, dyes, flocculants
8) Other materials and ancillary supplies

3.6 Raw Material Price Structures

In accordance with the type(s) of fertilizer project and process envisaged, the following price information on the corresponding raw materials and supplies is required.

1) Current prices at site or nearest point
2) Past and future trends
3) Alternative supply sources
4) Current types of supply contract and discounts

5) Available credit and financing
6) Government subsidies, controls
7) Duties and taxes
8) Relative material specifications to prices, quantities, and sources quoted, with corresponding guarantees and penalties
9) Other data - e.g. transportation facilities, freight rates.

3.7 Purchasing Contracts or Letters of Intent

All data indicating evidence of ability to obtain raw materials and supplies on favourable terms and which enhance the project should be furnished.

No. 4 UTILITIES AND SERVICES

Most fertilizer processes require all of the utilities and services indicated below, and the corresponding local details should be furnished to the fullest extent.

4.1 Electrical Power

1) Source(s) and supplier(s)
2) Voltages, frequencies, maximum limit available
3) Tariffs and rate structures
4) Reliability
5) Other data

4.2 Water

1) Source(s), prices, analyses, maximum available quantities of
   a) Process water
   b) Cooling water - river, sea or other possible source
   c) Potable water
   d) Fire-protection water
2) Reliability
3) Tariffs and rate structures
4) Other data

4.3 Fuels and Energy

1) Source(s), prices, analyses, maximum available quantities of
   a) Gaseous fuels
   b) Liquid fuels
   c) Solid fuels
2) Reliability
3) Tariffs and rate structures
4) Other data, e.g. availability of local steam

4.4 Waste Disposal Facilities for

1) Solid Wastes
   a) Adjacent land or water
   b) Nearby pits, valleys or other places
   c) Transportation to dumping areas (nature and cost)
   d) Other data
   e) Local regulations
2) Liquid Wastes
   a) Adjacent land or water
   b) Pits, dumps, etc.
   c) Local treatment plants
   d) Other data
   e) Local regulations
3) Gaseous Wastes
   a) Proximity to local habitats, vegetation, other factories
   b) Prevailing wind patterns
   c) Other data
   d) Local regulations

4.5 Miscellaneous Services

1) Local engineering shops and repair facilities
2) Spare parts, local availability
3) Electrical and instrument repair facilities
4) Laboratory supplies and services
5) Local availability of small tools, electrical sundries, hardware and "general plant stores", lumber
6) Other local supplies and services

4.6 Contracts and Letters of Intent

All information indicating an ability to obtain utilities and services on terms favorable to the project should be furnished.

No. 5 MANAGEMENT AND LABOR

5.1 Corporate Structure

1) Envisaged corporate structure
2) Names, qualifications and backgrounds of the project organisers
3) Proposed functions and responsibilities
4) Other data - e.g. history of proposed project, to date, if applicable

5.2 Management Structure

1) Proposed organization chart
2) Personal histories of executives already hired or available
3) Available consultants and specialists
4) Other data

5.3 Contracts and Salaries

1) Employment contract details for company officers and executives
2) Salary and earnings structures for officers and executives
3) Other data

5.4 Labor Details

Whenever possible, the labor requirements for the proposed project should be checked against local availability and the general pattern of labor relations for the area. Major items to be investigated include:

1) Number of employees needed, male and female
2) Types of work - by trades
3) Grades of employees - supervisory, skilled, semi-skilled, unskilled

4) Availability of the different types of employees needed
5) Proposed wage structure and rates
6) Local wage structures and rates
7) Labor unions - national, local, strike history of locality
8) Local fringe benefits and other customary employer contributions
9) Racial characteristics of locality
10) Employee housing, welfare and community services
11) Employee transportation - day and night
12) Local restrictions on foreign employees
13) Local attitude to the proposed project
14) Other data

No. 6 GOVERNMENT, LEGAL AND FINANCIAL CONSIDERATIONS

If local government policies relating to financial and administrative control are too severe, even the most promising project may be stifled. Accordingly, the following items need to be investigated before a decision to implement the project is made.

6.1 Related Government Policies

1) Political history of country
2) Policies and attitudes of present administration
3) Probable future patterns
4) Treaties regarding trade, taxes, defense, etc.
5) Tariffs, import and export controls

6.2 Legalities

1) Civic laws affecting land, mortgages, agencies, torts, etc.
2) Business laws affecting:
   a) monopolies, trusts, ownership
   b) permissible products and prices
   c) residence and nationality of owners and personnel
   d) trademarks, patents, licenses, use of natural resources, other business operations
3) Commercial laws relating to:
   a) investments
   b) corporate structure and capital
   c) business records
   d) government, union or other representation in internal business affairs, trade or labor disputes, etc.
   e) claims and enforcements

6.3 Monetary Conditions

Agreements and regulations affecting:

1) Exchange, repatriation of investment and earnings
2) Goods imported and exported
3) Restrictions on borrowing, investing
4) Representation of U.S., European and other banks
5) Insurances, bonds - local regulations, costs

(Obtain copies of current and proposed regulations)

6.4 Taxation (relating to proposed basis of operations)

Corporation taxes - national, state, local, on capital, income, excess profits and other funds.
Special taxes on foreign corporations and individuals.
Tax treaties with other countries and possible reciprocity.
Purchase taxes, import and export duties.
Taxes on payrolls, land, buildings, equipment, vehicles, alcohol and other materials.
Concessions - such as depletion and depreciation allowances, new industry assistance, etc.
(Obtain sample copies of current and proposed tax regulations when possible)

6.5 Capital (acquired, promised and to be raised)

Sources (fixed, working) amounts, and all relevant data.
Costs of loans and conditions.
Evidence of adequate fixed and working capital.
Provisions for over-runs and contingencies.
Government controls on equities, loans and returns.

No. 7 PROCESS AND PLANT CONSIDERATIONS

Although the processes to be used in a project will be selected in accordance with the type of products required and the raw materials and/or utilities available, several associated factors of a semi-technical nature need to be considered as well, when assembling data for feasibility analysis. Typical items include:

7.1 Locational Factors

1) Site accessibility - present and future
2) Transportation - present and future
3) Site preparation needed
4) Existing buildings, structures and other amenities
5) Expansion possibilities
6) Purchasing, leasing, options, for land
7) Local area data - geography, climate, altitude, etc.
8) Nearby industries and plants - types, capacities, owners
9) Other data

7.2 Proposed Process Factors

1) Patents, licenses, permits to use
2) Batch versus continuous
3) Operating schedule, by hours, days, per year
4) Expansion provisions
5) Assurance of process and equipment guarantees
6) Source of equipment items
7) Facilities for construction and equipment installation
8) Facilities for technical research and plant development
9) Other data

7.3 Plant and Production Items

1) Installed plant costs, plus land (from proposed suppliers)
2) Pre-operational costs (from proposed suppliers)
3) Start-up expenses " " "
4) Losses before break-even point (estimated)
5) Raw materials costs (from proposed sources)
6) Operating costs including maintenance (from plant suppliers)
7) Other, e.g. licenses, training, etc.

7.4 Contracts and Letters of Intent

Full supporting data, with guarantees and letters of intent relating to processes, plants, equipment and production performances should be obtained to support feasibility study investigations and subsequent claims for failure to meet any stated guarantees.

NOTE: Check lists for technical and operating features of the various fertilizer processes are highly specialised and are not included here.

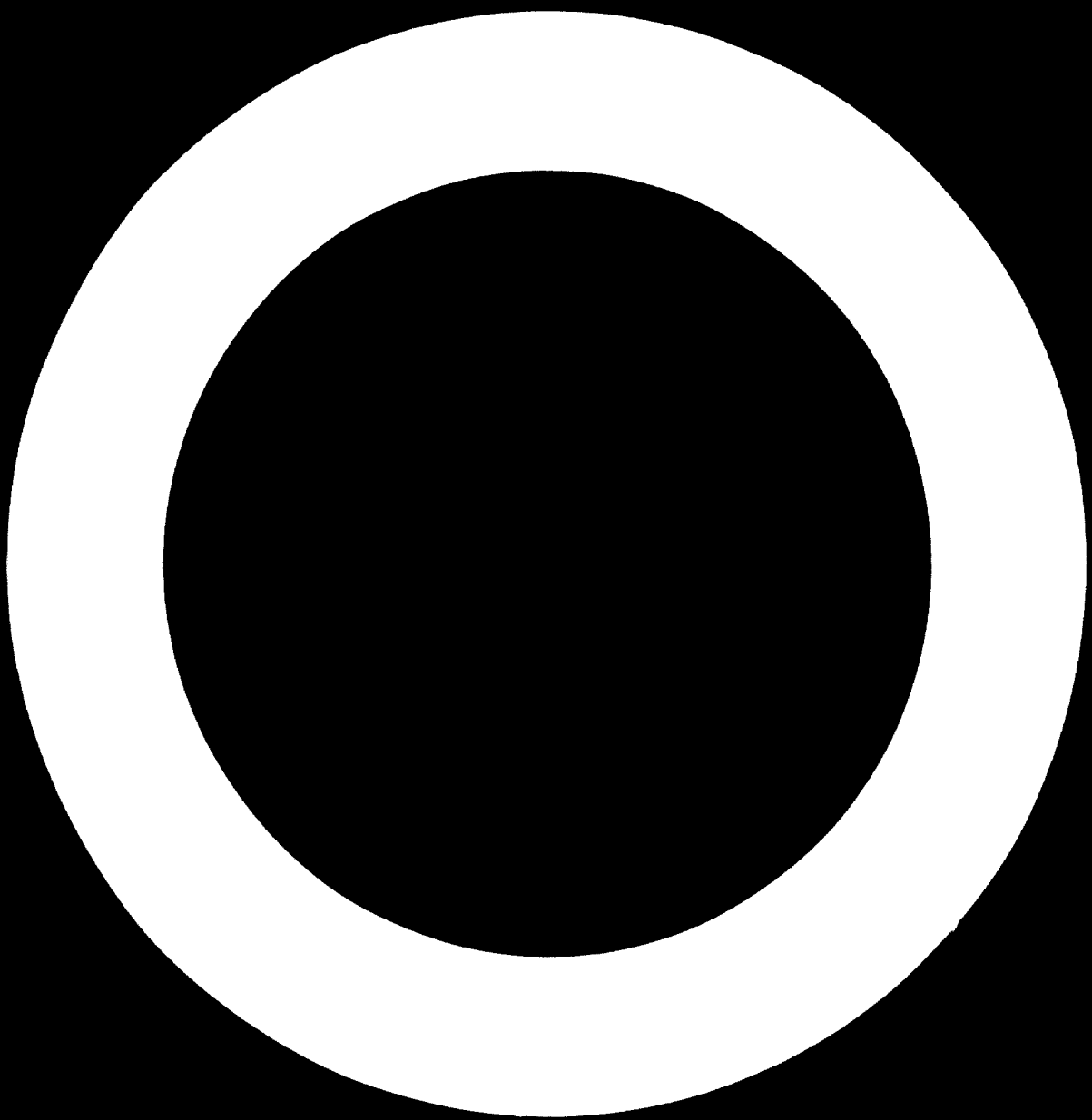
No. 8 MISCELLANEOUS ITEMS

8.1 Availability of Local Professional Services

1) Legal	(Check responsibility, status, experience of counsel and attorneys)
2) Financial	(Check strength and legality of accountant certifications)
3) Technical	e.g. surveyors, consulting geologists, engineering chemists, etc., (check experience and legal status)
4) Shipping	Brokers, shipper, forwarding agents, haulage, storage services (check reputation and experience)
5) Selling	Publicity, advertising, marketing and distribution (check reputation and experience)
6) Government or Privately-Sponsored Advisory Services	It is possible that considerable information, and possibly loans or funds may be available from the U.S. or other government sources, the United Nations, or large, private Foundations. The existence of local Chambers of Commerce or private business advisory services should also be checked.

8.2 Other Data

As related to each specific project. All pertinent information obtained in the field or elsewhere, e.g. details of competition, similar operations in other countries, political and technical items and current news, etc., should be collected and filed for guidance.



APPENDIX 3

PROJECT EVALUATION CHECK LIST

PRINCIPAL ITEMS

NO.	ITEM	AIDS (Check latest data)
1.	**AIMS**	
	National & Primary Goals[13]	
1.1	Increase in domestic food supplies.	U.N., F.A.O. and appropriate Ministry of Agriculture.
1.2	Savings in foreign exchange.	World Bank, A.I.D. Ministry of Finance.
1.3	Generation of foreign exchange.	Same as 1.2
1.4	Development of national strength and resources by indigenous efforts.	U.N. and appropriate Ministry of Commerce.
1.5	Development of regional and inter-regional strength.	U.N. and inter-regional organizations, e.g. ECAFE, ECLA.
	Private Investor Goals[14]	
1.6	Securing of raw material sources.	Appropriate Ministries, e.g. Mining, Supply, etc.
1.7	Creation of new markets.	Marketing consultants, commercial development specialists.
1.8	Investment security.	Financial analysts, A.I.D., major banks, investment houses.
1.9	Adequate financial return investment.	Same as 1.8
1.10	Good growth possibilities.	Marketing and commercial development specialists.

NO.	ITEM	AIDS (Check latest data)
2.	**SECONDARY BENEFITS**	
	National and Primary Factors	
2.1	Increased local employment.	Appropriate Ministries of Labor, Welfare, Commerce.
2.2	Improved local skills.	Same as 1.1.
2.3	Increased local purchasing power.	Same as 1.1.
2.4	Increased tax revenues.	Appropriate Ministry of Finance, Internal Revenue.
2.5	Additional amenities; roads, houses, utilities, etc.	Appropriate Ministries of Transport, Housing, Power.
2.6	Attractions for other industries; raw materials, services, docks, etc.	Same as 2.5.
2.7	Reciprocity between other areas and countries; tax, trade, etc.	Appropriate Ministry of Commerce and Trade.
	Private Investor Factors	
2.8	Increased corporate size and scope.	Relevant corporate executives.
2.9	Improved world logistic patterns for raw materials, plants and markets.	Same as 2.8. Also consultants.
2.10	Increased investment spread; improved stability and diluted risk.	Same as 2.8, plus sources of finance.

NO.	ITEM	AIDS (Check latest data)
3.	**SPONSORSHIP**	
	Private or Public Company	
3.1	Sponsor identity, background reputation, experience.	References from bankers, former employers, business associates.
3.2	Sponsor credit rating.	Credit investigators, banks.
3.3	Sponsor equity ability and policy.	Same as 3.1.
	Government or Official	
3.4	Political history and stability.	Consultants on staff political analysts. State Department.
3.5	Economic history and stability.	Consultants or staff economists.
3.6	Credit rating.	International banks, major suppliers.
3.7	Foreign exchange availability.	World Bank, international banks.
3.8	Equity ability and investment policy.	Same as 3.7.
3.9	Attitude to joint ventures with private industry.	Appropriate government ministries; actual investors in joint ventures.
3.10	Industrial and commercial associations and experience.	Same as 3.9.

NO.	ITEM	AIDS (Check latest data)
4.	**PROJECT DEVLOPMENT TEAM**	
4.1	Authorization.	Check source given.
4.2	Source of team.	Same as 4.1.
4.3	Team members; qualifications, experience.	Check references.
4.4	Terms of service; time, budgets, fees.	Check contracts.
4.5	Periods in field and at base.	Check references.

NO.	ITEM	AIDS (Check latest data)
5.	**PROJECT SEARCH AND CONCEPTION**	
5.1	Adequacy of leads and information sources.	Number of alternates reviewed.
5.2	Origin of project.	Via finder, outside approach, or on basis of search.
5.3	Necessity of project.	Appropriate government ministries, agencies, corporate executives.
5.4	Number of alternatives investigated.	Development Team.
5.5	Possibility of same goals via better use or expansion of existing captive facilities possible.	Same as 5.4.
5.6	Effect of possible foreign aid on increased size and scope of project.	AID, international banks, project sponsors.

NO.	ITEM	AIDS (Check latest data)
6.	**PROJECT PRIORITY & SANCTION**	
	National Priority	
6.1	Need for project.	Appropriate government departments, e.g. Planning, Industry.
6.2	Government priority status.	Same as 6.1.
6.3	Permit necessary.	Same as 6.1.
6.4	Conditions for permit.	Same as 6.1.
6.5	Possibilities of sanction, delay or refusal.	Same as 6.1. Probabilities of sanction and revised timing.
6.6	Alternatives if sanction not obtained.	Same as 6.1. Check refusal reasons, and if alternatives have been developed and/or discussed.
	Corporate (or Financing Source) Priority and Sanction	
6.7	Need for project.	Appropriate executives.
6.8	Priority status.	Same as 6.7.
6.9	Budget; timing, funds allocated.	Same as 6.7.
6.10	Possibilities of sanction, delay or refusal.	Same as 6.7. Check reasons, probability of sanction and revised timing.
6.11	Alternatives, if sanction not obtained.	Same as 6.7. Check refusal reasons, and if alternatives have been developed and discussed.

NO.	ITEM	AIDS (Check latest data)
7.	**PROJECT PLANNING AND DEVELOPMENT**	
	Political & Economic Environment in Country of Location	
7.1	Political background.	Consulting or staff political analysts. State Departments.
7.2	Economic background.	Consulting or staff economic analysts. Departments of Commerce, International banks.
7.3	Other industries and investors.	Executives of appropriate organizations.
7.4	Experiences of others.	Same as 7.3.
7.5	Insurances, risk factors.	State Departments, World Bank, AID, Commercial Banks.
7.6	Treaties with other countries.	Same as 7.1, 7.2.
7.7	Foreign exchange availability.	Same as 7.5.
7.8	Barter possibilities.	Same as 7.1, 7.2.
7.9	Attitude to foreign investors.	Same as 7.3, 7.4.
7.10	Future political and economic trends.	Same as 7.1, 7.2.

NO.	ITEM	AIDS (Check latest data)
8.	**MARKETS, PRODUCTS, SALES**	
	Domestic	
8.1	Agronomic details, customs, needs, trends.	U.N., F.A.O., Appropriate Ministry of Agriculture, Trading organizations, consultants.
8.2	Current fertilizer use, by types, grades, amounts.	Same as 8.1.
8.3	Optimum needs, by types, grades, quantities.	Same as 8.1.
8.4	Fertilizer consumption, trends, forecasts.	Same as 8.1.
8.5	Estimated share of market.	Same as 8.1.
8.6	Pricing and distribution policies.	Same as 8.1. Local transport companies.
8.7	Sales forecast, by types, grades, tonnages, revenues, years.	Same as 8.6.
8.8	Market and Product Study, details and check lists.	See Appendix 2.
8.9	Transportation and distribution.	Local trading and transport organizations.
8.10	Export Markets.[15]	Export marketing consultants.
8.11	Expansion possibilities, e.g. industrial and agricultural chemicals.	Same as 8.10, plus appropriate Ministries.
8.12	Pro-forma sales contracts.	Check with prospective customers.

NO.	ITEM	AIDS (Check latest data)
9.	**RAW MATERIALS**	
9.1	Availability and suitability of domestic materials.	Appropriate Ministries of Mining, Supply, etc. Local suppliers.
9.2	Reserves and ownership of domestic materials.	Same as 9.1.
9.3	Availability of imported materials.	Importers, appropriate Ministries, e.g. Trade, Finance and Industry.
9.4	Transportation of domestic and imported materials.	Importers, exporters, local shipping and trading concerns.
9.5	Study of suitable alternate materials.	Check with project developers.
9.6	Tests and pilot plant results on proposed raw materials.	Same as 9.5.
9.7	Pro-forma purchase contracts from potential suppliers.	Check with project developers and suppliers.
9.8	Study of alternate or supplemental supplies.	Same as 9.7.
9.9	Study of raw material price trends - past and future.	Check with project developers; also with marketing specialists, local industries.

NO.	ITEM	AIDS (Check latest data)
10.	**MANUFACTURING PROCESSES**	
10.1	Processes available.	Process contractors and consultants.
10.2	Processes studied.	Project developers.
10.3	Processes selected and reasons.	Project developers.
10.4	Process guarantees given.	Preferred contractors.
10.5	Possible alternates.	Same as 10.1.
10.6	Plant capacities selected.	Same as 10.1.
10.7	Type of contract chosen.	Same as 10.3, 10.4.
10.8	Firm prices, pro-forma contracts, price estimates obtained.	Same as 10.3 and 10.4.
10.9	Experience and status of preferred contractor(s).	Preferred contractors and their clients.
10.10	Plant Process Study, details and check list.	See Appendix 2.

NO.	ITEM	AIDS (Check latest data)
11.	**UTILITIES, SERVICES AND LABOR NEEDS**	
	11.1 Availability of adequate power, water, fuel.	Appropriate local utility organizations, local industries.
	11.2 Technical studies regarding suitability of utilities.	Same as 11.1.
	11.3 Study of process alternates regarding minimum utility needs.	Check with project developers and proposed plant suppliers.
	11.4 Availability of suitable labor.	Check with local authorities and employers.
	11.5 Utility, fuel and labor pro-forma contracts.	Check with project developers and local sources.
	11.6 Utility and Labor Studies, details and check lists.	See Appendix 2.

No.	ITEM	AIDS (Check latest data)
12.	**PLANT LOCATION**	
12.1	Raw material availability.	Local agencies, suppliers, other local industries.
12.2	Market accessibility.	Local and export shippers, transporters, prospective customers.
12.3	Alternate types of transportation available.	Same as 12.2.
12.4	Transportation rates, conditions, trends.	Same as 12.2.
12.5	Selected transportation methods and reasons.	Project developers.
12.6	Site conditions.	Local inspection. Discussion with local authorities and consultants.
12.7	Utility, fuel and labor availability.	Same as 12.6.
12.8	Site purchase price, rent or lease terms.	Same as 12.6. Discussions with owners.
12.9	Alternate sites studied.	Project developers.
12.10	Location study, details and check list.	Develop from Appendix 2.

NO.	ITEM	AIDS (Check latest data)
13.	**TECHNICAL & ECONOMIC FEASIBILITY** (Of selected process)	
13.1	History and development of process.	Proposed supplier, consultants.
13.2	Theoretical and practical features.	Same as 13.1.
13.3	Practical yield and balance.	Same as 13.1. Current users.
13.4	Useful by-products.	Same as 13.3.
13.5	Reliability, hazards.	Same as 13.3.
13.6	Risk of obsolescence.	Consultants. Current users.
13.7	Examples of similar installations.	Proposed supplier. Current users.
13.8	Availability of spares, services.	Same as 13.7.
13.9	Process economies; superiority over other processes.	Same as 12.7, plus consultants.
13.10	Technical & Economic Studies, details and check lists.	Appendix 2.
13.11	Feasibility Study Group.	

NO.	ITEM	AIDS (Check latest data)
14.	**CORPORATE MANAGEMENT AND SUPERVISORY STRUCTURES**	
14.1	List of proposed or selected company officers and directors.	Project developers.
14.2	References and backgrounds of above.	Project developers and proposed employees.
14.3	Terms of employment, salaries, fees, for above.	Same as 14.1, 14.2.
14.4	List of proposed or selected management and technical and supervisory personnel.	Same as 14.1.
14.5	References and backgrounds of above.	Same as 14.1, 14.2.
14.6	Terms of employment, salaries, fees, for above.	Same as 14.1, 14.2.
14.7	Organization structure and charts for all groups.	Project developers.

NO.	ITEM	AIDS (Check latest data)
15.	**FINANCIAL FEASIBILITY & GROWTH**	
15.1	Sources of funds; amounts, guarantees, terms.	Project developers. Proposed finance sources.
15.2	Proposed financial structure, debt repayment, depreciation.	Same as 15.1.
15.3	Alternate fund sources and financial structures studied.	Project developers. Domestic and international banks. Consultants.
15.4	Taxation studies, consultations.	Project developers, government authorities, tax specialists.
15.5	Investment-return studies, discounting methods used.	Project developers. Corporate finance consultants.
15.6	Risk studies undertaken; political, environmental, commercial.	Project developers. Political and economic consultants.
15.7	Sensitivity analyses made.	Project developers.
15.8	Contingency allowances; financial market, technical	Project developers, consultants.
15.9	Growth potential studies, location, commercial, financial.	Project developers, consultants.

NO.	ITEM	AIDS (Check latest data)
16.	**SEMI-VENTURE POSSIBILITIES**	
16.1	Search for suitable merger or acquisition possibilities.	Project developers. Business development consultants.
16.2	Search for suitable joint-venture possibilities with (a) government, (b) private interests.	Same as 16.1.
16.3	Analysis of merger or acquisition possibilities.	Same as 16.1.
16.4	Analysis of joint-venture possibilities.	Same as 16.1.
16.5	Achievement of same goals via non-project routes, e.g. trading, swaps, purchases, barters.	Project developers. Trading organizations. Commercial development, consultants.
16.6	Other semi-ventures, or non-profit investments offering equivalent or better financial returns.	Same as 16.5.

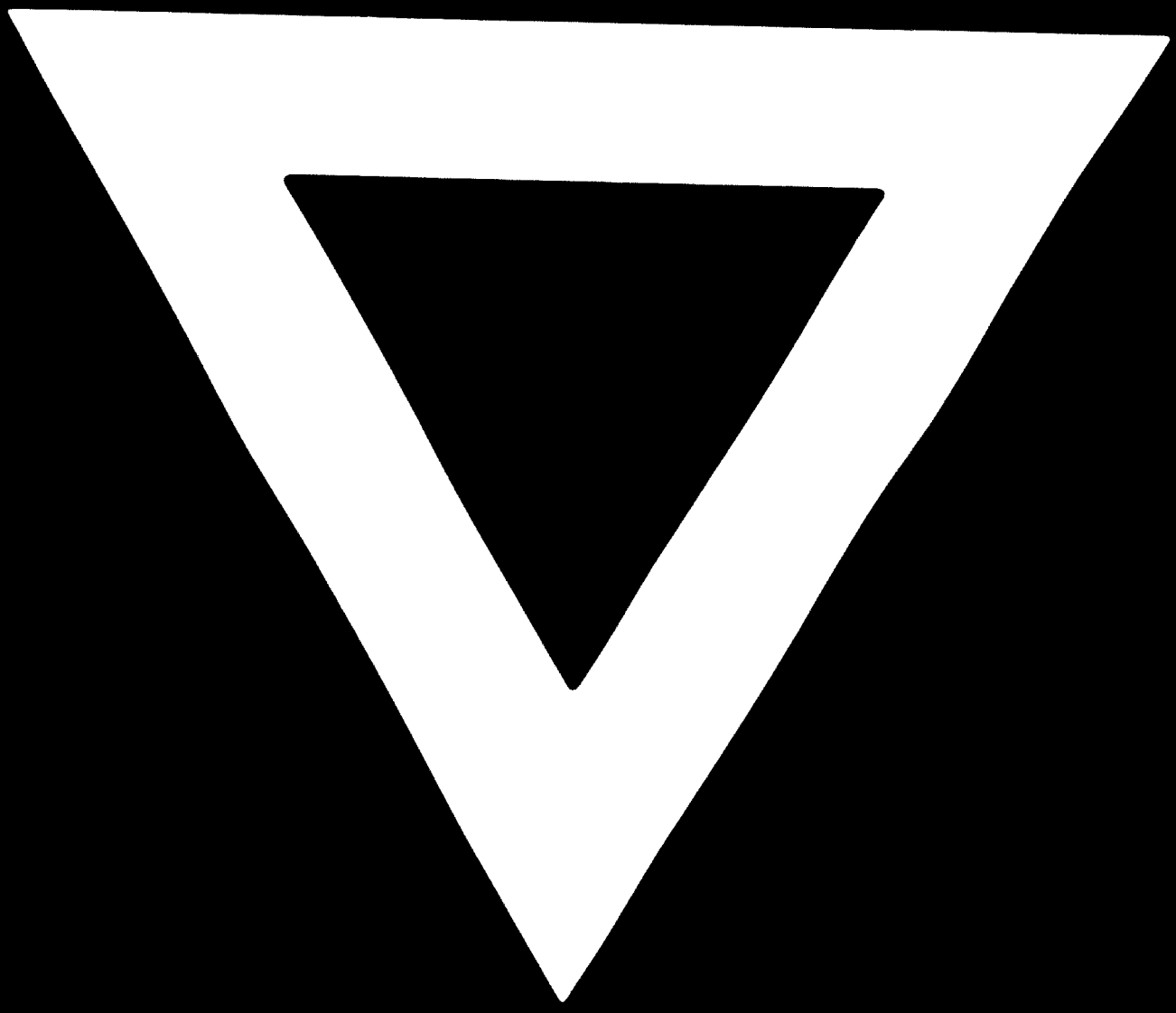
NO.	ITEM	AIDS (Check latest data)
17.	**FEASIBILITY STUDY & PROJECT PRESENTATION**	
17.1	Project Development Study Group.	Interviews, references for clients.
17.2	Experience and reputation of study group.	Same as 17.1.
17.3	Scope of study.	Project developers.
17.4	Depth of study.	Same as 17.3.
17.5	Adequacy and authenticity of supporting data.	Independent cross-check from sources different to those used by Development Group, if possible.
17.6	Adequacy of field work.	Same as 17.5, plus examination of basic data obtained.
17.7	Realism of claims and projections.	Thorough analysis of study. Obtain cross-check by independent consultants if in doubt.
17.8	Study format and presentation.	Compare with approved studies in a similar category.
17.9	Other recipients of study; their reactions.	Contact others if expedient and review.
17.10	Justification for re-study or expansion of work already undertaken.	For a promising study; if inputs have changed during interim or if bigger scope is indicated.

NO.	ITEM	AIDS (Check latest data)
18.	**PROJECT IMPLEMENTATION**	
	Planning	
18.1	Preparation of project time and cost schedules.	Project developers; proposed contractors.
18.2	Use of critical path or least-time techniques.	Same as 18.1. Also see Reference No. 3.
18.3	Project management and supervision by owner.	Check with owner for availability of necessary experience and ability.
18.4	Owner's arrangements for field progress and expenditure control.	Same as 18.3.
18.5	Inspection of contractor's arrangements for contract supervision and execution.	Check with contractor and clients.
18.6	Interim personnel hiring, training.	Project developers; owners.
18.7	Securing of raw materials, starter products, utilities, other supplies.	Same as 18.6.
18.8	Arranging start-up schedules and services.	Same as 18.6, plus checks with contractor.
18.9	Special cost control and supervision during initial operation.	Project developer; owner.
18.10	Arrangements for post-project appraisals and prompt action.	Same as 18.9.

NO. [redacted]

19. FEEDBACK

Ensure provisions are established for feeding back the results of the Project Evaluation to the sponsor and the Project Development Group, to gain advantage of additional experience and independent thinking as well as an impartial analysis.



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