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SEVERAL ECONOMIC AND COMMERCIAL FACTORS
DETERMINING THE SELECTION OF WORKING MACHINERY

presented by

W. R. A. G. General
Director Division

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.



United Nations Industrial Development Organization

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
TECHNOLOGICAL ASSISTANCE DIVISION
INDUSTRIAL PROJECTS SECTION

TECHNICAL NOTE

NO. 10
1974

SUMMARY

Two pre-investment conditions must be borne in mind when selecting either individual pieces of equipment or entire plants: the technical performance per se and the external conditions prevailing. This paper discusses the latter, i.e. raw material supply, labour and inputs and the disposal of products, and it supplements part of M. Kostel Traznik "General Selection Guidelines for Woodworking Machinery: II/WG.11/3".

Pre-investment surveys must consider the quantitative and qualitative availability and cost, including estimates, over the expected lifetime of wood and other raw materials, labour and management, energy and spare parts. Careful planning is particularly important for the forest resources to ensure a sustained yield of the desired size and quality of logs. Secondary or tertiary wood processing often uses products and by-products of primary conversion and this must also take pains to ensure their continued availability. Vertical integration can be a solution to this type of problem.



Organización de las Naciones Unidas para el Desarrollo Industrial

AL REVERENDÍSIMO PADRE SUPERIOR GENERAL DE LA ORDEN DE LOS DOMINICANOS, S. J.

MONTECARLO, MONACO, 1973

INDUSTRIAL DEVELOPMENT

INDUSTRIAL DEVELOPMENT - FORESTRY - MONACO

SUMMARY

The industrial development of a country, especially a developing one, must take account of its natural resources. The forest is a particularly important resource because of the wide range of products it provides, from raw materials for the primary sector to finished products for the secondary sector. The present report, prepared by the Industrial Development Centre, United Nations, is a study of the forest resources of Monaco and the impact of the primary sector on the secondary sector. It is based on a survey of the forest resources of Monaco and the impact of the primary sector on the secondary sector. It is based on a survey of the forest resources of Monaco and the impact of the primary sector on the secondary sector.

En los estudios de previsión de desarrollo industrial—incluidas las estimaciones para toda la vida útil prevista y para maquinaria—debe tenerse en cuenta la disponibilidad y el costo, en cantidad y calidad, de la madera y otras materias primas, la mano de obra, los recursos directivos, la energía y los repuestos. Es particularmente importante que se planifiquen cuidadosamente los recursos forestales a fin de asegurar un rendimiento sostenido de troncos del tamaño y la calidad deseados. La elaboración secundaria (terciaridad) de la madera utilizada (producto, subproductos de la transformación primaria y, por lo tanto, deben extremarse las medidas para asegurar su disponibilidad en forma continuada. La integración vertical puede ser una solución a este tipo de problema.

1/ La presente versión española es traducción de un texto revisado.

... the price of the product. It is also possible that the market at the time of the survey is not the same as the market in the future and that the results of the survey may be distorted by the delay of the end of the survey. It is also possible that the market may be different. Ad ...

The survey of the market should be considered as a prime requisite in preparing a development plan. It should provide information on the demand, in detail, intermediate and final use of the product(s) leading to both quality and quantity, competing materials and prices of the products, and the progress of overall development planning. A market survey can also identify the product that should be manufactured - a course which may be safer than first deciding on the product and searching for a market.

Whatever product is decided upon, its production must fit into the overall development plan of the country and be co-ordinated with the plans of other sectors.



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Organisation des Nations Unies pour le développement industriel

Réunion technique sur le choix des machines
dans l'industrie du bois
Vienne, 1-22 novembre 1966

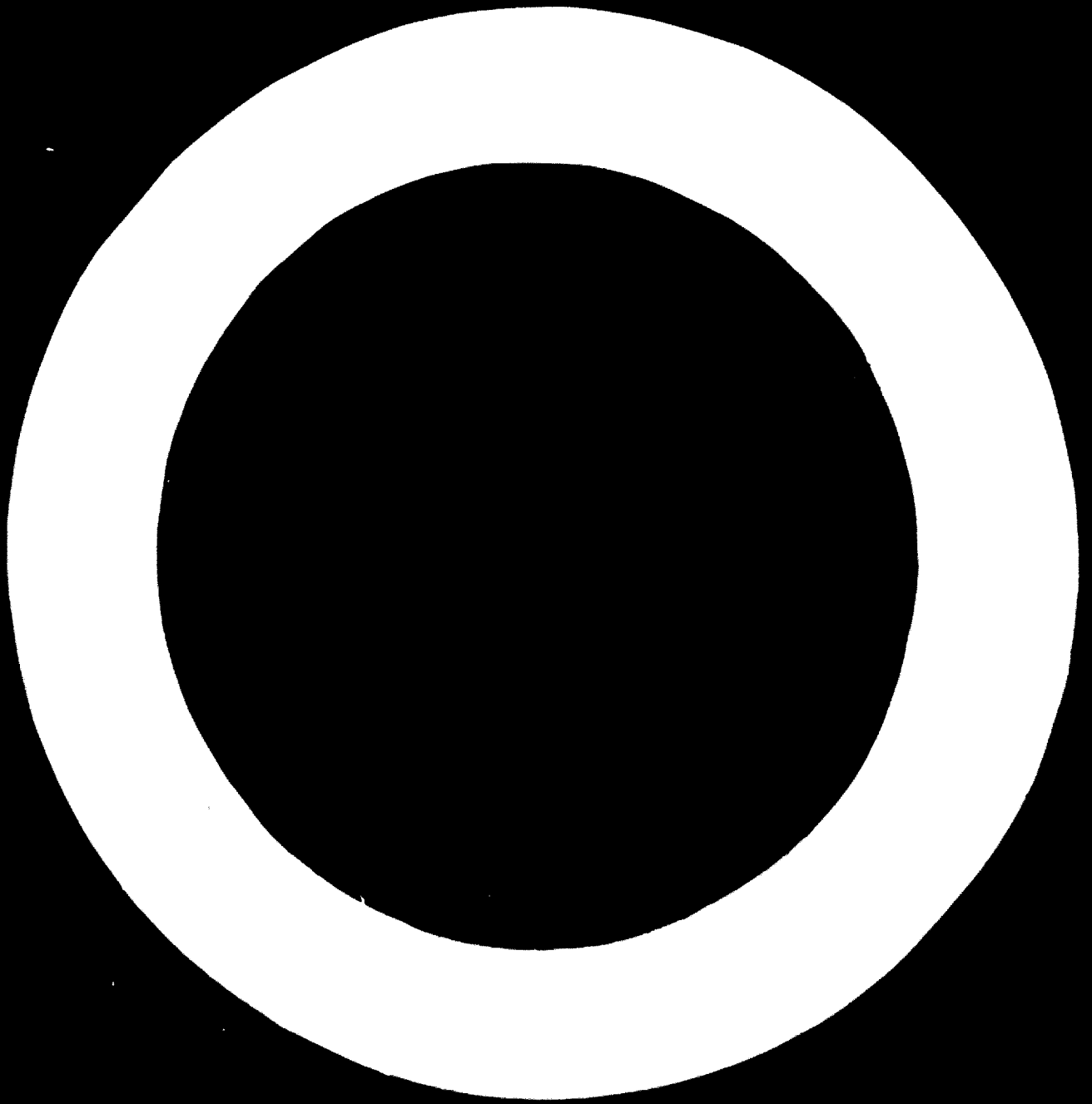
RESUME

QUELQUES FACTEURS ECONOMIQUES ET COMMERCIAUX INTERVENANT
DANS LE CHOIX DES MACHINES POUR LE TRAVAIL DU BOIS

document établi par
la Division de bois
CEE/FAG - Genève

Deux éléments importants doivent être pris en considération pour choisir des machines ou des installations complètes : leurs qualités techniques d'une part et les conditions dans lesquelles elles seront appelées à fonctionner de l'autre. Le présent document traite de ces dernières, notamment des fournitures de matières premières, de la main-d'oeuvre et de tous les autres facteurs de production, ainsi que des utilisations des produits. Ce document complète l'exposé établi par H. Amost Travnik (Directives générales pour le choix des machines pour le travail du bois : ID/IG.151/6).

Les études de préinvestissement doivent comporter une évaluation du coût, du volume et de la qualité des matières premières disponibles, ainsi que des estimations relatives à la durée de vie du bois et des autres matières premières, à la main-d'oeuvre et aux cadres nécessaires et aux besoins d'énergie et de pièces détachées. Il importe particulièrement de planifier soigneusement l'exploitation des ressources forestières pour assurer la continuité de l'approvisionnement en grumes de la dimension et de la qualité désirées. Les industries de traitement secondaire ou tertiaire du bois utilisent



souvent les produits et les sous-produits de la production d'acier et il faut donc veiller à assurer le confort de leur approvisionnement. L'intégration verticale peut apporter une solution aux problèmes de ce genre.

Les fortes pressions sociales qui s'exercent pour que les industries continuent d'employer une main-d'œuvre nombreuse risquent d'être stériles à long terme. La constitution d'une réserve de main-d'œuvre compétente et sur laquelle on peut compter est peut-être coûteuse mais elle devrait être rentable à la longue. Une industrie qui est à la merci des interruptions passagères des fournitures d'énergie risque de connaître des difficultés extrêmement graves. Elle doit aussi faire en sorte de ne pas avoir à procéder à des gros travaux de réparation.

Avant d'envisager le développement d'une entreprise ou la création d'une entreprise nouvelle, il faut faire une étude de marché approfondie. Cette étude devrait porter, notamment, sur les utilisations intermédiaires et finales des produits, en fonction de leur qualité et du volume de la production, sur les matériaux concurrents et leur prix, ainsi que sur la place que ces produits occupent dans le plan général de développement. Une bonne étude de marché doit également permettre de décider du produit à fabriquer - méthode plus sûre que celle qui consiste à décider d'abord du produit à fabriquer puis de lui chercher un débouché.

Quel que soit le produit choisi, son programme de production doit s'intégrer dans le plan général de développement du pays et être coordonné avec les plans adoptés pour les autres secteurs.

1. Introduction

The success of an industrial operation depends as much on the care with which it has been planned as on the skill with which it is run. Feasibility studies and pre-investment surveys are an essential step in the process of setting up a new industry, or adapting or modernizing an existing one. The scale of such surveys, and the funds which can justifiably be spent on them, will naturally be related to the size of the eventual investment being considered, and the costs involved will be debited as an essential part of the total capital investment.

For the selection of plants or of individual pieces of equipment, two interwoven aspects have to be taken into consideration: (1) the technical performance of the plant or equipment (2) the external conditions under which it will operate. The present paper is only concerned with the second of these. By 'external conditions' is understood the factors which determine the supply of raw materials, labour and other inputs, on the one hand, and on the other hand the disposal of the products, by-products and residues created by the plant or equipment. A wood-working industry, or for that matter, any industry, whether at the primary, secondary or tertiary stage of processing, cannot be considered in isolation from the economic, social and commercial environment in which it is operating.

Many of the external conditions which have to be taken into account in the selection of wood-working plants or equipment have been dealt with in the excellent paper by Mr. Arnost Trávník (General selection guidelines for woodworking machinery, ID/WG.151/6). The present paper should be read as a supplement to that of Mr. Trávník; a number of points already drawn attention to by the latter and which appear of particular importance to the ECE/FAO Timber Division are discussed below.

2. Material and other inputs

Pre-investment surveys must consider the quantitative and qualitative availability and delivered cost, including estimates of trends over the expected lifetime of the equipment, of the following:

- wood raw materials
- other input materials
- labour, supervision and management
- energy
- spare parts and repairs

The forestry industry's production is dependent on the quality of wood raw material available and on the economic conditions of the forest. The growth, age-class structure, species composition and condition of the forest which are actual or potential sources of supply, the yields which involve requirements for the growth of potential products, the various uses which may be competing for attention in the case, the methods of the forest management with regard to reforestation or afforestation and other management objectives such as the building of forest roads. Particularly in developing countries, the investment which will result in relatively large changes in the quantity or quality of wood required, the establishment of close collaboration between the forester and the industrialist as early as possible is of considerable mutual benefit. The forester is just as much concerned with establishing a regular long-term output for his wood and to make his plans accordingly, as the industry is to assure its wood supply.

In developing countries it frequently happens that a concession in a formerly virgin or under-utilized area is foreseen in association with plans to establish a new forest industry or to expand an existing one. Such cases should provide ideal opportunities for co-ordinated planning of forest production, the forest being managed as a permanently renewable resource, and industry. All too many examples exist of where the sustainable yield of the forest has overruled in the past for quick profits, with the result that the best qualities are "harvested", leaving to future generations a degraded forest which has been less profitable and more difficult to manage and harvest.

The question of the price which an industry is capable of paying for the delivered wood is directly related to the relative importance of wood costs in overall production costs and to the probability that the producer will be able to sell his output on the market. Consequently, calculations with regard to wood costs must be undertaken in conjunction with the marketing studies for the end-product, a question which is considered later. With increasing sophistication of the end-product, the relative importance of the cost of the raw materials from which it has been made declines, and that of other inputs, such as capital depreciation, energy, marketing and distribution costs, increases.

Similar considerations have to be given to the quality of the wood raw material available. An assessment must be made of the suitability of potential processing methods and equipment to the raw material currently on offer, but in addition, the relationship between the raw material and consumer acceptance of the final product must be considered. Furthermore, possible future changes in the quality of the wood intake must be allowed for, for example, a switch over from timber from virgin stands to that from regrowth, or the use of currently common species to final or lesser known species. If such a possibility is likely to occur, or the forester intends to bring it about deliberately, in the future, the

1, In some cases via another primary industry where the wood is transformed into primary product and residues, the latter for further transformation.

Selection of machinery must take this into account by ensuring that it can handle the range of qualities or species involved or can be adapted at acceptable additional cost to do so.

In the case of secondary or tertiary stages of wood-processing (furniture, building components, packing cases, etc.), the wood materials will not be 'raw' but the products of earlier stages of transformation - sawwood, wood-based panels, pulp, etc. In such situations, surveys need to be made of the industries capable of supplying the wood materials, industries competing for those materials and the long-term prospects of both. It will be particularly important to obtain an idea of the wood raw material supply position of the former and possible plans for expansion or diversification, for example the addition of a particle board mill to an existing sawmill in order to utilize the residues. There may be quite a number of industries supplying or capable of supplying wood materials to the plant which is the central object of study. In surveying the supplying industries, the objective is to establish whether, overall, a regular long-term supply of suitable wood materials can be assured and that any investment in a secondary or tertiary wood-processing plant with the object of increasing capacity, improving productivity or diversifying the production will not be jeopardized by supply problems. It is equally important to assess whether there is a likelihood of a major new supply element emerging during the working lifetime of the equipment or mill under consideration. The building of a new plywood or particle board mill within economic supplying distance of the secondary or tertiary plant in question could be the crucial factor in a decision to make greater use of these materials at the expense of sawwood. This may have important implications on the choice of machinery.

The economic supplying distance referred to in the previous paragraph is not an easy factor to determine in the case of primary or secondary processed wood products. In some cases, there may be no problem in purchasing supplies from anywhere in the country or even from overseas. The other extreme is where economic viability may demand complete vertical integration of the primary and secondary processing stages with the virtual elimination of intermediary transportation. Each case must therefore be considered in the light of its individual situation.

(b) Other input materials

In many developing countries, determining the supply situation for such ancillary input materials as glues, nails, screws, preservatives, paints, other coating materials, fittings and so on may be of even more crucial importance for an industry than that of wood materials. Such materials may not be produced domestically, and tariffs or other barriers may create serious difficulties to be overcome in establishing economic and regular supplies. As much care, therefore, must be taken in surveying the sources and reliability of supply of these as of wood or its products.

(c) Labour, supervision and management

The state of the labour market varies from country to country. As a generalization, it can be said that in the industrialized countries, labour is scarce and expensive and investment in labour-saving equipment can often be justified on economic grounds. In less developed countries, the problem is usually less clear-cut. Because there may be a high

level of unemployment or underemployment, there may be strong pressure on social grounds to keep industries relatively labour intensive. Such a policy may, however, be self-defeating in the long run, since it maintains a large labour force employed in unskilled or semi-skilled activity at low wage rates.

These are perhaps matters of national policy, but the individual firm faced with an investment decision will inevitably have to take such problems carefully into account. Assuming that the firm is in a developing country with ample unskilled labour reserves, the crucial point to establish is probably concerned with education and training. Firstly, is the labour force capable, temperamentally and in terms of skill, of being trained to use the machines efficiently which are otherwise suitable for the purpose? Secondly, are there facilities available for the proper training of adequate numbers of personnel? Put another way, under given conditions relating to the educational (in the sense of adaptability to the use of machinery) development of the workforce, on the one hand, and conditions on the labour market on the other, how sophisticated and/or labour intensive should the equipment to be installed be?

To build up a reliable, skilled workforce, capable of keeping machinery working properly and, when necessary, of carrying out repairs and maintenance can be time- and money-consuming. In many instances, therefore, an industry in a developing country may be well advised not to attempt to introduce labour saving equipment until it is absolutely sure that it can be operated by people with the requisite skills. Where such a gradual approach is technically feasible, it is simpler, and financially safer, to start simply and gradually introduce refinements to the equipment in step with the growing skills of the labour force than to be over-ambitious in the initial choice of machinery.

The above remarks apply principally to the workers actually manning the machines. With regard to those in supervisory and management positions, the skills required tend not to be so different between an industry in a developed and a developing country, or between a technically highly advanced or less advanced process manufacturing the same type of product. Experience in the industry, organizational and administrative ability, man management and leadership are likely to be of as much or more importance than educational background, but personnel with all or even some of these qualifications may be scarce in developing countries. Nevertheless, even a heavy investment in the right man or men will be justified if that is the way to ensure a smoothly running and efficient operation. This consideration applies more to the management of a complete plant or line, but if the investment in a single piece of machinery is big enough, a parallel investment in top-class supervisory staff is likely to be economically worthwhile, especially where the job includes the training of junior staff destined for management roles in the future.

(d) Energy

Energy is another major input and its availability in regular and adequate quantities is vital for the viability of an industrial operation. Thus it is not enough to check the suitability of the machines to the types of energy locally available, but it is essential to check the reliability of the sources and the prospects for the energy supply/demand

balance in the region. Numerous instances can be cited where, because of external factors (flooding, strikes, breaks in transmission lines, etc.), electricity, fuel oil or coal supplies have been cut off for extended periods, resulting in serious financial loss to the paper industries. With a growing degree of power-operated equipment in the plant, it becomes more important to increase the flexibility and reliability of power supplies, for instance by installing emergency power (the plant's own generation plant) or equipment which can use alternative forms of power. Wood-processing industries are often fortunate in that wood residues may be used for generating power and heat, but this advantage has to be weighed against other factors when the sale or transfer of residues for use or further processing (particle board, pulp) is being considered.

Energy has become a key policy issue in many countries and is likely to remain so in the future. Increasing attention is likely to be given to the degree of energy-intensiveness of different industries and their products. In this respect, the wood-processing industries may find themselves in a favourable position, since compared with many other industries, their requirements of energy per unit of output are relatively low.

The unit cost of energy varies considerably from country to country and according to the type of fuel. Worldwide, there is a possibility that demand for energy could gradually outstrip resources currently considered to be economically accessible, and the result could be a relative rise in cost. Even if such fears prove unreasonable, interest is likely to increase in energy-saving technologies and processes. Energy consumption per unit of output may become an increasingly important factor in the selection of machinery.

(e) Spare parts and repairs

Questions raised under (b) - Other input materials and (c) - Labour, supervision and management - apply equally to the problem of spare parts and servicing. Especially in developing countries, which have to import the original equipment, it is important to ascertain that a reliable system exists for the supply of spare parts, either from depots in the same country or by air-freight or other quick and reliable service from outside suppliers. The latter arrangement must include provision for avoiding customs or other administrative delays.

Normal servicing and maintenance will frequently be carried out by the firm's own staff, but the replacement of broken or worn-out parts and other ad hoc repair operations of a major kind may call for outside help and it is important to ascertain who is able to provide such service efficiently and quickly. The availability of a service and repairs facility within reasonable distance should be a positive influence on the choice of equipment.

No mill or piece of machinery can be guaranteed to give completely trouble-free service, and problems can arise especially during the running-in period. Any stoppage from whatever cause brings a financial loss, and quick access to spares and repair services ensures that the loss is kept to a minimum.

3. Markets

In Europe there was a period of a decade or more after the Second World War, when demand for wood products tended to keep ahead of the capacity to produce them. Consequently the main emphasis in many industries was on possibilities to raise production. More recently, with increasing competition from other materials and greater sophistication among consumers, the wood industries have come to appreciate that their commercial viability is as much dependent on the post-production phase of activity as on the production phase itself.

Furthermore, there is an awareness that the product must be offered in a form in which it can be effectively marketed. This has meant that management in wood-processing industries has become increasingly market-oriented and less production oriented. A similar phenomenon can be observed in industries in other regions, notably those in the tropical regions producing for export to the highly competitive markets in the industrialized countries.

To some extent, the type and detail of market information required will differ according to the type of investment being planned, that is to say, whether a complete new mill is under consideration or just an improvement or extension of an existing one. In the case of the latter, which is of chief interest to the present meeting, it is to be hoped that much of the basic information on the market will be already available, in which case investigations will centre on the qualitative and quantitative changes to the product which would result from the investment being considered and the capacity of the market to absorb them.

Whether it is already available or has to be assessed, the basic information on the market which is needed before an investment decision on new equipment can be reached will include:

- Intermediate and end-uses of the product(s) according to quality
- Intermediate and end-uses of the product(s) according to quantity
- Competing materials
- Prices
- The product(s) in the framework of overall development planning

(a) Intermediate and/or end-uses of the product(s) according to quality. The producer considering new investment needs to have as good an idea as possible of the applications of his products according to their various grades and dimensions. This information is relatively easy to obtain, but it is more difficult to make an objective and realistic forecast of future trends, either for the markets themselves or for the share of the individual manufacturer's product in the overall market. The market may, of course, be the domestic one or overseas ones or both, and the thoroughness with which such investigations can be done will be related to the size of the investment being considered and the finances available. In many cases, especially those which involve the introduction into a plant of equipment for refining or improving the product, the market survey should indicate the fields in which products of a given specification are likely to succeed, and this will influence the choice of equipment to install. This may be safer than deciding first on the product specification and subsequently looking for suitable market outlets.

(b) Intermediate and/or end-uses of the product(s) according to quantity. Experience has shown the considerable difficulty and cost of obtaining reliable information even at the national level on quantities of wood used for a given purpose. Furthermore, the opinion has been expressed that, provided data are available on end-uses according to quality and some idea of the importance of each end-use sector is known, detailed knowledge of the actual volumes of a product used for a given purpose is not essential. Thus, while all information on the market is helpful in the decision-making process, it is necessary to consider whether the collection of quantitative end-use data is likely to be worthwhile.

(c) Competing materials. Study of the market will include an economic and technical assessment of materials or processes which are replacing or may replace the product in question; or that could be replaced by that product. It may be necessary to determine whether changes in the design or specification of the product would increase its competitiveness sufficiently to justify additional investment expenditure.

(d) Prices. The importance of this is self-evident, but the collection of satisfactory price information and its correct interpretation is far from easy. It will be simplified, however, if the planned investment is an addition or replacement in an existing mill with already established markets and price structures for its products. If the investment is to establish a completely new mill or equipment with which to produce a new product, there is an unavoidable element of chance in estimating the relationship between the cost of production including marketing and expected profit margins, and the price of the product. Built into this calculation must be, if possible, estimates of likely trends - of labour, raw material and other production costs on the one hand and medium- to long-term market movements on the other. Especially in a market-economy country experiencing business cyclical fluctuations, such calculations can be little better than informed guesswork, but despite their limitations they can provide useful, though necessarily subjective, guidance.

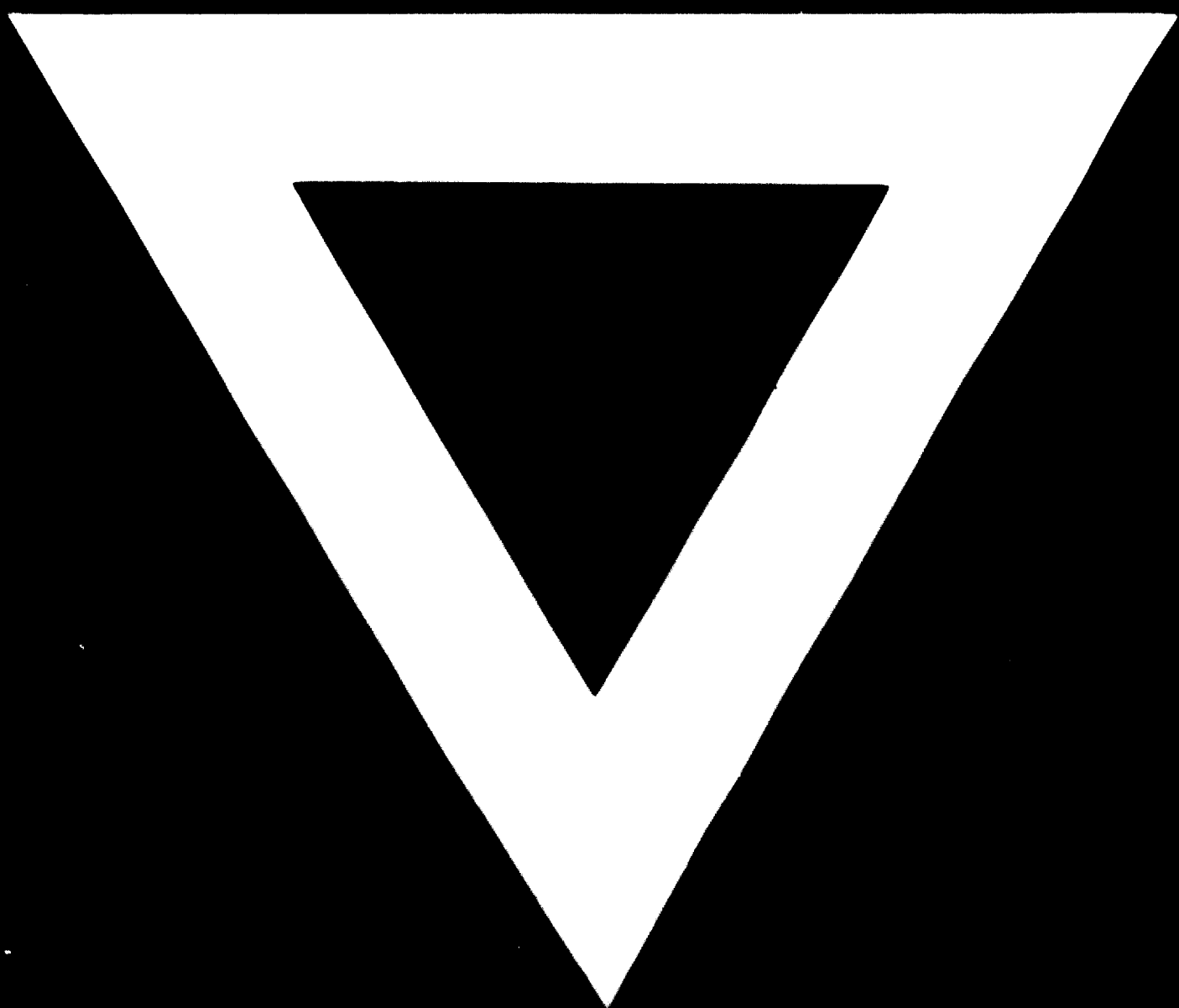
(e) The product(s) in the framework of overall development planning. Many developing countries have systems, for example through a Ministry for Development Planning (or similar title), for controlling or guiding the overall course of economic and social progress at the national or sub-national level. A key element of such systems is to remove bottlenecks between the supply and demand for resources, material and otherwise, and to achieve as high a degree of self-sufficiency as may be consistent with commercial and foreign policy. Even where small investments at the industry level are being contemplated, it is as well to determine how they will fit into the overall framework of national or regional development plans, particularly from the point of view of linking the intended output with plans for the potential user industries. A typical example would be investment in window or door manufacture, where it is essential to know plans (national and/or local authority) for dwelling construction and tourism (hotels, etc.), and to co-ordinate investment plans - the former as closely as possible with the latter.

4. Conclusions

It would be possible to extend this paper by discussing other factors of an external nature, such as outlets for by-products and residues, and environmental questions, notably the control of polluting emissions into the air or water. While these are undoubtedly important, this paper was not intended to be comprehensive in its coverage of external factors. It has, however, concentrated on the need for careful assessment of two crucial factors, namely the qualitative and quantitative availability of raw materials and other inputs and the markets for the output of a process, before a decision can be made on the type of investment and the scale of investment in a new plant or even in individual pieces of equipment.

It is advisable to have reached at least preliminary conclusions on these aspects before the selection of equipment on the basis of technical performance has progressed very far. The way in which a plant is run and the products it produces will be largely determined by external conditions, and a sound knowledge of these not only provides a foundation for making a good choice of equipment but increases the chances of being able to run a successful and profitable operation.





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