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Symposium on the Prospects for
Industrial Meat Processing in
Developing Countries

Vienna, Austria, 13 - 17 October 1975

PUBLIC ABATTOIRS OR INDUSTRIAL MEAT PLANTS 1/

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Summary

PUBLIC ABATTOIRS OR INDUSTRIAL MEAT PLANTS[1/]

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RESUME

ABATTOIRS PUBLICS OU INSTALLATIONS DE TRAITEMENT DE LA VIANDE[1/]

par

Mogens Jul* et E.C. Brock**

1/ Les vues et opinions exprimées dans le présent document sont celles des auteurs et ne reflètent pas nécessairement les vues du Secrétariat de l'ONUDI. Le présent document est la traduction d'un texte anglais qui n'a pas fait l'objet d'une mise au point rédactionnelle.

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Where organised meat slaughtering has to be established in an area local customs mostly need to be taken into consideration. Often butchers buy the animals from the farmers and sell the meat through established marketing systems. In this case the only option is probably to establish a public abattoire, that is a meat killing plant where so-called custom killing can be carried out for each butcher. Often the butchers will even demand that they do the killing themselves in the abattoir in order that cutting up and dressing may be exactly to each individuals desire. Where possible it will be more efficient to establish slaughtering by special groups of workers who carry out the killing against a fee paid by the client.

The butchers will often demand that killings take place only over a limited period each week in order that they can meet the optimal market conditions. Such considerations may well result in a utilization of plant capacity as low as 15 to 25 per cent.

Especially where meat export is considered it may be worthwhile considering establishing an industrial meat plant. Such a plant will buy the animals from the farmers, often transport them to the plant and recondition them for slaughtering on feeding and resting lots close to the plant. They will then carry out a complete line operation with specialised skilled workers carrying out each specific operation. Such plants can often be utilised to 75 per cent of capacity.

In an economic comparison it is the experience that public abattoirs often are 2 to 3 times as expensive to build and operate as industrial meat plants.

However, the choice may often not be based on purely economic considerations but on those indicated above relating to local customs, meat marketing patterns, etc.

Where a public abattoir is established it may be useful to keep in mind that this is likely to be a temporary solution. One may here refer to the experiences from Scandinavia where public abattoirs in former years were found in practically all towns. Today all butchers have become completely accustomed to obtaining meat from industrialised meat plants. This has resulted in the price spread between the price paid to the farmer and the price paid by the consumer having been reduced considerably in spite of the comparative high wages prevailing in these areas.

Lorsqu'on veut créer une entreprise d'abattage du bétail, il faut tenir compte avant tout des habitudes locales. Dans certains pays, les bouchers achètent directement les animaux aux éleveurs et les abattent eux-mêmes. Dans d'autres pays, on utilise une méthode de commercialisation tout à fait différente. Dans le cas présent, la seule solution qui paraît probable est la création d'un abattoir public pratiquant l'abattage sur commande pour chaque boucher, mais les bouchers préféreront souvent tuer eux-mêmes les animaux à l'abattoir afin de pouvoir débiter et peser la viande conformément aux désirs de chaque client. Il vaudrait mieux cependant que les animaux soient abattus par des spécialistes attribués par les bouchers.

Pour pouvoir mieux écouler leur viande, les bouchers exigeront souvent que l'abattoir ne fonctionne qu'un petit nombre de jours chaque semaine. Dans ce cas, le taux d'utilisation de la capacité des installations ne dépassera pas 15 à 25 %.

Si l'on envisage des exportations de viande, la création d'une entreprise de traitement industriel de la viande est probablement la meilleure solution. Cette entreprise achètera les animaux aux éleveurs et les transportera souvent elle-même jusqu'à des parcs proches des installations d'abattage, où ils se reposeront et seront engraissés avant d'être abattus.

L'usine elle-même sera outillée pour l'abattage proprement dit et pour toutes les opérations de traitement de la viande, et chacune de ces opérations sera effectuée par des spécialistes.

L'expérience montre que les abattoirs publics sont souvent deux ou trois fois plus coûteux que les usines de traitement de la viande, qu'il s'agisse des coûts de construction ou des coûts d'exploitation.

Dans bien des cas, cependant, le choix ne peut être fondé sur des considérations purement économiques car il faut tenir compte, comme on l'a indiqué ci-dessus, des habitudes locales, des circuits de commercialisation de la viande, etc.

Si l'on opte pour un abattoir public, il est utile de prévoir que, selon toute probabilité, cette solution sera seulement temporaire. En Scandinavie, par exemple, on trouvait autrefois des abattoirs publics dans presque toutes les villes. Maintenant tous les bouchers ont pris l'habitude d'acheter leur viande à des usines de traitement industriel de la viande. Bien que les salaires soient relativement élevés en Scandinavie la création de ces usines a permis de réduire considérablement l'écart entre le prix payé à l'éleveur et le prix payé par le consommateur.

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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

CONTENTS

PUBLIC ABATTOIRS OR INDUSTRIAL MEAT PLANTS

Mogens Jul and E.C. Brock

PREFACE

In preparing this paper the authors have had to rely mainly on their own experience from the meat industries of Denmark and other Western European countries. They have, however, received much additional data from Arild Holm, Engineer, Atlas, Copenhagen, and from N.E. Wernberg, Consulting Engineer, Copenhagen. Their valuable contributions are hereby acknowledged with gratitude. Special thanks are due to Mr. Wernberg, who has made most of the charts and diagrams included in the paper available.

INTRODUCTION

The considerations in this report on public abattoirs versus industrial meat plants are based on experiences gained in Europe where these two types of slaughtering establishments have existed side by side and each has served its purpose. Also, some experiences from operations in Asia, Africa and Latin America are included.

Industrial slaughtering operations, which are connected mainly with cooperative or private enterprises, have, as later shown in this report, clear labor, hygienic, and economic advantages. But sociological, marketing and sales conditions have given, and continue to give, reason for the existence of public abttoirs with their individual or custom slaughtering.

Development in Europe trends toward an increase in industrial slaughtering establishments at the expense of the public abattoirs with increased opportunities for export and sale of chilled meat in large quantities.

In Scandinavia most public abattoirs have disappeared or have been industrialized in some form or another. The same is happening now in Germany and the Netherlands, while in England, for example, public abattoirs are still in operation and being built.

I. ESTABLISHMENT AND ADMINISTRATION

A. Public abattoirs

As a rule a public abattoir is established by public authorities - normally municipal - with a view to gathering all private commercial slaughtering for an area - most often a large city - in one place where the animals may be slaughtered under satisfactory veterinary, hygienic, and health control conditions.

The slaughtering itself is done by private butchers with their own assistants (apprentices) or by contractors under contract to the abattoir.

A fee is paid (per kg. or per animal) to cover cost of the operation of the abattoir (interest and depreciation of buildings and equipment, water, steam, electricity, etc.), for veterinary inspection as well as for administration. The size of this fee, which influences greatly the sales price of meat in the area, is dependent to some extent on local tax policies. There may also be competition from other sources so that there is a desire to recover part of the cost of operating the public abattoirs by the public budget on a par with other public institutions. On the other hand, the public abattoir may have concessions as a monopoly and then by sufficiently high fees be made a self-supporting establishment.

Because of the nature of its function, a public abattoir is most often situated in the area of the consumers and, most often, built so that its operation fit the existing marketing system, both with regard to supply of live animals and sale of meat.

This - in connection with the widely varying interests of the abattoir's clients, the city's butchers and meat wholesalers, - make rational production planning, full utilization of capacity more difficult for a public abattoir.

It should be added that, in general, the typical public abattoir was planned, first and foremost, to meet the veterinary authorities' responsibility for providing a hygienic slaughtering facility and providing wholesome meat. Second came the wishes of the local butchers. On the other hand, often little special consideration was made of efficiency and economical operation. Quite to the contrary, the administration and financing bodies, i.e. municipal authorities, have often become accustomed to the fact that such a public facility must cost money, just like a school, a hospital, a sewage disposal plant, etc.

B. Industrial slaughterhouses

An industrial meat plant is often owned by a private party. It is operated primarily from a business point of view and often by a private or cooperative firm which is strong enough economically to finance its own facilities and business operations as well as to conduct slaughtering operations which meet hygienic and veterinary demands and regulations. However, these normally are forced to operate with a profit.

Attempts are normally made to place industrial slaughterhouses in the areas of production, that is in rural districts. The operations are based on full use of facilities and a large turnover. Production procedures are based on line operations with successive separation of the carcasses, resulting in very efficient use of machinery and a high productivity of labour. In fact, Henry Ford is normally credited for having invented assembly line operations, thereby contributing dramatically to the high productivity of modern industry. Yet, it has often been suggested, at least jokingly, that all Henry Ford did was to observe the very efficient slaughtering operations in the large meat packing plants in Chicago, and then reverse this process in his car assembly factory. Be this as it may, it illustrates that the characteristic of an industrial meat plant is that it does away with custom slaughtering and makes use of line operations, with much improved output per man hour and per unit of investment. Hereto may be added the fact that such plants may well be utilized throughout the work week. Public abattoirs, on the other hand, often have to complete killings within a few hours per week to meet the needs of each butcher and meat wholesaler. It then follows that from a plant efficiency point of view, the industrial meat plant is likely to be much superior to a public abattoir.

Private meat plant operators can make purchase agreements with the live animal market or meat producers. Their sale of meat is mainly at the wholesale level which offers the possibility of long term sales agreements. The most important prerequisites for being able to plan production and thus to achieve an economical use of the production apparatus are therefore present at a private or a cooperative meat plant. This type of slaughtering establishment prevails in North and South America as well as in North-western Europe.

II. PRODUCTION METHODS

A. Public abattoirs

The public abattoir must be constructed and equipped so that various slaughtering operations can be undertaken individually simultaneously, which is one of the reasons why line slaughtering is impossible. Normally, local butchers also oppose this form of slaughtering since it prevents them practising their own special methods and techniques. The fact that slaughtering installations thus often are used by various groups of people, quickly reduces the efficiency with which such installations are utilized and increases maintenance requirements and costs.

At a public abattoir, the whole slaughtering process right from the actual killing to the final inspection is often carried out, more or less, within the same confined area. This lack of slaughtering space is difficult to maintain a high standard of hygiene and it is comparatively difficult to carry out adequate veterinary inspection. Cooling facilities at a public abattoir reflect, as a rule, the different demands of the local butchers as the length of time and intensity of the chill. Meat is often removed from the abattoir before being chilled in order to transfer the unavoidable chilling loss on the customer (consumers) or also simply because the latter prefers meat at body temperature. Another aspect is the preference for use of meat which has the same temperature when it is slaughtered for the production of sausage. This does give a greater binding capacity of the ground meat (Vienna Sausage). It is well known from meat biochemistry as well as from practical experience that the use of slaughterwarm meat is superior to the use of chilled meat, in sausage manufacture. This accounts for the absence of chilling facilities in some public abattoirs in areas where much sausage is prepared by the local butcher or wholesaler. It does not, however, constitute a unique feature of public abattoirs. On the contrary, where indicated, industrial meat plant may carry out hot boning, using the appropriate cuts for sausage making while the more expensive cuts will normally be boxed, conditioned and eventually transported and sold in the chilled state.

Not in all cases will consumers prefer slaughterwarm meat, in other cases meat could simply not be kept in the warm state until delivered to the consumers without spoilage. Therefore it may often be necessary for a public abattoir to establish both meat chillers and cooler storage rooms.

The responsibility for maintainance, upkeep, extensions, etc. in a public abattoir normally rests with public officials. These may often be appointed as a stage in their official career, but may not always have the technical insight required to insure the economic operation of the abattoir. Also, where new abattoirs are built it seems that often non-technical considerations have been given undue consideration in lay-out, size of buildings, etc. It is probably no exaggeration to state that experience has suggested that in several places a municipality or other authority choses to build a rather ambitious building of high architectonial standard, while the personnel responsible for the buildings of industrial meat plants would be anxious to build as cheaply and effectively as possible since they are likely later to be responsible for the economic operation of the slaughterhouse. For instance, in a public abattoir, even inside the installation transport cost may not come out of the abattoir's budget. Conversely, in an industrial meat plant it would be a direct operation cost and much effort would be made in planning the building so that minimum transport resulted.

Utilization of by-products

Installations for the utilization of by-products are frequently not present in larger scales at a public abattoir. There are several reasons for this. One is that custom slaughtering often makes it difficult to collect the by-products in an effective and hygienic way. Also, the by-product belong to the butchers or wholesalers who use the abattoir. It may well be difficult to arrive at a uniform treatment and sales policy for such a large number of by-products with many owners. Therefore large installations with sophisticated equipment would hardly be economic.

There are other areas where the killings are so limited that the utilization of meat by products becomes uneconomic. In these areas they are not likely to be effectively utilized whether the installation is a public abattoir or an industrial installation.

6. Industrial meat plants

In a privately or co-operatively owned meat plant it is often easier to adapt the whole plant lay-out and installation for line slaughter.

The installation will here be based on a progressive slaughtering process from an unclean department including: lairage
stunning
bleeding
dehiding
scalding and dehairing (for hogs).

The above will be separated from the cleaner operations such as:
removal of guts and entrails
carcass splitting
meat inspection.

The killing and slaughtering operation will normally be carried out while the animals are hung on rails. The carcasses may often be transported by a conveyer.

The installation will often be of such a size that it is possible to invest in many work saving devices, e.g. hide pullers, automatic splitters, etc. Since the plant has a permanent skilled slaughtering crew, its personnel will without risk be able to use such sophisticated equipment.

This type of slaughtering results in considerable hygienic advantages. Slaughtering on the rail reduces the contamination from floors and between carcasses just as the use of well operated mechanical equipment reduces contamination from hands and tools.

Line slaughtering also facilitate an effective carcass inspection by trained inspectors.

It is worth mentioning that slaughtering on the rails has considerable ergonomic advantages. It is possible to adjust the height of the rails and install various platforms, often with adjustable heights in such a way that the operators can maintain convenient and sound positions of their bodies while they work.

Where line killing is compared with individual slaughtering of one animal at a time it is not unusual to find a production increase of 100 and 150% per man hour.

Utilization of by-products

In line slaughtering the various by-products are removed at fixed places from the animals. This makes it easy to collect them hygienically and effectively. Since the number of animals slaughtered normally is relatively large, it gives a good basis for investment in sophisticated installations for the utilization of all by-products, edible as well as non-edible.

III CHILLING SYSTEMS

Recent years have seen many examples where the undiscriminating introduction into developing countries of meat chilling practices learned from the industrialized world has resulted in installations which did not fit the local customs or conditions. Many such installations lie idle or are in very limited use.

A. Use of warm meat

In many tropical areas where refrigeration is practically unknown consumers are accustomed to buying slaughter warm meat from their meat markets. These consumers would react against chilled meat and such should not be offered.

Some hygienic considerations might suggest that the trade in warm meat might result in a high risk of microbiological spoilage. However, the meat trade in areas where this pattern prevails is based on a very rapid turnover and experience has shown that the meat trade can take place without undue risks.

In areas where this custom prevails it is likely to be most useful to use public abattoirs since each butcher would carry his meat away from the abattoir immediately after slaughter. No refrigeration installation are indicated.

B. Hanging floors

Some areas are accustomed to a moderate chilling of meat before it is consumed, but the meat trade is not equipped for keeping meat under refrigeration at all times. In such cases it would be technically inadvisable to use artificial refrigeration. The latter might easily result in meat which at one point is colder than the surroundings. In humid climates this would result in condensation on the meat surface and in a shorter keeping time of the meat than that obtained without refrigeration.

In such cases it is advisable to equip the slaughter house, normally a public abattoir, with hanging floors. These are fairly large areas with meat rails. After killing and dressing the carcasses are hung in these areas where there is very adequate air circulation through the hall and between the carcasses. Evaporative cooling takes place on the surface. Besides, the carcasses obtain quite a dry surface and will exhibit a very adequate keeping quality.

It is likely that this type of installation is advisable for most public abattoirs.

C. Chilled meat

Where chilled meat is accepted by the majority of the consumers the slaughter house may be equipped with artificial refrigeration. Where a public abattoir is considered this is likely to be quite expensive. The reason for this is that the abattoir has to be equipped so that it can take in to the chilling rooms meat wherever an animal has been killed. This gives a very uneven load on the refrigeration system, which normally has to be built with a very large capacity. Besides most public abattoirs have to establish cooler cells where each meat wholesaler can store the carcasses he owns or has purchased until it is convenient for him to take delivery of them.

D. Industrial meat plants

Practically all industrial meat plants are equipped for export or at least long distance shipment of meat. Here artificial refrigeration becomes a necessity.

E. Chilling and toughness

Any considerations regarding meat chilling should include appropriate attention to the risk of toughness of the meat. It is often not realised that the use of slaughter warm meat results in quite tough meat. When meat passes through rigor when still hot, muscles will contract. This contraction does not dissolve easily but results in meat which is quite tough. However, areas where slaughter warm meat is consumed are generally accustomed to using these in stews, boiled meat, etc. a form of preparation where toughness is not noticed so much.

On the other end of the scale comes the fact that very efficient modern refrigeration can result in toughness of the meat. This occurs when the carcass meat is chilled to below about 10 C before rigor. This can result in excessive toughness and market reaction. This knowledge is often overlooked where only mechanical considerations are given to efficient chiller installations. In modern meat plants it is very customary to chill meat in air streams of 6 - 10 C simply because a lower air temperature would result in tough meat. In these cases much care must be exercised lest the very moderate chilling process has an undesirable effect on the microbiological condition of the carcass surface.

Only for pigs does it appear that the latter effect, the so-called cold-shortening, is of little importance. For this reason it is customary in modern installations to chill hog carcasses at an air temperature which is about -15 C at the beginning of the chilling, increasing to about -2 C after 2 - 3 hours.

IV TECHNICAL ADVANTAGES AND DISADVANTAGES

The above has concentrated mainly on technical considerations. As will be indicated later many considerations such as local animal supplies, possibilities and meat marketing systems will often be of such importance that one would have to choose solutions that may not appear effective on a purely economic or technical evaluation.

However, in this chapter the technical and economic advantages and disadvantages of the two systems will be discussed. The discussion will mainly be based on European conditions and experiences.

In areas where mainly public slaughter units are still usually find a very large price differential between the price paid for the live animal and the price consumers pay for meat. This is due mainly to the following four factors.

A. [illegible]

One will often find that the [illegible] marketing channels go through many complicated [illegible] commercial stages which of course increases the [illegible] expenses shows that the cost increases anywhere from [illegible] per cent for each commercial stage an animal or a piece of meat has to go.

This suggests clearly that where possible an industrial meat plant should be established. The plant should be able to establish long term contracts with the producers and it could possibly have some long term connections to wholesalers or export distributors.

B. Animal supply

It is often found that the live animals and the meat products may suffer both weightwise and qualitywise as a consequense of ineffective treatment, transport, and marketing.

In this connection it is necessary to discuss whether the plant should be placed in the production area or near the consuming areas.

With today's facilities for refrigerated transport of perishable foods it appears to be cheaper and safer to transport meat and meat products rather than live animals over long distances. Generally it is calculated that the cost for transporting meat is 60 to 80 per cent of the cost of transporting live animals.

The transport of live animals is quite expensive, especially in a country with a warm climate. The animals will often loose considerably in weight and the quality will be reduced because of the stress of the animals during the transportation and the exitement which their exposure to unknown surroundings causes. After a long transport the animals will need a resting period and a feeding period, again resulting in higher costs. Both public abattoirs and industrial meat plants often find that they have to establish feed lots cum, resting places where the animals are kept for weeks and conditioned before they are slaughtered.

One of the reasons for lower cost of the transport of refrigerated meat is that the stowage capacity of the transport equipment, e.g. a railroad car or a truck is utilized much better by the transport of meat as compared to the transport of live animals. Table 1 compares calculations for transport of hogs as live animals and as carcasses from Oldenburg to the Ruhr district (300 km) in the Federal Republic of Western Germany. The costs are indicated in German Marks (1959) per 120 kg live weight. Column B is particularly interesting since in this all statutory fees have been deducted. This suggests that it was about 16 DM cheaper per 120 kg live weight to ship carcasses rather than the same amount of meat as live animals. The above suggests that where possible it is, from an economic point of view, advantageous to place the slaughtering installation in the production area.

In emerging countries, however, the above discussion may appear somewhat academic. There are many cases whereno road or rail links exists. Such factors will, of course, have a decisive influence on the type of transportation, whether live or refrigerated, will be used.

Figure I gives a schematic illustration of meat marketing routes, illustrating the factors discussed above.

C. Utilization of by-products and offal

A Swedish investigation has suggested that an effective utilization of the unedible by-products can cover all costs from the animal is removed from the production area till it arrives at the retail store. This includes transport of the animals, slaughtering costs, and shipment and transport of the dressed meat to the stores.

As mentioned above the industrial meat plant has such a size and can manage its operation in such a way that economic utilization of by-products is easy to put into effect; thus it can invest in effective gut departments for utilization of lard, dry rendering plants, drying installations for blood, a department for hides and skins, etc., also various glands may be utilized for sales to farmaceutical uses.

D. Operating cost

As mentioned above, one serious difficulty for a public abattoir is that it generally has to be of such a size that it has sufficient capacity to meet the peak supply periods. In addition it is often so that the clients of a public abattoir will insist on getting their meat ready on a special day and often right before a special hour which generally is market time.

In so far as variation over the year is concerned it is often found that the peak season will represent killings of about twice the annual average.

Similarly the butchers generally do not want the killings spread all over the week, it is not unusual that 50 per cent of the week's killings must be carried out the first day of the week and the remaining 50 per cent the next two days.

For this reason a public abattoir is often built with a capacity about 3 to 4 times that which would be required for the average killing. In other words, one has to calculate that the capacity will be utilised some 25 to 35 per cent.

A private industrial meat plant will generally purchase its own animals, after that it is quite easy for it to adjust killings over the year and possibly even carry out seasonal adjustments; mostly such plants can achieve a utilization of their capacity of about 75 per cent, some times even higher.

It is for this reason that costs for depreciation and interest for buildings and [illegible] per ton killed meat often are two to three times higher in a public abattoir as compared to an industrial meat plant. [illegible] are given in figures V and VI and in table 2.

It may [illegible] cost of water, electricity, oil, etc. [illegible] production is [illegible] costs [illegible] with [illegible] costs.

It is obvious that any slaughtering facility, whether public abattoir or industrial plant, must adjust its labour force and management personnel, administrative personnel, and personnel for veterinary control so that peak loads can be handled. Where this is considered the above discussion clearly indicates that a public abattoir is likely to have 2 to 3 times as much personnel as that required for an industrial meat plant with the same annual output.

An old OECD investigation from 1959 suggested that the total specific operating costs are 2 to 3 times as high in a public abattoir as compared to an industrial meat plant. However, this depends considerably on the degree of mechanization and the degree to which the production is specialized, e.g. if only hogs are killed or the plant must also kill cattle and sheep. The data from this study are given in table 3 where the costs are given in Swiss francs and apply to 1959.

V ECONOMIC SIZE OF PLANT

As has been indicated already above, the size of a plant has a considerable influence on the economy of its operation. A smaller plant is most expensive to operate compared with a larger. An exception, however, is a very small slaughtering plant for less than 10 units per day. These are very simple in building and installation and administration. For a plant of this size it becomes rather immaterial whether it is organized as a public abattoir or an industrial operation as long as the organization is efficient.

At a capacity of about 25 units per day more complicated installations are required. Operations become more specialized and experience shows that operating costs increase per unit. Where public abattoirs are concerned it seems that maximum cost may be reached at an output of about 500 tons of meat per year, for an industrial plant the maximum cost seems to be reached by 2000 tons of meat per year. Provided that the plant capacity in both cases is used effectively it seems that costs for both types of plants decreases thereafter.

Figure II and III illustrate for various sizes of productions in tons per year the necessary floor space.

Figure IV and V give similar calculated costs for capital outlay.

Similarly figure VI - VII show operating cost for both types of plants and VIII to IX the slaughtering cost.

It is worth noting that the data in figures I to IX are based on actual costs from existing installations. For the sake of simplification, however, rounded figures have been used to show more clearly the relation between the two types of plants and trends for various sizes of plants.

From a study by N.E. Wernberg table 2 gives some comparation figures for the construction of a public abattoir compared to an industrial meat plant. Table 3 gives from the above mentioned study data for operations costs.

In general it will be concluded that technically and economically public abattoirs have little to offer in comparison to industrial meat plants.

VI NON-TECHNICAL CONSIDERATIONS

Many special conditions will often indicate that a public abattoir may be the more efficient type of meat plant to use even when purely economic considerations would lead to a different conclusion.

Sometimes prices of meat and by-products vary quite considerably over the days of the week. In such cases there may be a need to concentrate the killings on one or two days. In that case a public abattoir may well be almost as efficient as an industrial meat plant.

Often the local pattern of meat marketing requires various types of treatment for various customers. Often some of the killings may have to be carried out according to certain religious rituals. In these cases the line operation of an industrial meat plant may not be feasible.

It is not infrequent that meat is marketed by a great many butchers. They buy their own animals and wish them slaughtered at the same time and with due consideration to their own special desires with regard to dressing, killing, etc. In these cases a public abattoir may be the only solution.

It is worth noting that some of the above considerations are often those which apply when attempts are made to organize slaughtering in an area. Economic considerations will often weigh strongly towards the installation of an industrial meat plant. However, it may simply be impossible to go against the wishes of the many induviduals in the meat trade and it may not be possible nor in fact desirable to interfere in the established channels between the producers of the animals and the butchers. In such cases the establishment of a public abattoir appear indicated.

VII SLAUGHTERING FACILITIES IN EMERGING COUNTRIES

A. Employment generation

Where slaughtering facilities are planned in emerging countries one will need to take into consideration the local supply of labour. It will often be found that the area has an abundant labour supply and few employment opportunities. The salary for the workers will often be so that many of the work saving devices common in the Western World will be uneconomic under such conditions.

Attention must here also be given to the fact that maintainance and the supply of spare parts will constitute considerable complications. For this reason also simple even if labour intensive methods will need to be developed. These can of course be found with equally success for a public abattoir and an industrial meat plant.

B. [illegible]

Where [illegible] considerations need be given [illegible] both [illegible] any [illegible] expan[illegible]

tions than by public abattoirs. Especially in the latter it is often difficult to maintain a high degree of sanitation even where one was originally instituted at a satisfactory level.

C. Capacity considerations

In calculating the necessary capacity of the meat plant one has to consider the special conditions that often apply to cattle in emerging countries. It is well known that in many countries a cattle herd is considered as an asset which one only hesitatingly parts with. This results in the supply to the meat plant being dependent on the possibilities for maintaining animals. In lush periods supply is generally limited while lean seasons results in difficulties for maintaining the animals and increasing supplies to the meat plants, often characterised in that the decision to send the animals to slaughtering was made too late. This means that the animals are partly starved and have difficulties withstanding the transport to the meat plants.

Considerations such as these makes it necessary to adjust the capacity of the installation so that killings at times may be up to 100 per cent over the average killing, while at other times killings may be less than 50 per cent of the average.

D. Meat supply

A public abattoir or an industrial meat plant in an emerging country is often looked upon as a factor which much guarantee a steady supply of meat all year around. With the abovementioned fluctuations in supplies it often becomes necessary for the plant to have a considerable freezer storage capacity in order that import of meat may be avoided and constant supplies may be safeguarded.

As mentioned above some often unexpected local customs may often make difficult the establishment of an industrial meat plant. Thus the experience in Sri Lanka is that only hotels will use chilled meat, while private users prefer warm meat. Here a public abattoir is probably indicated.

In Kuala Lumpur the installation must be so that a large number of butchers may slaughter a large number of animals in the first two hours before the opening of the meat market which takes place at 7.00 a.m. In this case also a public abattoir seems to be indicated, the utilization of its capacity is about 15 per cent.

In other cases it is found that the local meat trade prefers slaughtering cattle one day, hogs another day and sheep a third day. Also in this case a public abattoir appear indicated.

Meat marketing in emerging countries

Emerging countries have by and large the same pattern of slaughtering and meat marketing as that which is known for Europe. One may distinguish between the following three types of operations:

A-type - The butchers will themselves slaughter their own animals in a public abattoir, often using their own personnel.

B-type - The butchers or wholesalers have the animals they own slaughtered in a public abattoir by contract workers which are employed by the public abattoir. The butchers generally pay a fixed fee for the operation (where public abattoirs are established today one generally prefers this type of organizaton).

C-type - The plant buys the animals directly from the farmers and sell the meat to wholesalers or butchers (this type gives favourable possibilities for the establishment of industrial meat plants).

One may often find a combination between type B and C, this means that one can establish an industrial line slaughtering but must combine this with a certain possibility for custom treatment of the individual animal. In this case a public abattoir with limited line slaughtering appear indicated. One serious difficulty at this type of plant is often found in that it is difficult or impossible to control if the butchers get their own animals with them and even more if they get the offal and entrails from the same animal.

Cases have been found where the butchers will attempt to bribe the operators in order to obtain better animals than those they brought to the plant.

In a tight supply situation the combination between type B and C also encounter difficulties. It is customary that the local butcher or meat trader or meat wholesaler will buy the animals against cash payments to the farmers at receipt of the animal. Industrial plants often uses some kind of time consuming payment system. The producers are often somewhat sceptical towards this and will prefer to sell their animals for cash. This results in the fact that the butchers generally obtain the best animals and also even where supplies are limited in sufficient number.

A. Bush-butchers

It may be worth noting that there often is another competitor to the organised slaughtering. Here is referred to the socalled bush-butcher, a person who with very simple means will slaughter the animals in the rural areas, the villages, nearby forests, etc. The meat is often sold in towns both to institutions, hotels, and to private venders at competitive prices because the person's operating cost is very low. Neither hygienic considerations nor veterinary inspection has taken place. Yet, these conditions can be difficult to control.

CONCLUSION

Especially where an export is concerned and where reasonable quantities of animals are available all indications suggest that one should consider the establishment of an industrial meat plant. The plant should try to obtain rather than [illegible] for the animal supply and establish regular trading [illegible]. The plant should preferably be located in a production area.

When [illegible] it will often be [illegible] pattern [illegible]

that it is unavoidable to have a public abattoir where custom butchering can take place. It is worth keeping in mind, however, that this solution is a much more expensive one and will result in quite expensive meat, and yet probably lower prices paid to the primary animal producers.

In establishing meat plants in new areas one need often consider that quite a large cost is involved even compared with the cost in industrialized countries. This is due to the fact that together with investment in buildings and equipment often comes investment in living quarter for all workers, schools, hospitals, transport facilities, etc. since no infrastructure is available for an industrial plant.

This latter means that it often becomes extremely costly to establish such plants. Therefore it is unlikely that any private party might have means and inclination to undertake the establishment. Therefore the state or local government will generally have to provide the necessary funds which it may then loan to a private corporation or use for the establishment of a public corporation. However, regardless of type of financing the same considerations as those given above apply to the choice between public abattoirs and industrial meat plants.

References

OEEC, European Productivity Agency. Slaughter house facilities and meat distribution in OEEC countries. 1959 Series. Paris. OEEC 1959.

N.E. Wernberg. Charts, Tables and diagrams

FAO/WHO Training Centre on Abattoir management. Copenhagen. N.E. Wernberg 1968.

Table 1

Pig-marketing costs involving transports of live animals or carcasses from the Oldenburg district to the Ruhr area*

(Distance about 300 km., cost in DM per animal of 120 kg. live weight)

Item	A Current costs		B Costs less official charges, etc.	
	Live animals	Carcasses	Live animals	Carcasses
I. [illegible] AND MARKETING COSTS (LIVE ANIMALS OR CARCASSES)				
1. Cost of preliminary transport from farm to loading point or abattoir	1.20	1.40	1.20	1.40
2. Transport costs	4.59	3.69	4.59	3.69
3. Transport and insurance	1.50	1.80	1.50	1.80
4. Commission charged by co-operative or abattoir	5.25 (1.75%)	6.20 (2%)	5.25 (1.75%)	6.20 (2%)
5. Cattle or meat market charges	1.35	1.43	1.35	1.43
6. Dealer costs				
a. on the farm prior to transport or at the loading point	0.70	-	0.70	-
b. at the cattle market	1.00	-	1.00	-
7. Other market costs (dressing, bank charges, postage, telephone, straw, porters)	2.15	1.50	2.15	1.00
8. Agent's commission	4.50 (1.5%)	9.30 (3%)	4.50 (1.5%)	4.65 (1.5%)
9. Losses in weight	6.40	-	6.40	-
10. Compensation fund	-	5.70	-	-
Total	28.64	30.22	28.64	19.37
II. SLAUGHTERING COSTS				
1. Drovers' charges from cattle yard to slaughterhouse	0.60	-	0.60	-
2. Inspection (including testing for trichina)	-	3.30	-	1.00
3. Charges for the use of slaughterhouse and cold storage equipment	7.20	4.90	9.00	4.90
4. Slaughterer's charges	2.50		2.50	
5. Cutting and cleaning	0.50		0.50	
6. Insuring slaughterer or distributing slaughterer against injury	0.25	0.25	0.25	0.25
Total	11.05	8.45	12.85	6.15
GRAND TOTAL	39.69	38.67	41.49	25.52

* Gross cost.

Table 2

Comparative capital cost of public abattoirs and industrial meat plant*

	BOWYERS Private Pig Slaughterhouse 1964		LEEDS Public Abattoir 1966	
Capacity, tons/year	20.000		35.000	
Output, tons/year	15.000		15.000	
	U.S. $	%	U.S. $	%
Site and Siteworks	52.000	7.5	228.000	7.5
Buildings	278.000	38.5	1.545.000	49.0
Abattoir Equipment	92.000	12.5	440.000	14.0
Refrigeration	100.000	14.0	121.000	4.0
Technical Services	126.000	17.5	470.000	15.5
Technical Administration	70.000	10.0	316.000	10.0
Total cost	718.000	100	3.140.000	100
Yearly Depreciation and interest 12½%	90.000		390.000	
Calculated costs per 100 kg. of meat	0.60		2.60	

* From N.E. Wernberg.

Table 3

Composition of costs of various types of slaughterhouses with different utilisation of capacity*

	Old public slaughterhouse		Modern public slaughterhouse		Average public slaughterhouse		Private commercial slaughterhouse	
Weight/tons p.a.	12,600		6,700		8,000		24,000	
Capacity " "	25,000		40,000		35,000		25,000	
	Swiss francs	% of total costs	Swiss francs	% of total costs	Swiss francs	% of total costs	Swiss francs	% of total costs
1. Depreciation and interest of the capital and reservation	424.000	21	290.000	29	395.000	45	167.000	13
2. Coal, electricity, water, etc.	237.000	12	108.000	11	111.000	13	309.000	24
3. Administration, telephone and sundry expenses	393.000	20	202.000	20	110.000	12	561.000	44
4. Labour and supervision	920.000	47	400.000	40	265.000	30	239.000	19
5. Total costs	1.974.000	100	1.000.000	100	881.000	100	1.276.000	100
6. Calculated costs per 100 kg. of meat	16.5	.	13.4	.	11.0	-	5.3	

* Type unit:

Figure 1. Meat marketing routes.

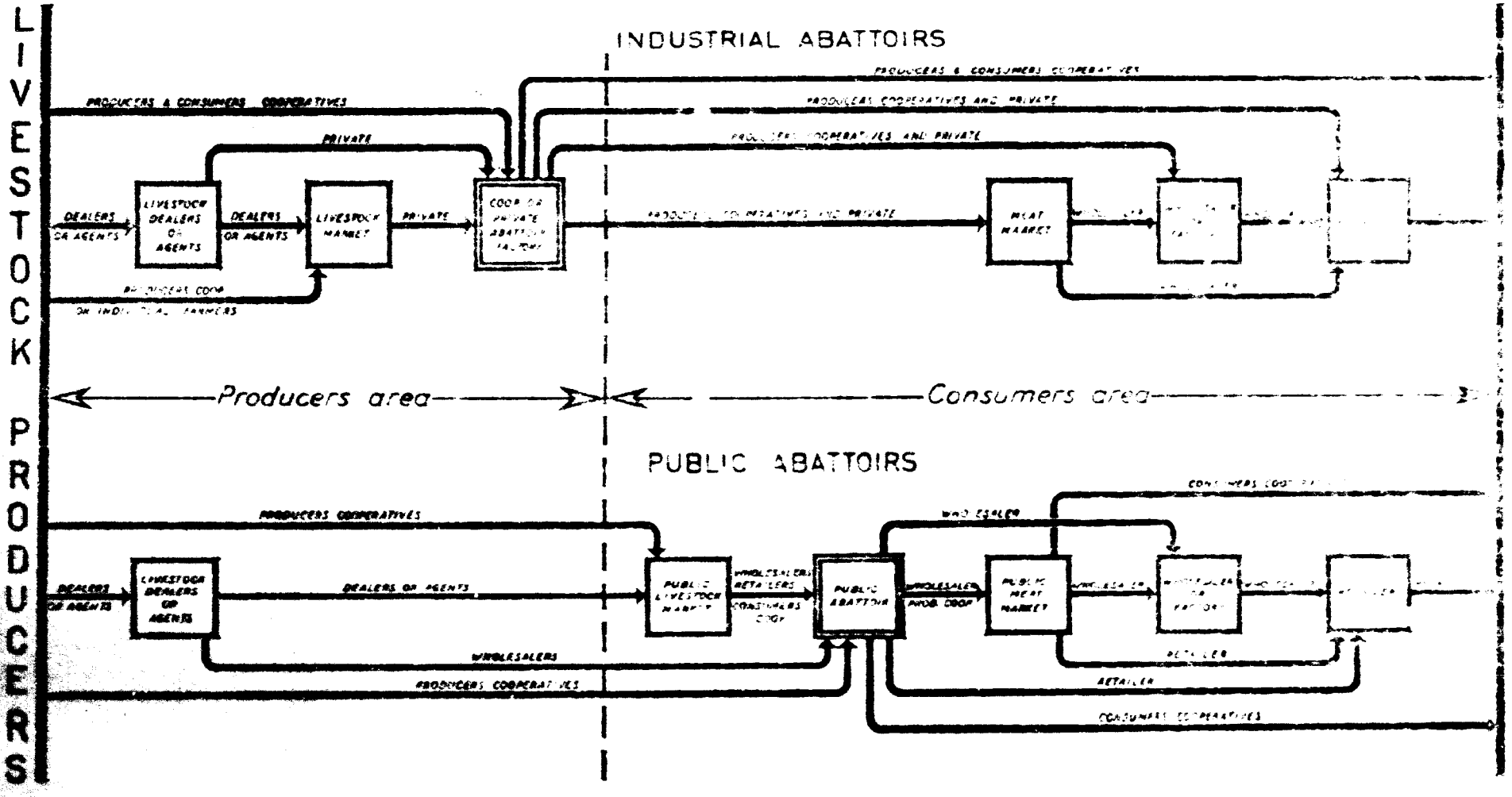


Figure II

Building floorareas

Required in various sizes and types of Abattoirs
with outputs of 100 tons to 5000 tons of meat per years

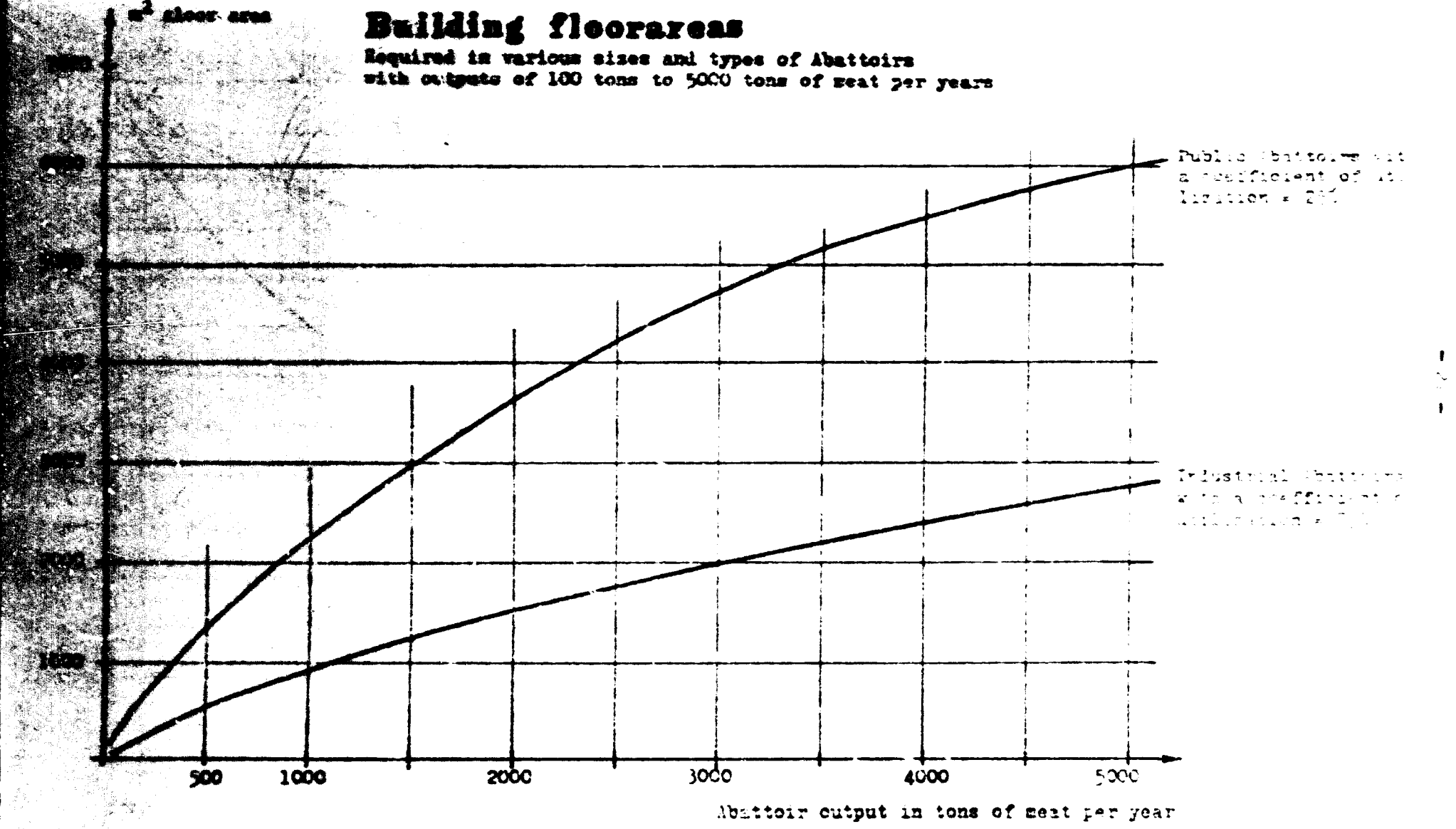


Figure III

Building floorareas

required in various sizes and types of Abattoirs
with outputs of 5.000 to 50.000 tons of meat per year.

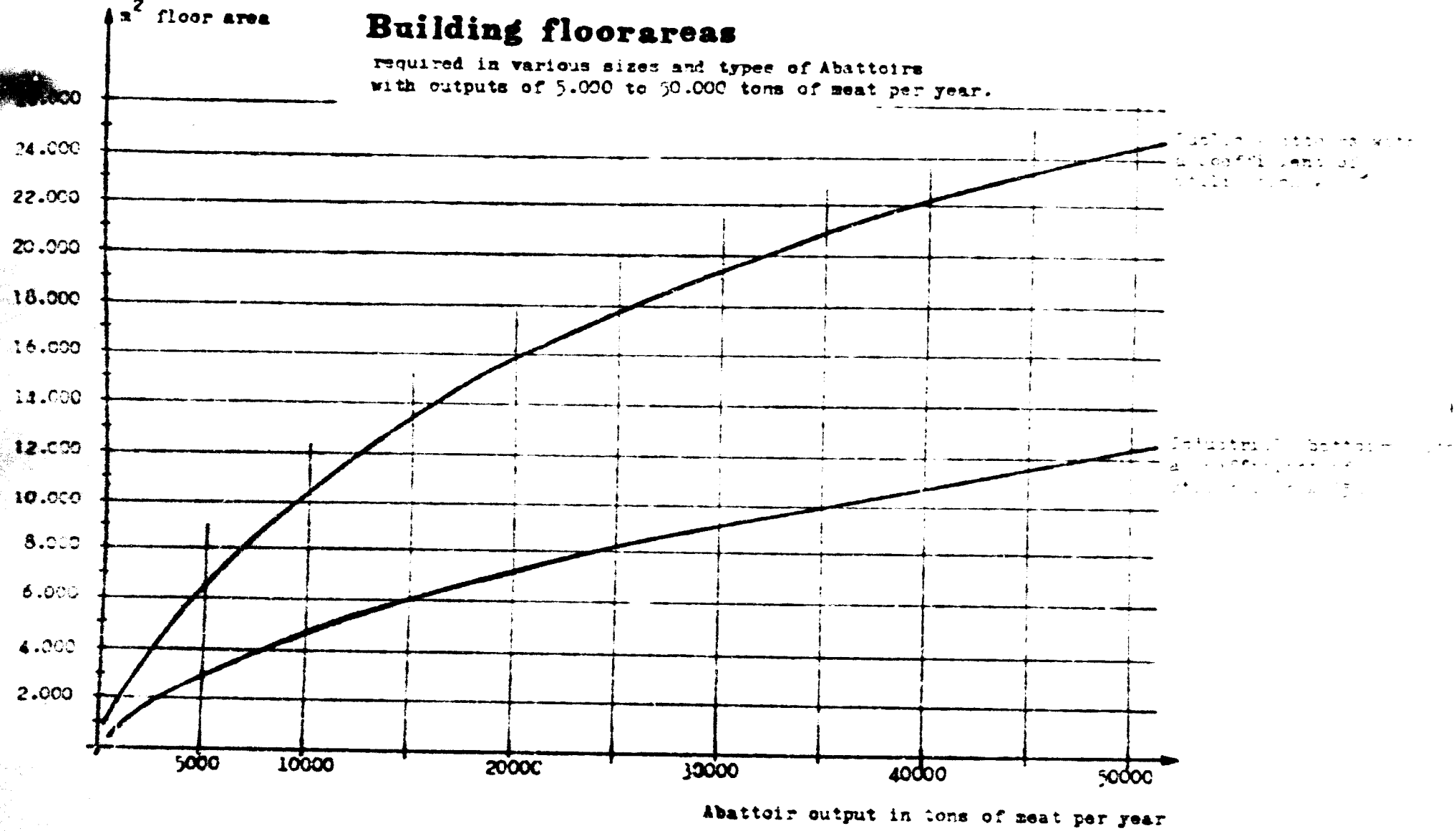


Figure IV

Cost of Abattoirs

of various sizes and types with outputs from 100 to 5.000 tons of meat per year

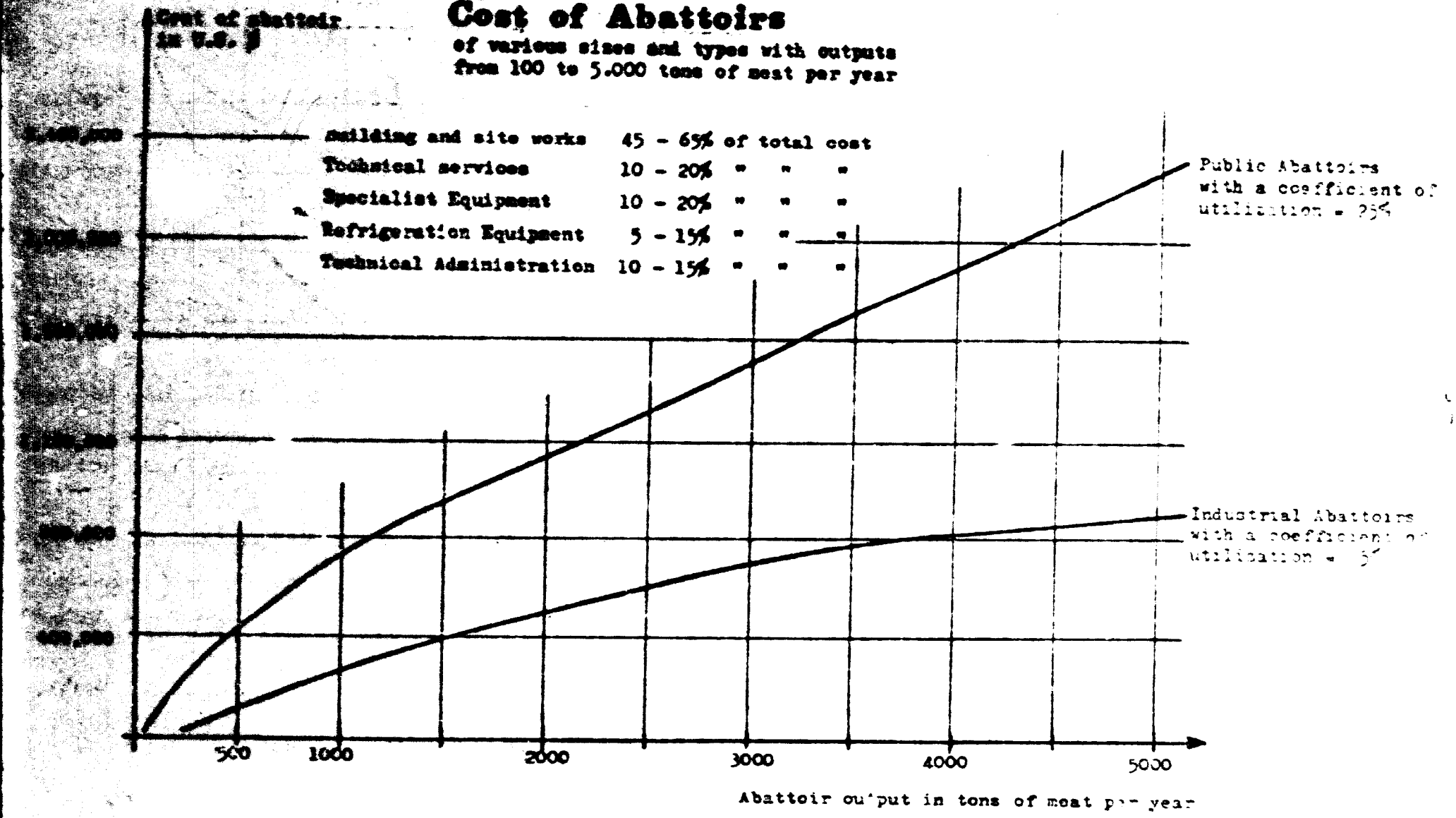


Figure V

Cost of Abattoirs

of various sites and types with outputs from 5000 to 50.000 tons of meat per year

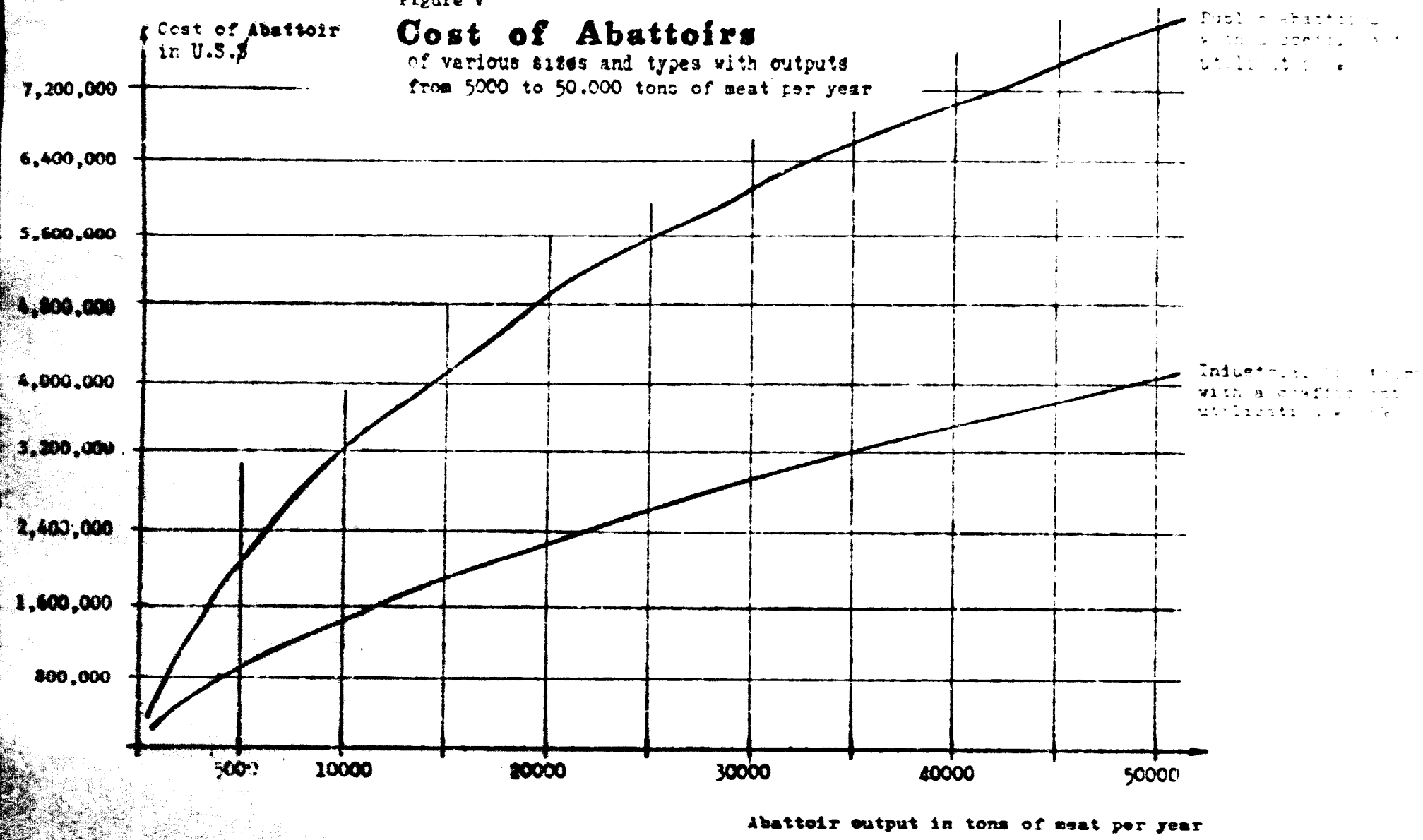


Figure VI

Operating costs

of various sizes and types of abattoirs with outputs from 100 tons to 5.000 tons of meat per year.

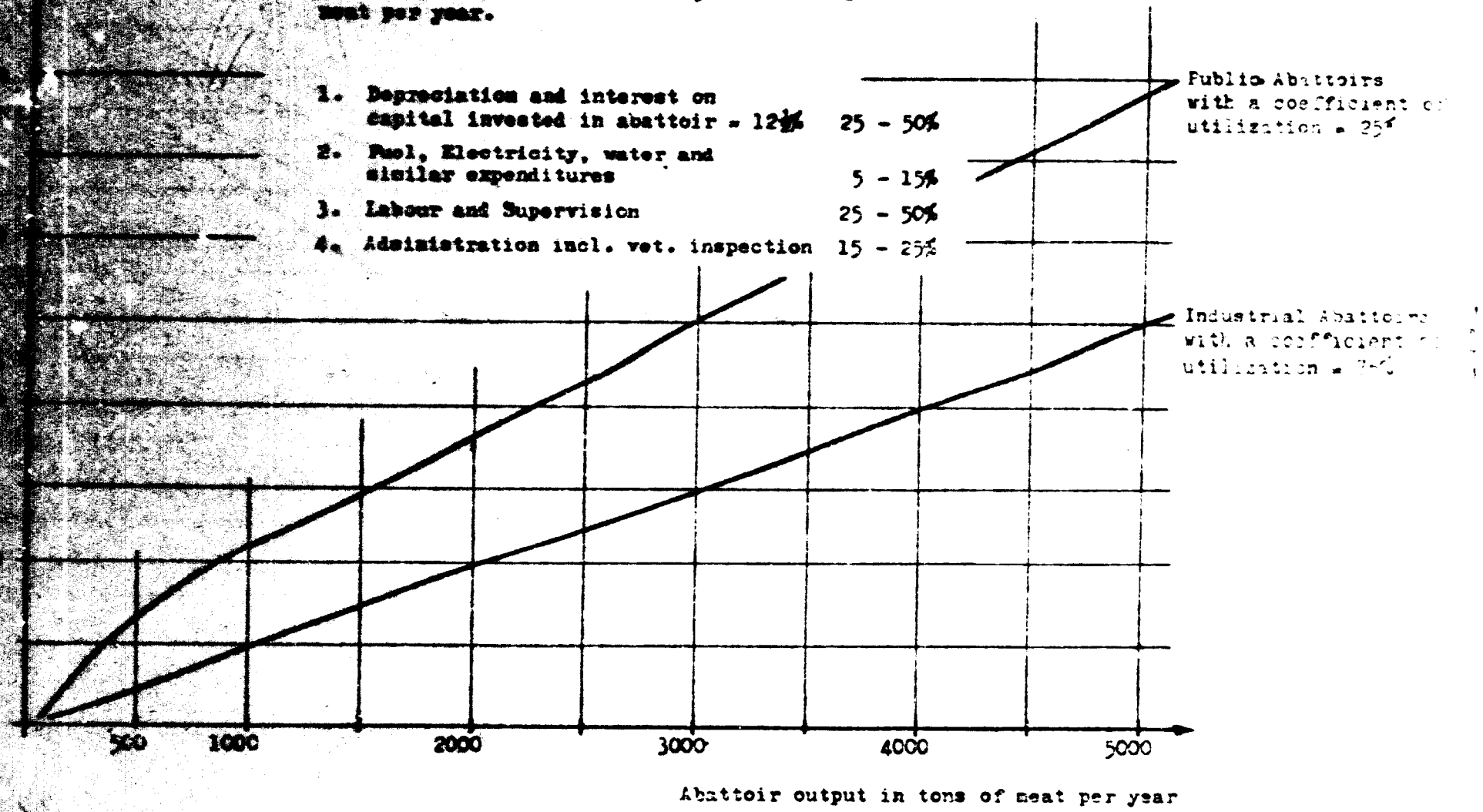


Figure VII

Operating costs

of various sizes and types of abattoirs with outputs from 5.000 to 50.000 tons of meat per year.

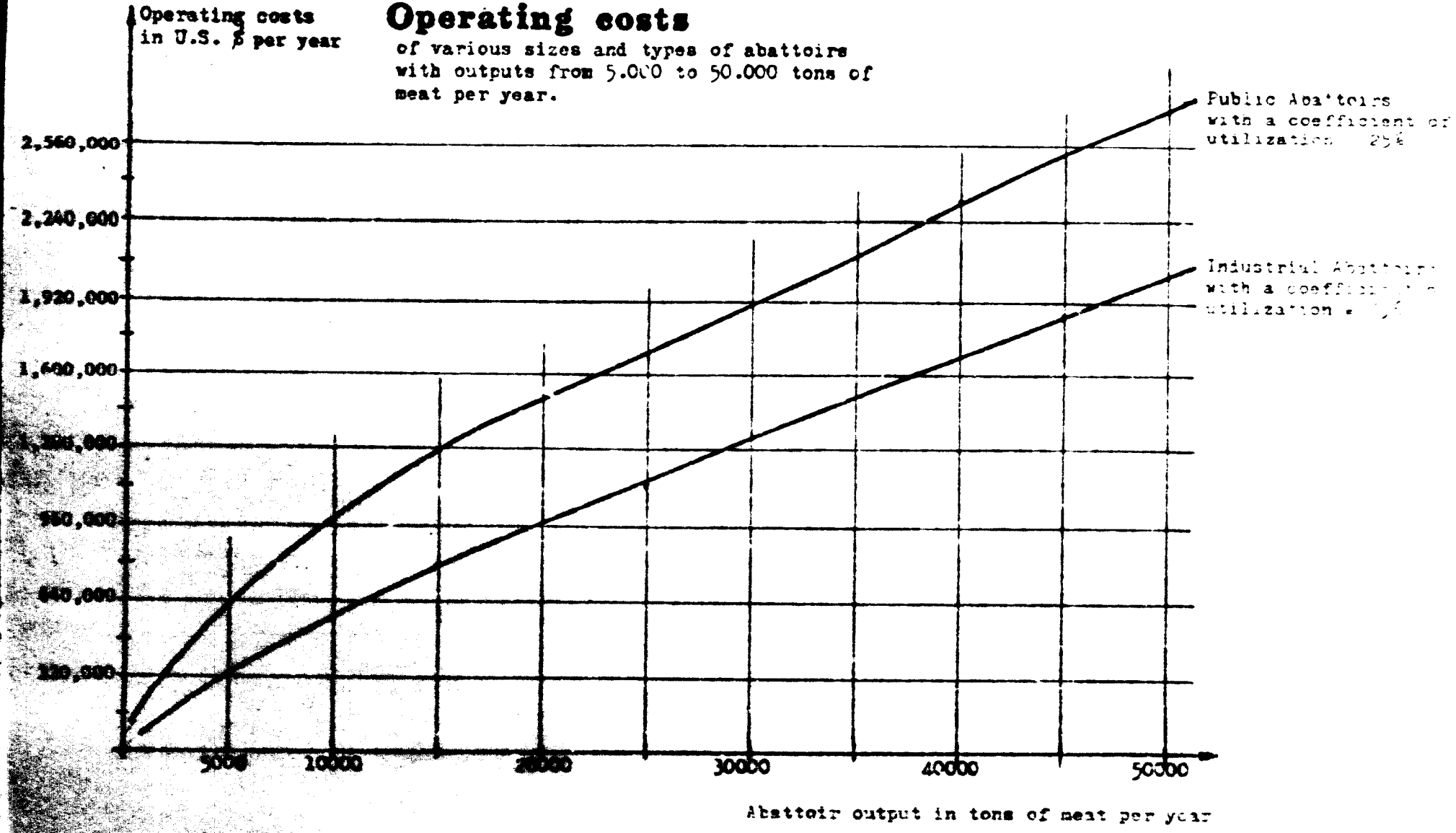


Figure VIII

Cost of slaughtering

100 kg of carcass meat in various sizes and types of abattoirs with outputs from 100 tons up to 5000 tons of meat per year

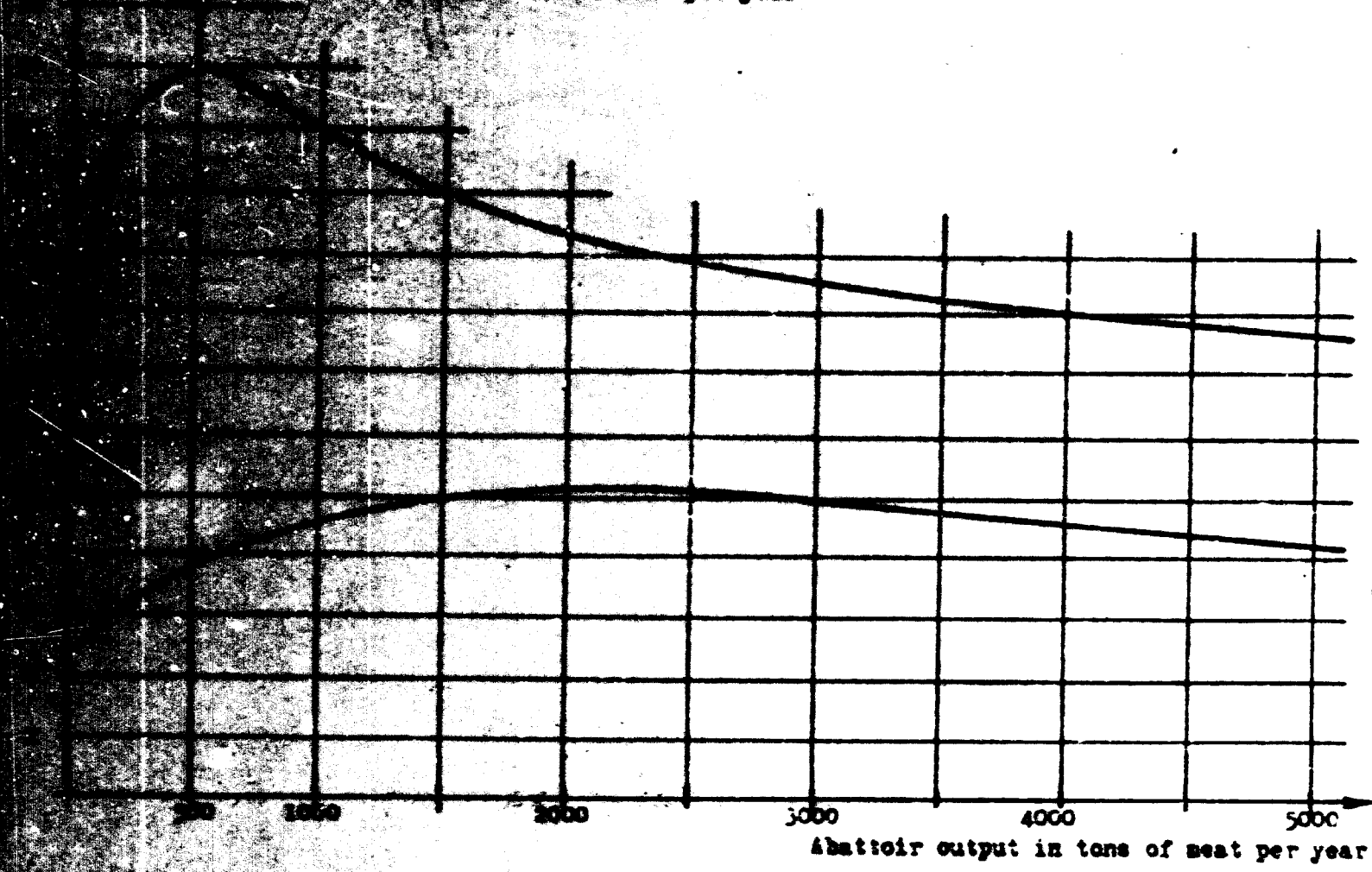
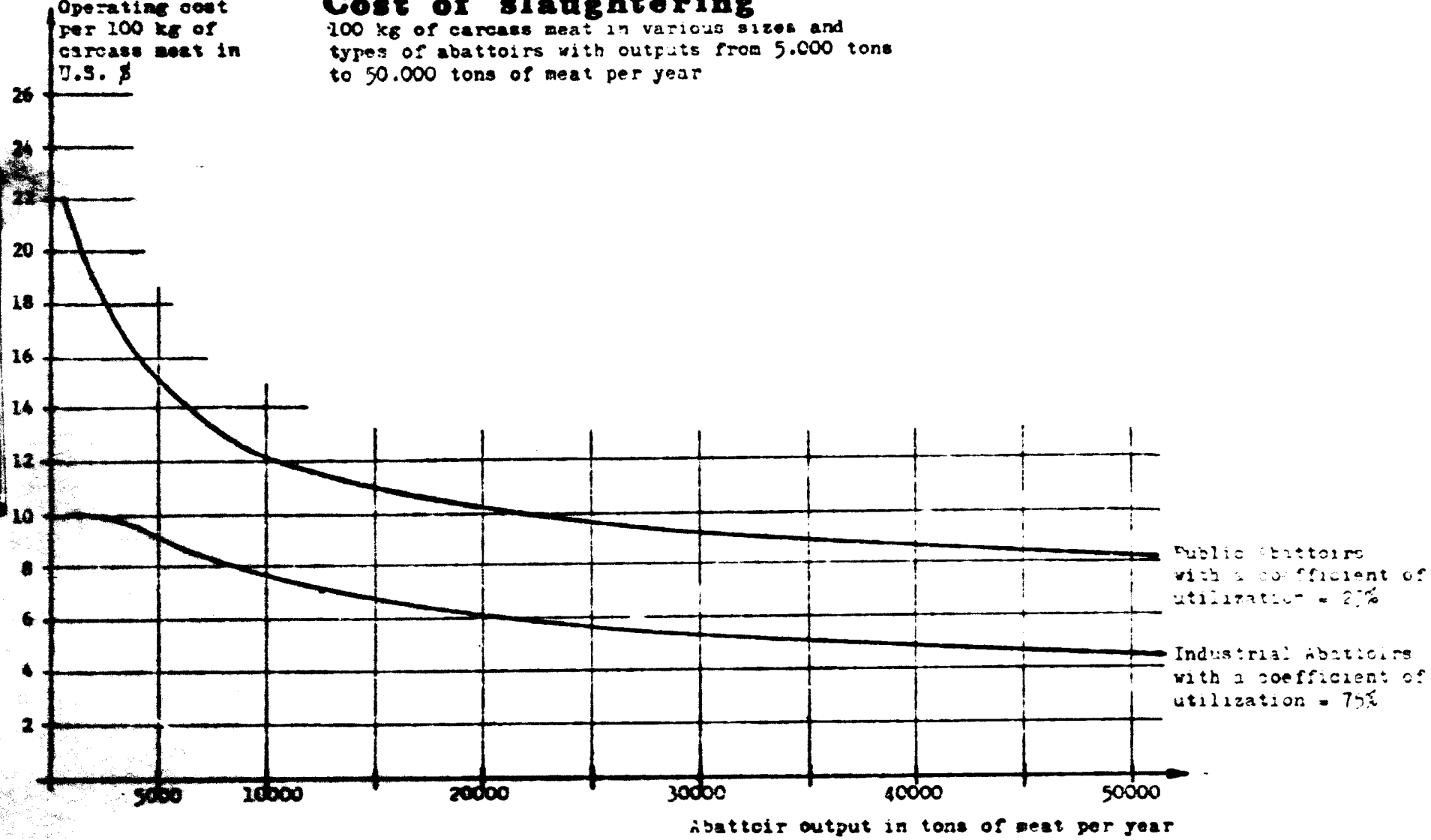
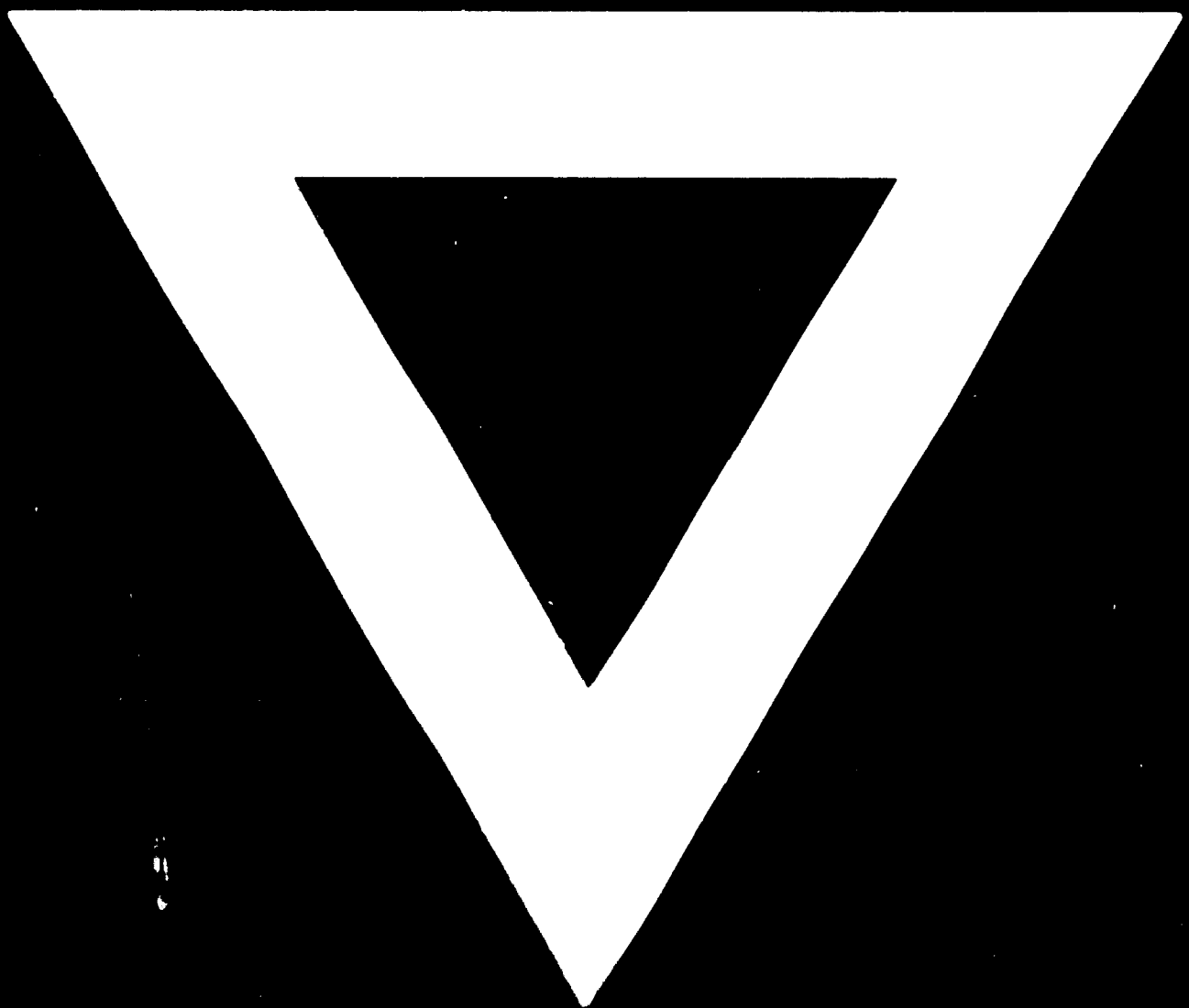


Figure IX

Cost of slaughtering

100 kg of carcass meat in various sizes and types of abattoirs with outputs from 5.000 tons to 50.000 tons of meat per year





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