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MEETING THE DEMANDS OF FOREIGN MARKETS' MEAT [1/]

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Meeting the demands of foreign markets

A relatively high proportion of the Danish meat production is exported. Total sales of meat and meat products at wholesale price level amounts to 9,000 mill. D.kr. (1,300 mill.U.S.$) per year. Out of this 5,400 mill.D.kr. or 60% is exported. The exports are spread quite widely with major consumers in the Federal Republic of Germany, Italy, Sweden, U.K. and U.S.A. This means that like any food industry the Danish meat industry must comply with domestic regulations and know the Danish tastes. More important, however, it has had to learn to manufacture a great variety of products specifically suited for various foreign tastes and meeting legal or veterinary requirements different from those which apply for domestic products.

The task of seeing to it that the various requirements are complied with is carried out at three different levels, firstly, at an official level, secondly at a joint government-industry basis and thirdly, by the manufacturers who maintain their system of quality control which is often quite elaborate.

Determining veterinary requirements

For meat products, the main legal requirements are veterinary regulations. As a meat exporting country Denmark must know the veterinary import regulations, which are often very detailed, in a great many countries. Fortunately, the Danish Veterinary Service is an active member of what might be referred to as the world net of veterinary and health inspectors; this means that the Danish veterinary authorities very quickly and most often directly are informed of veterinary requirement in any receiving country.

Enforcing veterinary requirements

The Danish Veterinary Service is a government agency. It has an extensive system of regulations, rules and circulars. It has a veterinarian in charge at each meat processing plant, normally present at the plant during all regular

working hours. He may have other veterinarians as his assistants and will normally also have one or more full time veterinary technicians to carry out certain routine inspection tasks.

Determining other legal requirements

Domestic requirements. Danish meat products must of necessity meet the Danish requirements both with regard to veterinary regulations and general legislation as it applies to wholesomeness, fair trade, etc., for food.

One question has frequently arisen which every exporting country may have to face. The Danish domestic requirements are sometimes stricter than those of an importing country. Some feel that it would be hypocritical not to let the strictest regulation, i.e. in this case the Danish, apply. This, however, would place the Danish industry at a competitive disadvantage. Also, some feel that it is not up to Denmark to decide what and how other countries should eat and that, therefore, only the regulations of the receiving country should apply for products that are exported. The Danish food law tends to agree with the latter view. This, on the other hand, does raise questions with regard to what should be done with a product if it is not exported to the country for which it was intended, etc.

Another problem is also frequently encountered, namely what should the Danish authorities do if foreign countries have regulations which are not really enforced. This is quite frequently the case, especially in the form of outdated food laws. This places the Danish authorities in a peculiar situation. They can hardly require that rules not enforced in a receiving country should apply to Danish products shipped to there and it is equally difficult to disregard them. Normally, a solution has to be found for each case as it arises.

Foreign requirements. For those foreign regulations which are not part of the veterinary meat control system, it is often quite difficult to get exact information. This is, for instance, often the case for regulations pertaining to food additives, net weight, date marking, etc.

The Danish Meat Products Laboratory attempts to maintain an intelligence service in this field. This means subscribing to several foreign official gazettes, also to trade journals which frequently are very valuable since they are quick to report new developments and even changes in administrative procedures or new interpretations, etc. Often these are not easy to come by through official channels.

In addition, a great deal of travel is required by the laboratory staff in order to maintain contacts in other countries. Contacts of this kind are also established through participation in the Codex Alimentarius work. While the usefulness of this effort will be touched upon later, it is unquestionable that the contacts that it leads to between authorities in the various countries are of great value. Much the same applies to the work of the International Organization for Standardization.

Enforcing other legal requirements

Some foreign requirements which are not part of the foreign veterinary meat inspection system, are brought to the attention of the Danish Veterinary Services and may eventually be incorporated into the requirements which are enforced by the Danish meat inspection system. In some cases foreign authorities, normally the meat inspection system of the receiving country, will even require that the veterinarian in charge at each plant in Denmark certify that certain requirements have been met.

Adherence to other legal requirements are enforced by the Danish Authority for Bacon Inspection and Control or the Danish Meat Products Laboratory. Each has visiting inspectors checking on the products at the manufacturing level and withdrawing samples from production to ascertain that requirements as for instance regards composition of brine, salt content, meat content, amount of added substances, etc., are met. Similarly, labels are inspected to ascertain compliance with foreign requirements.

Determining foreign quality requirements

It is often very difficult to get to know the taste preferences and other organoleptic characteristics which are important to foreign users. Foreign buyers, e.g.importers and wholesalers, have a great many requirements as to cuts and trims of carcasses, carcass meat and cut-up meat, apperance of Wiltshire-bacon, canned hams, prepared dishes, salami, etc. These, of course, have to be complied with since otherwise the product would not be imported. One interesting problem arises in the fact that not all such buyers are completely aware of developments in consumer's preferences in their own market. There are cases where consumers tastes actually are different from the concept the importer has thereof. The Danish industry is left with the need for maintaining a market intelligence system with offices in major importing countries. Following the advice of importers and Danish agents abroad, results of market analyses, etc., product adaptation has to be in agreement with what is the real requirement of both the foreign importer and consumer.

Animals that meet foreign demands. Some meat is sold in carcass or near carcass form. This for instance is the case for pig meat exported from Denmark to the U.K. as Wiltshire-bacon which is in fact cured pork sides.

In this as in several cases market requirements with regard to the relationship between fat and lean have been met by proper breeding and feeding the animal since no trimming or cutting is practical.

Pig breeding and feeding experiments in Denmark have concentrated mainly on the development of a pig suitable for Wiltshire-bacon for export to Great Britain. A period of experimentation and selection led to a special breed of the so-called Landrace pig, the Danish Landrace.

Over the years the tendency has been towards a desire for a leaner and leaner animal on the English market. Originally, much of the selection and breeding experimentation was based on the study of the conformation of the animal, its appearance, etc. However, it now became clear that the outer appearance of an

animal has little relationship to such factors as thickness of layer of fat, ratio of lean to fat, etc., nor to other characteristics desired by the consumer and apparent only in the cut-up pig. This meant that breeding and feeding experiments and testing had to be based on measurements on a slaughtered animal. The system works in this way that four piglets from the breeding stock to be tested are sent to one of by now four progeny testing stations. Here, the progeny is fed under controlled conditions to the desired weight and age and it is then,under conditions standardized as far as possible, taken to a slaughterhouse, slaughtered, split and trimmed in the normal fashion. Then the sides are cut and one determines such factor as internal fat measurements, lean-to-fat ratio, etc. The breeding animals, both boar and sow, are judged on the basis of the results of such progeny testing.

The critical problem was determining the criteria to be used in the selection. As mentioned above, first the outer appearance was used but proved to be of little value. Then, since thinness of fat was a major concern for the British buyer, the selection was based on the thickness of the back fat along the back of the split pig. The improvements were considerable, exhibit 1 shows how from 1929 to 1970 the average back fat thickness was reduced from more than 4 cm to less than 2,2 cm.

Another breeding characteristic was body length. As will be seen also from Annex 1 over the same period the body length was increased from about 88 cm to 96 cm.

However, eventually some camplaints occured about pigs designated "slight-of-lean" pigs. These were extraordinary in that they had a thin fatty layer along the back. Further to the side on the carcass, however, the fatty layer was quite thick. This could be seen only in a cut-up side, not in the split side as normally exported to Great Britain.

For this reason thickness of the side fat was introduced as a further characte-

ristic in breeding. As exhibit 1 shows this quickly lead to a remarkable improvement. The thickness of the side fat was reduced from 2,8 cm in 1959 to less than 1,6 cm in 1970; this improvement still continues.

Meanwhile, some further defects in the selection system became apparent. Selection was made on the basis of back fat thickness. What the customer wanted was really a large ratio of lean meat to fat; therefore, another characteristic was introduced, that is per cent lean meat in the side as apparent in the cut-up side of the progeny.

However, further criteria became important. The breeding stock showed a tendency to producing excitable animals which might show some defects in meat quality, e.g. poor water binding capacity, poor color, etc., i.e. so-called PSE (pale, soft, exudative) or DFD (dark, firm, dry). For this reason, laboratories were established at the points where the test progeny was slaughtered. Here, the quality of the meat, its color and suitability for curing are actually tested.

All these tests carried out on progeny have one large drawback. In order to determine the suitability of a boar or a sow one had to examine quite a number of progeny by actually feeding them to the desired size and weight and then slaughtering them. Among this progeny might be the best breeding stock. As a matter of fact, in each litter it is very likely that one pig might be more suitable for breeding than another. This could only be tested by examining the progeny of all.

For this reason the Danish Research Institute for Animal Husbandry together with the Danish Research Institute for Welding developed a meat scanner as outlined in Annex 2. This has much the same characteristics as an echo sounder. The apparatus is brought into position on a live pig and the transducer head is moved over the side of the pig. Reflections of the waves transmitted occur at the various dividing lines between meat and fat. A picture of the side is then flashed on a cathode ray screen much like a TV tube. In this way the ratio of lean-to-fat and the various fat measurements may be obtained with reasonable accuracy from the live pig and the best pigs may be selected as

breeding stock.

Setting product quality requirements for export. Once an appraisal has been made of the foreign quality requirements for a product, Danish specifications have to be drawn up. Obviously, in this, economics must be considered. Were price no consideration, even the highest quality could be met. In reality, what amounts to good manufacturing practice and a quality generally acceptable in the importing country has to be used as the minimum quality which may be exported.

Not infrequently, several grades have to be accepted, e.g. first, second, and third; A, B, and C; fancy, choice, and standard. Failure to set several grades or quality levels often lead to the minimum quality being set at too low a level and yet so high that too much of a production has to be rejected.

Thus, setting standards and specifications require a thorough knowledge of the market opportunities. The Danish Authority for Bacon Inspections and Control and the Danish Meat Products Laboratory, which are both Government agencies, base their work on the assumption that it is neither possible, nor practical, for a government agency to determine what requirements should be as regards quality criteria and specifications. Both services have an industry board which determines the general administrative procedure and an evaluation panel which decides on details with regard to quality requirements. Once rules have been determined the two services are obliged to enforce these uniformly in all plants.

As mentioned, the evaluation panels together with the agency develop specifications. These serve as guides for industry for producing these products in accordance with the quality requirements. Also, they are used by the evaluation panels for checking whether a product meets the requirements once agreed upon and they are used by the laboratory's inspectors when they are inspecting samples in the plants. The specifications are so designed as to cover all aspects of the market requirements. They are drafted after examination of samples purchased on the market and after discussions with marketing persons with experience in that market, using also any results available from laboratory analyses.

The specifications cover such legal requirements which may be made by that particular country to the product. One example is shown in annex 3.

Enforcing quality requirements

Once specifications and general quality requirements have been agreed upon, inspectors from the Danish Authority for Bacon Inspection and Control or the Danish Meat Products Laboratory will visit plants and warehouses to ascertain compliance with the requirements. In so far as Wiltshire-bacon is concerned, a great many manufacturing details are included in the specifications. Therefore, the Authority has to verify in the plants that these regulations are followed. One such criterion is the amount of brine injected into each side. A strict control with this is maintained by the Authority, using sealed liquid meters, etc. In addition, inspectors from the Authority inspect the finished product. If this does not comply with the regulations, a member of the evaluation panel is called. If he verifies that a violation has taken place a warning is issued; repeated offenders may receive a fine.

In addition, the Danish Authority for Bacon Inspection and Coltrol takes out at regular intervals, Wiltshire-bacon sides from all Danish bacon factories. They are evaluated by the bacon evaluation panel. Scores for each quality characteristic are given and the various establishments are listed in accordance with the score. The desire for getting a high score may be an incentive for the plants. Those with very low scores may receive a warning or even a fine.

The Danish Meat Products Laboratory inspects a great variety of products. It is considered most practical that each factory uses such manufacturing methods which they themselves consider most appropriate. Since the customer sees the finished product, the quality control is based on inspection of that only, the only exception being that of controlling thermal processes for canned products.

Here, quality evaluations are carried out twice every week. The day after each session every plant receives a notice of the scores assigned to each sample of each product. This serves as a guide to the production personnel who will know exactly how the plant stands compared with others and where improvements are indicated.

Inspectors from the laboratory also visit the plants and tests the products there, in the presence of factory personnel. If defective products are found following the sampling plan given below such productions are refused export. Such cases, or cases where lots of low albeit acceptable quality are found, lead to an increased frequency of inspection for that plant.

Sampling plans. It would be understandable if an authority, having established quality requirements for each type of product, would inspect one or more samples from each lot of goods produced and hold back the lot until the sample had been examined and found acceptable. However, the export from Denmark of meat products amounts to some 25 mill D.kr. (U.S.$ 4 mill) per day. Holding back this amount of produce for just one week would require large increases in warehouse capacities and constitute a serious loss of interest on money invested. In addition, inspecting one sample from each batch produced would require a laboratory at least five times the size of the present ones and four times as many inspectors. Funds are not available for such a large undertaking and it would hardly be justified. Therefore, in this as in most inspection and control systems, one has to base the system adopted on the funds and facilities available for control purposes and determine how these can be put to the most efficient use.

Since many meat products exhibit considerable variations even within any one batch, it may not be correct to rely too much on the findings from the examination of one sample from a batch. The Danish Meat Products Laboratory has adopted the sampling plans indicated in Annexes 4 and 5. These show how the initial sample is six units except in the case of very large units, e.g. canned hams in 21 lb cans, where each unit is especially valuable. Here only 2 units are withdrawn. A decision is then made on the basis of inspection of those 6 o 2 samples. If defects are found, the sampling plan indicate how many further units must be withdrawn and what decision should be reached with regard to the lot.

Subjective quality determination. As regards subjective quality requirements, a committee, the so-called evaluation panel, will for each product group study each type of product produced and reach a decision as regards the organoleptic

quality to be required. On the basis of this, inspectors from the laboratory inspect the products at the plants to verify if the products meet the requirements set by the panel normally using the abovementioned sampling plan.

Thus, a critical part of the system is the evaluation panel. It is composed of industry representatives, selected evenly from sales departments and production departments. Experience have indicated that sales personnel tend to have difficulties in determining exactly how qualit, should be; it appears as if they hardly can discuss quality without also considering price. Their counterpart on the panel is production people; they have a tendency to be very strict when it comes to defects which are due to work carried out by inexperienced or negligent operators, etc., while they tend to be lenient when it comes to defects due to the raw material or factors beyond the immediate control of the operators in the manufacturing process. Also, they tend to be conservative and prefer a product and a quality with which they themselves have become accustomed.

In addition to making decisions as regards desirable quality levels, the evaluation panels work out proposals for specifications for the products and comment on all procedural and technical matters regarding the quality control system, their proposals to be submitted for approval to the administrative board. In addition, two of the evaluation panel members are invited to attend the weekly evaluation sessions at the laboratory to decide whether decisions made by the laboratory staff during the past weeks have been in accordance with the agreed standards of the evaluation panel.

The procedures used for establishing an evaluation panel and rules for the conduct of its business are given in Annex 6.

Since determining the required quality level realistically is the most critical part of the system, much effort is put into informing the quality panel. The laboratory has an extensive network whereby samples of products from other countries are purchased on the foreign markets, shipped to Denmark and studied by the evaluation panel in cooperation with the laboratory staff. Such comparisons make it easier to determine what the quality level should be. The labora-

tory also makes an effort to arrange for visits by foreign specialists to discuss quality requirements with the panels. Finally, where it is economically feasible, trips to the more important market areas are arranged for the panel in order that they may discuss market requirement directly with importers.

Objective tests. For several products a great variety of objective tests for quality have been established. Thus, various formulas have been developed to determine the meat content of meat products, added salt and water in cured products, the center temperature reached during heat processing of canned meats, presence and amount of non-meat additives, etc. Many of these tests are required by foreign purchasers or foreign authorities. Where this be the case the laboratory has to follow or develop a sampling plan. One such plan is illustrated in annexes 7 and 8 which apply to cured shoulders exported to North America. In this case, a quality control chart as shown in annex 8 is maintained at the laboratory for each plant and the rules indicated in annex 7 apply. This particular requirement is one set up by a foreign import authority. It appears to have the drawback that a plant may fail for quite a bit before sanctions begin. Conversely, a plant may have its production withheld awaiting laboratory analyses for quite a long time before it is again permitted to export without prior approval by the laboratory.

For other objective tests sampling plans are drawn up by the laboratory through its quality panels and administrative boards. Examples for meat content analyses are shown in annex 9.

Many countries have regulations as to the amount of water which may be added to cured products. It is well known that it is technologically necessary to add some water during curing but it is, of course, undesirable that excessive amounts should be added. Such procedures might lead to abuse, e.g. if one producer were to use water in excess of the amount used by other producers.

In the case of Wiltshire-bacon Denmark has a carefully controlled system whereby the pumping pickle is controlled for each side. Each plant has a meter sealed by the Danish Authority for Recon Inspection and Control. The Authority

checks on the number of sides produced and relates it to the amount of brine used. The amount of brine permitted in each side is limited to 1,5 litres. This is to avoid excessive shrinkage in England; the fact that it is strictly controlled has been a factor which has given considerable confidence in the quality of the Danish Wiltshire-bacon.

For other products the amount of added water is normally controlled by analytical means. Here, it is assumed that the composition of the fat-free part of the meat is 20% protein and 80% water. This means that a sample can be taken and its nitrogen content determined. This is then multiplied by 6,25 to obtain the amount of protein.

A water and salt analysis is also carried out. If the amount of salt and water is 4 times the amount of protein or less it is normally assumed that the product has been produced without a weight gain. Conversely, tha amount of salt and water in excess of 4 times the amount of protein is normally considered to be that amount which was added during the process.

It is clear that this cannot be a completely exact measurement since the amount of protein found in the lean parts of meat will vary quite considerably. For instance in annex 10 are indicated the factors which are used instead of the factor 4 suggested above, for calcualting the amount of water naturally present compared to the protein content in meats exported to the U.S.A.

In most cured products, a certain amount of water or salt and water uptake during curing is accepted. As an exampla annex 10 gives the amounts permitted in the U.S.A.

Information systems. The Danish Meat Products Laboratory has accepted as its purpose to make certain that inferior products are not producad rather than rejecting tham by an inspection system. This means that the manufacturers need extensive information as regards what the requirements are and how they can be met. The laboratory has a staff of consultants who visit the various plants and advise on how the required quality can best be met. In addition, personnel

from the plants are invited to participate in the sessions of the evaluation panel simply to give them an opportunity of becoming better aquainted with the requirements of those panels. Finally, the laboratory frequently invites the industry as a whole to special sessions where the evaluation panel and the laboratory staff present to the participants various samples of Danish and imported products and discuss in detail what the quality level is and what it should be, point out defects and discuss how they can be avoided, etc. In addition, of course, the plants receive a variety of printed information, e.g. such as annex 3.

Determining quality requirements in industry

Quite apart from official requirements, each plant must have its own guidelines. These may be minimum requirements above those stipulated by official agencies since a plant may manufacture products of a particularly high quality demanding an extra high price. Conversely, however, a plant will have guidelines, expecially as regards yields, etc., to make certain that the production is economic. These standards are worked out in close collaboration with customers, e.g. large scale buyers in foreign countries, and internally with the industrial engineering and the accounting departments.

Surveillance of quality in industry

An industrial plant can carry out daily quality evaluations, much along the lines followed by the official control bodies. This, however, should only serve as a final check in a much more integrated control system. Normally, quality control personnel is present during the various stages of manufacturing to make certain that mistakes do not occur which would result in eventual rejection of a product Often, these internal quality control inspectors may have to withhold batches of raw material, packaging material, etc., to the annoyance of operating personnel. Therefore, the quality control staff should report to the general manager or the technical manager or some other person who is a member of the top management team of the company. Otherwise, if quality control reports to sales, decisions tend to be somewhat dependent on price fluctuations. If it reports to production, too much leeway may be given since production tends to feel that it is more important to produce than to produce quality.

As already mentioned, quality control personnel must be dispersed throughout the plant. It is of little value for management to be informed that a quality control laboratory has inspected some finished products and rejected them for sale. This is a great financial loss and very often simply not economically nor psychologically feasible. Instead quality control personnel must have many stations throughout the plant, keep records, check weights, etc., to see that mistakes do not occur. Thus, quality control personnel has to monitor the quality of the meat raw material and also to see to it that for instance fresh meat is being used before it is too old. Similarly, quality control personnel has to check on temperatures during meat processing, etc., all in order to make certain that defective products are not manufactured.

Similarly, the quality control personnel must check on plant hygiene, where canning occurs, it must check on retort equipment, double seamers, etc. In connection with any such control, the results of examination of the finished products should be reviewed to determine if improvements in some parts of the production control are indicated.

Controlling fat content. Comminuted meat products normally have to meet a specific fat content, e.g. for luncheon meat maximum may be 30%. Exceeding this level would result in the product being retained, while a fat content much below that would constitute an economic loss since the fat is normally the least expensive meat ingredient.

Comminuted meat products are generally manufactured by chopping and grinding various batches of meat trimmings. It is not easy to estimate the fat content of each batch. Therefore, it becomes difficult to arrive at the right fat content in the finished product. Thus, a rapid method of analysis for batches of meat trimmings becomes important.

The Danish Meat Research Institute has developed one method, illustrated in annex 12. 30 kg of each batch is taken out by selecting at random portions from various places in the batch in an attempt to make certain that the total sample is as representative of the composition of the batch as possible. The 30 kg of

material are placed in a container in such a manner that not too many air pockets are formed during packing. The material is then placed on a scale as shown in annex 12 and is filled so that exactly 30 kg have been placed in the container. The container is now placed on a vibrator platform and water is added with a perforated steel spear, with which the contents of the container are also gently stirred. In this way water is added and most of the air pockets are eliminated. The stirring has to be carried out quite carefully in order not to whip air bubbles into the material. The container is filled up almost to the rim with water and a lid is placed on it. Now the container is connected to a vacuum pump and evacuated until a pressure of 0,8 atmospheres has been reached. This process should eliminate all air pockets. The container is now returned to the scale and connected to the water supply in such a manner that it is filled up completely with water. A new reading is taken on the scale and the fat content of the sample can be read directly or the face thereof. Different readings are used for fresh and for salted materials. After measurement, the sample is placed in a tub. When the water has drained off the meat is returned to the batch from which it was taken.

One will see that the method is based on an indirect measurement of specific gravity, this, of course, being indicative of the fat content of the meat sample. In annex 13 a conversion diagram is given for the relationship between specific gravity and fat content, this to be used for fresh meat; another has been worked out for meats which have already been salted.

Normally three readings of this nature are made on each batch of raw material.

Another method is based on a very rapid fat determination by chemical means. In this only a very small sample is used; therefore, it is mandatory that a representative sample from the batch be withdrawn as indicated above. This sample is passed through a meat grinder several times in order that it may become completely uniform. From there a small sample of approximately 45 g is transferred to the instrument in which it is dried, extracted with tetrachlorethylene and the specific gravity of the solution containing the fat from the sample is measured; this then gives a direct reading of the fat content of the sample.

The difficulty with both methods is, of course, that it is difficult to eliminate errors due to the considerable variation which may occur within a batch due to various pieces of meat therein having different fat contents.

Systematic use of the former of these two methods have made it possible to reduce variations considerably. In dry sausage, for instance, one may aim at a fat content in the finished product of 60% but actually experience variations from 40 to 70%. With the first method suggested, variations may be reduced to from 57 to 61%.

Flow sheet analyses of plant sanitation. In former years much emphasis was placed on the appearance of work rooms, tiled floors and walls, an adequate number of wash bowls, the use of stainless steel to the exclusion of wood, galvanized iron, etc. Also much energy and work was devoted to plant clean-up. The rationale behind this was that easy-to-clean equipment and plant will invite good sanitation and also, that working time used for plant clean-up was always considered an investment well spent.

However, work carried out by the Danish Meat Research Institute and the Danish Meat Products Laboratory suggested that a closer look at plant sanitation and clean-up procedures was necessary. Simple bacteriological flow sheet analyses were introduced, using simple agar plate counts as suggested in annexes 14 and 15. Today such methods are in use in most Danish meat plants.

The Danish Meat Products Laboratory acts as a central clearing house for data in this area. Monthly reports as the one shown in annex 16 enables each quality control manager to see how his plant rates with regard to sanitation in comparison to other plants. The flow sheet analyses also permits him to follow progress from week to week in his own plant.

The use of these flow sheet analyses convinced the Danish Meat Research Institute that traditional clean-up procedures left much to be desired. Virtually much effort was often expanded in removing visible dirt or moving it around. However, bacteria cannot be seen. Therefore, most clean-up procedures were not really

suited for arriving at plants with low bacterial counts in the essential places.

Very detailed analyses revealed the danger areas in various types of plants. Then work methods studies lead to detailed specifications for clean-up procedures which resulted in greatly improved sanitation. The clean-up operation is now often carried out by special sanitation teams and mostly at considerably reduced cost.

Controlling the finished product. As already mentioned, each plant checks the finished product every day mainly to ascertain that the quality control through the various processing stages has performed correctly. Here, it is desirable that a total test be used. This means that first, the wholesale carton containing the retail packages is inspected. e.g., to see how the carton is presented, if it is labelled and sealed correctly, etc. Similarly, quality control personnel have to look at the labels of each unit, etc., and then, finally, examine the final product and carry out such analyses and taste tests which may be required.

International quality considerations

An exporting country may sometimes feel overwhelmed at the differences in food laws in various countries, what is accepted in one as wholesome may be considered as toxic in another and therefore prohibited, etc. The Danish meat industry is faced with having to meet requirements in a great many countries which are, at times, not even mutually compatible. Therefore, Denmark supports the FAO/WHO effort to formulate an internationally accepted codex. It may be long before such are universally agreed but already, the codes and standards adopted have been reflected in national legislation and greater uniformity is found today in such matters as permitted food additives, hygienic requirements, etc. These efforts are directed mainly towards the attainment of complete safety, wholesomeness, etc.

The codex system attempts also to draw up standards for the individual food product, i.e. quality characteristics. Here, however, food habits, technologies and users' preferences differ widely from country to country or even from one

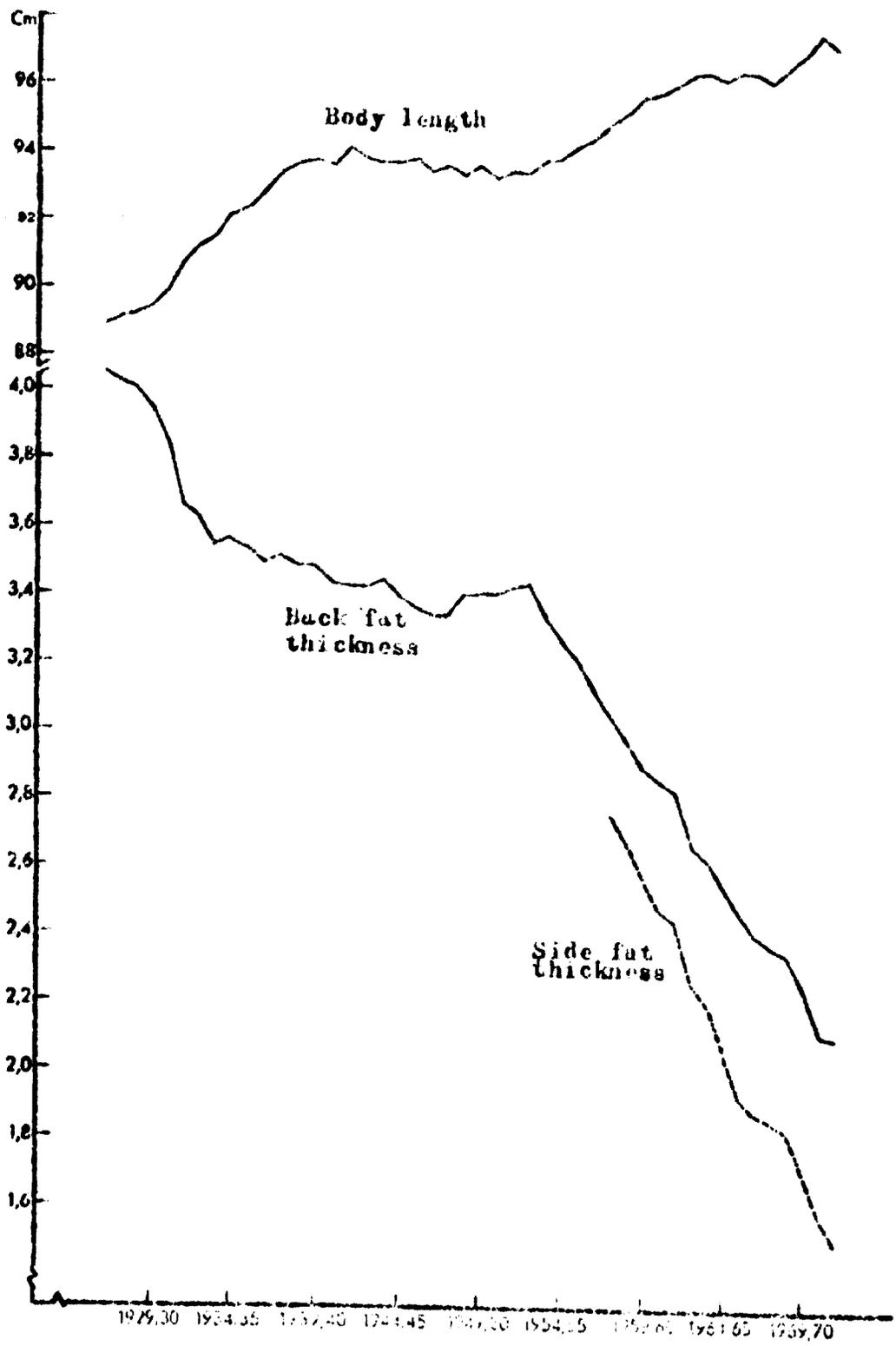
region to another within one country and they change so rapidly that a meaningful, up-to-date standard rarely can be developed, accepted and revised with sufficient efficiency to make it useful.

Responsiveness

Especially when an export industry is established the most important tradition to incorporate into the manufacturing system is probably one of responsiveness. It must be realized that changes in consumers tastes and preferences take place very rapidly. These changes are difficult to transmit all the way back to the original producer, and yet, his ability to respond to such changes will determine his success or failure. Similarly, new developments take place in packaging material, distribution methods, etc. The most important characteristic of quality control personnel and of the system itself is that it must be quick to discover changes in preferences and requirements, etc. and it must be quick to respond so that the products continually meet these changing requirements.

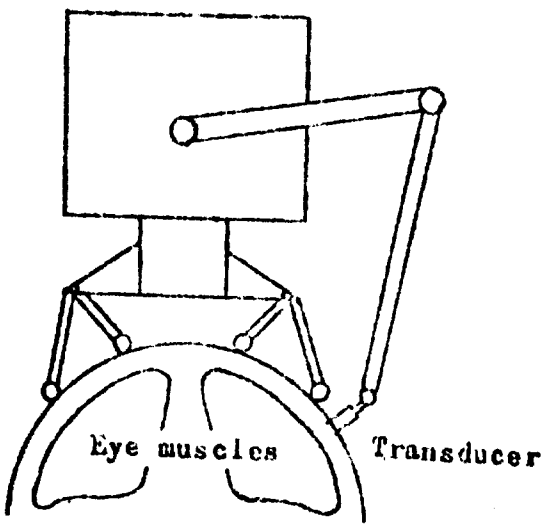
Annex 1

The development of the Danish Landrace pig

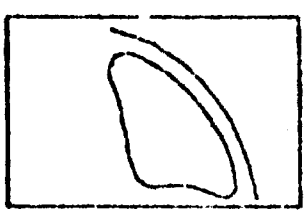


Annex 2

Scanner for obtaining internal measurements of fat thickness and meat content



Pig



Cathode tube

ANNEX 3

Specifications for luncheon meat, Country X

Composition

Meat ingredients. According to the legal requirements of country X, luncheon meat must consist of chopped pork or beef meat, i.e. skeletal, muscle, possibly mixed with the corresponding fatty tissue. The addition of rinds, sinews and intestines is not permitted.

Maximum limits. Salt 2,5%

Nitrite (only as nitrite salt and in per cent of the total amount of meat and fatty tissue used 0,02 (country X requirement)

Spices and sugar may be added with no maximum limit (country X regulations)

Casein or blood plasma (in percentage of the total amount of meat and fatty tissue used) 2,0% (country X requirement)

Added water (calculated, using the feder number) 4,0% (country X regulation)

Fat, when the product is designated lean, 8-15 % (country X requirement)

Fat, when the product is designated regular, 35% (country X requirement)

Ascorbic acid permitted (country X regulation).

All other added substances are prohibited, i.e. nitrate, phosphate and flour.

Containers

Can. Can must be marked with establishment No., date of manufacture, type of product, these markings can be in codes. Can to have visible vacuum, they must be clean and free from rust internally and externally.

Annex 3 (continued)

Label

1. In country X language, name of the product, i.e. ready-to-eat luncheon meat.

2. Name and address of manufacturing company or firm for which the the produch has been manufactured.

3. Net weight (at the time of filling) in grams or kg.

4. Year of manufacture or latest year when the product should be used (the text must indicate which of these apply).

5. A list of ingredients is optional. If it is used, it should be in order of decending amount; nitrite may only be declared as nitrite salt.

6. The addition af casein or blood plasma should always be indicated separately from other text and in an easily visible manner as: Manufactured with YY per cent casein or manufactured with ZZ per cent blood plasma. (only one of these may be used in any one product.)

Other information

Information regarding food regulations etc. of country X are found in the laboratory's information series - country X.

Procedure for organoleptic tests

Any defects present should be noticed. Any defect of consequence should lead to the product being rejected.

The external surface should be smooth and of the same color as the cut surface.

Annex 3 (continued)

Fat seperation is tolerated in small amounts only. A discolored surface, corrosion, dirt, discoloration from the can, etc., is recorded as defects.

The product must fill the can completely. Sleck fill is considered a defect.

The cut surface must have a natural meat color, presence of sinews, air pockets, discolouration of the cut surfaces are recorded as defects.

The presence of rinds or intestines always results in rejection.

The meat block must have a uniform consistency and a rather short chew feel. As defect is considered rubbery, doughy or watery texture.

The product must have a pure taste. As a defect is counted off taste or doughy taste.

Annex 4.

Sampling plan for canned meat control, normal cans

1 sample	No. of defects	Decision	2 sample	No. of defects	Decision
6	0	accepted			
	1-2 critical 1-4 critical and essential	new sample	10	1-2 critical 1-4 critical and essential	accepted
	3-6 critical 5-6 critical and essential	rejected		3-16 critical 5-16 critical and essential	rejected *

*If the manufacturer requires, an additional sample of 30 cans may be withdrawn. 4 or more with critical defects, 7 or more with critical and essential defects means that the lot is rejected, less that it is accepted.

In addition, all lots are examined for major defects. If one is present the lot is rejected.

Annex 5

Sampling plan for large units of canned meats

1 sample	No. of defects	Decision	2 sample	No. of defects	Decision
2	0	accepted			
	1-2 critical and essential	new sample	10	1-2 critical 1-4 critical and essential	accepted
				3-12 critical 5-12 critical and essential	rejected *

*If the manufacturer requires, an additional sample of 30 cans may be withdrawn. 4 or more with critical defects, 7 or more with critical and essential defects means that the lot is rejected, less that it is accepted.

In addition, all lots are examined for major defects. If one is present, the lot is rejected.

Work of evaluation panel at Danish Meat Products Laboratory

Members of the evaluation panels are appointed for one year at a time. They are appointed by the administrative board. An appointment may be renewed.

Members of the evaluation panel participate in accordance with a shedule worked out by the Danish Meat Products Laboratory in the evaluation sessions at the laboratory.

The evaluation panel, assisted by the laboratory, draft proposals for circulars regarding procedures for the export quality control, etc., and submit such proposals to the administrative board for approval.

The evaluation panel meets when required, preferable not less than every other month. The agendas of these meetings are determined by the chairman of the evaluation panel in collaboration with the laboratory. Meetings of the evaluation panels may be followed by a meeting to which representatives from all plants producing meat products for export are invited. The object of this is to demonstrate for anyone interested the level of quality desired by the panel. Often, competing products from other countries are displayed at such sessions. Two members of the panel are invited to two weekly evaluation sessions at the laboratory and participate in sessions where an appeal is made against a decision by the laboratory. For the latter sessions at least two members of the evaluation panel must be present and no person participating in the evaluation may represent plants involved in an appeal.

A member of the evaluation panel must participate in at least 50% of all meetings and evaluation sessions, to which he has been invited within any given 12 month period.

If a member of an evaluation panel leaves the employ of a meat producing plant, his membership is automatically terminated.

A member may under special circumstances have a personal substitute. He must be from the same company and his appointment must be approved by the administra-

Annex 6 (continued)

tibe board. In such cases both the regular member and the substitute participates in meetings of the whole evaluation panel. Where the evaluation panel travels to export markets either the regular member or the substitute member may have his travel expenses refunded by the laboratory.

Annex 7

Control chart for canned shoulders

Normally, an establishment may ship products as they are produced. Analyses will be carried out by the Danish Meat Products Laboratory at intervals, the length of which is determined by the prior history of the production at each plant.

For content of added salt and water, the following zones have been established.

Upper limit	13,6%
Zone A	11,7% to 13,5%
Zone B	9,9% to 11,6%
Zone C	8,1% to 9,8%
Zone C'	6,2% to 8,0%
Zone B'	4,4% to 6,1%
Zone A'	2,5% to 4,3%
Lower limit	2,4%.

Shipments can continue until one of the following limits is reached.

8 consecutive samples fall in zone C or above
4 out of 5 consecutive samples fall in zone B or above
2 out of 3 samples fall in zone A or above
1 sample fall above upper limit.

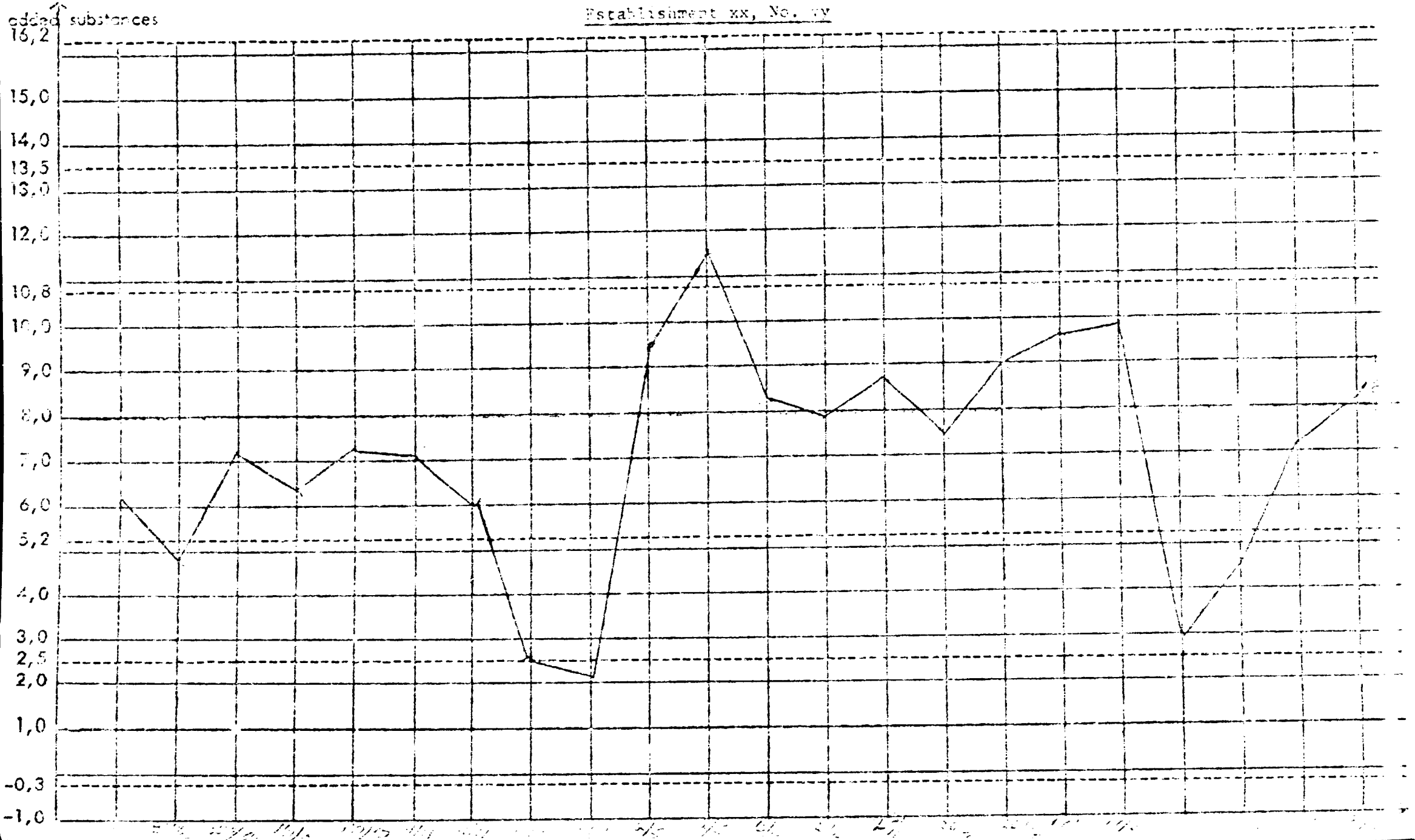
If this is found the following productions may only be exported after prior approval by the Danish Meat Products Laboratory requiring an analysis of 8% or lower, or in zone C, but with at least one out of the previous seven samples in zone C' or lower.

Results are plotted in a control chart as shown in exhibit 8.

Annex 8 Control chart for canned shoulders

Product: Canned shoulders

Establishment xx, No. yy



Annex 9. Rules for analyses of meat content

For certain markets the Danish Meat Products Laboratory requires a minimum meat content and minimum lean meat content in some meat products. (Meat content is determined using the so-called Stubbs and More formula.)

The requirements are as follows:

Product	Zones	
	% meat	% lean meat
Pork in natural juices	95,0 - 92,0	57,0 - 55,0
Pure pork	95,0 - 92,0	57,0 - 55,0
Chopped or minced products	90,0 - 87,0	54,0 - 52,0
Cured pork	90,0 - 87,0	54,0 - 52,0
Sliced bacon	90,0 - 87,0	no limit
Pork luncheon meat	80,0 - 77,0	48,0 - 46,0
Mixed luncheon meat	80,0 - 77,0	48,0 - 46,0
Frankfurter and vienna sausages	70,0 - 67,0	35,0 - 33,0
Cocktail and hot dog sausages	50,0 - 47,0	25,0 - 23,0
Meat loaf products	65,0 - 62,0	39,0 - 37,0
Meat with cereal	80,0 - 77,0	48,0 - 46,0
Meat paste	70,0 - 67,0	35,0 - 33,0
Meat paté	70,0 - 67,0	no limit

Annex 9 (continued)

For this schedule, the following sampling plan apply:

Sample No.	Units	Number in or below zone	Decision
1	2	0	approved
		1 - 2 in zone	2. sample
		1 - 2 below zone	rejected
2	3 from same lot as 1	1 - 2 in zone	approved
		3 - 4 in zone	approved but 3. sample
		5 in zone or 1 - 3 below zone	rejected
3	5 from a sub-sequent lot	1 - 2 in zone	approved
		3 - 5 in zone or 1 - 5 below zone	rejected

Annex 10

Factors used for determining added water in pork

Type of product	factor
1. Chopped Ham	3,83
2. Chopped Pork	3,83
3. Canadian style bacon	3,83
4. Deviled Ham	3,83
5. Ham	3,83
6. Ham roll	3,83
7. Ham sectioned and formed	3,83
8. Luncheon meat	3,8
9. Picnic roll	3,93
10. Pork loin	3,83
11. Pork roll	3,83
12. Pressed ham	3,83
13. Sausages in brine	4 0
14. Shoulder	3,93
15. Sliced bacon, baconslab	4,0

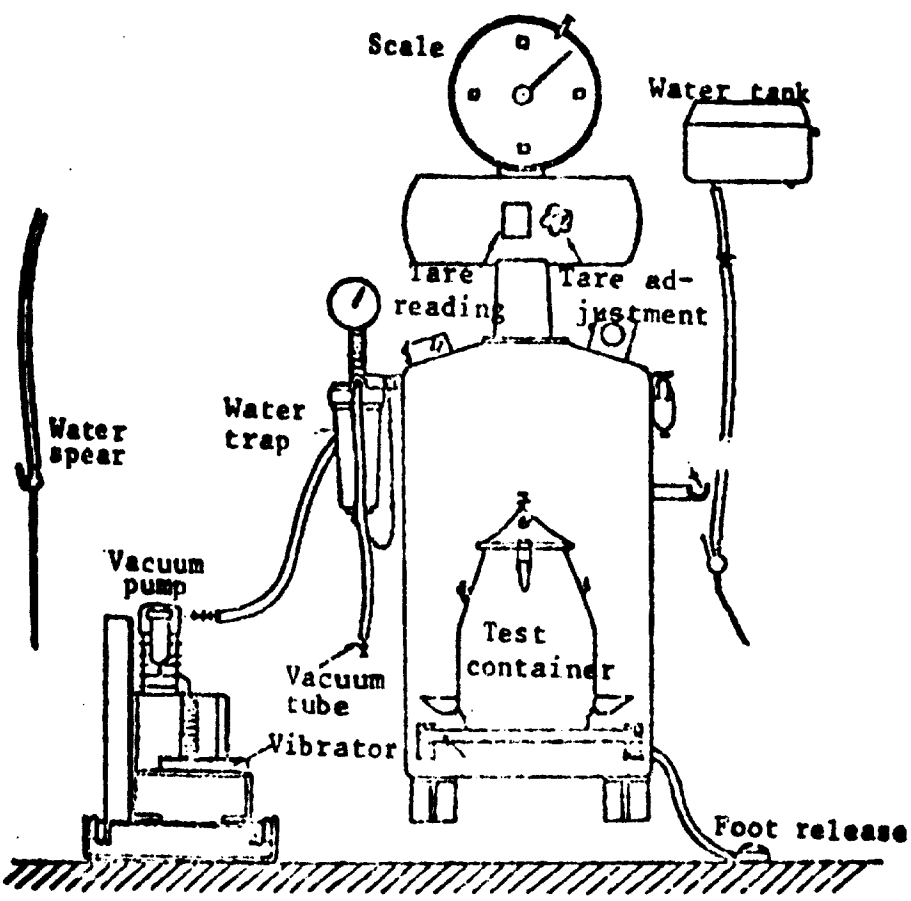
Annex 11

Amounts of added water or curing ingredients permitted in some products.

Type of product	% added water	% added salt and water
Chopped ham	3,0	
Chopped pork	3,0	
Deviled ham	0,0	
Ham, whole		8,0
Ham roll	0,0	
Ham sectioned and formed		8,0
Luncheon meat	3,0	
Pork loin		8,0
Pork roll	0,0	
Pressed ham	3 0	
Sausages in brine	10,0	
Sliced bacon		0,0

Annex: 12

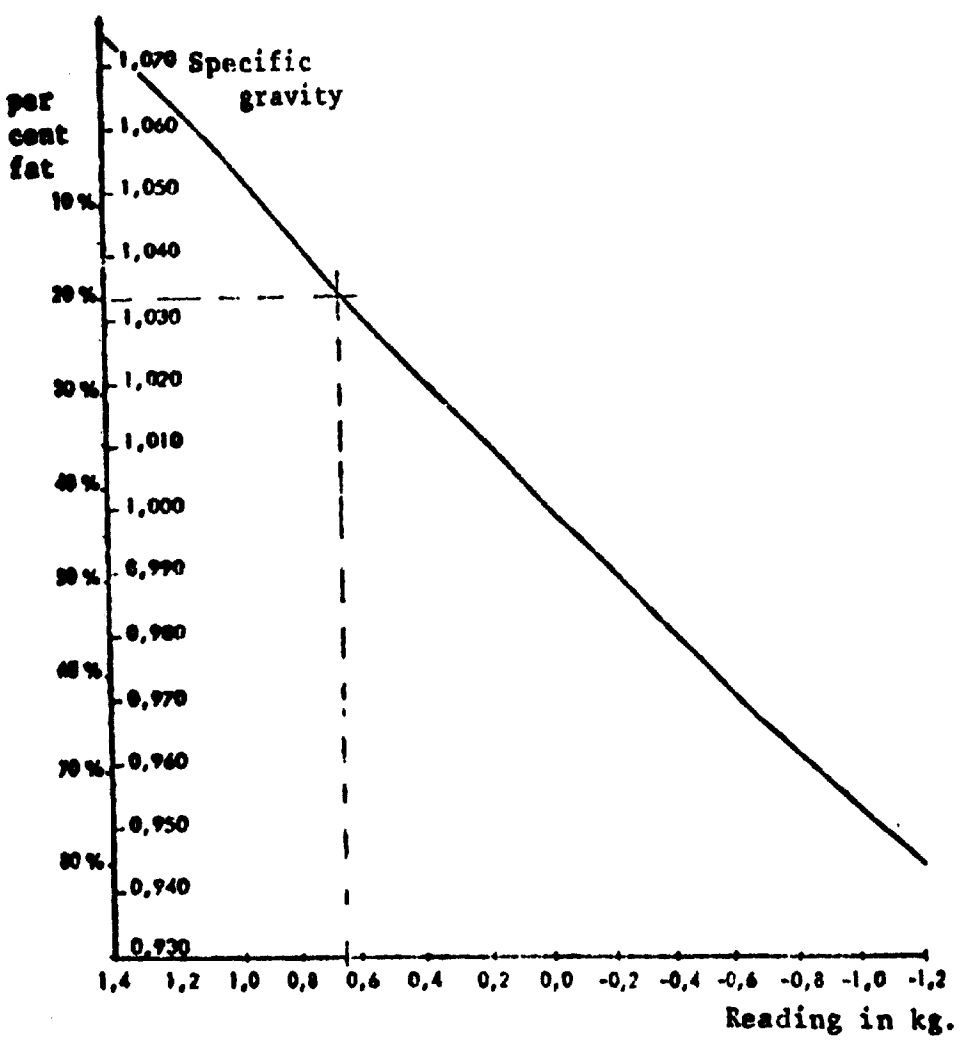
Arrangement for measuring fat content of meat trimmings



Annex 13

Specific gravity of meat

The ordinate indicate the specific gravity for fresh meats of **various fat content,** the abscisses the corresponding reading on the **scale shown in exhibit 12. As** indicated by a dotted line, a reading of 0.65 **kg would indicate a** specific gravity of 1.032 and a fat content of 20%.



Annex 14

Simple bacteriological examination methods for plant sanitation control

This method aims at attaining simple data by uncomplicated means to evaluate plant cleanliness.

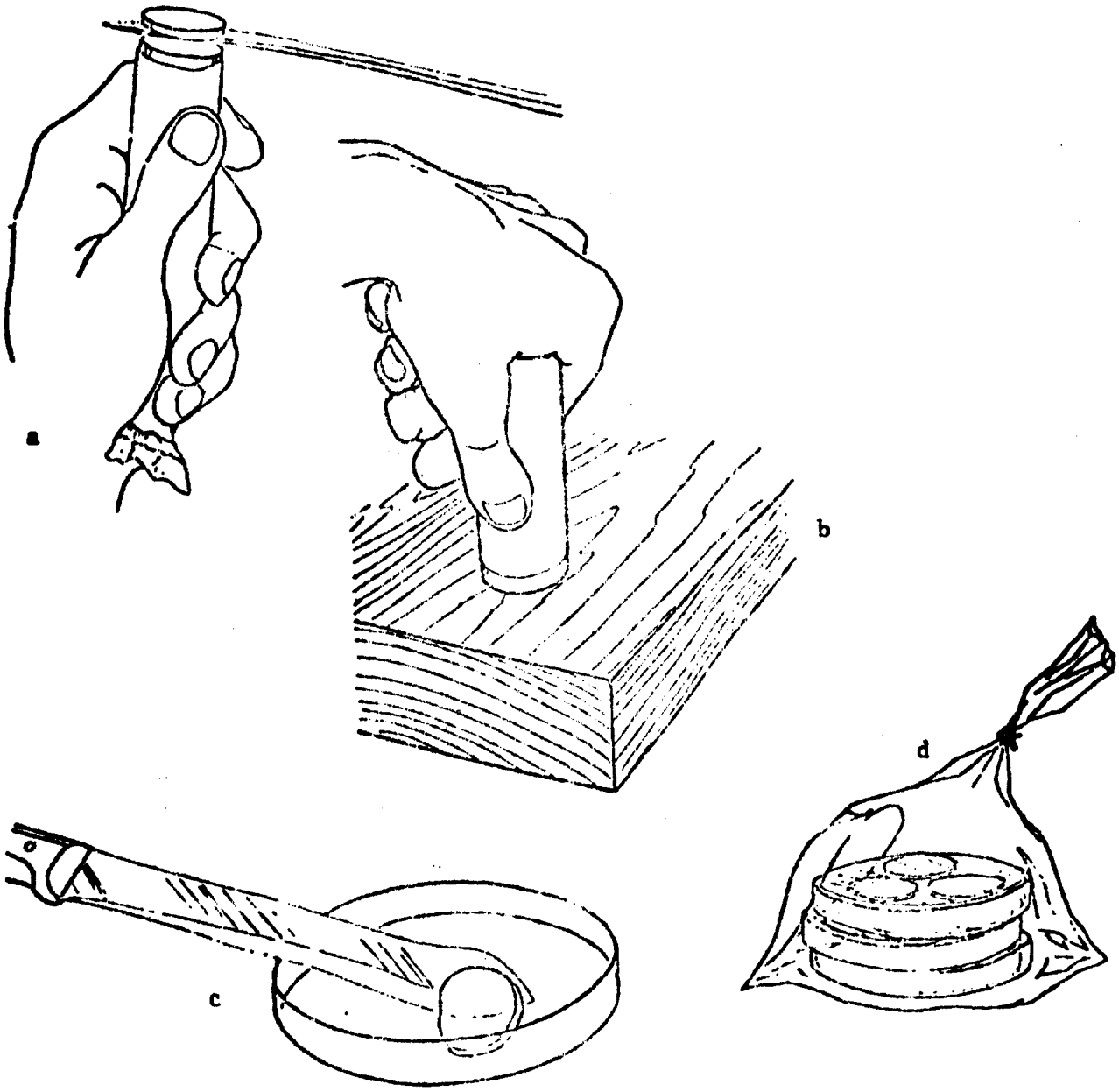
Most often, the so-called agar-sausage method, originally a Dutch idea, developed by Ten Gate, is used. The plants buy or may themselves manufacture the agar sausage which is an ordinary plate count medium, combined with agar, and filled into an impermeable artificial casing, which is sterilized, e.g. at 116°C for 30 minutes. The technician rinse his hands carefully. He uses a narrow knife which is sterilized by being passed through a flame. With this the agar sausage is cut and the surface is pressed against that surface which is being tested as seen in exhibit 14. Afterwards, the agar sausages is pressed about five millimetres out of the casing, a slice is cut off and placed in a petri dish. Many samples are taken in the same manner, all plus some controls are placed in petri dishes and incubated in a clean closet at room temperature. After 1-2 days the plates are observed. On some slices, a few dots (bacterial outgrowth) may be seen, each stemming from one bacteria on the tested surface. This would be considered very clean. Other slices may show more dots and some may be completely overgrown with bacteria, indicating an unsatisfactory condition of the surface.

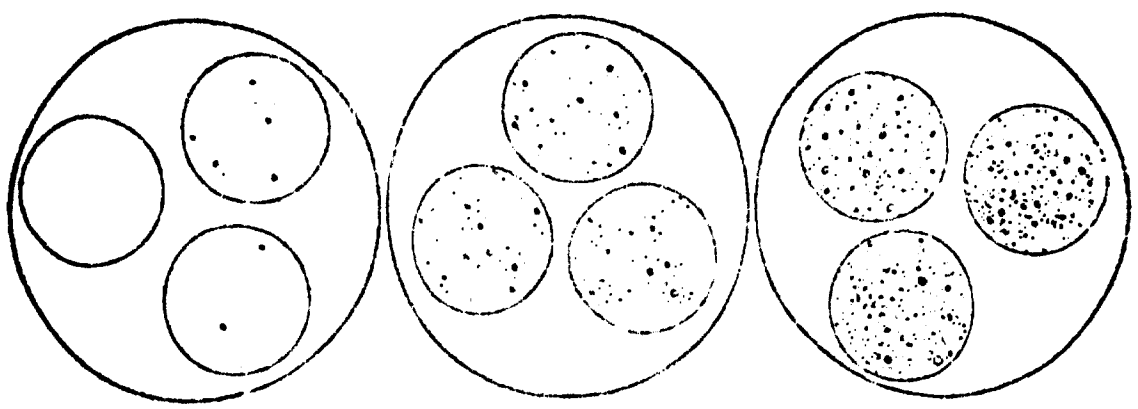
Results may be tabulated as shown in exhibit 16.

A similar method uses commercially available contact plates. These are much like the above slices of the agar sausage but aseptically packed; they are used in much the same manner as the agar sausage by being pressed on the test surface and incubated as above.

Annex 15

The agar sausage method for sanitation control





satisfactory fair unsatisfactory

Annex 16

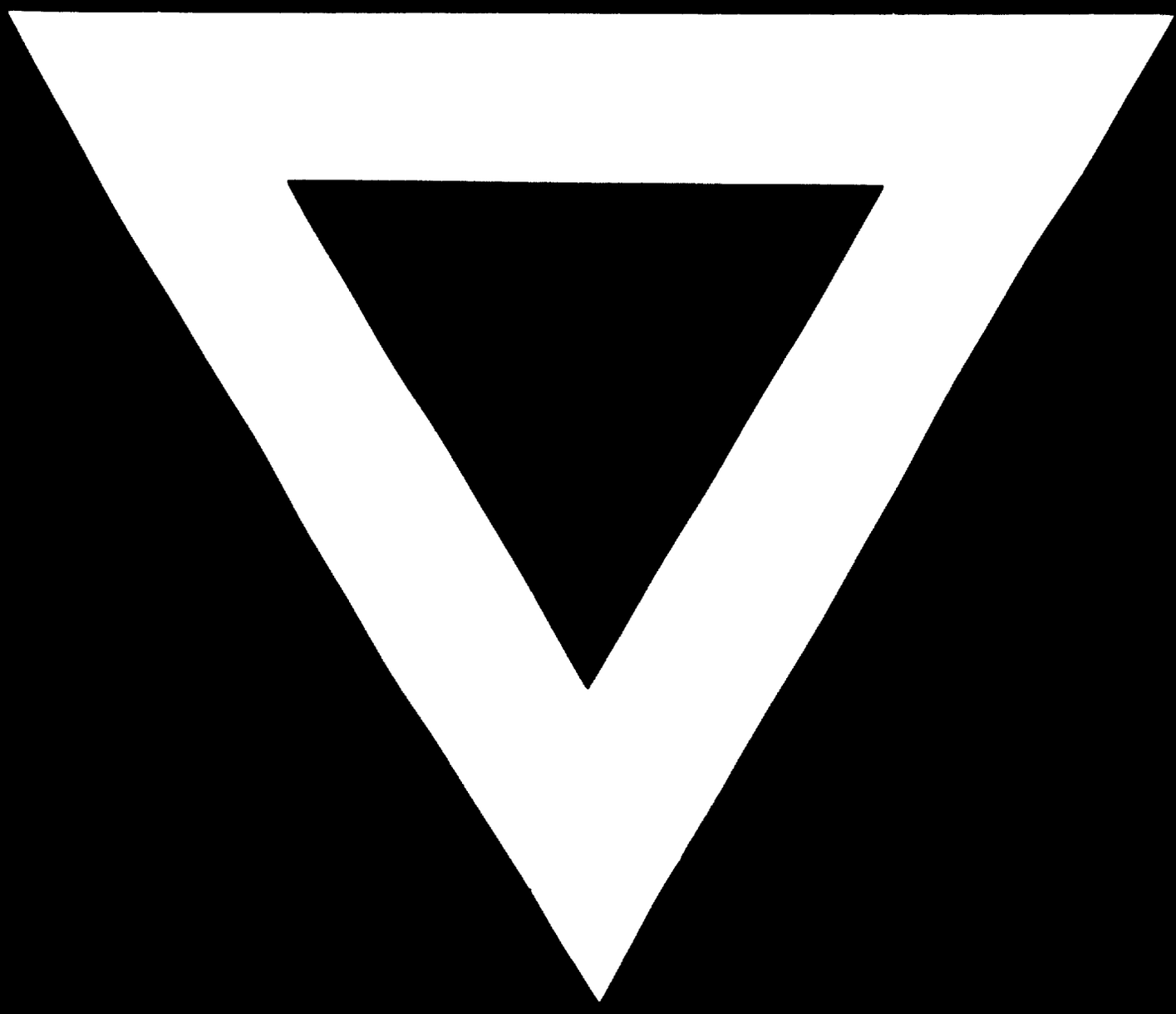
Records of bacteriological flow sheet analyses

Meat processing plants report the findings of their bacterial flow sheet analyses as described in exhibit 14 to the Danish Meat Products Laboratory. The data are tabulated by the laboratory as shown here and distributed in such way that each plant can see how their sanitation compares with that of the other plants but without disclosing the identity of any of these.

When indicated, the laboratory advises on improvements in test procedures and as regards improvements in clean-up procedures.

Annex 16 (continued)

Establishment No.	Sausage and canning plant		Ham curing and trimming		Cut-up department		Slicing department		Slaughtering plant		Other	
	No.of tests	% unsatisfactory	No.of tests	% unsatisfactory	No.of tests	% unsatisfactory	No.of tests	% unsatisfactory	No.of tests	% unsatisfactory	No.of tests	% unsatisfactory
1	78	14	25	0	65	5	22	5	83	19	46	9
4	96	46	-	-	173	20	18	22	-	-	23	39
5	16	13	-	-	10	10	16	13	-	-	6	0
7	52	24	12	0	-	-	-	-	-	-	-	-
8	161	2	-	-	107	6	-	-	93	6	67	2
10	-	-	-	-	-	-	25	0	-	-	25	36
11	46	35	-	-	32	15	-	-	23	9	-	-
4	-	-	-	-	20	60	-	-	147	40	-	-
16	36	0	81	0	-	-	-	-	-	-	-	-
17	80	15	140	9	140	6	100	4	132	11	116	7
18	-	-	95	6	-	-	-	-	-	-	-	-
19	18	40	30	7	32	6	36	5	-	-	34	15
20	10	30	6	0	28	14	-	-	52	4	20	10
21	49	0	-	-	47	19	-	-	125	0	100	3
22	10	0	41	10	13	0	12	0	-	-	-	-
23	22	10	11	72	6	50	-	-	-	-	4	0
25	18	0	-	-	18	0	-	-	-	-	12	0
26	28	7	40	3	16	6	4	0	32	3	16	0
27	-	-	33	0	-	-	-	-	36	4	-	-
28	56	14	-	-	-	-	-	-	28	30	7	0
29	154	8	-	-	75	0	-	-	58	22	85	2
32	15	7	-	-	-	-	9	0	19	30	15	40
33	-	-	-	-	73	21	-	-	45	12	-	-



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