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Project Study Working on Development Approaches to
the Problem of Transportation and Refrigeration of
Food in Developing Countries

January 17, 1970

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John G. ...

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1. INTRODUCTION

The problems of cost accounting and distribution in developing countries are very wide and complicated, having different aspects in different countries and regions in each particular

In general and each of these countries has its own particular situation because of the different geographical conditions of each producing country and the different stages of the economic growth of the labor force and the increasing population pressure on the land along the coast

Starting with the main problems of the population of labor and the increasing population pressure and the increasing pressure of the population existing in other general and each of these countries it is the objective to an important part of the economic development

2. WORLD-WIDE

The amount of the total available is roughly based on 1974-1975, cattle grazing and feeding. The present population of about 1,000,000 people would need 1,000,000 tons of cattle, 1,000,000 tons of sheep or goats and a similar feeding amount of about 1,000,000 tons of horses and pigs. The water requirements for these animals are also considerable, especially in the arid areas. The amount of water is roughly estimated to be between 100,000 and 200,000 gallons per day.

Perhaps, it would be better to have the water, including about 100,000 gallons, in a closed loop system with a total cost of about 1,000,000 dollars.

The water for grazing and feeding, a very high value, water for the plants in the area, especially in the regions of pasture and other.

The water for the animals is

about 100,000 gallons per day for the animals and the water for the plants is about 1,000,000 gallons per day. It is necessary to have about 100,000 gallons per day of water for the animals and the water for the plants is about 1,000,000 gallons per day.

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Remarks: Only some herds of thousands of heads, which have an organized top-down.

Cattle movements are slow, and the cattle groups are not used to sell their animals, unless in need of money.

The available cattle are not sufficient to supply competing cattle of different classes, always in age.

The average age of the slaughtered cattle is between 7 to 8 years, while the cattle reach their optimal weight when 4 years old.

The actual rate of growth is estimated at 9%. The actual yearly consumption and exports are about the following:

Slaughtering for local consumption	100,000 heads
Slaughtering and export of chilled meat	25,000 "
Slaughtering for the production of bones	15,000 "
Export of live cattle	170,000 "
Total	310,000 heads

Seasonal variations are observed in the cattle quality and weight, due to the seasonal variations in the presence of pasture in winter. During the rainy season, and shortly later, abundant green pasture is available and the cattle gain weight and are at their best state. From winter into the dry season, they suffer the lack of pasture and water and thus lose weight and quality.

The price of live cattle changes according to the place and the yearly season being, for example, from 7,000 to 10,000 francs CFA per head of a medium quality, in the growing area of Kanié, and reaching sometimes about 15,000 francs CFA, for cattle of extra quality at Zort-Archambault, about 60 km south. (50 francs CFA = 1 FF, 250 francs CFA = about 1 US \$).

as an average price of about 0.50 to 1.00 per cwt should be considered for cattle of an average live weight of 100 to 150 lbs. designed for export and 0.25 to 1.00 per cwt for a head of cattle marketed for industrial purposes. The live market prices vary in general between 2 cents per lb. to 25 cents per lb., of live weight according to quality and grade (between 2 to 10 lb cents/lb. of live weight).

3. ELIMINATION OF LIVE CATTLE

The quantities of live cattle are supplied from farms to the live stock markets, comprising Southern Nevada, in the West, and the Central States Republic, in the South. Small quantities pass also to the Southern States. The live cattle trade is done in the traditional way, by means of the cattle yards and the stock pens to the immediate markets.

The export of the live cattle is controlled and a percentage tax of 1% (one per cent) is imposed on the exported live cattle. The tax is not actually levied in any form of cattle yard through the pen and being furnished without any other kind and without paying the tax. It is, however, a considerable source of revenue to the Government.

The live cattle lose weight in the way because of fatigue. The mortality rate among the live cattle caused by disease, theft, or other causes is very high, especially as the cattle are not always immune.

No systematic statistics and measurements are available concerning the weight losses in the way. An evaluation for these losses may be deduced from the average carcass weight of the slaughtered cattle being about 175 or 180 kg. in growing areas, 18 kg. in Port-Archaibault (about 6 kg. more), and 145 to 150 kg. in range (about 57 kg. more of Port-Archaibault). The losses in the carcass weight represent obviously also losses in quality of the resulting meat.

The rate of mortality may vary from areas to up to 4%, or more, depending on the case.

The cost of removal of the live cattle from pastures (based on August 1967) is about 1,000 per acre per head, comprising the cost of labor and the cost of transporting the cattle to weight and marketing.

Differences in approach exist between the Government and the neighboring countries, regarding the removal of live cattle from pastures.

The Republic of France having cattle as one of its main resources, tends to keep the cattle grazing the pastures and the resulting products (leather, wool and some milk) are sold.

The weight of the cattle is important, as is the case with live cattle, with the other hand, to have the live cattle as one of the main products for their own supply and for all the work connected with the marketing and the utilization of the by products of these plants.

In addition, various measures have been established for and such systems are operating in practice, especially:

about 1,000 head of cattle were removed from pastures from 1964 to the neighboring countries, mostly by planes from 1964 to 1966, and in part, by railroads from 1966 from pastures.

The present requirements for export of live cattle is mainly for the cattle of the best quality, while the lower grade cattle remain for the inland consumption and for the production of leather and wool.

An excessive increase in the export of live cattle from the pastures may lead to the lowering of the average quality of the remaining cattle and at the same time, because of the excess of supply and demand, the price for the cattle chosen quality will rise, thus hindering the export possibilities.

It is, therefore, important to develop the possibilities of utilization of the lower grade cattle, to reduce and to alter the balance towards a deterioration of the average quality of the cattle herd.

The reported case is slaughtered and chilled at the regular slaughterhouse of West Long and West Arkansas. The case slaughtered at West Long is sent as provided by the 4 freight planes, carrying about 20 tons of meat. The chilled case is changed in pallets before the arrival of the plane at an intermediate point where it is placed on the aircraft of West Long where the case is chilled until the arrival of the plane. The case is loaded onto the plane in the same pallets and the plane takes off immediately after loading. The duration of the flight depends on the distance and the number of stops in the way and is approximately between 10 to 12 hours. This case is not refrigerated by being in the plane.

The chilled case reported from West Arkansas is transported from West Arkansas to Long (100 to 150) by refrigerated trucks of 10 to 15 capacity carrying between 10 to 15 tons of chilled meat in half size cases hanging in the trucks. The duration of the transport is between 20 to 24 hours with few hours stop in the way. For the balance of cost the only way meat is at present time by truck. The refrigerated cargo longer and is transported as return freight from Long to West Arkansas.

The case received for further shipment by plane is chilled in the trucks until the plane arrives and then reloaded directly into the plane with the 4 freight planes. The case is first reloaded on the pallets and then with the pallets into the plane.

Upon arrival in destination the chilled case is reloaded from the plane into the airport cold storage (Bismarck, Minn.) or transported to the business cold storage until sold for local consumption.

The wholesale meat trade is practically in the hands of European companies and butchers having the financial means to carry out these operations, starting with the purchase of the live cattle in Tchad, and then the retail distribution to their own butcheries and the wholesale of the meat to the African butchers.

In many African markets, meat is still sold by cuts, without weighing, and prices are discussed among buyer and butcher. Meat prices are controlled for boned and boneloss meat, and for the different cuts. The price control is not always strictly observed, and very often the cuts contain more bones, fat and tendon than the average present in the whole carcass, for which the controlled price is fixed.

The European butcheries are generally well equipped and sell available meat and sometimes import meat also from Europe. It often happens that the remainder of the carcasses from the European butcheries, pass on to the African market, after the removal of the best cuts.

The differences in price between the European butcheries and the African ones, are very big, as may be seen from the following table, given as an indication for some meat cuts sold in Fort-Lamy (Tchad) in July 1968:

	African butchers prices at the Central market <u>(Fr. CFA/kg)</u>	European butchers <u>(Fr. CFA/kg)</u>
Round steak		520
Fillet	150	600
Beefsteak	200	400 to 500
Liver	100	150
Tongue	100	180
Tripes	30	200

Similar price ratios are to be found also in other African countries.

The retail controlled boneless meat prices, in different countries, are the following:

	<u>Retail price</u> <u>frs.CFA/Kg.</u>
Port-Lamy (TCMAD)	125
Bangui (RCA)	180
Bonala (CAMEROUN)	200
Libreville (GABON)	300
Brassaville (CONGO) about	410

Meat is a relatively expensive product in comparison to other available foods rich in proteins, such as dried fish (150 frs.CFA/Kg), peanuts (15 frs.CFA/Kg), sesame (15 frs.CFA/Kg) and milk 10 frs.CFA/Kg). Prices differ as seen above from one country to another, depending mainly on the transport and handling costs; cost of transport is sometimes higher than the cost of the meat itself.

The low income of the African population living in the bush being between 20,000 to 25,000 frs.CFA per family per year (80 to 100 US \$), is a limiting factor for this part of the population for the purchase of fresh meat. This population has its meat supplies from local sources, such as hunting or gathering available animals of all types (reptiles, birds, insects, worms, etc.).

The main consumers for the cattle meat are the people living in the cities of the richer agricultural or mining zones having a higher income to afford the purchase of meat.

The European part of the population is among the most important clientele for meat. A drop in meat consumption is clearly noticed during the vacation periods, when European people are on leave abroad.

The African population prefers, in general, meat to fish and is willing to buy meat. It is, therefore, expected that any increase in the standard of living in the future will be associated with an increase in meat consumption.

Smoked and dried meat are produced in Tchad by hot smoking or sun drying. The most important local products are:

" Banda " - hot smoked meat, made from hunted animals and old cattle, this product is exported mainly to Northern Nigeria.

" Kinda " - a product of meat (or fish) ground and cooked together with sesame, under the form of a solid cake, sold mainly on the markets as local food.

"Charmoutte" - sun dried meat in stripes.

The price of these products is relatively cheap, but the quality is rather poor.

4. TRANSPORTATION PROBLEMS

All cattle growing countries in Central and West Africa, are situated in the interior of the continent, thousands of kilometres from the sea.

On the other hand, most of the consuming centers are in the countries situated along the sea, having also a free access to imported meat and fish from the local sea-fishing.

The problems of transport are among the most difficult to be solved. The high costs of transport have a great influence on the cost of the meat at its destination, as well as on the costs of the imported products, such as fuel, building materials, machines, packaging materials and other products associated with the meat production.

The lack of good communicating roads and railways and the difficulties encountered in transportation during the rainy season, when many roads are flooded and cannot be used at all, means that air freight transportation, in many places, is the best available form at present.

For the Republic of Tchad, the transport difficulties form a great obstacle for the development of the meat industry, as well as for other activities.

The main meat producing center of Fort-Lamy is cut off from the south of the country in the rainy season and transports are done during this period, only by planes. The second center, Fort-Archambault, is open all the year to the south for road transportation, but transportation is still difficult in the rainy season, because of the many stops forced on the way.

4.1. The transportation of live cattle:-

The most common form of transportation for live cattle is the traditional method of driving the cattle heads from the growing area to the consuming centers as described above. The main problems in this case consist of the availability of pasture and water, the immunity against diseases, and the resulting losses in weight, quality and mortality, as described above.

Water wells are continuously drilled in Tchad along the cattle roads, to secure water supply to the moving cattle and the situation is improving in this respect.

The development of ranching zones associated with the supply of water and veterinary services to the moving cattle, may certainly help to reduce the weight losses and mortality of the cattle.

The ranching system may be based on natural pasture, residues from agricultural cultures and additional concentrated cattle food of local origin, such as cotton seeds, oil cakes, bone and meat meals, that may be produced as by-products of the meat industry and other added minerals and medical products.

The immunity against diseases is already done on a wide scale, but due to the vast areas and the dispersion of the cattle, it is very difficult to control all the cattle. For the cattle destined for export, additional treatment is preferred before the cattle enter the forest zone, but as it is associated with the payment of the veterinary tax connected with the export it is not always done by the cattle dealers who try to avoid the payment of this tax.

Adding veterinary supervision and pest control treatments (such as cattle dips or sprays), against ticks and other parasites, at the ranching places, may be also of great advantage.

Occasional quantities of live cattle are sent also by trucks from Fort-Archambault to Bangui, when the trucks arriving from Bangui have no return freight. Small quantities are also shipped by barges on the Oubangui Congo rivers from Bangui to Brazzaville. These means of transportation do not seem to have much future.

4.2. The transportation of chilled meat by planes:

The air transportation of meat has the great advantage that it enables the quick delivery of fresh chilled meat over long distances and permits a quick turnover of the working capital.

The difficulties are mainly with the regularity and availability of return freight that forces about 2/3 of the total cost of the two way traffic on the meat transportation costs.

The present costs of the air freight transports of meat from Tchad are the following:

	<u>LES CFA / Kg</u>
From Fort-Lamy, to:	
Youde (CAMEROON)	35
Donnia (")	40
Libreville (GAMBIA)	70
Port-Gentil (")	80
Brazzaville (DEMOCRATIC CONGO)	90
Pointe Noire (")	105-140
Kinshasa (CONGO)	72.5
Bangui (R. C. A.)	55
From Bangui, to:	
Brazzaville or Kinshasa	45 to 50
Pointe Noire	50 to 60

The above mentioned prices are given for the full cargo of the plane. With smaller planes at partial cargo, the cost of the air transportation may result higher than given above.

4.1 The best transportation of meat:-

The best transportation of meat may be done only where and when the transportation is possible all over the year.

The cost of the chilled meat transportation by refrigerated trucks between Fort de Kambouli and Bengul (50 km) based upon a truck load of 16 tons, was found to be the following:

	<u>(rs. CPA per ton)</u>
Wages, oil, petrol and lubrication etc	48,000
Tyres and tubes	17,000
Spare parts and repairs	13,500
Taxes and licenses	500
Salaries and personal expenses of driver and second driver	14,000
Loading etc	1,500
Overhead expenses	50,000
Insurance	20,000
Depreciation	60,000
Interest on invested capital	10,000
Total:	<u>186,500</u>
10 % surcharges	<u>18,650</u>
Total:	205,150
Income from the return trip freight (12 % of 5,000 rs CPA) average	<u>72,000</u>
Total:	<u>277,150</u>

The resulting cost of transportation of chilled meat will be 16.6 rs CPA/ton

The fixed expenses which are very high in this case (insurance, depreciation, interests on the invested capital and overheads) mean that the trucks must be fully used. The availability of the return freight may also alter the final price.

The quality of the meat sent by the refrigerated truck is better than the quality of the meat resulting from the driven cattle. The average carcass weight is 160 Kg, instead of the carcasses of 145 to 150 Kg obtained from the driven cattle. This factor favours the development of road transportation of chilled meat.

The cost of land transportation of chilled meat is 2,5 times more expensive than the cost of transportation of common non refrigerated goods.

The cost per ton/km of refrigerated meat is about 26,4 frs.CFA while the cost of common goods is about 10 to 11 frs.CFA.

It is expected that with the continuous improvements in road building and maintenance, the cost of road transportation will be reduced in the future.

4.4. River transportation for meat:-

River transportation for chilled and frozen meat from Bangui to Brazzaville and Kinshassa may be cheapest, as compared to the present transportation costs by planes, but this is involved with the establishment of a refrigeration chain comprising a cold store at Bangui's side and a refrigerated boat (or barge) and cold stores at the destination part. The program is envisaged for the future but is postponed for the time being because of the lack of the necessary funds.

5. MEAT PROCESSING PROBLEMS

The processing problems may be classified into two main activities: the improvement in the existing meat industry and the development of new products.

5.1. Production of chilled and frozen meat:-

A considerable development in the export of chilled and frozen meat for the local markets may be achieved by replacing the traditional export of live cattle with chilled and frozen meat. Two aspects are present, as described above.

- a) Economic - concerning the competition of prices and changes in traditional economic structure of the cattle trade.
- b) Political - concerning the interest of both parties, Tchad as exporter and the Central African Republic and Nigeria as importing countries to slaughter the cattle as raw material for the benefit of their employment and the trade in each country.

The development in this direction is a slow process due to the difficulties in change of the existing meat trade structure and the difficulties of organizing and running-in of a new supply system. Practical experience with Tchad meat company S.I.V.I.T. controlling the new meat complex recently installed at Fort-Archambault, has shown that the export of chilled meat from Fort-Archambault to Bangui by refrigerated trucks may be competitive for live cattle export if done on the same basis by buying the cattle in the grazing areas, and if the official taxes connected with their export are paid.

The development of meat freezing may be very interesting at present, for the following products:

- a) The production and export of deboned meat, instead of carcass meat.
- b) The freezing and export of the inner organs (not exported at present)
- c) The freezing and export of certain selected cuts, (roastbeef, fillet, rumpsteak, etc.,) to be recovered from the production of meat products (canned meat, dried meat, meat extract).

The freezing and export of deboned meat may save about 30% on the freight costs for the bones, fat and tendons having a lower value for marketing. On the long distance shipments, this difference in cost of freight may largely compensate the difference in costs for freezing and packaging. The problems related to this development, to be started soon by the meat complex of Fort-Archambault, lies mainly in the organization of the refrigeration chain for the export and marketing of frozen meats.

5.2. The processing of canned meat:-

The cost of the empty can is an important factor in the final cost of the canned meat.

The choice between imported flattened cans or the production of cans locally, are to be examined according to the plan of production and cost of the resulting cans.

With a big variety of can sizes, flattened cans necessitate a larger stocking of cans in comparison to local manufacturing, where the stocks may be kept in tin plates only; this factor may be important, especially if the plant has a limited working capital fund. The purchase of limited quantities of flattened cans is associated also with an increase in price. Flattened cans are also considered as a finished or semi-finished product, considering import taxes and duties, in comparison to the tin plate imported for the local manufacturing of cans.

The local manufacturing of cans is also involved with more employment and personnel training, important for developing countries.

Taking in consideration the relative high cost of the can, between 25 to 30% of the total cost of the product, it will be of interest to increase the quantity of the packed meat in the can and, therefore, pre-cooking of the meat is more advantageous in comparison to meat products cooked in the can.

Canning of the inner parts may be a good way for their utilization, beside the freezing methods described already above.

/sold at about 500 frs.CFA/Kg/

Canned meat is a relatively expensive product in comparison to the fresh meat or dried local meats. Canned meat may find a wider use if the price of the meat in the can and its nutritional value may be on the same level or competitive to the fresh meat. This may be obtained in some cases in places distant from the fresh meat supplying place where the differences in costs of transport and storage between chilled or frozen meat and canned meat will compensate for the additional costs of production of the canned meat.

The production of cheap concentrated spiced meat sauces, to be used with the foods of cereal or amidonic origin (mil, rice, manioc, sorgho, corn) may be of interest for the local population and help also in the development of local production of vegetables to be used in the preparation of these products. Sauces of meat and tomato juices seem the most popular in this case.

5.3. The production of dried and smoked meat:-

Smoked, dried meat, is produced in T.had by the traditional way, as described above.

The products are of poor quality, as the smoked meat is in part carbonized by the heat and, while sold, is often infested by insects.

The production of smoked dried meat of a better quality by controlled smoking may be of a great interest for improving quality of the existing products.

Smoked, dried meat, seems to be one of the most convenient products to be developed for the African people where no refrigeration facilities are available.

The production of smoked dried meat may also be cheaper than canned meat, due to the relative lower cost of the packaging material to be used and the content of fresh meat value for the same transported weight.

The production of smoked dried meat and sausages is envisaged at the meat complex of Fort-Archambault with smoking ovens equipped for controlled smoking.

Sun drying for meat of a better quality may also be envisaged during the dry season, where the sun temperature is high and reaches 40°C, and sometimes more, and the relative humidity drops between 10 and 15%. The production may be done on a seasonal basis only during a few months in the year.

The production of dehydrated cooked meat may also be considered either by the known commercial processes, with the addition of the meat bouillon concentrate to the dehydrated meat, or by dehydrating the meat used for the production of meat extract.

Dehydrated meat may be also a very convenient product for the local markets, where a high nutritive value is concentrated in a small transported weight, reducing the influence of the transportation costs on the final cost of the product. Packaging problems do exist in this case, to be solved according to quality standards accepted for the local markets.

5.4. Production of meat extracts:

The production of meat extracts from the lean and old cattle is a very suitable solution for the utilization of these raw materials. Meat extract, being an export product, does not interfere or replace any meat product envisaged for the local markets.

The development of a meat extract industry, associated with corned beef production, means that the main product is corned beef and unless its marketing is not secured, the risks may be too high to enter into high investments in this industry.

The development of a meat extract industry associated with dehydrated meat may be easier, because of the higher yields in meat extract and the small investment required.

A feasibility study done in this direction, shows that the production of meat extract may be convenient if it is associated on one hand with the freezing and export of the selected cuts and part of the inner organs to the neighbouring African markets and if it is associated with the products of dehydrated meat, which may serve as a cheap protein food for the local population. The public acceptance of dehydrated meat products is still necessary to be done possibly on a pilot scale, before starting a big production scheme.

5.5. The utilization of the by-products:-

The recovery and the utilization of the by-products may bring an additional revenue to the meat industry.

Blood and meat wastes and bones resulting from the slaughtering operations may be turned into blood and meat and bone meals and return into the cattle feeding cycle as concentrated cattle foods.

Part of the bones may be treated in stainless steel autoclaves, for the recovery of the bone marrow and fat (to be used as edible products in the canned meat production) and the extracted bones may be crushed for bone meal for cattle or poultry feeding.

Hoofs oil may be recovered for the local tannery needs and be used locally.

Intestines may be used for local sausage production as part of the meat processing programme.

Horns may be used for bone meal, or for the production of buttons or the other cheap articles for the African markets.

The glands may be frozen for further use in pharmaceutical industry and, when available in sufficient quantity, local extraction may eventually take place.

The hides may be worked into leather at a local tannery, for the production of sandals and shoes.

The development of these products is also envisaged by the mass complex of Fort-Archambault and is partly started.

3.6. Processing problems

Certain problems associated with meat processing are the same as for other food industries in developing countries, for example:

3.6.1 Labour: Local non skilled labour is available and is relatively cheap. On the other hand, skilled labour is more difficult to get and in any case should be trained at the plant itself.

The cost of the services of European experts is extremely high, in comparison to the cost of local personnel. The direct salaries (generally for about 10 months/year), housing, insurance, medical costs, car cost, etc., bring the cost of a foreign expert to about 4 to 5 million (CFA) per year (between 15 000 to 20 000 US Dollars), and sometimes higher, compared with an average salary of 150 to 200 US Dollars/year for a non skilled labourer and 120 to 200 US Dollars/year for a driver or a mechanic. It means that one foreign expert may cost the plant about the same as 40 to 50 local labourers.

The above mentioned proportions between the costs of the local labour and foreign experts lead to the necessity of having the maximum utilization of present foreign experts in order not to overcharge the costs of production by those of these experts.

The personnel qualifications of the foreign experts and their attitude and readiness to train the local personnel are very important.

The foreign expert should be on the one hand responsible for the plant operation, and in this respect he should keep the strict discipline and order at the plant, but on the other hand, he is expected also to be a teacher and train the personnel.

The lack of trained personnel, especially at the initial stage of the running-in period of the plant limit the number of the products to start with, and one must pass gradually from the more simple operations and products to the more complicated and delicate products. These problems are to be solved in each plant and place, according to the local conditions.

5.6.2. The choice of the equipment:- The lack of trained personnel should be also considered in the choice of the equipment and the processing methods and programme.

The use of hand operation should be examined, if not preferred to mechanized operations, considering not only the higher investments and complications associated with the use of the mechanized operations but also the social aspect of giving employment to more people.

On the other hand, the installation should be equipped with safety control and measuring and registering indicators in order to avoid any danger of breakdown of the equipment, or deterioration in quality of the product, and to enable easily following and controlling the processing conditions.

Simple and sturdy machines and installations easy to operate and maintain are preferred. Spare parts should be available in sufficient quantity to make the necessary repairs.

5.6.3. Energy and fuel problems:- Costs of energy and fuels are generally high in comparison to the prices in the developed countries. In Tchad, for example, the heavy fuel used for steam-boilers is paid at about 30 frs.CFA/Kg, which means that the fuel component in the cost of steam is about 1 US cent per Kg of steam. The cost of electricity is also very high and should be considered as average of about 20 frs.CFA/KWh (about 8 US cents/KWh).

An economy in fuel and electricity in processing operations may be sometimes achieved by using, for example, and if possible, the natural climatic conditions, such as solar energy for pre-heating of water or air drying.

In many places, stand-by Diesel electro-generators may be required because of difficulties in the regular supply of electricity by the central municipal power stations or interruptions in the current, caused by storms.

The installation of electrical safety controls and measuring instruments are very important, as mentioned already above.

5.6.4. Food habits' problems:- Food habits are to be considered when dealing with any improvement or the introduction of new products in the African markets.

Advertising methods, necessary for the introduction of new foods, are very difficult, due to the dispersion of the population over a wide area as well as the presence of illiterate people in the villages.

The introduction of new products, associated with a reduction in price, convenience in storage properties and of the same culinary types of existing products, may be easier. Pilot tests are therefore required before starting the production and marketing of new products on a wide scale.

6. RITUAL PROBLEMS

Ritual slaughtering, according to the Moslem law, is required in Tchad, for the moslem part of the population.

Slaughtering and processing of pork cannot be done at the same places and with the same equipment, because of these ritual limitations.

Pigs are raised on a negligible scale in Tchad, in comparison to cattle, one of the reasons being the ritual problems associated with this meat.

Due to the relative high price of pork meat, in comparison to beef, and the fact that pig raising is continuously developing in the neighbouring countries, it is difficult to foresee a considerable development in pig raising and pork meat industry in Tchad for export.

7. VETERINARY PROBLEMS

Because of the existing cattle diseases, the import of Tchad's meat is prohibited in Europe.

A full control of the cattle disease all over Tchad cannot be expected in the early future. On the other hand, local controls and disease prevention treatments may be more successfully achieved on limited zones that may probably lead to permit the entry of this part of the controlled meat from Tchad to Europe.

The procedures to be studied may be made on the same basis as those of 1953, for the frozen meat that was shipped from Ethiopia to Israel, where the live cattle were treated, immunized and controlled in properly isolated quarantines for a period of time sufficient to secure their immunity.

The association of a ranching system, as described above, with a quarantine system under strict veterinary control may be advantageous and may lead to cattle of good quality, free from diseases.

Opening the European markets for Tchad's meat may be a very important phase for the development of the economy of Tchad and its meat industry.

8. SOCIAL PROBLEMS

The development of cattle growing and meat processing is associated also with many social problems connected with the traditional nomadic habits of the cattle growers and their attitude to consider cattle as a symbol of wealth, as well as the traditional marketing systems.

The improvements in cattle raising and the development of agriculture will certainly lead to a change in the social structure and the transition from nomadic cattle raising to ranching and agriculture.

The present lack of sufficient water wells is one of the reasons for cattle migration moving along the pasture area and water sources. The new water wells drilled every year in Tchad are mile stones towards the stabilisation and the development of a mixed agricultural economy based upon cattle growing and field crops.

The continuous development and the increase in the standard of living and the population at the urban centers, will lead to an increase in meat consumption.

9. INVESTMENT PROBLEMS

Investment problems are some of the most difficult problems to solve.

Local capital is very limited and the participation of foreign capital is to be obtained only if a relatively high profit may be secured with a quick return on the invested capital.

The development of the cattle raising and the meat industry does not enter into the category of projects of high immediate profits and a quick return of the invested capital. Therefore, the investment funds are to be found or secured by the Government itself or by external aid.

The aid funds are limited and, when available, it takes a long time until approved. As the Government funds are generally also limited, suppliers' credits are sometimes used, which are given in general for a relative short term of 5 years and 6% interest and are involved with additional costs for covering the Credit Security and other risks. The short term credits, and the additional required costs and interests to be paid, form a heavy load on the Government budget, as it has to support the new industry that cannot pay back the loan in such a short term.

It should be also expected that proceeding with the countries' development, ^{the} part of the African activity and investments, will be increased in the meat trade and the meat industry.

10. MARKETING PROBLEMS

The marketing problems depend mainly on the purchase power, the price of meat to the consumer, and the cost of meat in comparison to other available foods.

In the marketing systems many middle-men are involved at present, and it comes out that the cattle grower is badly paid, the consumer price is relatively too high, and most of the profits remain with the middle-men.

The traditional marketing systems are built as decentralized systems individual activities may be improved if they could have been organized in more efficient systems with better and more economic operational methods. The saving in the costs of middle-men, losses in handling and the better utilization of the carcass meat for different purposes, may improve the final costs and increase the marketing possibilities.

The lack of properly organized refrigeration chain in the meat handling and meat trade influence also the marketing possibilities of fresh and frozen meat, mainly in the inland.

The replacement of the imported meat products by local products may pose also problems. The imported meat products are purchased mainly by the European part of the population for whom the differences in price count less than for the African population. It may, therefore, take some time before they accept and replace the products to which they are accustomed and which they trust, by the new local products.

At present, the development of the meat industry is basically a marketing problem. Raw materials are available, hunger for meat is unfortunately present, capitals for development may be found for safe investments, but the lack of purchase power does not permit development.

It is rather a vicious circle. Reducing costs means investments in improvements, but these are too risky if the marketing is not secured.

Tax policy is also involved. Replacing the imported products by local products exempted from taxes as encouragement to the new industry, means a loss of income to the Treasury from the imported goods. The lack of sufficient treasury funds does not always enable the governments to free the local products from taxes and the given tax facilities are not sufficient as a help and aid to the new coming industry.

Improvements in the meat marketing system and facilities for the African market are also needed for improving the equipment and the hygienic conditions. At present meat is sold mainly at the central markets and single butcheries in the African quarters are very rare. The installment of these butcheries is too expensive for the local butchers and needs an external help for carrying it out.

The price control system for meat marketing may also be improved. The existing price control on the meat, and the lack of a definition for the quality of meat leads to speculation in sales. As quality has little meaning in the African markets, everything is sold at the official price and it may be often found that meat with bones contains 40% bones and sold at the official price; just the same boneless meat may be sold within the connective tissues, tendons, fat, etc., that should be normally trimmed.

The trends for the development of the fishing and fish industries in the importing countries of meat situated along the sea and the establishment of a refrigeration chain for fish from the sea into the mainland may have, in the future, an influence on the quantities of meat that may be imported.

For the time being, it does not seem that the sea fish form a very strong competition for meat. The actual selling price, for example, of the whole sea fish at 130 CFA/Kg at Libreville (GABON) against 200 to 220 CFA/Kg of bone-in meat, do not form a substantial difference in favour of fish. On the other hand any development in the refrigeration chain for fish may be used in part also for meat.

The application of a development policy, organization and investment, to increase the revenue of the cattle growers and the reduction of meat prices for the consumers, may lead to a considerable improvement in the production and marketing systems. This requires well organized bodies that have the necessary know-how, organization, and financial strength to carry out this object, and the help of the local Governments.

11. S U M M A R Y

The problems associated with meat processing, and marketing in developing countries have many aspects and much can be done to advance and improve the present situation.

The development problems for meat form part of many other problems. They cannot be tackled separately and are influenced by the advance and the development trend and program of each country.

The improvements should lead to the sale of more, better, and cheaper meat for the consumer, with a higher income to the grower. The passage from the primitive traditional way of operation into better organized systems, may be better envisaged, if it will be done by organized bodies or companies that have the "know-how" organization and the necessary funds to carry out these operations, as well as Government aid.

Improvements are needed and may be achieved all over the line, starting with the cattle raising, live cattle trade, fresh, chilled, and processed meat production and marketing.

With the live cattle trade, in replacement of the export of the live cattle by chilled and frozen meat, may give place to a considerable extension of the present meat industry to the meat producing countries.

With meat processing, the utilisation of the lower grade cattle for meat processing to replace the imported products as canned meat, developing new products such as dehydrated and smoked meat for the local markets, and the production of meat extracts for export to the developed countries, may be part of the program.

The better utilisation of the inner organs and the by-products of the meat industry, may also increase the revenue of the meat industry.

The development of the transportation means and the reduction in transportation costs are one of the most important factors associated with the meat prices.

The training of the local personnel is essential and the new coming enterprises should serve also as training schools for the future.

Financial aid is essential in order to help the new coming industries and activities. Financial aid under the form of long term credits at a low rate of interest is necessary as the meat developing projects, being basically an agricultural activity, necessitates long term investments.

The development programs in the meat industry will certainly be also associated with social changes in the way of living by passing from nomadic and traditional form to a more established form of living, where cattle raising will be associated with agriculture and more modern forms of raising and marketing systems that will lead to a higher standard of living, more and better food at lower prices.



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