Guidelines for
Livestock Marketing and Processing Components in Bank Funded Projects

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For the World Bank

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INTRODUCTION

The purpose of this Guideline is to inform those managing Bank projects of the Bank’s role in funding livestock marketing and processing components. The guideline provides some background information, project appraisal check lists, some essential items to be included in such components, and the recommended Best Practices. The Guideline also identifies some livestock marketing and processing activities to be avoided, wherever possible, in Bank funded projects.

The livestock sector is an important vector of growth and value added in the Developing World. Most farmers, and especially poor ones, keep ruminants for multiple purposes (milk, meat, wool, traction, manure and savings). Monogastrics and poultry are often a source of complementary income for smallholders, including the most disadvantaged (landless farmers and women).

Since the 1960s, investment in livestock development by the Bank and other donors has been significant. Many projects have financed livestock infrastructure including stock yards, markets, cold stores, rural roads and waterpoints, and have constructed processing facilities such as milk processing plants, slaughterhouses and by-products factories. Funds have also been channelled to support professional associations and industry boards. Most of these investments aimed at supporting the development of ruminant production, while pigs and poultry development resulted from investments by the public and private sectors, as well as government incentives to support and develop “infant” industries. Large scale, vertically integrated, and highly efficient poultry production (and to a lesser extent pig production) and processing systems developed in Western countries have been successfully transplanted to the rest of the world.

The increasing financial burdens entailed by government provision of infrastructure and services, however, combined with a tight fiscal situation in most countries, has led to rationing of investment and declining quality of services. In many countries this has resulted in poorly maintained and crumbling public infrastructures and processing units, and as a consequence, a move towards “privatisation” (in various forms) of processing plants.

Throughout the world, and particularly in Africa, Middle-East, Eastern Europe, and Asia, there is a need for modernisation of the livestock processing industry.

Assistance in such developments, by the World Bank, would depend on clear project objectives to avoid the pitfalls of public sector management, and to involve some participation of the private sector where possible.
BACKGROUND

« By 2025, the world population will have increased by 3.2 billion, an increase of 60% on the 5.3 billion in 1990. Approximately 90% of this increase will be in developing countries, where already three-quarters of the world’s people live. The greatest absolute population increases are expected in Asia, although the highest growth rates will continue in sub-Saharan Africa (SSA).

Over one billion people currently live in absolute poverty and some 800 million people in the developing world are malnourished. The highest incidence of poverty is currently in South Asia, although it is expected that over the next 20 years the incidence of poverty will increase by 40% in Africa.

Chronic undernourishment, an indicator and result of poverty, may, in the medium term, reduce in West Asia and North Africa (WANA) and Latin America and the Caribbean (LAC) and, on a long term horizon, in Asia. However, over 650 million people – 156 million of them children – are expected still to be food insecure by 2020, with up to 35% of the population in SSA facing chronic malnutrition. In India and Bangladesh alone, the proportion of malnourished children is expected to be nearly double that of the rest of the world by the year 2020.

Most impoverished people live in rural areas, but increasing numbers are urban dwellers. The readily available essential amino acids and micro-nutrients from meat and milk are particularly valuable in the diets of children in poor urban households, where limited choice of foods and dependence on starch staples make it difficult to obtain a nutritionally balanced diet.1

Livestock play a critical role in both the sustainability and the intensification of agricultural productivity in most farming systems. They make vital contributions to the production of food, their manure helps maintain soil fertility and they contribute to the overall farming enterprise by providing income and employment. Two-thirds of the world’s livestock are in developing regions, where production efficiency is estimated at one quarter that of developed regions. Over 90% of the livestock in developing countries are owned by rural smallholders. Major constraints to improve productivity include animal disease, the poor quality and/or inadequate supply of feed, diminishing plant and animal bio-diversity, inadequate links to markets and unresponsive policy environments.

In developing countries, livestock and their products contribute approximately 29% of the total value of agriculture, fisheries and forestry production. This figure increases when traction and manure are considered.

Faced with increases in the human population and in the numbers of malnourished and poor people, there is an urgent need to develop interventions that increase livestock productivity and supply of livestock products. Although livestock production growth rates are expected to decline from 4.6% per annum over the last two decades to 3.8% p.a. in 2010, there is a need for a 155% increase in livestock products over current production levels to meet demand by 2020. » (extract from ILRI Medium term plan 1998 – 2000).

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1 Meat and milk produced by many poor rural families are not consumed by the family, but sold for income to buy cheaper sources of energy, protein and vitamins.
MEAT

LIVESTOCK POPULATION

With the exception of Poultry, the growth in livestock population over the past 17 years has not kept pace with the growth in human population, which has grown by 30% since 1980. The output of livestock tonnage has increased significantly, however, largely due to improvements in productivity.

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<tr>
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<tbody>
<tr>
<td>Cattle</td>
<td>1,216</td>
<td>1,285</td>
<td>1,319</td>
<td>8%</td>
</tr>
<tr>
<td>Pigs</td>
<td>796</td>
<td>853</td>
<td>935</td>
<td>17%</td>
</tr>
<tr>
<td>Poultry</td>
<td>7,193</td>
<td>10,758</td>
<td>13,457</td>
<td>87%</td>
</tr>
<tr>
<td>Sheep/goats</td>
<td>1,553</td>
<td>1,773</td>
<td>1,752</td>
<td>13%</td>
</tr>
</tbody>
</table>

Source: FAO data

MEAT PRODUCTION IN DEVELOPED AND DEVELOPING COUNTRIES

Global meat production is expected to reach 227 million tons in 1997 and the current growth in meat production is being stimulated by an increasing rate of consumption in developing countries which, since 1994, has overtaken the production in developed countries. The charts below indicate this recent trend. Whilst the rate of increase in production in developing countries in 1997 is expected to be 8%, in developed countries it is practically zero. (1% after some years of negative growth).

Meat consumption is stagnating in developed countries, but in 1997 about 56% of the total meat consumed in the World was in developing countries and this growth rate is expected to be 8.3 percent in 1998.

Developing countries will become increasingly more important for meat production and consumption as the current low level of consumption of their inhabitants, and their expected increase in GDP, strengthens the sustainability of growth in the market trend for animal products.

Chart-1 : World meat production (millions tons)

Source: FAO data

Aggregate World Meat Production and Consumption

<table>
<thead>
<tr>
<th>1997 Preliminary</th>
<th>Production and Consumption (million tons)</th>
<th>Per Capita Meat Consumption (Kg per capita)</th>
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</thead>
<tbody>
<tr>
<td>Bovine Meat</td>
<td>57.6</td>
<td>9.8</td>
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</table>

Source: FAO data
THE CONVERSION OF LIVESTOCK TO MEAT.

Statistics on meat production and consumption vary quite significantly depending on the source, and need to be used with some degree of caution. This is partly due to the rapidly changing production levels, and partly due to the conversion of animal population data into meat production data at optimistic yields. In most cases it is not clear if meat production statistics refer to boned-out meat or bone-in carcasses.

Task Managers are advised to check livestock to meat conversion data carefully when using it for investment project decisions.

Comparison with international meat yields is not wise, since the meat market in most of Asia utilises animal components that would not be used in some Western countries. Farming methods are not automated to the same degree as industrialised countries; Cattle tend to be smaller and variable in weight, poultry are frequently harvested early to relieve local cash shortages, and official data is based on best achieved (or theoretical) results rather than actual average results. These, and other operational differences, cause errors when using conventional «Western» yields to convert livestock populations into meat production data. Project analysts should allow at least 10% reduction for large livestock, and 15% for small livestock and poultry, against the sponsors estimated live-weight to meat conversion calculations - unless their project is integrating livestock production and processing with very sure yields. The conversion of livestock production to meat yield is demonstrated in the following table:

<table>
<thead>
<tr>
<th>Conversion of livestock to meat</th>
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<tbody>
<tr>
<td>Live-weight at slaughter Kg</td>
</tr>
<tr>
<td>Beef cattle</td>
</tr>
<tr>
<td>Dairy cattle</td>
</tr>
<tr>
<td>Sheep</td>
</tr>
<tr>
<td>Pigs</td>
</tr>
<tr>
<td>Broilers</td>
</tr>
<tr>
<td>Rabbits</td>
</tr>
</tbody>
</table>

Source : Dickerson
Note : Performance levels noted by Dickerson are not peaks, but an average attainable by most breeders.

THE MEAT INDUSTRY : CONSTRAINTS AND OPPORTUNITIES

SUMMARY

Improvement of Meat Marketing Methods.
The geographical location of livestock supply areas has an important bearing on the location of markets, method of marketing and place of slaughter. Major requirements contributing to the improvement of efficiency of marketing of livestock are; (i) the establishment of concentration yards (assembly point) and public stockyard markets in the production area; (ii) the development of an accurate market information system on prices. (iii) the utilisation of a uniform terminology of grade standards for livestock and meat and (iv) the existence of adequate banking and credit facilities. In addition, the development of meat production has to be placed in the broader environment of sector policies and trade regulations, which impact both formal and informal sectors.
National Network of Slaughterhouses.
Slaughter facilities range in capacity and complexity from the single outdoor slab to large technically advanced industrial abattoirs. In addition, many countries are facing problems linked with inadequate processing facilities and over-capacity. A major issue relates to the location of slaughterhouses, in production areas as opposed to consumption areas and the lack of an efficient transport system (railroad, trucks and water supply) that is critical. The development of refrigeration (transport and cold-stores), which has a profound improvement on slaughtering and on the distribution of meats and makes it possible to slaughter live animals nearer the place of production and ship the dressed carcass to the consumption centres. Without refrigeration the animals need to be slaughtered near to the point of consumption.

Improvement of Management and Operating Standards.
Most slaughterhouses have become run-down, inefficient and financially unprofitable. The various aspects of management include asset ownership, operation and maintenance, capital investment, and commercial risk and can be dealt with through different options; complete divestiture to the private sector, concession, service contract, management contract and lease. Moreover, the following prerequisites for successful implementation of different private sector options need to be considered; stakeholder support and political commitment, outlet markets (export and local market), profitability and cost-recovery tariffs, and a developed regulatory framework.

Improvement of Standards of Quality and Environmental Health.
Many of the slaughterhouses are unhygienic from the point of view of human health either through disease transmitted by animals or by unsanitary slaughter procedures. Availability of water and the disposal of effluents from slaughterhouse are also important issues. Health and environmental concerns raise the question of public good content in slaughtering activities and the respective roles of the private and public sectors in the management of slaughterhouses. Clear technical and sanitary regulations and enforcement capabilities have to be developed. Also, the international recognition of good zoo-sanitary status and the compliance with health and food safety obligations mandated by international agreement (Codex under the WTO) are critical for export development and result in a zoning of production and consumption regions.

Improvement of Overall Management of the Meat Sector.
For many developing countries there is a greater comparative advantage for livestock production. Their Governments can promote the development of the livestock industry through adequate incentives and mechanisms for improving livestock marketing and processing. In parallel, the private sector, in particular professional associations, have an important role to play to foster sector structure; At the local level the development of co-operative producer associations to assemble, load and ship livestock to a specific market, with an increasing emphasis on the marketing function, increases producer returns from livestock. At the national level, Meat Boards can assist producers in prospecting the best export outlets for the various classes of livestock. Beside producer groups, other professional associations are having an increasing role in the development of the sector, these include user groups for marketing and processing facilities, as well as dealers and butchers associations. The role and rationale of these associations will be investigated.

Promotion of Private Sector Participation.
In many countries, sectoral price and trade policies are hampering the development of the private sector on both national and export markets. In other countries, cumbersome regulations can constrain marketing activities. Another negative factor, inherent to the meat sector, is the in-elasticity of slaughter services demand relative to price which results in an increase of backyard slaughter when the cost of services are raised.

MARKETS AND MARKETING

Constraints. The problems of cross border trading of live animals are extensive particularly in terms of finding common livestock health regulations and inspection procedures that are acceptable to both countries. Livestock trading and meat trading within each country also has its problems largely due to breakdown of poorly funded infrastructure, and local preferences.

The following covers most of the constraints that are likely to be experienced throughout the developing world, including the inadequacy of market facilities, transport, cold storage, communications and the problems experienced at customs posts. Also the problems caused in the local livestock industry by ‘dumping’ of meat products by developed nations.

Opportunities. These problems, in turn, demonstrate the opportunities for investment by Bank funded projects, and clearly
indicate the delicacy and care with which investments need to be made in order to be successful. A number of projects (non Bank funded) that have tried to impose Western standards on developing countries have foundered due to the construction of ‘modern’ facilities that do not meet the needs of the local livestock industry. These investment opportunities are equally relevant to most developing countries.

Livestock Markets

Main constraints. Each type of market has its specific problems of location, equipment, organisation and management and the related problems of financing investments and recurrent expenditure. Terminal markets are in most urgent need of Bank funding, but secondary markets, border markets and collecting markets also need Bank investment if the domestic livestock sector is to meet the demands of increasing population.

➢ Terminal markets

Present problems. Problems are experienced in large towns where the markets are still located in the urban area. The majority of large towns have their terminal markets in urban areas, and face inevitable difficulties for traders and for the inhabitants.

Rationale for Bank investment in de-centralisation. Large terminal markets will continue to collect and concentrate the largest proportion of livestock and will have major problems in the forthcoming years. Decentralisation will be needed and should include resolution of land tenure, provision of access roads, cleansing installations, equipment, communication and banking services, transport, professional services, and staff.

|Their importance and need for relocation justifies terminal markets to be financed by Bank projects.|
Task managers should take account of several recommendations when including market relocation in their projects.

a) **Local associations** of traders and butchers need to be involved in the design, organisation and management of new markets, and local recommendations need to be a condition of the loan. **Example.** The terminal market of Abidjan was built in the 1960’s to a design based on a European model, without any involvement of the local personnel. Traders refused to use the new facility due to the inconvenient layout in design, and the market has remained unused.

b) **Weighing Livestock.** It is unrealistic to impose the sale of livestock according to accurate weight, or by auction. The majority of butchers cannot afford time for these lengthy procedures and cattle are normally traded by estimated weight. This is efficient and fast, and is used in most markets also in Asia. The estimated weight is in many cases quite accurate.

c) **Modernisation of markets** is possible in Bank funded projects that include integrated systems of production and processing, mainly for export. In this case vertical integration of a thoroughly modern market system to international standards is essential.

#### Secondary or grouping markets
Grouping markets are located in areas between livestock production and consumption near main roads or railways. Mixed cattle are brought from collecting markets and are sent to terminal markets in larger and more homogeneous batches. These markets need equipment according to the volume of livestock traded: fences, attachments, corrals, feed troughs, water, scales, and some offices. If they are located near a town they can use public services: mail, telephone, banks, possibly water and electricity. As with the terminal markets, they need a management committee and the involvement of professionals associations. The committee will fix tariffs, control taxes and payments, oversee maintenance, restrict the access of general public, and improve transaction practices and collection of statistics.

Their role of co-ordination between regions justifies these markets to be financed by Bank funded projects.

#### Border markets
Most border posts between countries are solely for customs purposes and for sanitary control of livestock. Border markets are located at political boundaries rather than at natural livestock exchange points. The best example in SSA is in Cote d’Ivoire where five markets were established in 1978 and four less significant in 1990. Market management was undertaken by a public sector enterprise and was independent of customs services (avoiding graft and corruption). The markets are situated near small towns to benefit from existing public services. Their major function is to provide monthly detailed statistical information on livestock movements (around 150,000 cattle and 300,000 small ruminants a year).

Traders benefit from the market services: vaccination, veterinary treatment, corrals, watering, loading facilities, emergency slaughter point, and on market information for the terminal markets. Sales, however, are relatively unimportant as this is largely a transit point. Investment in equipment is relatively high (about US$110,000), and taxes are charged to cover the operating and maintenance costs (about US$50,000 per year). A typical fee would be US$0.5 per head for cattle and US$0.3 for small ruminants.

Bank funded projects should invest in this type of market as it is strategic at regional, national and international level for the development and improvement of the livestock trade.

#### Collecting markets
There are several thousand small primary markets in SSA with a livestock collection radius of about 40km collecting about 100 cattle equivalent (about 80 cattle and 200 small ruminants) per working day. An adequate cattle production density is needed to support these small markets, and if less than 100 cattle equivalent per day, professional collectors would not visit on a regular basis. This results in low prices offered by local butchers and the resultant loss to producers.

Equipment is very simple at markets and can be financed by local collectives or by operating associations of cattle breeders. If investment is included in a Bank funded project it should be through a relevant association.
Task managers should note that: Influential cattle breeders often propose market construction projects where the density of cattle is too small to support the market. These projects are unrealistic, and collection can be better resolved by door to door buying and by programming sales of livestock or by having periodic fairs. Market complexes decline rapidly unless adequate roads, railways and facilities are created and maintained. There may be socio-political problems at collecting markets and these need innovative solutions while cattle stocks are built-up to commercial levels.

TRADERS

In all agricultural and livestock markets the market traders are the key to a successful operation. A number of new markets have been set-up in China and India under Bank funded projects, and good incentives have been provided under the project to encourage established market traders to move to the new facilities. This is essential if a new market is to establish quickly. The ownership of markets is generally in the public sector or in a company set-up with public sector involvement. In SSA the majority of livestock markets belong to the public sector or town councils. In eastern and southern Africa some markets belong to the meat boards. Traders associations should always be involved in the market management in collaboration with other organisations including breeders and town councils. Public and municipal market taxes for commercial transactions are paid by breeders and traders. It is a common problem throughout the developing world that few of these taxes are used for maintenance or improvement of market infrastructure.

One of the main constraints of animal traders’ organisations is the lack of short term credit facilities for their members. The majority of traders sell cattle, sheep and goats on credit to small butchers but the butchers funds are often inadequate, and cash shortages frequently block the system. Cattle traders also buy livestock from breeders by credit, and the interest can be as high as 10% to 20% a month. It is important that traders associations can get timely bank credits at reasonable rates of interest.

Bank funded projects should ensure that credit facilities are available at each stage of the production and trading chain, and should include some form of credit or working capital in cases where this is missing.

IMPORTS

Imports. Most developing and many developed countries domestic agricultural sectors are protected with import tariffs resulting in very low levels of meat import with the exception of poultry. Most meat is consumed directly from the fresh meat market, and frozen or chilled meats are not less well accepted by the domestic consumer. Imported, frozen and chilled meats, may be restricted (by regulation), and do not, therefore, have a strong presence in the domestic market.

Dumping practices. The availability of cheap imports in all developing countries can have a significantly depressing effect on production in the home market.

EXPORTS

World trade in animal products was US$83.3 billion in 1994 equivalent to 2% of world trade, 21% of agriculture, and more than twice the cereals trade (38.4 billion US$). In current dollars the growth rate has been 8.4%/y during the last 30 years but the developing world exports only 14% of its animal products. Meat accounts for 59% of the world trade in animal products in which beef is US$25.8 billion, small ruminants US$3.5 billion, pork US$12.6 billion and poultry US$6.4 billion.

Exports are regulated by WTO and for non tariff barriers by the SPS (Sanitary and phytosanitary) agreement of Marrakech signed in 1994. This exhaustive set of regulations defines the strict norms applicable to exports. Exporting slaughterhouses need to comply with ISO 9000 and be checked by the importing countries. Veterinary services need to be recognised internationally and by the importing country, and the producing country has to demonstrate that there is no sanitary risk for the importing country.
LIVESTOCK AND MEAT TRANSPORT

LAND TRANSPORT

In most developing countries land transportation of livestock and meat is very basic but improving. Refrigerated transport in the public sector is difficult to justify largely due to maintenance problems and due to difficulties in obtaining a ‘return-load’ for the refrigerated truck or rail wagon. The private sector is increasingly taking over road transport, and in the more developed and modern cities they will invest in refrigerated transport to meet the demands of supermarkets. Countries such as India and China have well developed roads that are maintained to a reasonable standard, and now include modern highways. In these countries refrigerated transport is already commonplace, and Bank funded projects need to invest in modern transport, or preferably to facilitate the participation of private sector transport owners. Development in SSA has progressed more slowly largely due to the poor standard of the road networks.

Railways are still largely owned by the public sector in most developing countries. Bank investment in refrigerated railway rolling stock is not advised for Bank funded livestock projects, largely due to the very limited level of control that the project would have over the operation and maintenance of the wagons. One example of a good Bank investment in insulated milk wagons does exist on ‘Operation Flood’ dairy project in India, but this is an exception and not the rule.

Relative competitiveness of various modes of transportation

Most developing countries use modern transport systems for livestock transportation, but in Africa there is still some livestock trekking. Modern livestock transport (by railway or by truck) is perceived as more expensive than trekking but surveys have shown that transportation of livestock between 200-1400km is actually less costly by modern transportation and the comparison depends largely on the cost of servicing loans and on livestock losses. With modern transport systems the initial capital cost of equipment is high, but the livestock reaches its destination rapidly, and reasonably safely, and the main costs are in fuel, maintenance and equipment replacement. Trekking ties up large herds of expensive livestock for several weeks, and involves high debt servicing costs and livestock fatalities on the trek. The result is that trekking can be two to four times more costly than modern transportation. Livestock trekking is, therefore, declining with the improvement of transportation infrastructures, and a reduction in transport costs in the final value of the livestock.

Rail transportation

Railway developments in Asia were established early in the 20th century, and livestock services are well established in most countries, the largest volume of rail livestock traffic being between China and Hong Kong. Rail developments in the SSA region were much later, and since the 1970’s there have been no major improvements. Moreover, since the network was in the public sector it has declined significantly since 1980, with deficiency of wagons, increase in breakdowns and accidents, increases in tariffs (due partly to corruption), staff without salaries, and strikes. The costs of rail transportation over long distances are lower than road transport costs, but in SSA their actual costs (including delays and losses) are higher, and rail volumes have decreased by up to 50% in the past 14 years.

Trekking. Rail transportation decreased since 1975 and modern (largely road) transportation systems reduced trekking to less that 16%. Trekking is still used for short journeys and for localities without adequate roads. Rail is still used for small ruminants. Road and rail transport cover 90% of the total.

Improvements required. The railway systems can transport more livestock at lower costs and with less damage to the environment, but in many developing countries the lack of investment funds, and poor management by the public sector, inhibit the growth of livestock transportation by rail. Investments in railways in SSA could be made by the private sector and the participation of large meat traders, importers and exporters could be practical, but this would be dependent on upgrading of the entire railway network and control system to ensure that livestock was not stranded en-route.

Railway investments under Bank funded livestock projects are not recommended.
Road transport
Expansion of long distance or inter-regional road transport of livestock is directly related to other freight traffic, and cattle transport is usually subsidiary to the main freight. Most livestock trucks in developing countries are not specially adapted for cattle transport and although specialised livestock trucks could transport more livestock, they are more expensive and may not find a return load. The intensity of cattle traffic is therefore related to the main freight traffic which varies according to regions and seasons. This results in the costs of cattle road transportation varying by a ratio of 1:2. Surveys in SSA indicate that the average cost for cattle transport is low at about 8% to 9% of the final live cattle price for 500km and 17% to 18% for 1000km.

Trends and constraints. In most developing countries there are few constraints for livestock transport by road, as trucks are held mainly in the private sector. Some restrictions may apply due to licensing requirements (including India and China) but truck transport is otherwise relatively free of constraints. The growth of livestock transport by road in China has been significant since 1990, and is directly related to the expansion of the highway network that has been largely Bank funded.

The rate of growth of road cattle transportation in SSA was 3% to 4% between 1964 and 1994 in West, East and South Africa. It is a little higher in West Africa since export producing areas and import consuming areas are more delimited and this implies more active exchanges. Excepting roads and road maintenance all transport belongs to the private sector. During the 1980’s, corruption and extortion increased in the public sector in areas affecting cattle trucks and traffic. In spite of intervention of public authorities, extortion increased costs by about US$15 per head. Some private companies provide insurance against extortion for about US$3 per head on long distance routes, and this has been effective in reducing corruption and extortion in these areas.

Improvements required. The increasing demand for road transport and road infrastructure requires the relevant public services to be reinforced, and for road security to be improved including protection against extortion. Administration also needs to avoid long delays at borders and could follow the good example of Cote d’Ivoire where border delays have been minimised. It is not usually practical to tackle these problems in a Bank project, but by involving the private sector in vertically integrated projects, the private sector will usually resolve such problems.

Private livestock trucks need to be promoted for small ruminants (their transport by ordinary trucks are twice as costly as in transport of cattle). This could be best achieved by associations of transporters and some credit for truckers can be recommended for Bank funded projects.

Information on terminal markets (prices, volumes, qualities) is usually very poor. With the increasing role of modern transport, traders need current information so that they can select destinations according to the market opportunities. At present only large traders can pay for limited information and others risk arriving at markets where too many livestock are on sale, depressing prices. The Bank needs to support the creation of information systems taking account of existing examples, and adapting them to each country.

REFRIGERATED TRANSPORT

Road and rail. Refrigerated road transport is common in Asia, and becoming increasingly the preferred method of meat transportation. Refrigerated rail transport is not common and in the few areas where it is available it is expensive. Investment will be required in refrigerated and insulated road transport for most Bank funded livestock projects that involve slaughterhouses.

In West Africa it is technically feasible for long distance transportation of carcasses by refrigerated lorries, but there are numerous problems. Refrigerated road/rail transport systems were started in SSA in the 1960’s, and all ran at a loss. During the same period a private company ran a trial refrigerated rail wagon service between Burkina Faso and Abidjan that could transport up to 1200t per year through to 1981, but this has not been continued. There is one remaining refrigerated transport system in West Africa between Ferkessedougou and Abidjan where a State owned company transports 900t/y of refrigerated carcasses on good asphalt roads over a distance of 600km. The company has been privatised since 1990 but refrigerated services are unlikely to be competitive with non-refrigerated transport or trekking.

Task managers need to take account of the following factors when considering investments in refrigerated transport as opposed to fresh meat transportation.
The cost of pre-freezing needs to be added to the theoretical cost of refrigerated transport.
Trucks and wagons rarely find a return load of refrigerated freight, and return empty.
Breakdowns have more repercussions than with conventional transport.

Example. The real costs of refrigerated transport in SSA, taking into account all associated pre-freezing costs and system risks, is nearly double that of trekking. Refrigerated transport can, therefore, only be used for high quality meats that can compete with imported meats.

Refrigerated traffic could increase if investments are made in insulated or refrigerated trucks and in cold stores at the arrival sites. Bank funded projects normally need to invest in some refrigerated transport.

AIR TRANSPORT

Air transport of refrigerated meat is not common in any part of the world, excepting special high value consignments to lucrative markets.

It is not practical for Bank funded projects to invest in this mode of meat transport.

SLAUGHTERHOUSES AND MEAT PROCESSING

RATIONALE FOR BANK FUNDING.

Hygienic humane slaughterhouses are an essential requirement of the meat industry sub-sector in all countries, and the quality and availability of these facilities in developing counties vary significantly. It is difficult to generalise, but large slaughterhouses in Asia and Africa have been constructed to a reasonably good standards, but have frequently been left without adequate funds to maintain the essential services and standards of hygiene. Small slaughterhouses and slaughter yards are usually basic, and may not have been designed with adequate facilities to maintain modern hygienic conditions.

Good slaughterhouses of any capacity should facilitate livestock slaughtering in controlled hygiene conditions, high levels of quality control, production of reliably hygienic meat for consumers, and should facilitate the wholesaling of meat. Large slaughterhouses should also enhance animal by-products for added value, and should facilitate the sales of export meat and meat products. Slaughterhouses are an essential link in the livestock production and marketing chain.

Public Health.

Veterinary public health is one of the most important aspects to be considered in relation to increasing urbanisation and emerging sanitary problems in sub-Saharan Africa (SSA), and slaughterhouses are filters against zoonosis such as cysticercosis, trichinosis, actinomycosis, actinobacillosis, anthrax, tuberculosis, rabies, tetanus, salmonellosis, brucellosis, botulism, erysipelas etc.

Process plant hygiene.

Present levels of sanitary and hygiene standards within the meat sector are currently inadequate in most developing countries. Local processing plant designers have very little knowledge of modern materials, modern processes, and cleaning and sterilising systems. Livestock is inspected before and after slaughter, but in most plants the inspectors do not have access to modern laboratory equipment to test for pathogens, or to identify suspected diseases.

The concept of identifying the supplier with the carcass is largely unknown, and packaging and labelling systems are unsophisticated. An attempt will probably be made in China under the Smallholder Beef Cattle Development Project (1998) to introduce a pilot scheme for improved regulations concerning hygiene, packaging and labelling, but details of this have not yet been finalised.

In view of the public health implications and general need for expansion of the meat industry to cope with increasing populations, Bank funded projects need to consider some form of investment in slaughterhouses and meat processing plants. This may need to be in the private sector, and the role of the private and public sectors is discussed in detail later in this paper.
Slaughterhouse profitability and capacity utilisation.
Capacity utilisation varies considerably in most developing country slaughterhouses from less than 10% to more than 70% of the maximum designed capacity. The following are some factors that are partly responsible for this:

- Most slaughterhouses are still managed by public servants that have few marketing skills. This is changing as financial pressure mounts to improve productivity and cut un-economic operations, but the change is likely to be slow, and in remote areas will continue into the next millennium.

- Funds for working capital are generally unavailable from public sources, and most companies are unable to raise more than a small proportion of their actual requirement of working capital. Contracts with farmers to provide livestock for slaughter on credit are commonplace, but farmers object to this, as they may not receive their full payment if the slaughterhouse runs into financial difficulties. The Bank has helped to provide funds under some projects for “Initial Working Stocks”, but in the longer term this will only be resolved by participation of commercial capital from Banks or from commercial marketing partners.

- The traditional livestock production pattern in cold climates is to raise stock in the spring and summer, and slaughter at the onset of winter. This reduces the necessity of feeding during the winters, and provides cash reserves for farmers in their non-productive winter season. Slaughterhouses are frequently idle during the growing seasons, but very active in the early winter and spring. Livestock production patterns are changing in Asia with the improved availability of quality feeds, and with the levelling of demand peaks due to cold chain storage and marketing systems. Also by the introduction of managed farming methods by some of the meat companies.

- National festivals, feasts and banquets increase prices substantially in festive seasons, and farmers plan their production cycles to take advantage of the high prices.

Very few public or private sector plants are operating above 70% capacity, and at these levels of production it is difficult to produce a profit.

- Older plants that have relatively low operating costs, and investments that are already discounted or written off by earlier public sector owners, can usually produce a positive cash flow at around 60% of designed capacity. An FIRR of about 16% will normally produce a positive cash flow at these plants.

- Newer processing plants and Bank projects that have investments to support with debt servicing, capital repayments and dividends to investors would need to produce at least 21% FIRR in order to produce a positive cash flow. This would normally require the management to operate the plant at more than 80% of designed capacity.

By-products.
Most small to medium slaughterhouses trade in skins, hides, fats and bone. Very few have their own by-products processing facilities other than crude rendering tubs.

- In many instances hides and skins are wasted by inadequate storage before despatch to the tannery. Semi-putrefied hides and skins do not tan well, and the resultant leather is full of holes, reducing its value to the leather trade.

- Bones of larger animals can be sold to gelatine mills, but in Asia the price of bones has dropped rapidly with increased availability. In many areas the value of the bones is less than the transportation cost to the mill.

- Tallow and fat is sold readily to other processing industries, particularly soap makers. Most slaughterhouses can sell these by-products, and fat and tallow are traded items.

- Blood products are not generally traded, but some large modern slaughterhouses have facilities, or have arrangements with local pharmaceutical factories, and can sell these by-products.

Meat processing technology.
Meat processing is influenced by changes in eating habits and increased living standards that have created opportunities for processed products. The meat industry in Asia is beginning to appreciate the added value and increased market opportunities of processed meat products. In the past this has too frequently been accompanied by low quality inputs, and a general lack of knowledge on meat product processes and recipes. There has been very little development in the area of processed products, and most proposals in this field are for traditional dried, spiced, salted and cooked products that already exist in the market. There is potential for new products including smoked meat products, ready-to-cook meals, and some “Western” style foods.
ENVIRONMENTAL ASPECTS

Growing population and urbanisation, rising incomes and changing consumer habits are the main underlying causes for increasing environmental degradation in most cities. Slaughterhouses and meat processing activities add to this problem. In developed countries, processing plants have been relocated away from large cities, and enforcement of environmental regulations have significantly reduced effluent problems. In developing countries, insufficient infrastructure and weak institutions have not achieved the same result, and environmental control at and around slaughterhouses is relatively poor. One positive factor is that there are fewer by-products from slaughterhouses in developing countries as a larger proportion of the animal components are consumed. (see de Haan et al, survey)

In most developed countries slaughter activities are centralised and the carcass is often de-boned at the slaughterhouse and cooled before being sent to retail outlets. Consumers prefer lean meat and only a few items of offal are sold as cuts, such as brain, kidney, liver, sweetbread, and tongue. This results in large volumes of inedible offal, by-products and bones to be used or discarded by the slaughterhouse. Generally, the clean fatty material is processed separately into edible fat. Other parts may be used to produce bonemeal, meatmeal and bloodmeal or compounds of these products. Modern abattoirs are well equipped with facilities such as running water, steam, power, refrigeration, transport, etc. and can put to further use all edible and non-edible by-products for human consumption, pet food, feed industry or fertilizer.

In developing countries a large range of slaughterhouse capacities and technologies exist and slaughter sites can vary from a simple slaughter slab to modern slaughterhouses. Large-scale industrial processing units import technology from developed countries, often without the rendering plants or waste treatment facilities. Slaughterhouses often discharge blood and untreated wastewater into sewers or streams, and destruction of sick animals is inadequate. Blood coagulates in drains, where it becomes putrefied, causing bad odours and sanitary and environmental problems. By-products may be wasted or lost due to insufficient skills and poor management in the slaughterhouse, poor quality equipment, low incentives for recovery of by-products, and lack of regulations or their enforcement. Most slaughterhouses in the developing world are public enterprises lacking sufficient funds to maintain high quality operations. Slaughter fees are kept low to prevent illegal slaughter, and the resulting meagre revenues are often used for other purposes than the operation and maintenance of the abattoir.

Slaughterhouses require copious amounts of hot water, steam and chemicals for sterilisation and cleaning the plant and equipment, and the resulting main pollutant is waste water. Effluent from slaughterhouses is heavy in organic materials including fat, oil, protein and carbohydrates, and some cleaning chemicals, all of which are biodegradable and contains insoluble organic and inorganic suspended solids. The plant would also produce solid wastes including paunch manure and fat, and ash and clinker from the boilers. The following table gives an overview of the potential waste water emissions of a typical red meat slaughterhouse, before treatment. A red meat slaughterhouse would typically produce 26 kg of BOD per ton liveweight, whereas a poultry slaughterhouse would have much lower BOD loads not exceeding 10 kg BOD per ton of liveweight before treatment.

<p>| Potential waste emissions of a red meat slaughterhouse |</p>
<table>
<thead>
<tr>
<th>Kg BOD/t LW</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockyard and pens</td>
<td>0.25</td>
</tr>
<tr>
<td>Blood</td>
<td>10</td>
</tr>
<tr>
<td>Hide removal and cleaning</td>
<td>3</td>
</tr>
<tr>
<td>Scalding, dehairing</td>
<td>0.7</td>
</tr>
<tr>
<td>Paunch</td>
<td>2.5</td>
</tr>
<tr>
<td>Intestine handling</td>
<td>0.6</td>
</tr>
<tr>
<td>Rendering</td>
<td>2</td>
</tr>
<tr>
<td>General cleaning</td>
<td>3</td>
</tr>
<tr>
<td>Meat packing</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total polluting potential</strong></td>
<td><strong>26.05</strong></td>
</tr>
</tbody>
</table>

Source: Verheijen et al 1996

All slaughterhouses and meat processing plants need to treat their effluents and emissions, and an Environmental Impact Assessment Report (EIAR) must be produced during slaughterhouse appraisal. All waste products from the slaughterhouse need to be recovered for further processing, or treated in a treatment plant. All effluents and emissions
after treatment need to be to national environmental standards, or in countries that do not have national standards the Banks environmental guidelines may be used. Environmental monitoring systems need to be established, and the relevant agency identified to carry out the monitoring.

There are economies of scale in waste treatment and by-product utilisation, and large-scale processing usually facilitates a higher utilisation of by-products, good waste management, and enforcement of regulations. The disposal of concentrations of waste materials from the treatment plants may be a problem but inert sludge from flue scrubbers and effluent plants can be mixed with manure and dispersed on agricultural land to some advantage. In large-scale production, considerable management effort is needed to keep waste production at an acceptable level. By-products need to be utilised in-house or by contractors that have secondary processing facilities such as rendering plants, gelatine mills, and fertiliser units. Small-scale processing does not lead to excessive waste loads if the plants are geographically distributed. Typical products that are not used by the slaughterhouse and need to be sold on for further processing are: skin or hides, fat, blood, bones, feet, horns, paunches, intestines and reproductive organs. In some SSA countries several of these items may be considered as edible.

SLAUGHTERHOUSE MANAGEMENT

In many developing countries most slaughterhouses are managed by technical staff and not by administrative staff, and in most cases they are veterinarians. It would be preferable for these units to be managed by professional staff that have good experience in financial and commercial management, and even better if they are managed by the private sector.

SANITARY REGULATION IN SLAUGHTERHOUSES

The sanitary and hygienic operation of a slaughterhouse is regulated as follows:

- International, national and local regulations (as relevant) controlling veterinary inspection for ante-mortem and post mortem examination of livestock, carcases, and offal.
- International, national and local regulations controlling all aspects of sanitary and hygienic requirements in slaughterhouses and food processing plants.
- International and national equipment design and installation standards relevant to slaughterhouses and food processing plants. Many of these standards originate from the ISS, International Sanitary Standards.
- National and local regulations on working conditions for employees in the slaughterhouse and food industries.
- International, national and local regulations (as relevant) on operating procedures in slaughterhouses. These may also include religious preferences and rituals.

Regulations controlling sanitary and hygienic requirements in slaughterhouses. Most states are bound by a multiplicity of regulations concerning the location, design, management and operation of slaughterhouses, and these need to be identified for each proposed project. Project sponsors and appraisal teams should also consult the World Health Organisation “Guidelines on slaughterhouses and meat hygiene for developing countries” by Dr. I. Mann, Publication No. VPH/8356. This publication is practical, descriptive and technical, and covers most regulatory requirements that would be encountered.

Slaughterhouse construction, equipment and installation. Slaughterhouse design and equipment standards are regulated for plants that need to export their products, but at a national level are more frequently covered under food processing or veterinary regulations. Project sponsors and appraisal teams should consult the FAO Animal Production and Health Department technical paper No 73 (ISBN92-5-102740-4) “Standard design for small scale slaughterhouses”. In general:

Emergency slaughter. All slaughterhouses must have separate and isolated facilities to slaughter injured or sick animals.

Lairages Every slaughterhouse should have sheds permitting animal grouping and recuperation before slaughter and ante mortem veterinary inspection. Paths and runs from the lairs to the slaughter room must be designed without protrusions to prevent damage to moving animals.

Slaughter. Stunning, lifting and killing must be done in conditions that observe animal protection to limit suffering to
animals, security for workers and must be hygienic.

**Bleeding.** Animals must be bled as soon and as completely as possible, and all blood must be evacuated from the slaughter room.

**Carcass dressing.** The dressing process should be designed to separate food and non-food products rapidly and hygienically, and to keep the surrounding equipment, floors and walls clean and safe for workers. This normally means that chutes or conveyors must be arranged for removal of paunches, skins, hoof, horn and offal to separate rooms. Carcasses must be suspended on a rail during this process or supported in a cradle.

**Architectural requirements.** The general architectural requirement of the slaughterhouse building is to facilitate the various processes of slaughter whilst maintaining the highest possible hygienic standards. The buildings can be simple, but should incorporate the essential hygienic requirements. The processes involved in the slaughterhouse produce acidic wastes that contain pathogenic bacteria and non edible materials, and the task of separating the high grade edible products from potentially lethal waste products can be significantly facilitated by the building design.

  a) Internal walls and floors should be ceramic tiled with epoxy grout, or an alternative waterproof and acid proof finish.
  b) Floors with a fall of at least 2% towards drains to prevent puddling and build up of dirty water on the floors.
  c) Roof beams and trusses should be enclosed and ceilings flat to avoid build-up of dirt and dust that could fall onto food products.
  d) Windows should be sealed closed to prevent ingress of dust and insects.
  e) Window sills should be sloped to facilitate washing down, and to avoid build-up of dirt.
  f) Ventilation arranged to ensure positive air pressure in the clean area and air flow from clean to dirty areas, preventing airborne contamination and removing foul odours.
  g) Doors self closing and tight sealed to prevent ingress of insects, animals and vermin.
  h) Personnel ingress restricted through sterilising rooms.
  i) Internal drains arranged with water seal drain traps and designed so that contaminated water passes directly to outside drains.
  j) Lighting (natural or artificial) to provide at least 120 Lux at working levels.
  k) Wash points and hoses located in all processing areas.

**Processing rooms.** Offal, skins, paunch, horn and hoof (fifth quarter) processing rooms can be adjacent to carcass and meat processing rooms, but must be isolated to ensure that no un-clean materials can contaminate the carcasses. This can be achieved by good architectural design in which:

  a) Product hatches between clean and un-clean areas are small
  b) Ventilation is arranged to ensure positive air pressure in the clean area
  c) Personnel access from dirty to clean areas is avoided.
  d) Internal drains ensure that contaminated water passes directly to outside drains.

**Veterinary inspection:** In most countries resident inspectors have offices and laboratories at the slaughterhouse, and are required by law to carry out post mortem veterinary inspection of all carcasses and fifth quarter components. During this inspection diseases and abnormalities are rejected, and carcass quality classification recorded. Records have to be kept of all rejected materials. HACCP methodology is needed (see new regulations of WTO for accreditation of veterinary services). These include complex methods of risk analysis and require staff to be trained in the international standards.

**Slaughterhouse equipment.** The products of blood, meat and other body fluids are very acidic and corrosive, and as a result all slaughterhouse equipment should be constructed in stainless steel or in hot dipped galvanised steel, or in an alternative corrosion proof material. All surfaces should be smooth, polished, and without crevices that could allow build up of organic materials that would putrefy and contaminate the products.

**Non-refrigerated slaughterhouses.** In small slaughterhouses without refrigeration and air conditioning equipment, and at meat markets, quartering and cutting should be done quickly and efficiently without any delay. This requires only cutting tables, tools, and hanging rails but also requires the highest standard of hygiene conditions, as meat and blood products putrefy rapidly in warm cutting rooms.

**Refrigerated slaughterhouses.** In large slaughterhouses and export establishments, carcasses must be cooled and stored in refrigerated rooms. Carcass cooling is required to remove the body heat of the animal, normally from about 36 Deg C to 12 Deg C.
This is best achieved in a closed cool room, with hanging rails and tracks, and with ceiling mounted fan/coil coolers. After carcass cooling all carcass cutting, boning and meat packing rooms should be maintained at 12 - 16 Deg C. Chilled meat storage rooms can be maintained at 1 - 4 Deg C at which bacterial action is virtually arrested but the meat will not freeze. Quick freezing meat products should be frozen at -35 Deg C followed by storage in cold stores in which the temperature is dependent on the expected storage period. For short term storage of a few weeks temperatures below -20 Deg C are sufficient, but for more than three months temperatures should be below -25 Deg C, and for long term storage below -28 Deg C.

FACTORY REGULATIONS
Factories act regulations, animal slaughter regulations and food production regulations are required to be displayed at slaughterhouses in most countries. These vary but generally concern safe working conditions, personnel health and hygiene, material circulation, handling and storage of food products, personnel admission to production areas, professional behaviour, work organisation and the hygienic upkeep of the premises. Bank teams should ensure that such regulations are available and displayed as required by local law.

TRAINING SLAUGHTERHOUSE PERSONNEL

Management. Management training is one of the more essential requirements at all slaughterhouses in developing countries. There is a general lack of awareness among managers concerning product selection, marketing techniques, manufacturing technologies, personnel management, financial controls, and investment management. Also in the role that can be played by the private sector in forming joint ventures with the public sector for slaughterhouses and meat marketing.

Inspectors. Abattoir inspectors need to be trained to professional qualifications that should include livestock inspection, meat inspection, sanitary standards and laboratory techniques. These qualifications are normally a combination of academic and practical courses, and in the event of shortages of qualified staff in a project area these courses can be supported by Bank projects. Inspection staff in export abattoirs must be aware of international regulations relative to the World Trade Organisation (SPS) agreements.

Workers and technicians. Slaughterhouse workers need to be trained in slaughtering, dressing, cutting and packing meat, and in separation and preparation of edible and non-edible offal. Also in the operation and maintenance of equipment, plant cleaning and disinfection, and in working practices and hygiene. On Bank funded projects this can involve investments in training at existing (well managed) abattoirs, and training by equipment manufacturers during plant construction and commissioning.

DISTRIBUTION

Butcheries. Major cities throughout Asia now have supermarkets and fast food stores, and the requirements of these have generated butcheries that comply with modern hygienic standards. A few modern butcheries located in main towns or butcheries in super markets in the SSA region also have modern facilities and specialist butchers that are skilled at cutting and meat processing. Their customers generally have a good standard of living and the butcheries are selling both local meat and good quality imported meat of good hygienic quality. The price of this high grade meat can be two or three times higher than on the local market. The owners of these butcheries would be able to invest in their meat industry if needed.

The majority of butcheries in rural Asia and in SSA countries are very small and some of them unhygienic. Generally they have no facilities to keep meat cooled or frozen, so they need to sell their meat within a few hours of slaughtering. Some butchers associations have invested in refrigeration equipment, but this is still a minority.

Retailers. Official licensed butchers are numerous in sub-Saharan countries, and in the informal sector there are many more. Butchers generally work with several assistants (4 to 6) for slaughtering, transport and selling meat, and on a daily basis a small traditional butcher would typically slaughter and sell one bovine and several small ruminants. The assistants usually family members and are paid in kind. The majority of these small butchers buy animals in the local markets and pay on credit at high interest rates.

Training in the distribution chain
Training of professionals in the meat marketing and distribution chain is essential and should include the following aspects:
Guidelines for Livestock Marketing and Processing

Professional breeders associations leaders:
- Marketing and market organisation,
- Organisation management,
- General overview of processing sector.

Animal traders association leaders:
- Marketing and market organisation,
- Organisation management,
- Regional market
- Credit
- Sanitary regulation

Butchers and butchers associations leaders:
- Slaughter, dressing, cutting
- Meat processing
- Hygienic regulation
- Management and credit
- Marketing

Vet and inspection workers:
- Hygienic conditions
- Veterinary inspection
- Export sanitary regulation.

PUBLIC AND PRIVATE SECTOR ROLE IN THE MARKETING CHAIN OF LIVE ANIMALS

To face the growing demand for meat and meat products, governments of developing countries have historically embarked on a policy of strong participation of the public sector in the meat industry, and this has been encouraged by donors and funding agencies. The has resulted in public or joint ownership enterprises but these have returned disappointing results, many facing financial difficulties, shrinking budgets, and competition from world-wide markets. These failures led to new policies in many countries to privatise most parts of the meat industry.

The new SPS (sanitary and phytosanitary) agreement signed at the 1994 WTO conference in Marrakech provided new regulations for livestock and livestock products marketing. By this agreement member countries will be required to avoid trade barriers for non justifiable sanitary arguments that have no scientific basis, and to make their decisions according to scientific evaluation of sanitary risks. The key of this new policy is the reinforcement of Veterinary Services and the main thrust is the participation of livestock industry professionals. The role of each sector can be summarised as a) the Public Sector to oversee legislation, regulation and control, and b) the Private Sector to involve itself in production, processing and marketing.

Present situation. Public sector regulates security, health and hygiene policy, fiscal policy, statistical control, and the professionals involved in the industry. It also has financial or economic involvement when professional organisations and the private sector are not properly co-ordinating the marketing chains of live animals. Public sector regulation includes:
- Providing finance and management of collective installations and equipment
- Regulating and control of the quality of traded livestock
- Creating and disseminating information on markets (numbers of livestock, prices)
- Assisting traders to get commercial credit for their activities.

For these services the livestock industry pays taxes usually charged by head of livestock presented or sold at the market. The taxes are variable but are generally low compared with the value of the services provided. In Guinea, for instance, the taxes recovered represent only 28% of the cost to the public sector. Taxes are often avoided or not received by the public sector due to losses to corruption. Tariffs would need to be 3 or 4 times higher to fully recover the costs of the services, and this explains the deterioration of public sector services, facilities and equipment. Some surveys have shown that large markets at ports and terminals with an income of US$400,000 to US$1,000,000 can be profitable, with costs only 20% to 50% of the income from market services.

Main recommendations
- The Private Sector needs to be involved in new regulations to improve their applicability (mainly for taxes and
levying systems).

- The Public Sector needs to install and improve information systems and the rapid dissemination of information, some of which can be given to professional associations. With improvement in transportation, information systems become crucial for the regulation and profitability of the marketing chain of animal products.
- The Public Sector needs to impose industry standards and specifications which will guarantee free access to all users providing they comply with the regulations. Also to maintain and replace equipment and facilities bought by the public sector (or by donors).

**Necessity of external regulation**

As the public sector improves the efficiency of marketing chains of livestock products, by giving more initiative and importance to the private sector, it has also to ensure that the world market will not inappropriately interfere with internal regulations and controls. Between 1982 and 1994 this problem damaged SSA meat production. Several countries in the region allowed import of under-priced meat and offal and did not take any action against these unfair imports (or took action very late). This adversely affected local production and inter-regional trading.

Since 1994, there has been an improvement mainly due to currency depreciation, but the situation is still unstable. To make these production chains sustainable, specific regulations have to be in place (Cote d’Ivoire has a system of variable taxes for example). These regulations would be more effective if they were implemented by regions of exchange (SADC, IGAD, Chad-Niger-Nigeria, Mali-Burkina Faso-Cote d’Ivoire etc). Regional policies (implemented increasingly since 1994) should be encouraged by donors and funding agencies if the fragile production chains of animal products in SSA are to be strengthened.

The total value of traded live animals in SSA (cattle and small ruminants) was estimated at US$4.5 billion in 1994 of which 14% was for export. This value could double by 2020 if there are no new impediments to the world meat trade. New regulations of WTO remain complex for the developing world, and it would be in contradiction with the spirit of WTO agreements to prevent the countries of SSA from creating regulations for a fairer co-operation with meat industry of countries that have a world dimension.

**Public Sector in the past.**

The public sector officially controlled livestock slaughter in both India and China until the 1970’s, and very few privately owned slaughterhouses existed. Livestock producers were required to take their animals to public slaughterhouses where they would be charged various fees for veterinary inspection, slaughtering, and certification of meat. Some slaughterhouses bought livestock and sold meat and meat products through Government marketing agencies in China, and through private traders in India, and some slaughterhouses existed only as a community slaughtering service. This was inconvenient for rural livestock farmers, and in both India and China traditional backyard slaughter remained common, with the associated health risks. Small-scale slaughter yards existed or were set-up in most Indian towns and villages where animals were slaughtered on the ground, or on a slab. Animals were slaughtered at first light in the morning, and most meat was sold fresh to the consumer by 9 am. No refrigeration and no veterinary inspection was available for this level of processing. In China conditions were more controlled, and the Bureau of Animal Husbandry set up small scale township slaughterhouses, with capacity of 100 pigs per day (or equivalent in larger species), but the remoteness of many villages, and the difficulty of transportation, produced similar rural slaughtering conditions to those in India.

The situation was very much the same in most of Asia, in SSA, in CIS and in many parts of Europe. On-farm slaughter was common-place in southern Europe until the mid-1970’s.

Both India and China introduced legislation in the 1970’s to liberalise the ownership of slaughtering and processing facilities, and to exact more positive public health controls on the industry. In India this was presented as the Meat Products Order (MPO), 1973, enabling private companies to slaughter and process meat within the MPO regulations. In China it was part of Government policy changes towards market economy that opened the markets to free enterprise. This did not improve the control of slaughtering in rural villages as free enterprise owners concentrated on large-scale operations that little affected village slaughter procedures, and inspectors were normally located in towns and not villages. Backyard slaughter continued in the traditional way in both India and China. This has resulted in free markets (street markets) throughout the two countries, where fresh meat is hung in the open, butchered, and sold direct to the consumer. This is hazardous in the hot climates of India and southern China, but in the sub-zero temperatures of northern China in wintertime is probably relatively safe.

The SSA region was in a similar situation: The region was exporting US$100 million bovine meat in 1964 and importing US$120 million by 1994. During the same period production went from 1.8 million t/y to 2.9 million t/y.
Public Sector at present.
The public sector remains the largest owner of slaughterhouses in India, China and SSA at the present time, but meat processors are now mainly in the private sector or owned by commercialised public sector companies. In the SSA region only countries in the South of Africa that are free of FMD are meat processors. This is changing rapidly as the public sector divests itself of unprofitable slaughterhouses, and the divestment takes several forms:

- **Shareholding companies.** The majority are being taken over by the private sector with some participation of the public sector owners by way of «Land as equity». In this scenario the public sector owner has the land and buildings valued, and this value forms the public sector equity in the newly privatised company. In all respects the company operates as a commercial company, but the public sector is a (normally minority) shareholder.

- **Dereliction and sale.** Many public sector slaughterhouses are falling into disuse as competition is experienced from the private sector. The land and buildings are then available for re-development as industrial or housing land, and land is re-allocated to other uses. This is a common feature of derelict slaughterhouses in urban areas where land values are already high, and increasing.

- **Commercialisation.** Some public sector slaughterhouses and meat processing plants are «commercialising» their operations. This normally means that the public sector enterprise registers as a Limited Liability Company, or a Shareholding Company, and is owned by several public sector shareholders. The structure, operation and management of the commercialised company is similar to that of a privatised company in most respects. A board of directors is formed to be responsible for policy, and the management is given full control over all commercial and operational aspects of the company. Some of these companies are already incorporating private sector shareholders, particularly where technology transfer or marketing expertise makes this desirable.

Since 1988 China has constructed covered markets for the sale of grain, fruit, vegetables, meat and fish in most small towns. Some are wholesale markets with retail shops attached, but most are retail markets. Many of these markets were constructed under Bank funded ADP projects. These are rapidly replacing the open-air street markets and are more hygienic and more easily controlled. There are still open street markets where vendors object to paying fees for a stall in the covered market, but this is controllable by local authorities, and should phase out as the consumers become more selective with their purchasing habits.

It is not easy to persuade market vendors to move from street markets, where they pay no fees and are not controlled by officials, to newly constructed covered markets. The vendors object to paying fees, fear they will loose custom due to their need to charge higher prices and to their relocation, and fear the tight control (and probably corruption) of local officials.

One Bank funded wholesale market in Hebei Province in China was successful in encouraging relocation by charging no fees to vendors for the first year. The authorities defined a series of cities that would be the target markets for selling their products, and advertised for market traders to relocate to their wholesale market. Traders were given a significant package of incentives to move including residence permits, free education for their children, free medical cover, and tax free status for six months. Local traders were also encouraged to move to the new market and could select their stall location (and could keep it). Vendors that moved experienced no harassment from local officials, but those that remained in the street market were made to comply with all local retail regulations. This «stick and carrot» approach turned the new market into a thriving site by the second year of operation, and achieved a move from street trading to covered market trading that had proved difficult at other newly constructed markets.

India has a tradition of well-organised wholesale markets (Mundi’s) in all large towns, and more recently in smaller towns. These tend not to include meat markets as strict vegetarians (about 30% of the population) would find it repulsive to have meat and vegetables sold alongside each other. Meat markets are, therefore, normally located in the Muslim quarter, and are regulated by Muslim customs and culture. Modern butchers shops with air conditioning and hygienic facilities are still rare, and serve only the middle to high income groups, but these groups are expanding with economic growth. The recent introduction of supermarkets has included frozen and chilled packed meats, with apparently no objection by vegetarians.

The SSA region already has this type of covered market in capital cities, and is also experiencing an increase in construction of covered markets with improvements in market conditions in many of the larger towns.

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2 **Equity.** Cash raised by the Enterprise from it's own resources, or from shareholders, to invest in the proposed project equipment and facilities. This cannot include loans from banks or institutions, but can include cash grants from any source that are free of interest, and do not require repayment.
Public Sector in the future.
The economies of both India and China are growing rapidly, together with the per capita consumption of meat. Local Governments in both countries are under pressure to become more efficient, and to reduce costs. The disposal of publicly owned facilities, such as slaughterhouses, to the private sector is an obvious way to achieve this, but poses the ethical problem of selling State assets. The ownership of land is controlled in both countries; in India in terms of size of holding, and in China all land belongs to the State and can only be leased. Both countries have discovered that land on which their old facilities are located can readily be used to retain a share in the newly privatised companies, and thus a share of any future profits. New and rehabilitated slaughterhouses implemented by private sector (or commercialised public sector) companies, frequently involve a share being held by the previous owners (the provincial, county or district Department or Bureau) equivalent to the assessed value of the land. The new company may be a shareholding company, Limited Liability Company or a Joint Venture between public and private sectors, but the public sector retains a share in the fixed assets, and in the profits.

The value of land and existing buildings on publicly owned factory sites in China are assessed by the National Assets Bureau, and these are frequently over-valued. This causes considerable friction between the public sector owners and the private sector project sponsors. The owners want a large share in the new enterprise in-line with the high valuation of the land and buildings provided by the National Assets Bureau, and the private sector sponsors realise they will not get their expected return on investment due to the dilution of their holding. This causes delays in project implementation, at best, and quite frequently a complete breakdown in the agreement. A large proportion of project proposals are cancelled due to these or similar disagreements between the public sector owners and private sector sponsors. Bank missions that are preparing projects that include «Joint Sector» factory proposals should check that agreement has been reached on land and building valuations; If not, the Bank mission should make it conditional on the partners to sign an agreement before appraisal, or withdraw from the project. The alternative is inevitable project delays, and probable post-appraisal of new proposals to replace the defaulting components.

Privatisation or commercialisation of publicly owned slaughterhouses and meat processing facilities are well advanced. In China, particularly, the Bank and other agencies have funded new or rehabilitated slaughterhouses in most provinces, on the basis that they are commercialised or, more recently, under private or Joint Sector ownership, and many of these facilities are coming on-line in 1998-99. Current Bank projects under appraisal include at least six slaughterhouses and meat processing plants for rehabilitation and expansion. Private meat plants are a thrust sector of Indian industry too, and as the new plants come on-line and create competition it is probable that poorly managed and under-funded public enterprises will close down.

The regulatory role of the public sector.
The public sector will continue to share ownership of the slaughterhouses and processing plants due to the land and buildings (fixed assets) that have been surrendered for a share of ownership in the newly created Joint Sector companies. Management of the plants will be private sector in most instances in order to utilise the private sector management and marketing expertise that was lacking in the public sector units. The role of the public sector then becomes one of regulation of the meat industry, rather than an active participant in the ownership and management of slaughterhouses and meat plants. Regulation would include the following:

- Regulation of livestock production conditions, feeding and farming practices to minimise risk of diseases that could affect meat quality and pose risk to the workers or consumers.
- Regulation of meat quality.
- Setting standards and procedures for livestock production, transport, and inspection.
- Setting standards and procedures for livestock slaughter, meat production, processing, storage, transport, and inspection.
- Regulation of factory design and specification.
- Building design standards, construction, wall finishes, floor finishes, drainage, lighting, air conditioning, and effluent treatment and disposal.
- Equipment design, sanitary and cleaning features, to minimise risk of non-sanitary events occurring during operation.
- Quick freeze and cold stores design standards.
- Setting standards for packaging, labelling, storage and transportation of meat and meat products.
- Licensing regulatory Boards and to operate inspection services throughout the industry to impose the above standards.
- Training, examining and licensing professional and technical personnel for the above regulatory posts.

The role of the private sector.
The participation of the private sector in meat production and processing is relatively new to both China and India. It is just
starting in some places of SSA. In the context of the declining role of the public sector in ownership and management of the slaughterhouses and processing facilities, the role of the private sector becomes, increasingly, **investigation in the modernisation and commercialisation of the meat industry throughout the region.**

**Small scale processors.** Small private sector meat processors do exist in both China and India, and there are some good examples of innovative meat processing companies handling less than 3t/d of finished product. These companies usually rely on agents (middlemen) to market the goods for them, and pay heavily for advertising and agents fees. Most appear to be dissatisfied with the performance of their agents. These companies produce traditional smoked, salted, spiced or dried meats, and have no access to modern technology to upgrade their products or their capacity. Very few of these are able to generate sufficient counterpart funding to participate in a Bank project. Their role in development is somewhat limited, but their presence in large numbers is a stabilising influence on prices charged by the larger processors. It is also a strain on the resources of the public sector regulatory and inspection authorities.

<table>
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<tr>
<th>Bank missions that include the expansion of small meat processing companies in their project should look carefully at:</th>
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<tr>
<td>- The technical content of the proposal to ensure that modern hygienic buildings and processes are being proposed. If technology is inadequate the mission should require the sponsor to accept technical assistance (under the project) for development of acceptable processes.</td>
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<td>- The ability of the sponsors to raise counterpart funds and working capital. If counterpart funding is inadequate the sponsor should be required to raise the funding before appraisal, or drop out of the project.</td>
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<td>- The marketing proposals that should include the participation of an existing (experienced) meat products marketing company in the project. If marketing is weak the mission should assist the sponsors to meet experienced marketing agents that would be prepared to take an equity share in the enterprise.</td>
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</tbody>
</table>

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3 **Small scale meat industry.** A modern slaughterhouse that processes less than 30,000 head of cattle or large animals per year (120h/d), or processes less than 2.5 million poultry/rabbits per year (1,250 b/h), or less than 50,000 head of small ruminants or pigs per year (200h/d). These facilities would have a range of stainless steel machines, processes and mechanical conveyors for peeling, eviscerating, splitting, boning-out, cutting and packing, and would operate on one shift per day for about 250 days per year.

4 **Sponsors.** The group, company, agency or person that proposes and supports the application of an enterprise to participate in a Bank funded project. The sponsor will normally have a financial interest in the enterprise, and will be required to provide a feasibility study and all relevant data for appraisal. The sponsor will be required to provide at least 20% equity in the enterprise, or to have partners or shareholders that can provide 20% equity. The sponsor will also provide acceptable guarantees of counterpart funding and working capital funding. In some cases the enterprise may be its own sponsor.
Large scale processors\textsuperscript{5}. Large private sector meat companies should have a strong developmental role to play in the meat industry in Asia. Supermarkets, fast food chains, frozen (and tinned) food producers and meat packers are all expanding their operations throughout the region, and particularly in China. This includes multinational food outlets (McDonald’s, KFC, Hard Rock etc.), all of the major hotel chains, and food companies (Unilever and P&G), that bring with them their very specific requirements of raw meat quality, texture, processing parameters, sanitary standards, and packaging style.

- These companies have access to foreign technology.
- They have experienced staff that have been abroad to study slaughtering or meat processing, and will train their locally employed staff.
- They would know the strength of their competitors, and be able to develop products for specific markets.
- These companies have their own marketing department and have adequate skills turnover to support advertising and local development of their Brand Name.
- These companies have product development facilities to continuously research new or improved products.
- These companies are able to generate sufficient counterpart funding to participate in large development projects.

Large scale processors and multinationals do not normally participate in Bank projects, but the Bank can use them as developmental catalysts to the industry, to guide and develop the smaller processors into reliable contractors and suppliers.

Medium scale processors\textsuperscript{6}

Between the multinational and small scale processors are the mainstream medium scale local companies that are most likely to apply for participation in Bank projects. These private sector meat companies are frequently offshoots of the old public sector companies, and commercialised components of the State Farms. They may need substantial technical support, are probably short of funds, and are in the process of developing their marketing plans.

The best developmental course for these companies will be as contractors to the multinationals, where they will be guided by the technologies and experience of the large companies. Some currently thrive on their own by retaining and developing old (public sector) market contacts. Others are struggling to find new markets, and to raise their processing capacities to sustainable levels.

This is the group, however, that will slaughter and process the largest proportion of livestock in the near future, and if it finds a niche market, has the potential to grow rapidly. It is also the group that needs most financial and technical support to develop a strong and healthy private sector meat industry that can take over satisfactorily from the declining public sector facilities.

RECOMMENDATIONS AND BEST PRACTICES

RATIONALE FOR PROJECTS IN LIVESTOCK PROCESSING.

Hygienic and commercially active livestock and meat processing industries are essential to the well-being and public health of any nation. In the reforming socialist economies where most industries were State owned (including India and China) privatisation of livestock processing enterprises is well under way. Public sector units have been short of funds for many years, and investment in modern hygienic processing buildings, sanitary stainless steel processing equipment, laboratories to ensure public health standards are maintained, and training of personnel, has not been made. Modern, commercial and private sector units are being constructed, and as these come into production they will take over from the less efficient and less commercial public sector units, and replace them.

Private sector processors fall into three general categories:

\textsuperscript{5} Large scale meat industry. A slaughterhouse that processes more than 50,000 head of cattle or large animals per shift per year (165h/d/shift), or processes more than 5 million poultry/rabbits per year, or more than 300,000 head of small ruminants or pigs. These facilities would have a fully automated stainless steel slaughtering, cutting and packing line and would operate for about 300 days per year. Operation could be extended to two shifts/day in the peak season.

\textsuperscript{6} Medium scale meat industry. A slaughterhouse that falls between the processing capacities defined in notes 2 and 4.
a) Small scale plants that may survive at a low level of investment, but do not have the resources to support large expansions. Small-scale meat enterprises will continue to apply for Bank funding, but are unlikely to have sufficient resources to raise equity, counterpart funds and working capital, and are at considerable risk of under achievement in marketing.

b) Large scale plants that are owned by, or affiliated with, multinationals and foreign companies. The large companies that are currently penetrating the Indian and Chinese markets do not need Bank funding, and have adequate resources to attract commercial of IFC loans if needed.

c) The middle road processors that may have been previously State Owned, but are privatising and commercialising their operations. Medium scale livestock processing factories can benefit substantially from Bank funding, and can help to address the shortages in technology, skills and public hygiene that were a feature of many public sector units. They are likely to be new private sector enterprises, or public sector enterprises that are privatising. They are also likely to have sufficient resources and political presence to support an application for a Bank loan.

STRUCTURE OF BANK FUNDED MEAT INDUSTRIES.

Vertical integration is a highly recommended structure for meat industry investments in developing countries. The project enterprise needs to have good control of livestock quality, breeding, feeding, husbandry and off-take timing; Good control of slaughterhouse procedures, and of freezing and cold storage facilities; Good control of meat selection for processing, and of process technology, packaging and marketing. These are most easily achieved by vertical integration within the enterprise or by contractual agreements with livestock producer groups funded under the project.

SELECTING MEAT INDUSTRY PROJECTS FOR BANK FUNDING

There are no formulae for ensuring that a Bank funded meat industry component will be successful since we are dealing with commercial enterprises that have to survive in a competitive market place. The preparation and appraisal teams can set a number of selection and appraisal criteria, however, that will eliminate most risks and provide a best possible scenario for commercial success of the project funded enterprise. It is unlikely that any project proposal would meet all of the criteria, but they enable Bank teams to select the best proposals that are on offer, and to improve them where necessary by incorporating as many of the criteria as possible.

SELECTION CRITERIA.

Sponsor selection criteria.

Sponsors credibility. Selection criteria need to concentrate not only on the production, technical, financial and marketing merits of the project enterprise, but also on the commercial experience, stability and financial strength of the sponsor. Selection of potentially successful processing projects requires analysis of the sponsor’s proposal from many angles. The following check list can be used to appraise the suitability of the sponsor. The criteria are explained in more detail in the text following the checklist.
### SPONSOR PROPOSAL CHECKLIST AND RECOMMENDED STATUS

<table>
<thead>
<tr>
<th>Criteria and their acceptability</th>
<th>Slaughterhouse Capacity</th>
<th>Sponsors status</th>
<th>Enterprise meat processing facility status</th>
<th>Staff /management stable for at least 3 years</th>
<th>Financial status</th>
<th>Equity available</th>
<th>Guarantees</th>
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<tbody>
<tr>
<td></td>
<td>Large</td>
<td>Medium</td>
<td>Small</td>
<td>(a) Sponsors status</td>
<td>(b) Enterprise meat processing facility status</td>
<td>(c) Staff /management stable for at least 3 years</td>
<td>(d) Financial status</td>
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<td>&lt;1&gt;</td>
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(a) **Sponsors status.** The sponsor would preferably be a private sector company, or a public sector company that is privatising or commercialising, but not a public sector unit. Public sector slaughterhouses and meat processors are in decline, and will probably not survive the commercial competition from private sector units, and Bank funding of public sector units is, therefore, not recommended.

(b) **Enterprise meat processing facility status.** The sponsor would preferably have an existing production facility that is already operating at high levels of plant utilisation, and wishes to expand, modernise or diversify production. Newly formed meat companies that are not experienced in the meat industry are rarely successful.

(c) **Staff and management stability.** The sponsor would need to be a stable organisation with professional managers and technical personnel that are not subject to regular senior staff transfers. Public sector units suffer from frequent staff transfers, and the new managers rarely support the projects of their predecessors.

(d) **Financial status.** The sponsor would have financial strength that can be demonstrated by a strong balance-sheet, and a positive cash flow in recent years. Credit worthiness current ratio should be provided by the sponsor or calculated by the Bank mission. Gittinger details this calculation, and suggests that a current ratio of 2 (or more) is satisfactory; less than 1.5

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7 Current ratio calculation see «Economic Analysis of Agriculture Projects» by J.P. Gittinger
may be unacceptable.

(e) **Equity availability.** The sponsor should have sufficient liquid assets to invest at least 20% of the project cost from their own funds, and preferably 30%, or has a commercial partner that is prepared to provide this level of equity.

(f) **Guarantees.** The sponsor must be able to provide guarantees that are acceptable to the Bank for World Bank loan, Counterpart Funding, and Working Capital. Failure to provide satisfactory funding guarantees should eliminate the proposal from the project.

(g) **Counterpart funding and working capital.** The sponsor must have a financing plan for counterpart funds and working capital to be available on schedule by local banks and institutions. This has been a major problem in China, and many project participants withdrew from Bank projects as their local banks could not meet their promised funding schedules.

**Enterprise proposal checklist.** All construction projects and commercial enterprises pose risks to the investors, but with a reasonable degree of financial planning, good design, technical assistance and marketing expertise, the risks can be minimised. The main considerations of the appraisal team should be to ensure that the risks of commercial failure of the enterprise are minimised, and therefore the team should produce a detailed checklist. The criteria are explained in more detail in the text following the checklist. Each processing proposal may have some specific requirements that are not contained in the following checklist, but should include at least the following.

**Commercial plan - Enterprise proposal checklist.** The sponsors should have a detailed commercial plan of operation that follows-through from availability of raw materials at a commercially viable cost, to the marketing of their products within the current market prices.

(a) **Marketing plan.** New and existing Enterprises generally lack marketing skills, and as a result they have difficulty selling their incremental products. They may need technical assistance from the Bank, in the form of a marketing consultant, to carry out market surveys and to make contact with buyers at supermarkets, processors, institutional buyers, exporters and hotels. The project should, therefore, finance market surveys and the relevant TA, to identify a suitable product range, and markets. In the case of one Bank project this involved a marketing seminar at which potential customers were invited to meet the enterprise managers, and to present their requirements for product types, product quality, packaging, transportation, and distribution. This was a very successful seminar that has left the project sponsors with marketing contacts, and with a good knowledge of their specific requirements.

**Product range.** The product range should not be limited to one product, but should include several products to spread the commercial risk. If one product accounts for more than 60% of the plant income, the proposal is risky and probably needs re-working. Too many slaughterhouses expect to sell 100% frozen packed meat at high mark-up, and too many meat processors have only one processed meat product.

**ISO 9000 and product quality.** If products are to be sold into a major metropolis, they will need to meet international standards in order to compete with imported products, and the enterprise should design the factory for ISO 9000 registration. Sponsors that propose inexpensive processes to manufacture traditional «local market - low quality» products usually find their customers have moved up market by the time the plant is completed, and they cannot sell their low quality products.

**Sales contracts.** Commercial funding agencies (commercial banks) frequently require secure sales contracts before agreeing to loans, and the counterpart funding may be dependent on signed contracts or signed letters of intent from each identified client.

<table>
<thead>
<tr>
<th>ENTERPRISE PROPOSAL CHECKLIST AND RECOMMENDED STATUS</th>
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<tbody>
<tr>
<td>Criteria</td>
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<tr>
<td>(a) Marketing plan</td>
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<tr>
<td>- Market survey completed</td>
</tr>
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<td>- Products identified</td>
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<tr>
<td>- Market identified</td>
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<tr>
<td>- Wide product range</td>
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</table>
(a) **Enterprise commercial plan.** The Bank mission should ensure that raw materials buying prices are not significantly lower than farm-gate prices used in the production components of the project. Too frequently livestock production components expect significantly higher prices for their livestock than the processing enterprises are expecting to pay.

**Utilities and operating costs** should be current market costs, and should not contain any form of subsidy that might be removed at a later date. Power and coal are typical examples of subsidised operating costs that can be changed at short notice by the local (government) suppliers.

**Product selling prices** should reflect current prices in the market in which the goods will be sold, and the market needs to be thoroughly researched and identified before appraisal.

**Operating volumes** should be realistic, and should be in line with recommendations in the market survey. Most factory proposals are for buildings, stores, processing lines and equipment that are vastly over capacity. The Bank mission should estimate the required building areas and processing line capacities and modify the sponsors proposal accordingly.

(b) **Livestock quality and availability.** Livestock production in developing countries is often in the hands of local authorities, and changes in personnel or policies are frequent at local government level. This can result in disruption of livestock supply, inappropriate selection of breeds, inadequate feeding and husbandry regimes, and changes in livestock prices that are politically motivated rather than commercially driven. The Bank funded enterprise should have a sound contractual arrangement with local farming groups for the supply of livestock, and good examples of this are available on Bank projects. The following is a good example of recommended practice:

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8 Dexin Meat Company in Jilin Province of China.
(a) The enterprise specifies the breed of cattle to be used, and may provide the initial progeny to the farmer group if not available in the area.

(b) The enterprise may own its own livestock farms or signs livestock production contracts with groups of farmers. Alternatively the Enterprise may buy young steers in the market, and finishes them in enterprise owned feedlots. Both systems are acceptable for Bank funded projects and are effective in securing an assured supply of cattle at the target weight to the slaughterhouse.

(c) The enterprise recommends feed type and quantities at different stages of growth, and may own feedmills, or buy feed from commercial millers to supply to their farmer groups.

(d) The enterprise provides inspectors (veterinarians) to visit the production units at least three times during the life of the animal. Each inspector supervise about 1,000 to 1,500 animals, and advises farmers on feeding, veterinary requirements and husbandry practices; Inspectors may reject animals (or farmers) from the project if they are not progressing to schedule.

(e) Animals are culled at 18 to 24 months, and must meet the carcass weight target set by the contract. Farmers are paid above average prices for their high grade livestock at the target carcass weight, with bonus/penalty incentives either side of the target.

(a) **Technology quality and availability.** The Enterprise will need technical support during project implementation in process plant design, equipment specification, procurement procedures, plant construction and commercial operation. Most developing countries do not have experience in designing and operating modern processing plants, and select out-dated technologies that cannot produce the fine quality products, energy efficiency, environment control and sanitation standards that are required in today’s markets.

Negative replies to the checklist here should not exclude the Enterprise from the project, but should indicate to the Bank mission what investment is needed in TA to bring the proposed plant up to acceptable standards. This may include input from technical consultants or technical institutions (such as FAO), and in the case of the Banks largest processing plant project, Operation Flood in India, this involved setting-up a technical institute to design and supervise construction of the 300 processing factories that were constructed under the project. Operation Flood was deemed very successful in terms of implementation, and without this technical input, the processing plants would stand little chance of meeting any form of international standard for their products.
(b) **Site location suitability and services availability.** It may seem obvious to select a suitable site, but factories have been built where water or power is unavailable and services needed to be brought many kilometres, or in the middle of residential areas where environmental concerns would eventually close down the plant. In the event of any negative replies on this section of the checklist, the sponsor should be asked to find an alternative site.

**Project Implementation Plan (PIP) : Implementation, investment and operational checklist.** This covers the adequacy of the investment schedule, financing plan, operating plan and cash flow of the Enterprise. The criteria are explained in more detail in the text following the checklist.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Preferred condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise investment costs realistic and current</td>
<td>Yes</td>
</tr>
<tr>
<td>- Civil works</td>
<td>Yes</td>
</tr>
<tr>
<td>- Buildings</td>
<td>Yes</td>
</tr>
<tr>
<td>- Equipment supply and installation</td>
<td>Yes</td>
</tr>
<tr>
<td>- Vehicles</td>
<td>Yes</td>
</tr>
<tr>
<td>- Training</td>
<td>Yes</td>
</tr>
<tr>
<td>- Other costs : Design, Taxes, CIF, Recurrents</td>
<td>Yes</td>
</tr>
<tr>
<td>Enterprise financing plan for construction project in place</td>
<td></td>
</tr>
<tr>
<td>- From equity</td>
<td>Yes</td>
</tr>
<tr>
<td>- From local banks and institutions</td>
<td>Yes</td>
</tr>
<tr>
<td>- Funding for working capital in-place</td>
<td>Yes</td>
</tr>
<tr>
<td>Enterprise operating plan</td>
<td></td>
</tr>
<tr>
<td>- Capacity utilisation build-up realistic</td>
<td>Nil</td>
</tr>
<tr>
<td>- PY-1</td>
<td>Nil</td>
</tr>
<tr>
<td>- PY-2</td>
<td>25%</td>
</tr>
<tr>
<td>- PY-3</td>
<td>50%</td>
</tr>
<tr>
<td>- PY-4</td>
<td>75%</td>
</tr>
<tr>
<td>- PY-5</td>
<td>100%</td>
</tr>
<tr>
<td>Enterprise viability</td>
<td></td>
</tr>
<tr>
<td>- FIRR over 20 years</td>
<td>&gt;21%</td>
</tr>
</tbody>
</table>

**Two case studies** of the financial analysis of investments in slaughterhouses are covered in the Annexes Dechang Duck Slaughterhouse and Huidong Mixed Livestock Slaughterhouse. The sponsors should produce a similarly clear and detailed investment schedule, funding programme and operational schedule that provides the cash flow profile over 20 years of operation.

Items in the above checklist are detailed below for technical clarity:

(a) **Investment costs.** Feasibility studies presented by project sponsors frequently miss vital costs in the investment schedule. Table-1 in the case studies shows a detailed investment schedule, and Bank missions should ensure that all investment costs shown on the schedule are included in the sponsors tables.

**Land.** The cost of land is not covered by Bank funding, but is a cost to the Enterprise, and needs to be included in the financial analysis.

**Civil works.** Covers land preparation, access roads, public utilities supply, and effluent treatment plant (ETP). Bank missions should ensure that the ETP meets National Environmental Protection Agency emission standards.

**Buildings.** Traditional (old) slaughterhouse designs involved many separated buildings to minimise the risk of cross infection between different sections of the plant. Modern designs should need to employ only four main buildings:

- **Main processing building** including the slaughter room, carcass chilling room, cutting room, quick freeze, packing room, and cold stores. This building will also include workers dressing rooms and showers, meat inspection and test laboratory, and stores for production and packing materials.
- **Emergency slaughter building** (well separated from the main plant) for Livestock that arrive injured or...
diseased.

**Services plant building** for power, water, steam and compressed air supply services. This building would also include control systems for the effluent plant, a mechanical and electrical maintenance workshop, and spare parts and general stores.

**Office block** with canteen etc. Factory regulations may require the office block to be fenced off or separated in some way from the processing buildings, as the office and plant workers come under different employment laws.

The design specification for slaughterhouse and processing plant buildings needs to meet National and International standards for food processing plants, and these make the buildings expensive. Floors must be sealed against water ingress and must be acid and alkali resistant, and with a durable finish – usually non-slip ceramic tiles. Drains designed to keep the floors clear of water and to avoid unsanitary lodging of organic materials. Walls should be ceramic tiled up to 3 metres height and window-sills sloped to avoid dust collection. Ceilings and structures designed without voids to avoid dust and dirt collection. The specifications are extensive and well defined in most countries, and make the process building cost about 50% higher than other buildings on the same site.

**Equipment.** The sponsors may propose equipment to be supplied by local companies that have no track record in food processing industries. Bank missions should insist that all slaughterhouse equipment goes out to ICB, and that bids are invited from the major equipment manufacturers that are generally located in Europe, Japan and the USA. All equipment and fittings that come into contact with the meat should be manufactured in stainless steel, or an alternative hygienic engineering material. All other items in the slaughterhouse should be in galvanised steel or aluminium, or protected by stainless steel covers. Rusty steel and flaking painted surfaces are inevitable if these standards are not maintained. And this results in very unhygienic conditions. Include in the equipment costs the CIF and installation costs, commissioning and spare parts.

**Vehicles.** Refrigerated transport would be required at most slaughterhouses, and the cost of these vehicles is at least double the cost of a standard truck of the same capacity. In SSA countries there is currently a case to avoid refrigerated transport, but this should change as the countries develop.

**Training and TA.** Include the marketing study, training of workers, training of management if necessary.

**Other costs.** The design of the buildings and plant may be additional to the cost of construction, and the cost of equipment, and there will be construction site overheads to be supported during the construction period.

**Fees.** Commitment fee, technical service fee by the PMO, and interest during construction are all costs to the Enterprise, and although the Bank may not be funding these they will need to be included in the investment costs.

(a) **Operating plan.** Table-2 in the case studies shows a detailed Operating Plan for the slaughterhouse, and Bank missions should ensure that all costs shown on the schedule are supported by acceptable recent prices. All operating costs and materials intake quantities need to be defined and scheduled accurately.

(b) **Financing plan.** Table-3 in the case studies shows a detailed Financing Plan, and Bank missions should ensure that all investment costs shown on the investment schedule are covered by financing from some guaranteed source.

(c) **Cash flow.** Table-4 in the case studies shows a detailed Cash Flow Statement and FIRR calculation. This is dependent on accurate sales prices and «Meat Yields» of products from live animals. (See Sect-I for meat yield tables). Note that the Meat Yield is a little higher in China as several animal components are used in Chinese cuisine that are not used in Western cuisine. The proposal should produce at least 21% FIRR at full capacity utilisation to provide sufficient revenue for tax, debt servicing, dividend payments, and modest capital growth. Below 21% there is little chance of the plant being viable.

**Working Capital Calculation.** Table-5 in the case studies shows a detailed Working Capital calculation. The products may be sold continuously throughout the year, or may be stored for long periods and sold during festive seasons. This needs to reflected in the calculation – dependent on the specific circumstances of the locality.

**Sensitivity analysis.** Table-6 in the case studies shows a detailed Sensitivity Analysis, and this should be carried out to demonstrate that the Enterprise is financially viable under normal variations in investment costs, operating costs, raw material costs, and selling prices. Also under varying capacity utilisation down to 80% capacity.
Revenue after Tax, Debt Servicing, and Dividend Payments. Table-7 in the case studies shows a chart. This details revenues after tax, debt servicing and dividend payments. The company needs some capital growth to enable future expansion, modernisation or development of new products, and below 21% FIRR this is usually not achieved. The dips in revenue in years 5, 10 and 15 are caused by replacement costs of capital equipment that has reached the end of its useful working life.

Assumptions. Table-8 in the case studies details the assumptions that have been used in the financial analysis.