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International Science and Technology Institute, Inc.

AN EVALUATION OF THE SOMALI KISMAYO MEAT FACTORY

FINAL REPORT

Prepared for:

U.S. Agency for International Development
Mogadishu, Somalia

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EXECUTIVE SUMMARY

Background and Scope of Work

The objective of this investigation is to assess the potential contribution of the Somali Kismayo Meat Factory (KMF) to the marketing of Somali livestock products if the factory were operated as a private enterprise. Given the areas of expertise of the Evaluation Team and the brevity of the time frame, the investigation focused on the production side, the system of production up to the point that meat or meat products leave KMF. The feasibility of alternative product lines was beyond the scope of this investigation, as such an assessment would require market information unavailable to the Team and unobtainable in the time alloted to the preparation of this report. This report thus constitutes one component of a systematic analysis of how Somalia's livestock and livestock products can be marketed internally and externally to the country's best advantage; further study, particularly of existing systems of production and of internal and external markets, is needed to complete the picture.[1]

This investigation was funded under USAID/Somalia project number 649-0132, "Policy Initiatives and Privatization Project," and was completed by the International Science and Technology Institute, Inc. (ISTI). The task order originally called for just the services of a food processing engineer (Dr. Masson) but was amended at ISTI's request to include a range livestock specialist (Mr. Artz). Dr. Masson was chief-of-party and focused his attention on the functioning of the factory itself, while Mr. Artz addressed the cattle input constraints to KMF. The Team was in Somalia 20 days, from August 19 to September

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1 At the time of this report's writing, a U.S. Agency for International Development funded study was being implemented in Somalia directed towards evaluating the health and marketing viability of Somali livestock.

8, 1985. Given the Team's dependence on secondary, often inconsistent data sources, the data presented herein should be taken as rough rather than precise estimates.

Observations, Conclusions and Recommendations

The Evaluation Team, as a result of its investigation and its overall experience, has been able to make some observations, conclusions and recommendations regarding the cattle input constraints to KMF and the functioning of the plant itself. These are listed below and are separated into two categories of discussion: cattle production considerations, and engineering and meat processing considerations. While important factors related to each observation are noted and discussed in the text, these are only briefly noted here in this summary.

Cattle Production Considerations: Observations, Conclusions and Recommendations

KMF is situated at the interface among southern Somalia's pastoral and agro-pastoral livestock production systems and domestic, regional and world markets for livestock and livestock products. In this delicate position, it is susceptible to the vagaries of all of these and all are characteristically dynamic. The following observations were made regarding the region's cattle production systems as they constrain the functioning of KMF:

- o Somalia's pastoral economy is primarily subsistence oriented. Most cattle are managed as part of mixed herds kept by nomadic pastoralists whose mobility is essential to rational exploitation of forage and stock water resources which are extremely variable in space and time. These cattle are kept for several reasons: as a source of milk and, to a lesser degree, meat for household consumption; as a "bank" for stored wealth; as income producing "capital equipment"; as a source of prestige; as currency in traditional ceremonies and transactions; and as a source of cash income to meet the household needs of pastorialists for purchased commodities. Cattle are not produced solely to generate cash income as analysts with Western perspectives tend to assume, so it is extremely difficult to understand and manipulate the incentive structure facing Somalia pastoralists so as to induce them to market a specific number and type of cattle at a particular place and time.

o The secondary but important commercial inclination of Somali pastoralists is evident in the lengthy history of the country's large and highly specialized organization of cattle traders. These middlemen serve producers and markets alike by communicating market information to dispersed pastoralists and conditions of production to urban markets in Somalia and abroad, as well as by their more obvious role in transferring cattle and capital. In connecting pastoralists with markets, the traders can mitigate, to a degree, the problems of uncertain marketed output of cattle noted above.

o To date, the Somali cattle market has been dominated by the live export trade, particularly with Saudi Arabia. That market has demanded and paid premium prices for mature cattle, almost exclusively bulls from five years of age up. This influence, combined with the multiple reasons for keeping cattle listed under the first point above, fostered the evolution of a pastoral herd structure, management system and marketing mentality under which female animals are kept in the herd as long as they are reproductive, and males are kept until they reach the age and size required by the live export market. Therefore, domestic markets, including KMF, have access only to dry cows and immature animals culled because they do not make the grade or because they threaten their mothers' survival in times of environmental stress. This situation is not likely to change until there is an established, consistent market for younger cattle where pastoralists can sell such stock to better advantage than they obtain by keeping it on the "free" feed of communal grazing lands and selling it at maturity. The demise of the live export market, a more likely prospect in light of the continuation of the Saudi ban of Somali cattle imports imposed in May of 1983, might set the scene for such a shift in marketing patterns.

o There are several developments impending in the agricultural sector which bear on cattle production: control of the tsetse fly in productive riverine zones appears likely in the near future; irrigation projects, including the massive Baardheera Dam project, should continue to increase production of crops such as sugarcane, rice, cotton and bananas, the by-products of which constitute a potentially important source of cattle feed; and small-holder agricultural exploitations in irrigation and rain-fed areas are increasing in number and becoming increasingly oriented toward production of forage crops or crop residues for use on-site or for sale. Maize is especially important in irrigated areas, as is sorghum in rainfed zones. Further, capital investment in industries such as fisheries, oil seed processing, urea production and meat processing are yielding more by-products with feed value. These developments indicate an increase in southern Somalia's potential to condition, fatten or finish cattle on "grass ranches," in small-holder stall feeding operations or in commercial feedlots.

o Given the remote location of most of Somalia's borders with neighboring nations, the large populations of ethnic Somalis on both sides of these borders, and the nomadic lifestyle of these pastoral populations, it is predictable that livestock would flow among these countries, in response to

differential resource availability or market conditions, without effective restraint. Current evidence suggests that the most important flow of cattle is from Somalia to Kenya because of the strength of the Kenyan shilling relative to the much devalued Somali shilling and the existence of healthier, more consistent cattle markets in northern Kenya. That region also has commercial beef ranching and fattening operations which may attract younger, higher quality Somali cattle, the type which may prove essential to future operations of KMF.

These observations bear on the cattle input constraints facing KMF now and in the future, allowing the Evaluation Team to draw the following conclusions. In the short run, KMF will continue to have access only to the aged dry cows and immature culls upon which it has depended in the past. These animals are suitable for the production of processed meat products of the sort produced by KMF to date, but which the factory can evidently no longer market profitably. These animals are the poorest quality and least expensive cattle available, and KMF has been considered the "market of last resort" for their sale. In purchasing and converting these surplus animals into a useful if not profitably saleable product, KMF performs a useful service. That the factory could continue to perform that service while generating a profit as a private enterprise appears unlikely at this time, but it would be premature to state that conclusion without first examining the potential markets for processed meat products.

In the medium to long-term, changing conditions might make younger, heavier, higher quality and certainly more expensive cattle available to KMF, permitting the factory to process and market chilled carcasses or frozen primal cuts, the meat products upon which world trade in beef is currently based. Such a shift in the factory's cattle inputs would most likely occur only if the live export trade were effectively halted so that new market demands might induce producers to market the required numbers and types of cattle. The shift would further require realization of the agricultural development planned for southern Somalia and of

the region's potential to condition, fatten or finish cattle. Development of these conditions would open a range of options to KMF. Initially the factory might produce chilled sides for Middle Eastern markets, using cattle similar to those formerly exported live for the same regional markets which formerly purchased them. These cattle might not require fattening or finishing, but could be conditioned and brought up to market weight at a younger age. The trick would be for the factory to eliminate the problems which plague and will eventually cripple Somalia's live export trade--poor health and disease, uncertain supply, inconsistent quality, and high transportation costs--while retaining the aspects which made that trade viable for centuries--proximity to regional markets, particularly on the Arabian Peninsula; provision of leaner, stronger flavored beef; and trading with fellow Islamic nations. Further, the value added by conditioning, perhaps fattening, slaughtering and initial processing, as well as the value of hides, offals and other by-products, would accrue to KMF and be retained in Somalia.

At the other extreme of the range of options, KMF might eventually produce carcasses and frozen primal cuts of sufficient quality to be competitive on the world market dominated by a few, primarily Western producers. For this to occur, KMF would need a regular input of fattened and finished beef animals. This input could be assured only when two conditions were met: first, when a consistent flow of feeder cattle was available from the pastoral areas; second, when an adequate and regular supply of feedstuffs was available, preferrably from local agricultural and industrial sources given the high costs of transportation and of imported livestock feeds. Fattening and finishing operations might consist of stall feeding by agricultural small-holders, of commercial feedlots, or of a combination of the two.

It should be noted that the diversity of Somalia's natural resource base, coupled with current government policies toward the development of livestock and agriculture, supports a stratification policy which would allocate the various phases of livestock production and marketing operations to different geographical areas on the basis of their comparative advantages regarding such factors as forage and water resource endowments, location relative to transportation networks and centers of consumption or processing, and availability of required inputs. The flow of feeder cattle from arid and semi-arid range areas to productive riverine areas for fattening and finishing and hence to nearby Kismayo for slaughter, processing and export from Kismayo port would be consistent with such a policy.

A significant clandestine flow of Somali cattle to Kenyan markets could limit the prospects for KMF and for the entire Somali livestock economy. The direction and magnitude of this flow is extremely difficult to assess; it is frequently mentioned but almost never documented. The desirability of Somali nomads' ability to freely traverse the border in response to climatic caprice--and the virtual impossibility of preventing them from doing so--is accepted. The problem comes when the influences of Kenyan market forces on Somali production and marketing systems become significant but are not quantified or even qualitatively understood. It is essential that future marketing studies address this issue.

In a nutshell, current cattle input constraints facing KMF result from a well-established traditional system of cattle production and marketing oriented toward subsistence and live export. Until that system evolves to a different form, cattle inputs to the factory will continue to be limited in number, quality and seasonal availability. However, the system is changing; shifts in market

demand from the outside and in agricultural development on the inside may improve the prospects for a privately owned KMF to produce and profitably market livestock products in the near future.

Engineering and Meat Processing Considerations: Observations, Conclusions and Recommendations

The KMF plant was constructed by the Russians to manufacture thermally processed meat products and has been operated for sixteen years almost exclusively for this purpose. It was not designed to produce chilled or frozen carcasses or wholesale or retail cuts of meat, and over the years the plant has sold only minor amounts of what is listed on KMF's books as "pure meat". Although in recent years there has been a strong downward pressure, world-wide, on profit margins of meat packers and processors, fresh meat products tend to be more profitable because their prices have been relatively firm, and because investment and labor costs per unit of output are lower.

If KMF is to be restored to profitability, therefore, it probably must produce a line of fresh meat. This change will require a major capital investment. The profit-making potential, and thus the real value of the plant and of any private investment which might be made in it, ultimately depends on market opportunities and cattle supply, both of which are particularly dynamic. This report considers the possibility that KMF could attract private capital at this time in view of these factors.

- KMF's design presents major obstacles to producing wholesome fresh or frozen meat. These are detailed in Chapter 3 of this report. Moreover, the staff of KMF is accustomed to working in an environment in which sanitation considerations can be downgraded because the product is subsequently retorted. They are untrained in the techniques of cutting and wrapping meat to wholesale or retail standards. Thus not only would most of the unit processes at KMF have to be redesigned and re-routed, but also, almost every worker on the production line would have to be reassigned and retrained. At the same time, rigorous meat inspection procedures would have to be instituted and observed by workers and supervisors (Chapter 5).

o KMF contains a considerable amount of equipment for processing by-products; however, little of this is operational. Thus most of the cost of slaughtering and processing must be assigned to the meat alone. Hooves, horns, blood, paunch and viscera, tallow and bones are virtually all wasted. Hides are not processed but sold unprocessed to an adjacent tanning plant through the Somali Hides and Skins Agency (SHSA). It is doubtful whether the plant is receiving optimal return from organ meats such as liver, tripe, heart and kidney. The economics of processing and marketing all slaughterhouse products requires close examination and perhaps, liberalization or untying of sales arrangements with SHSA, and market development for processed by-products.

o It is very difficult to estimate the cost of the equipment and supervision which would be required to phase in a fresh meat line and recover a minimum of economically valuable by-products. The Team is not certain as to the market possibilities for various qualities of fresh meats and for organ meats and byproducts, hence to determine an optimum product mix given the likely supply and qualities of beef available to the plant. It would therefore be desirable to defer a definitive feasibility study until informed judgments can be made in this regard.

o Moreover, the Team was unable to obtain adequate information concerning the present condition of KMF's utilities (electricity, steam, water, ammonia). None of these systems were operating at the time of the Team's visit, and the Russians retained the bulk of the technical data on them when they abandoned the plant. It is the Team's belief that a potential private investor in the plant, if a serious commitment were to be made, would not wish to bear the risk of utility breakdown (and unavailability of spare parts) and would replace all of them. Aside from the power, materials handling, heating and cooling systems, the additional equipment required, if purchased from U.S. sources, would cost approximately $US 2 million, fob U.S. ports. Installation costs, over a period of several months, during which the plant would necessarily be completely shut down, might add an additional $US 1 million; and if allowance were made for production lost during that period, this figure would have to be further increased. If some of the utilities were found to be unsound, or if major construction were required (e.g., to re-route overhead rails, or to enlarge the kill floor) the total might be as high as $US 5 to 6 million. Under the circumstances, such a level of investment might be difficult to recover from the sale of the product.

o But even this expenditure would not deal with the human problems alluded to above -- in fact, it would exacerbate them. The labor force at KMF might strongly resist acquisition and application of new skills, within the fine tolerances required for quality control in the meat packing industry. The plant is overstaffed, with 400 employees (some illustrative examples within KMF's individual unit processes are cited in Chapter 3). Rationalization of certain operations, laying-off or reassigning large numbers of people, and disciplining others for violation of sanitary and safety standards, could entail serious labor strife, in which other organs of the Government might intervene, in view of the large number of civil-service jobs involved. In the Team's opinion, few private firms could be enticed into such an imbroglio.

o These considerations are quite separate from the question as to whether KMF's current line for processed products should be separately refurbished and/or replaced; yet the condition of the latter also requires immediate attention. The factory cannot at this time be relied upon to produce a safe thermally-processed product (canned stew or corned beef). With programmed assistance from the United Nations' Food and Agriculture Organization (FAO), however, some of the more serious problems of food safety might be solved, although this is by no means certain. If KMF continues to operate as a thermal processing plant, this would have far-reaching implications concerning overall demand for utilities, use of the labor force, types of cattle to be purchased, plant layout, management and marketing efforts -- it would thus be impossible to redesign for fresh meat without a prior decision as to retain or modify the processing lines.

o This leads the Team to consider the option of removing the prime cuts from the hind quarters and deboning and processing the remainder of the carcass. This option would permit alteration of the product mix to meet market demand, and facilitate continuous use of the slaughtering unit at close to capacity. The programmed FAO assistance to the thermally processing facilities makes the option somewhat attractive so long as further investment in equipment for thermal processing can be avoided, and so long as the fresh meat could be sold in Somalia, since it would be unsuitable for sale elsewhere for human consumption. If the canned products produced by the equipment refurbished with the assistance of FAO could not be sold at a profit, they could be phased out of KMF's product line in favor of other products. This approach would retain the rigid metal can, a form of packaging which is rapidly losing ground to lighter, less expensive materials requiring less thermal processing. If the product is to be subsidized or given away (as it would be under government programs such as that offered by the FAO) KMF can profit from the production of thermally processed beef. Otherwise, its commercial future appears doubtful without conversion to a less expensive form of processing and packaging, such as the combination of Ultra-High Temperature (UHT) and aseptic packaging in plastic or laminated cardboard.

This processing/packaging technology is now sufficiently advanced to process chunk foods such as stewed beef as well as fruit chunks, fruit juices and milk. However, it does not appear likely that KMF would be able to convert to UHT in the near future. The volume of product required by such a process is very high; and there is no indication that KMF could assemble beef or other products, so that the unit could operate at capacity. The unit would also be very demanding as regards reliable utilities.

The price of such units is of the order of $US 500,000. But they require a major investment in start-up costs, training and technical assistance, as well as (probably, in the case of KMF) improvement of the qualities of utilities, in order for this new technology to be assimilated in Somalia.

o Bearing in mind all of these factors, the Team believes that the most viable option would therefore be to construct a new plant, designed for fresh meat. Floor capacity could be reserved in it for the production of items not now produced by KMF, such as dried and smoked products. These possibilities could be evaluated in a feasibility study for the new plant. (This plant would complement, not necessarily replace, the existing KMF facility.)

In a nutshell, the Evaluation Team believes that refurbishing KMF to its original capacity in the product lines for which it was initially designed seems to be an unpromising venture over the long-run and might eventually have to be abandoned. However, it should be noted that the FAO has chosen this option and is providing financial support for its implementation. The Team does not believe that a private enterprise could be spliced into this project. Instead, a private firm, in the Team's opinion, would have a much higher probability of success as a separate activity, designed for the purpose of preparing chilled or frozen meat for sale in international markets.

1.0 SCOPE AND METHODOLOGY OF EVALUATION

Scope of Work

The Kismayo Meat Factory (KMF) evaluation, requested by the USAID Mission in Mogadishu and the Government of the Somali Democratic Republic, was funded under USAID/Somalia project number 649-0132, Policy Initiatives and Privatization Project. The investigation, whose overall objective was to assess the meat processing facility in light of its viability and worthiness to private investors, was undertaken by the International Science and Technology Institute, Inc. (ISTI). Originally the evaluation only called for the services of a food processing engineer, but was amended to include a range livestock specialist. Specifically, the Evaluation Team was asked:

- to summarize the market potential (both domestic and foreign) for alternative product lines;
- to analyze the supply side--material inputs (including the health and viability of the livestock sector), labor, capital;
- to analyze the costs and benefits associated with alternative product lines, production capacities, and technologies;
- to evaluate the net worth of the Kismayo meat processing facility, and its assets, based on present book value;
- to set forth the optimum product lines, production capacity and technology which will maximize returns to the investors; and
- to write a summary report highlighting results and outlining specific conclusions and recommendations.

Given the areas of expertise of the Evaluation Team and the brevity of the time frame (the Team was in-country 20 days), the investigation focused on the production side, the system of production up to the point that meat or meat products leave KMF. The feasibility of alternative product lines was beyond the scope of the investigation, as such an assessment would require market information unavailable to the Team and unobtainable in the time allotted to the preparation

of this report.[1] The report thus constitutes one component of a systematic analysis of how Somali's livestock and livestock products can be marketed internally and externally to the country's best advantage; further study, particularly of existing systems of production and of internal and external markets, is needed to complete the picture.[2]

Methodology of Evaluation

The Evaluation Team had the opportunity to review a variety of documents, studies and reports, both in Washington, D.C. and in Somalia. The team had access to a number of prior evaluations of the Kismayo Meat Factory, as well as the more general literature pertaining to the livestock and agricultural sectors in Somalia (see the report's Bibliography for a complete listing of reviewed documents).

The Team had extensive discussions, informal and formal, with many Somali government officials, private citizens, and project personnel involved in livestock, agricultural, meat processing and privatization issues. Meetings were held with various officials at KMF; at the Ministries of Industry, Livestock, Agriculture and Forestry; with the National Range Agency; with the Somali Hides and Skins Agency; and with representatives of various livestock traders associations, to name a few sources of information. The USAID Mission staff and contractors also provided a continuing source of information. (A complete list of persons contacted in Somalia during the course of the evaluation can be found at the end of the study text.)

Most important for the Team's understanding of the KMF operations was a nine day visit to Kismayo and field trips to its surrounding environs. While in

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[1] Marketing information presented in the report is based on data compiled from field interviews and an extensive review of the literature.

[2] At the time of this report's writing, a U.S. Agency for International Develoment funded study was being implemented in Somalia directed towards evaluating the health and marketing viability of Somali livestock.

Kismayo the food processing engineer focused on the functioning of KMF itself, while the livestock specialist addressed the types, qualities and quantities of cattle inputs available to the plant.

The Team members included:

Dr. Frank G. Masson, Independent Consultant; and

Mr. Neal E. Artz, Department of Range Science, Utah State University.

2.0 CATTLE PRODUCTION CONSIDERATIONS

2.1 Importance of the Livestock Sector

Somalia is one of the world's poorest nations, and its economy is almost entirely dominated by the livestock sector. The country's estimated 40 million animals include 5 million cattle, 6 million camels, 12 million sheep, and 18 million goats. Table 1 charts the growth of each of these animal populations from 1975 to 1983. Nomadic and transhumant pastoral systems involving mixed herds of these types of animals are the backbone of the livestock sector, providing livelihoods for the 50 to 70 percent of the population directly occupied in pastoral production, contributing at least 60 percent to Somalia's Gross National Product (GNP), and generating upwards of 80 percent of the country's foreign exchange earnings (see Table 2). The productivity of the sector is respectable; about one third of the total livestock off-take is exported; the remainder is consumed in roughly equal parts by producers and domestic consumers (see Table 3). Reusse (1982) provided an excellent summary description of the Somali livestock sector.

2.1.1 The Live Export Trade

The important foreign exchange earnings generated by the livestock sector result primarily from live animal exports. Table 4 demonstrates the evolution of this trade since the 1950s, and historical records indicate that live animal exports to the Arabian Peninsula have gone on for centuries. Table 5 shows the numbers and types of livestock exported between 1980 and 1983 from Somalia's major ports. Virtually all live exports are purchased by Arabian Peninsula nations, particularly Saudi Arabia, North Yemen, United Arab Emirates, and Qatar. More recently, Egypt has become an important buyer of Somali livestock. Table 6 shows the destinations of Somali exports of cattle and small ruminants from 1980 to 1983. The details of Somali livestock production and marketing outlined below illuminate the organization, the problems, and the widespread

Table 1: Livestock Population in Somalia (1975 - 1983)

Year	Cattle 1,000 head	Camels 1,000 head	Sheep 1,000 head	Goats 1,000 head	TLU* 1,000 head
1975 1)	3,951	5,428	9,452	14,997	12,119
1976	3,998	5,487	9,613	15,342	12,278
1977	4,346 2)	5,577 3)	10,306 4)	15,694	12,769
1978	4,698 2)	5,668 3)	11,011 4)	16,056	13,267
1979	4,755	5,731	11,198	16,425	13,443
1980	4,812	5,784	11,389	16,803	13,622
1981	4,870	5,858	11,582	17,180	13,803
1982	4,928	5,922	11,779	17,585	13,986
1983	4,987	5,987	11,979	17,989	14,153
TLU conversion factor	0.8	1.2	0.1	0.1	
Average growth (%) rate	1.2	1.1	1.7	2.3	

* TLU = tropical livestock unit = 250 kg.

1) = Year of last livestock census in Somalia
2) = Refugee influx of 300,000 head in 1977 and 1978
3) = " " " 30,000 " " " " "
4) = " " " 530,000 " " " " "

SOURCE: Ministry of Livestock and Forestry Resources, 1985.

Table 2: Estimated Value of Foreign Exchange Earnings from the Export of Live Animals, 1981 - 1983

(Figures in Millions of Dollars U.S. Unless Otherwise Indicated)

	Cattle		Camels		Small Ruminants				
	Total FOB Value	% Estimated FE Earnings	Total FOB Value	% Estimated FE Earnings	Total FOB Value	% Estimated Earnings	Total Estimated FE Earnings	Official FE Earnings	Ratio of Official to Total Estimated Earnings
981	31.9	26%	4.6	4%	86.2	70%	122.7	98	.80
982	46.5	32%	5.6	4%	91.4	64%	143.5	106	.74
983	13.5	14%	3.1	3%	74.5	80%	93.6	84	.90

SOURCE: John Holtzman, 1984. "Review of Livestock Marketing and Livestock Marketing Facilities in Somalia," U.S. Agency for International Development, Mar.

Table 2: (Continued)
Notes:

1. FOB prices used in calculating total FOB foreign exchange earnings were obtained from interviews with livestock exporters in 1982 and 1984. Exporters reported C&F prices at Jeddah from which Somali-Hellenic Shipping Company (SHSC) freight rates were subtracted to arrive at FOB prices from each port. The number of animals of each species exported from each port was multiplied by the FOB prices, and then summed across ports for each species, to calculate total FOB earnings in dollars by species.

2. C&F prices for Jeddah are used in all the calculations, although C&F prices in North Yemen, the UAE, and Qatar were not necessarily the same. Exporters report that the prices in the other markets are similar to Jeddah prices, so it is assumed, for computational simplicity, that all prices received in foreign markets were the same as the Jeddah prices. The C&F prices at Jeddah used in the calculations are :

Year	Cattle	Camels	Small Ruminants
1981	340	450	70
1982	350	500	70
1983	360	525	70

Prices vary in Jeddah in response to market conditions. During the month or two before the hadj, prices are typically higher. After the peak export period and jilaal C&F prices are often lower than these used in the calculations.

3. Some livestock were shipped from Berbera and the small ports via dhows at different cost (typically lower to North Yemen and higher to the UAE and Qatar). Higher freight rates were also paid by exporters shipping livestock from Mogadishu and Kismayo to the UAE and Qatar. Finally, exporters from the three major ports also paid higher freight rates than those charged by the SHCO in order to ship livestock via chartered vessels during the pre-hadj period. The lower freight rates to North Yemen are assumed to be offset by the higher rates to the UAE and Qatar and to Jeddah before the hadj. For the sake of simplicity, the SHSC rates are used. The rates were $6.50 per small ruminant, $39 per head of cattle, and $65 per camel from Berbera to Jeddah from 1981 to 1983. Rates from Kismayo and Mogadishu were $14.50 per sheep or goat, $85 per head of cattle, and $174 per camel from 1981 through February 1982, after which freight charges were lowered to $13 per small ruminant, $78 per head of cattle, and $156 per camel.

4. The official foreign exchange earnings for 1983 are preliminary and were calculated by USAID. Actual official earnings may be somewhat lower if the ratio of official to estimated total earnings in 1983 is no higher than in 1981 and 1982. Official earnings in 1983 would be about $75 million if this ratio were 0.80 as in 1981.

Table 3: Estimated Livestock Production in Somalia (1981 - 1983)

	1981			1982			1983		
	Cattle	Camels	Sm.Rum.	Cattle	Camels	Sm.Rum.	Cattle	Camels	Sm.Rum.
Population (N° x 1,000)	4,900	5,900	29,200	4,950	5,950	29,600	5,000	6,000	30,000
Offtake (%)	10.9	2.3	18.6	10.9	2.3	18.6	10.9	2.3	18.6
Offtake (N° x 1,000)	534	136	5,431	540	137	5,506	545	138	5,580
Domestic slaughter (N° x 1,000)	417	122	4,066	383	122	4,057	491	130	4,454
Exported (N° x 1,000)	117	14	1,365	157	15	1,449	54	8	1,126
Slaughter value (So sh/head)	4,000	8,000	600	4,500	9,000	800	5,000	10,000	1,000
Export value ($/head)	200	320	30	230	370	35	260	420	40
Slaughter value (Mio.So sh)	1,668	976	2,440	1,724	1,097	3,245	2,455	1,300	4,454
(Mio.US$)	23.4	4.48	40.95	36.11	5.55	50.71	14.04	3.36	45.04
Export value (Mio.So sh)	219	42	383	507	78	712	219	53	703
Total value (Mio.So sh)	1,887	1,018	2,823	2,230	1,175	3,967	2,674	1,352	5,157
Grand Total (So sh)	5,727,700,000			7,361,030,000			9,183,000,000		
(Average annual)	(1US$ = 9.35 So sh)			(1US$ = 14.03 So sh)			(1US$ = 15.6 So sh)		

SOURCE: Ministry of Livestock and Forestry Resources, 1985.

Table 4: Live Animal Exports From Somalia (1950, 1960, 1970-79)

Year	Cattle	Camels	Sheep	Goats
1950	2,700	200	121,000	
1960	12,000	6,000	576,000	
1970	45,402	25,508	545,731	605,289
1971	56,105	23,202	608,436	576,177
1972	77,089	21,196	788,867	828,389
1973	69,606	27,914	684,214	638,525
1974	27,406	23,692	655,126	556,085
1975	38,663	33,351	1,550,442	272,566
1976	76,238	36,622	373,566	374,057
1977	54,381	34,602	727,626	441,585
1978	73,925	20,968	727,626	723,185
1979	79,000	17,000	579,000	616,000

SOURCE: Ministry of Livestock and Forestry Resources, 1985. (Data compiled by the Ministry of Planning & Livestock Development Agency Foreign Trade Statistics, Central Statistical Department.)

Table 5: Livestock Exports by Port (1980 - 1983)

	1980		1981		1982		1983	
	No.	%	No.	%	No.	%	No.	%
Cattle								
Berbera	56,001	59.5	51,912	44.8	60,193	38.3	29,917	68.4
Mogadishu	13,776	14.6	31,009	26.7	45,706	29.1	6,600	15.1
Kismayo	24,374	25.9	31,889	27.5	51,011	32.4	7,246	16.6
Smaller Ports	Nil	Nil	1,193	1.0	385	0.2	N.a.	-
Total	94,151	100.0	116,003	100.0	157,295	100.0	43,763	100.0
Camels								
Berbera	8,050	46.7	4,663	31.7	3,948	25.7	3,360	44.6
Mogadishu	3,251	18.9	3,678	25.0	6,158	40.1	950	12.6
Kismayo	5,944	34.5	6,384	43.4	5,262	34.2	3,225	42.8
Total	17,245	100.0	14,775	100.0	15,368	100.0	7,535	100.0
Small Ruminants								
Berbera	1,408,316	95.1	1,281,128	93.9	1,312,159	90.5	1,052,473	94.3
Mogadishu	13,210	0.9	56,114	4.1	89,358	6.2	57,020	5.1
Kismayo	9,522	0.6	4,203	0.3	9,016	0.6	6,587	0.6
Other Ports	50,140	3.4	23,546	1.7	39,057	2.7	N.a.	-
Total	1,481,188	100.0	1,365,041	100.0	1,449,590	100.0	1,116,080	100.0

SOURCE: John Holzman, 1984, (Data compiled by the NRA, Department for the Development of Livestock Marketing Facilities.)

Notes: Data for exports from the small ports are not yet available for 1983.
Percentage totals which do not sum to 100.0% result from rounding errors.

Table 6: Cattle and Small Ruminant Exports by Country of Destination (1980-83)

	Saudi Arabia		North Yemen		United Arab Emirates		Qatar		
	No. Head	%Total	No. Head	%Total	No. Head	%Total	No. Head	%Total	Total Exports
CATTLE EXPORTS									
1980[a]	53,397	95.3%	2,425	4.7%	-	-			56,022
1981[b]	104,308	90.2%	10,852	9.4%	440	0.4%	-	-	115,600
1982	146,066	92.9%	10,619	6.8%	585	0.4%	25	Nil	157,295
1983[d]	22,144	50.6%	21,419	48.9%	200	0.5%			43,763
SMALL RUMINANT EXPORTS									
1980[a]	1,293,763	91.9%	112,059	8.0%	2,500	0.2%			1,408,322
1981[b]	1,344,318	89.8%	78,856	5.3%	71,472	4.8%	1,800[c]	0.1%	1,496,446
1982	1,310,907	90.4%	88,926	6.1%	48,057	3.3%	1,700	0.1%	1,449,590
1983[d]	1,062,768	95.2%	52,312	4.7%	1,000	0.1%			1,116,080

SOURCE: John Holtzman, 1984. (Data compiled by the NRA, Department for the Development of Livestock Marketing Facilities.)

[a] 1980 data are for exports from the port of Berbera only. Export data by country of destination are unavailable for the other parts. The export statistics reported in the Foreign Trade Returns, 1980, Ministry of National Planning appear incomplete for cattle (80,000 cattle exported to Saudi Arabia, 5,389 to the U.A.E., none to North Yemen) and exaggerated for small ruminants (1,565,004 head).

[b] 1981 data are taken from the Foreign Trade Returns, 1981, Ministry of National Planning.

[c] The 1,800 small ruminants appearing in the "Qatar" column were actually exported to Kuwait in 1980.

[d] The figures from 1983 do not include exports from the smaller ports.

effects of the live export trade, particularly with respect to cattle. The point to be noted here is that the importance of exports of livestock and livestock products to Somalia's economy cannot be overstated.

2.1.2 The Contribution of Cattle

Most of the nation's cattle are found in the southern half of Somalia: Table 7 indicates that nearly 75 percent were counted in the eight regions composing the southern and trans-Juba areas when the last livestock census was conducted in 1975. Both the total and the southern and trans-Juba areas' share have increased since then. It is estimated that Somalia's cattle production in 1986 will exceed domestic needs by 112,000 head.

As indicated by Table 8, cattle have taken over an ever more important share of the live export trade, constituting more than 43 percent of the total tropical livestock units (TLSs) exported in 1982, the best year for livestock exports in Somalia's history. That year, cattle accounted for 32 percent of the nation's foreign exchange earnings for live exports. In May of 1983, however, Saudi Arabia, which had imported at least 90 percent of Somalia's live cattle exports since 1975 (Table 6), placed an embargo on Somali cattle. This sparked a flurry of action in Somalia to overcome the problems cited by the Saudis and other importers. Funding and physical efforts were redoubled to improve animal health services, stock routes, quarantine areas, marshalling yards and loading facilities at major ports. (Holtzman 1984 provides an excellent review of marketing and marketing facilities, and Dorman's report is informative regarding the animal health constraints to live cattle exports.)

To date, the embargo is still in effect, though the incidence of rinderpest in Somali export cattle which was the stated reason for its imposition has apparently been eliminated, and other suppliers -- particularly the European Community -- have stepped in to meet Saudi demand for beef. Live cattle exports

Table 7: Livestock Distribution in Somalia (1975)*

Regions	Cattle 1,000 head	Camels 1,000 head	Sheep 1,000 head	Goats 1,000 head
Northern				
West Galbeed	145	606	2,245	2,161
Teghder	44	320	917	852
Sanag	74	205	1,521	664
Nugal	12	155	223	611
Barl	15	240	1,385	2,095
Total	290	1,526	6,291	6,383
Central				
Mudug	340	751	1,136	2,744
Galgadud	218	395	588	1,734
Hiran	170	461	287	1,159
Total	728	1,607	2,011	5,637
Southern				
Middle Shebelli	382	205	325	720
Lower Shebelli	419	293	90	200
Benadir	22	1	6	19
Bakool	100	192	70	274
Bay	255	362	55	192
Total	1,178	1,053	555	1,405
Trans-Juba				
Gedo	528	784	500	725
Middle Juba	366	236	25	127
Lower Juba	861	222	70	127
Total	1,755	1,242	595	1,572
National Total	3,951	5,428	9,452	14,997

* = 1975 = Last Year of Livestock Census in Somalia

SOURCE: Ministry of Livestock and Forestry Resources, 1985.

Table 8: Recorded Livestock Exports from Somalia (1980-1983)

	Cattle		Camels		Sheep	Goats	Total Small Ruminants		Total Livestock[b] Units
	No. Head	% TLU	No. Head	% TLU	No.	No.	No.	% TLU	
1975	39,883	14.2%	34,223	15.2%	892,702	691,759	1,584,461	70.5%	224,576
1976	58,385	29.4%	33,502	21.1%	406,961	380,106	787,067	49.5%	158,917
1977	54,956	25.5%	33,296	19.3%	491,503	461,268	952,771	55.2%	175,538
1978	76,982	26.9%	21,580	9.4%	738,848	714,771	1,453,619	63.6%	228,528
1979	67,886	26.0%	12,508	6.0%	716,907	705,268	1,422,175	68.0%	209,034
1980	95,151	31.3%	17,245	7.2%	747,078	734,110	1,481,188	61.5%	240,685
1981	116,003	38.0%	14,725	6.0%	685,046	679,995	1,365,041	56.0%	244,031
1982	157,295	43.4%	15,368	5.4%	730,232	719,358	1,449,590	50.7%	286,163
1983[a]	43,763	22.7%	7,535	4.9%	558,793	557,287	1,116,080	72.4%	154,153

SOURCE: John Holtzman, 1984. (Data compiled by the NRA, Department for the Development of Livestock Marketing Facilities (1982-83) Livestock Development Agency (1975-1981).)

[a]The figures for 1983 do not include exports from the small ports.

[b]Total livestock units are calculated as follows: 1 camel = 1.0 TLU; 1 head of cattle = 0.8 TLU, 1 small ruminant = 0.1 TLU.

to Middle Eastern markets, particularly to Egypt, have continued, but at a greatly diminished rate. This situation supports two conclusions: first, that the potential contribution of cattle to Somalia's all important livestock export trade is large, increasing and essential; and second, that the live export of cattle, particularly to a single market, is extremely risky. Somalia must diversify both the markets it serves and the cattle products it markets. The major barriers which impede both of these courses of action will be pointed out below.

2.2 Cattle Production and Marketing

Detailed understanding of systems of cattle production and marketing in Somalia is spotty, as indicated by the diminutive size and high degree of repetitiveness of the body of literature germane to these topics. Important insights into traditional modes of production from an anthropological perspective are available from Dahl (1979), Dahl and Hjort (1976), and Swift (1977). Some of the limited experimental and descriptive studies on range ecology and manipulation, grazing systems, animal performance, and other technical issues have been written up and disseminated, but many have never been reported. Statistics generated by the government are notoriously hard to get and inconsistent. Reports generally parrot their predecessors until what may originally have been put forth as pure speculation is repeated often enough to be accepted as fact, which it may or may not be. Finally, what documentation does exist is scattered and difficult to access. Thus the researcher is left to piece together an image of reality on the basis of general reviews of the sort cited above supplemented with whatever scattered details he/she is fortunate or ingenious enough to find. Improvement of this undesirable situation requires, first, research to provide the detailed information required by export consultants and, second, standard procedures for reporting research and for accessing

research reports, government statistics, consultant reports, and other information sources.

In the case of this investigation, the required information includes the technical details of current systems of cattle production and marketing, particularly patterns of land use, herd structure and composition, rates of off-take for household consumption and for sale, influence of market forces, and attitudes toward potential interventions in production and marketing systems. In this section, the Evaluation Team will outline Somali systems of cattle production and marketing, as they bear on the functioning of the Kismayo Meat Factory (KMF) as accurately as is possible in the absence of a comprehensive data base. Under each heading, the focus of the analysis will tighten from generalities at the national level to the specifics of the Kismayo area--specifically the Lower Shebelli, Middle Juba and Lower Juba regions from which KMF draws the majority of the cattle it processes--and to the plant itself according to the amount and pertinence of available information.

2.2.1 Range-Based Production

Less than two percent of Somalia's approximately 63 million hectares is cultivated. The remainder is rangeland, primarily savanna with less important components of riverine deciduous forest, acacia forest, thorny shrub land, desert and semi-desert grassland, and barren desert shrub land. This rangeland constitutes the primary forage base for the nation's livestock, though food crop by-products and, to a lesser but increasing extent, forage crops provide essential dry-season and drought feed. Watson and Nimmo (1985) provide these range vegetation and productivity profiles for the three regions from which KMF draws cattle:

° Lower Shebelli (19,425 km^2): The mean annual precipitation is 576 mm. Areas adjacent to the Shebelli river, one of Somalia's two permanent rivers,

support crops, swamps, seasonal flood grasslands, and dense wooded bushland/ bushed woodland with Dobera, Balanites, Acacia, Euphorbia, and large gallery species such as Tamaraindus indicus the more important woody genera and species. The alluvial plain is covered by dense bushed woodland, and the coastal dune ridge has dense Acacia tortilis woodland on stabilized sands. Dry matter production from grasses, forbs (weeds and leafy plants) and small shrubs is estimated at 815 kg/ha excluding production from farms and swamps, and at more than 391 kg/ha for other woody plants. This region supports the highest density of herbivores of all southern regions, with cattle the most important in terms of biomass. Recent surveys indicated a cattle population of 706,000 (the average of Watson and Nimmo's (1985) two surveys).

° Middle Juba (43,572 km^2): Mean annual precipitation is 460 mm. The western segment is for the most part sparse to medium wooded bushland, with Acacia, Euphorbia and Terminalia among the more important woody genera. Denser wooded bushland and bushed woodland is found further east, with Dobera, Balanites and Comniphora genera added to those already cited. Areas of grassland/forbland are found on clays in the north west, and seasonally flooded grassland bands line the Juba--the country's second permanent river--and Shebelli channels. Dunelands support Acacia tortilis woodland. Dry matter production from grasses, forbs and small shrubs is estimated at 740 kg/ha excluding farm and swamp production, and at well over 141 kg/ha for other woody plants. This region supports the lowest densities of livestock of the southern regions, with cattle and camels the most important in terms of biomass. Recent surveys indicated a cattle population of approximately 383,000 (average of Watson and Nimmo's (1985) two surveys).

° Lower Juba (35,114 km^2): The north western segment is a medium density bushed woodland/wooded bushland with Acacia, Euphorbia and Terminalia among the more important genera, mixed with saline bushed grassland/forbland with

scattered trees and shrub thickets. The south eastern segment is very diverse with dense gallery forest of Diospyros and other forest trees, palm gallery forest, Diospyros forest patches, Delonix/Adansonia (baobab) woodland, Adansonia forest, seasonally flooded shrub thickets and grasslands, dense Acacia/Adansonia bushed woodland, mangrove thickets, etc., to name but a few of the more important vegetation associations. Dry matter production from grasses, forbs and small shrubs is estimated at 805 kg/ha excluding farm and swamp production, and at much more than 179 kg/ha for other woody plants. This region supports a medium to high density of herbivores, with cattle the most important by far in terms of biomass. Recent surveys indicate a cattle population of approximately 823,000 (the average of Watson and Nimmo's (1985) two surveys).

Past estimates of the carrying capacity of Somalia's rangelands have apparently been overly conservative, contributing to the widely held opinion that they have long been overstocked and, as a result, deteriorating in condition. More recent assessments counter that conclusion (Reusse 1982, and Watson and Nimmo 1985). The primary explanation for this discrepency seems to be the negligible forage values given to browse (twigs, shoots and leaves of trees and shrubs) by past investigators; it is now known that browse contributes significantly to the diets of all types of Somali livestock including cattle. Watson and Nimmo (1985) recalculated past estimates of carrying capacity using current precipitation and production values and giving browse a more realistic role in diets, concluding that Lower Shebelli was moderately overstocked, Middle Juba was greatly understocked, and Lower Juba was slightly understocked. The apparent overstocking of Lower Shebelli was judged a fallacy, the result of the region's agricultural productivity supporting considerable numbers of animals off the rangelands on crop by-products. Periodic overstocking is inevitable in arid and semi-arid pastoral zones with climates as capricious, options for rapid destocking as limited, and supplemental feed reserves as small as those of

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Somalia. However, overstocking apparently does not pose the imminent threat to Somalia's pastoral productivity feared by some.

Two points which bear critically on this analysis emerge from examination of the rangeland base of Somalia's cattle production. First while the country's rangelands are apparently not significantly overstocked, they are probably stocked at close to their carrying capacity; no quantum increases in sustained offtake are likely under current management. Second, the fact that rangelands provide virtually all the forage consumed by Somalia's cattle--only survival-level dry-season and drought rations are typically provided by agricultural enterprises-- insures that Somali cattle will be extremely lean under the best of conditions, given current management.

2.2.2 Traditional Management

Spatial and temporal variability in the availability of forage and stock water demand mobility; Somalia's pastoral nomadism and transhumance are largely products of the area's bimodal monsoonal rainfall pattern and inter-year variability in mean annual precipitation. In the three southern regions of interest here, most cattle are congregated along the Juba and Shebelli Rivers, on crop residues and the margins of receding swamps where burning spurs the succulent regrowth of grasses, during the long Jilaal dry season from December through April. With the onset of the Gu rains in May, cattle are dispersed out to rainfed croplands and beyond, into the more arid hinterlands. The distribution of cattle becomes more uniform than clumped, as during the dry season. Dispersion is probably most during the Der rains from September through November before declining availability of forage and ephemeral stock water forces herds back into the vicinity of the rivers. Many Kenyan herds venture into the southern part of Somalia during this period in years when the fall rains are good.

Pastoral production in Somalia is traditionally subsistence oriented. Most cattle are integrated into mixed herds managed by nomadic or transhumant herdsmen and are kept for several interrelated reasons: to provide milk and, less importantly, meat for household consumption; as a "bank" for stored wealth; as a source of prestige; as currency in traditional ceremonies and transactions; e.g. to pay bridge prices and blood debts; and as a source of cash income to meet the generally rudimentary needs of the pastoral household for purchased commodities. Though these diverse reasons for keeping cattle are not ranked according to relative importance, the last is certainly not the most influential over herdsmen's management decisions.

Still, Somali pastoralists do have a long history of commercial activity, primarily selling live animals for export to the Arabian Peninsula. This trade has been going on for centuries, and the Arabian preference for Somali stock is well established. The importance of cattle relative to other types of livestock in this trade has increased over the past decade. Arabian buyers have paid premium prices, well above world market levels, for mature Somali bulls, the preferred animal. The magnitude and profitability of this trade has molded traditional management; pastoralists keep bulls in their herds until maturity, realizing that the sale of just a few such animals will generate enough cash income to provide for the family's needs.

This brief discussion of traditional management illuminates three salient points. First, seasonal displacements of pastoral herds create differences in the seasonal availability and price of cattle; more cattle are marketed at lower prices in the dry season when herds are concentrated in the riverine zones and feed is most difficult to obtain. This situation is exaggerated in drought years. Second, subsistence oriented pastoralists do not react to market forces in the same way as commercially oriented ones; it is difficult to influence

their management so as to generate a marketed supply of a given type of animal at a specific place and time. The marketing patterns of these producers may demonstrate the backward-bending supply curve cited by economists describing traditional pastoral systems. Third, the influence of the live export trade will be difficult to dispell; Somali producers will likely continue to produce mature bulls to meet their cash needs as long as there is any prospect for selling such animals as profitably as in the past. Though the live export trade is currently reduced and likely to diminish more in the future, it will probably take substantial effort and time to induce pastoralists to produce and market another type of animal such as a younger steer for KMF.

2.2.3 Marketing

The organization of livestock marketing in Somalia is based on the activities of a cadre of private, competing, and highly specialized traders who convey livestock from a multitude of minor gathering areas in the hinterlands to municipal and export markets. Traders generally belong to pastoral groups themselves, and their networks. After functioning for many years, these networks are so efficient that, although animals move through several hands between the producer and the municipal market or export staging area, the original price paid in the hinterlands rarely differs from the price ultimately received by the trader by more than 15 percent. Virtually all innovations in livestock marketing are the result of the ingenuity and experience of these traders.

Although livestock traders traditionally operate independently and competively, recent developments in the scale of live exports and demands imposed by importing nations regarding animal health and sanitation, means of transport, and size, uniformity of quality, and timing of shipments have forced the traders to organize themselves. The result is several large trading associations which work with pastoral producers, the Somali government, and buyers and governments

and importing nations to keep the trade active. They work with pastoralists to insure production of mature bulls for the export market as well as immatures and dry cows for municipal consumption, with pastoralists and bankers to arrange financing of purchases, with officials of their own government to guide public investment in the livestock sector, with shippers to arrange transportation, and with buyers and officials of importing countries to negotiate the terms of contracts. Somalia's livestock marketing infrastructure is, effectively, the livestock traders associations.

The live animal trade is oldest and best organized in the north, passing through the port of Berbera which was until recently the world's highest volume livestock shiping point. In response to the new buyer demands noted above, the northern trading associations have invested their own capital in physical marketing infrastructure, building holding and staging areas, producing fodder commercially, and organizing private veterinary services. In the southern areas, traders seem less willing to invest in anything beyond tne purchase, mandatory health and sanitation measures, and required feeding of livestock. Small, independent traders and networks provision local municipal markets, and the Tawfig livestock traders association amasses herds of mature bulls for the export trade. As will be noted below, this organization has also been contracted to fill the cattle needs of KMF in the past.

According to the director of Tawfig, the group is composed of 40 traders who combine individual resources but have no joint resources. The group operates in the southern area, from Mogadishu south. These traders were stuck with a substantial herd (more than 50,000 head) of export quality cattle when the Saudi ban was imposed in May 1983, and were obliged to maintain it until they used much of it to fill a 22,000 head contract for shipment to Egypt in 1985.

(Table 9 a monthwise breakdown of live cattle exports from Kismayo port from 1982-1985, shows this first substantial shipment since the Saudi ban. It is interesting to note that exports peak during the three months preceeding the hadj, the Islamic feast of sacrifice.) The head of Tawfig is a member of the Somali delegation in Egypt at the time of this writing to try to negotiate a 100,000 head contract for 1986, but nonetheless these traders foresee the end of the live cattle export trade. They predict that Somalia will be forced to export chilled carcasses and/or frozen or chilled primal cuts in the near future, and they believe that grass ranches, commercial feedlots producing 100,000 head of fattened cattle annually, and a renovated, privately operated KMF are essential if this shift from live exports is to be successfully implemented. The question is who should finance these developments. The Tawfig traders, unlike their northern counterparts, are not interested in such investment themselves. However, they predict that, if a market for carcasses of fattened cattle were to be established, the private sector would assuredly make the necessary capital investment.

The two meaningful aspects of Somalia's livestock marketing system touched upon here are, first, that highly efficient, vertically integrated networks of traders are in place to serve as the essential conduit linking isolated pastoral producers to export markets. They perform the vital function of transmitting information relating to supply and production conditions to the markets, and information on demand and consumer preferences to the producers. Though the influence of the traditional live export trade is deeply ingrained in the production system, the traders should serve to efficiently carry new market signals to the producers. Second, the trader associations have demonstrated their capacity to stay abreast of current developments in the livestock sector and to intervene as necessary with their own substantial expertise and capital.

Table 9: Monthwise Cattle Exports from Kismayo Port (1982-85)

	1982	1983	1984	1985
January	--	1,500	--	--
February	2,700	3,230	600	2,152
March	1,100	1,766	--	3,149
April	--	--	--	6,822
May	--	750	--	1,503
June	1,300	--	--	2,718
July	6,851	--	--	3,463
August	16,570	--	--	6,406
September	18,990	--	--	N.A.
October	2,400	--	--	N.A.
November	--	--	--	N.A.
December	1,100	--	--	N.A.
Total	51,011	7,246	600	26,213

SOURCE: Holtzman, 1984, for 1982-83 figures; the Kismayo Meat Factory annual reports for 1984-85.

They will likely play a significant role in fostering the evolution of whatever form of production and marketing infrastructure ultimately replaces the live cattle export trade. That role should be anticipated if not directed.

2.2.4 Livestock Movement

Cattle are virtually always trailed from place to place in Somalia; only in a few regions during the Jilaal dry season when all parts of the country are accessible is trucking feasible. The lack of motorized transportation is conventionally cited as a major shortcoming of traditional pastoral systems, but current thought questions that view (Reusse 1982, and Sandford 1983); trucking often increases mortality rates and decreases condition relative to trailing. Trucking has been promoted in Somalia, in principle if not practice, as the logical way of getting certified healthy cattle from holding and quarantine areas to port without risking recontamination from other stock encountered while trailing. This would help the traders to meet the stringent health standards imposed recently by importers, but it would probably not be necessary if only less stringent standards for slaughter cattle were applicable. The point is that the issue of whether or not to motorize transport would be less pressing if the export trade shifted from live animals to carcasses or frozen meat.

2.2.5 Holding and Staging Operations

Most cattle are moved in from the pastoral hinterlands along the several major stock routes linking those areas with coastal markets. These routes are provisioned with water points, veterinary stations, and in some cases reconditioning areas. It should be noted that these facilities, as well as those described below, may never have operated at their intended level or have deteriorated to the point that they cannot do so currently. Still, the system does facilitate cattle movement and marketing. Cattle destined for domestic

consumption are diverted off these routes to municipal slaughtering facilities, while those bound for export wind up in staging and holding areas.

In the south, stock routes for export animals lead to Kismayo port. As an intermediate step, most cattle are held at the Lahaley holding ground, a National Range Agency managed facility consisting of 20,000 ha of rangeland divided into 10 pastures with a fenced 2 km^2 quarantine area, wells, and a surrounding trench to keep out trespassers. Upon entering the facility, cattle are vaccinated against rinderpest and CBPP then held for a week and vaccinated against anthrax, blackquarter and haemorragic septicemia. After three weeks in the facility they are trailed to the marshalling yard at Kismayo port for shipping. The traders who own the cattle bear most of the costs incurred at the holding and marshalling areas, the most important of which is the purchase of feed, usually sorghum or maize stover purchased from small farmers or baled grass hay produced by the Trans-Juba Project (more below). Two other holding areas, one 114 km from Kismayo at Gelib and the other 80 km away at Aglibah, serve the Kismayo port, but neither has been well-developed or used at anywhere near capacity.

The existence of these facilities illustrates one important point: that producers, private traders, and the Somali government--albeit with donor assistance--do cooperate on the use and provision of capital improvements to the marketing infrastructure. It can be noted too that inappropriate or unpopular facilities are neither used nor maintained. This cooperation would likely continue through any reorganization of marketing infrastructure required by a shift in export product lines, and existing stock routes, holding and marketing areas might prove useful as well.

2.2.6 Prices

Somali cattle prices are currently very high and, as noted above, trade margins are low. The premium price demanded, as well as some of its implications,

is illustrated by Somalia's 1984 negotiations to try to sell 60,000 live cattle to Egypt. The Egyptians offered $1,020 per ton, approximately the current world price, but the Somalis asked $1,316. No agreement was reached until 1985 when the Egyptians finally agreed to buy a much reduced number, 22,000 head, for $1,100 per ton of liveweight. At the time that shipment was completed, European Economic Community (EEC) beef carcasses were reportedly available in large quantities for $900 per ton in Cairo. It will be interesting to see how the negotiations for a larger 1986 contract currently underway conclude. It may be significant to note that almost a quarter of the agreed-upon price will be charged to repayment of a military loan from Egypt to Somalia; one wonders if Egypt will continue to import Somali cattle once the loan has been offset.

These high prices on export markets pull up cattle prices on domestic markets because virtually all males are held for the former, leaving only culls and dry cows for the latter. (Export of females is prohibited.) Competition for this inferior stock is intense, especially among urban butchers. Currently, even though domestic prices are high, it seems that many Somali cattle are being sold in Kenya to take advantage of the relative strength of the Kenyan shilling over the much devalued Somali shilling. This decreases supplies in Somalia, forcing domestic prices even higher. Finally, constant devaluation of local currency coupled with high rates of inflation combine with these market factors to drive domestic prices ever higher.

These high prices and the resulting limited available supply of cattle are the factors that forced KMF operations into the red over the past decade according to the plant's managerial staff. Table 10 shows the numbers, mean weights and prices paid for cattle slaughtered at KMF from 1980 through 1985, but those figures do not represent real market conditions, as noted on the table. A single real example may be more illustrative. In 1984 the Kismayo

Table 10: Numbers, Mean Weights, and Mean Prices for Cattle Slaughtered at the Kismayo Meat Factory (1980-85)

	No. Slaughtered	Mean Weight (kg)	Mean Price (So. sh.)
1980	16,237	230.3	690.84
1981	6,805	230.5	665.50
1982	2,723	219.1	*
1983	1,793	169	*
1984	3,236	233	1,904.29
1985	--	--	--

Key: * indicates cattle "donated" by producers to be processed for use by military.

-- indicates data for year not yet completed.

SOURCE: Kismayo Meat Factory annual reports.

representative of the Tawfig traders association was contracted to supply KMF with 15,000 head of 250 kg cattle. The ceiling price to be paid by the factory was 2,300 So. sh. The trader was able to provide fewer than 5,000 head, and he reportedly took a loss of almost 3 million So. sh. in providing even that many. That was a year when the Saudi ban on Somali imports had caused the price of an export quality bull to fall to between 6,000 and 8,000 So. sh.; in 1985 the prospect of increasing live exports to Egypt has pushed that price as high as 13,000 So. sh. The price the factory can afford to pay is a function of the market value of its canned meat products, while the asking price is seemingly unrelated, primarily a function of the artificially high price demanded, and to date received, for live Somali cattle. The factory is in a bind.

Since it began operations in 1969, KMF has employed three different methods to purchase cattle. Reviewing them offers some insight into how a privately operated factory might best obtain cattle inputs. First, until 1980 the Livestock Development Agency (LDA) was in principle the sole supplier of cattle to KMF. However, three times during that period disagreements between the factory's managerial staff and the LDA--the latter was not providing enough cattle at a sufficiently low price--resulted in the factory's undertaking the purchase of cattle itself. This occurred in 1974-75, 1977-78, and 1979-80. During these interludes, KMF hired buyers, purchasing agents, veterinarians, and other personnel needed to acquire the necessary cattle inputs. This method was apparently preferrable to dependence on the government supply monopoly, the LDA, which was abolished for its inefficiency by the Council of Ministers in 1980.

Between 1980 and 1984, KMF did not purchase cattle on the free market. During the first two years of that period, Somali was stricken by drought, and the government ordered the factory--and provided funds--to purchase cattle at

the factory gate which would otherwise have died of starvation. This provided pastoralists some income, KMF staff some work, and converted cattle which otherwise would have been wasted into a useable product. It did not generate a profit. During the following two years hostilities flared between Somalia and Ethiopia, and KMF was ordered to produce corned beef for the Somali armed forces using operating funds provided by the Ministry of Finance and cattle "donated" by pastoral producers. Again, the factory served a useful purpose but did not generate a profit.

It was not until 1984 that the factory attempted to procure cattle on the free market, and this time it let a contract for the desired animals, specifying the number, weight, condition, and ceiling price. As noted above, that contract was not entirely filled, but the KMF manager felt that contracting with traders was the best method for purchasing cattle; there were no government inefficiencies to deal with, and the factory was not responsible for the costs of extra staff, transportation, veterinary treatments, etc., which under contract were born by the traders.

Three salient points are evident from this discussion of cattle prices. First, Somali cattle are at best expensive, at worst far over priced. Though live cattle importers have, for various reasons, agreed to these prices in the past, it is unlikely that Somali cattle will continue to command premium prices, on the hoof or in any other form, for long. Second, the high prices obtained on the live export market pull prices up on domestic markets, limiting the options available for diversifying production of cattle and cattle products including processed meat. This phenomenon will likely continue as long as mature bulls command premium prices in the live export trade. Third, the acquisition of cattle is best left to the traders who have the experience, skills and connections necessary to do it efficiently. The task is too specialized

for new enterprises to undertake it, and government marketing organizations have a bleak history in Somalia and the rest of postcolonial East Africa.

2.2.7 Livestock Development Policy

Somalia's general policy toward development of the range/livestock sector is divided into measures to reduce pressure on rangelands and measures to support pastoralists. The former include extending crop production in the riverine areas and encouraging integration of crop and livestock production systems, settling pastoralists in the riverine areas, improving marketing, increasing exports, stratifying livestock production so that reproduction is emphasized on semi-arid rangelands, fattening and finishing in more humid areas, thereby increasing employment options for pastoralists. The measures to support pastoralists include avoiding further degradation of rangelands by considering range carrying capacity in planning water development, developing knowledge of the range resource base by collecting baseline data, and encouraging soil conservation practices. They also include animal health measures, particularly prophylactic programs directed specifically toward instilling confidence in the health of live cattle exports, and measures to privatize importation, sales, and distribution of animal drugs and to encourage primary animal health care at the producer level.

The most pertinent aspects of this policy here are its export orientation, its emphasis on crop/livestock integration, and the stratification program it outlines. Regarding the first aspect, the emphasis for the moment seems to be on live animal exports, but especially in the case of cattle this emphasis might easily be redirected toward alternative products which KMF could produce for export in the future. Crop/livestock integration would also tend to increase the number of alternative forms of cattle production and marketing possible, and thus the potential for a more important role for KMF. In the same vein, a

stratification program which allocated the various phases of cattle production and marketing to geographic areas with comparative advantages in the availability of resources to perform them would make the most efficient use of Somalia's diverse base of all sorts of resources and increase the options for KMF to contribute to export marketing. In sum, successful implementation of the measures comprised by this policy would increase the feasibility of operating KMF as a private enterprise.

2.3 Potential for Conditioning, Fattening, and Finishing Cattle

If market studies indicate that carcasses or primal cuts would be the most profitable products KMF could produce, the factory will need access to higher quality beef animals. Determination of the most desirable type or quality of animal would depend on consumer preference; for instance, the Saudis might purchase chilled sides from the same sort of cattle they formerly imported live, preferring the leaner, tougher, stronger flavored--and Islamic--beef of mature Somali bulls to other available products. Such animals would require minimal conditioning on good rations prior to slaughter. At the other extreme, Somalia might opt to compete on the world market for carcasses or prime cuts judged to be high quality by Western standards. This would require the development of some form of high capacity, technically sound, and consistently productive cattle fattening and finishing capability in the southern region. There are certainly important differences among the various sorts of feeding operations which lie between these extremes, but from this speculative perspective it is more instructive to consider the commonalities: all require adequate and consistent supplies of feedstuffs; all demand inputs of cattle in sufficient numbers and of the type which responds to the specific regimen; and all depend on a differential between the price per unit of weight of cattle coming into and going out of the operation. These requirements are evaluated individually below.

2.3.1 Feedstuff Availability

Several developments in the agricultural and, to a lesser degree, the industrial sectors promise to increase the amount and variety of livestock feed in Somalia. The first of these involves control of the tsetse fly which infests highly productive areas in the vicinity of the Shebelli and Juba Rivers, prohibiting use of these areas for critical dry-season grazing under current management and precluding their use as grass conditioning/fattening areas under stratified management in the future. However, Somali tsetse areas are not contiguous with fly zones in Kenya or Ethiopia, and experimental attempts to control the fly through a combination of brush clearing and insecticide application have proven effective. A tsetse control project with technical support from the British Overseas Development Agency (ODA) is currently implementing a six-year program designed to eliminate the tsetse fly from the inter-riverine area. Successful completion of this project would open substantial areas to the development of high quality native or improved pastures which could be used to condition or fatten range produced cattle.

The second promising prospect involves the potential for increasing fodder production from small-holder farms. As more and more land is brought under cultivation in the southern region, farmers are increasingly interested in augmenting the forage value of their crops for their own use or for sale. The area supports the majority of Somalia's settled livestock producers. Maize and sorghum by-products and residues have traditionally been utilized as livestock feed, but that use is becoming ever more efficient. Farmers no longer allow pastoralists to graze crop aftermath free of charge. Rather, they sell sorghum stover for a profit of about 1,000 So. sh. per hectare and rice straw for 1,500 So. sh. per hectare if they produce more than they can use themselves. This trend should produce increasing amounts of fodder for the energy and roughage

components of rations for conditioned or fattened cattle. (Table 11 shows crop production figures for the three southern regions for 1982.)

The third potential source of new feedstuffs is the rapidly developing commercial cropping sector. Irrigation projects on the ground and on the drawing board will provide increasing quantities of cash crop by-products and residues such as rice, straw, glume and bran, bagasse and molassas from cane sugar production, cotton seed and tops, and banana stalks and leaves. The following projects are especially interesting:

° Bardherra Dam: This project has been discussed for years, but recent recalculation of the construction costs make it appear more feasible. If completed, the project would open 15,000 ha on the upper Juba to irrigation over the following 20 years. Preliminary soil studies indicate that the area is best suited to rice and possibly cotton production.

° The Mogambo Project: This irrigation project, situated near Kismayo and funded by Kuwait and West Germany, is currently being implemented. Five-hundred ha were cultivated and sown to rice in 1985, and 2,000 ha should be cultivated in 1986.

° The Fanooli Project: This Chinese (PRC) irrigation project has 500 ha under rice at present but will add 400 to 500 ha per season until the target area of 8,000 ha is reached according to the project plan.

° The Juba Sugar Project: This Ministry of Industry project currently produces sugar cane on 5,000 ha but is intended to ultimately bring 7,000 ha into production. Its 1984 production was approximately 53,000 tons which is judged poor because of dry season water availability problems.

The Jowhar irrigation project, Somalia's first, is apparently about to be scrubbed because of poor design and low productivity. In addition to these projects, private commercial production of irrigated crops with potential feed

Table 11: Crop Production in Somalia - 1982 (GU and DER season)

Crop/Region	Rice Qts	Maize Qts	Sorghum Qts	Beans Qts	Sesame Qts	Groundnuts Qts	Cotton Qts	Vegetables Qts
L/Shabelli	49,475	721,570	252,628	8,800	245,891	3,108	24,500	24,500
M/Jubba	37,800	148,380	134,080	1,632	73,906	1,422	2,198	50,500
L/Jubba	17,950	176,920	60,832	2,800	81,240	2,792	3,720	78,500
Total	105,225	1,046,870	447,540	13,232	401,037	7,322	30,418	153,500

SOURCE: Ministry of Livestock and Forestry Resources, 1985.

value, particularly bananas, is increasing sharply in the riverine areas. Collectively, these agricultural developments should provide substantial quantities of a variety of feedstuffs over the next decade, greatly increasing the cattle fattening potential of the southern region.

The fourth area of interest is the developing industrial sector, specifically the by-products it generates which have feed value. The Ministry of Industry operates a urea plant near Mogadishu which has a capacity of 45,000 tons per year. It is currently operating at about a third of that capacity, and plans are being considered to shut it down and sell it, perhaps to Kenya, because the availability of diesel fuel, the raw material it utilizes, is likely to be a constant constraint. If the plant remained in operation, especially if operated near capacity, urea might be available to provide protein for prepared feeds. Another potential source of protein is Somalia's nascent fisheries industry. The Somali Marine Industries plant at Kismayo is primarily a cold storage facility, but according to the manager it could produce approximately ten tons of raw fish meal annually. That industry should continue to expand. Other contributions of feedstuffs might come from the oil seed processing industry, the citrus processing industry, and from what ever meat processing facilities, such as KMF, which might be developed.

These developments in the agricultural and industrial sectors might well provide the feedstuffs necessary to support some sort of cattle fattening industry in the southern region. However, initial attempts should be undertaken modestly and experimentally, and dependence on expensive imported feed grains should be avoided. If the results were positive, private investment would likely extend the industry to fill demand for conditioned, fattened or finished cattle.

2.3.2 Cattle Constraints

Three types of African zebu (Bos indicus) cattle are found in southern Somalia. The most common is the Surqa, thought to be a cross between the thoracic humped zebu and the Sanga, long-horned and cervico-thoracic humped zebu. The breed is common in southern Somalia, northeastern Kenya and southeastern Ethiopia. It is also known as the Jiddu or Tunni. Surqa are best known for their hardiness and resistance to tsetse-born trypanosomiasis and harsh environmental conditions, and it appears to be more a dairy than a beef type animal. Mature animals stand between 110 and 130 cm at the withers, bulls weighing an average 320 kg and cows 270 kg.

The second most common breed is the Boran, an East African short-horned zebu found throughout northeastern Africa. In southern Somalia it is usually found in mixed herds with Surqa cattle. In Kenya it is considered primarily a beef breed--the carcass has good beef characteristics--but in Somalia its milk production is its most valued trait. Boran are extremely heat tolerant and do well in dry areas. Mature animals average 110 cm at the withers, with males weighing up to 600 kg but averaging about 300 kg in Somalia, and females averaging 300 kg.

The least common breed is the Duwara, found in the Lower Shebelli region and along the coast in regions of higher rainfall. It too is an East African short-horned zebu, similar in size to the Boran. It is one of Somalia's best milk producing breeds, averaging over five liters per day under improved management.

Under traditional management, these cattle are slow to grow and to reach reproductive maturity. Calves must typically share milk with their human owners, and age at first mating for cows is usually between four and five years. Though weight losses are the rule during difficult dry seasons and droughts,

these animals demonstrate rapid compensatory weight gains once even moderate quality diets are available. Grass conditioning and, up to a point, fattening are quite effective. Experience in East Africa has shown these breeds, particularly the Boran, to be ideally suited to feedlot finishing (see Creek 1972 and Tables 12 and 13). The "cheap growth" rates of animals grown out on unimproved pastures and rangelands are acceptable, and gains of a kilogram per day while laying down layers of finish fat on diets of concentrated feed in feedlots are common.

While the performance of these cattle is evidently no constraint to feeding operations, the availability of feeder animals may be. As noted above, pastoralists currently keep as many reproductive females as possible in their herds and are reluctant to market males before maturity at the age of five years or more. The two- to three-year-old animals which perform best in feeding operations are rarely found on the market. This problem will not likely be mitigated until the incentive to produce mature bulls for the live export trade is removed. If the most valuable animal producers could take to market were young steers or bulls, males would probably be marketed at the appropriate age. As long as the potential for premium profits exists and maintenance of cattle on common rangelands is perceived by pastoralists as cost free, feeding operations will be seriously constrained by the availability of cattle.

The situation is further complicated by the variation in cattle availability and prices between the wet and the dry seasons. While some variation is probably inevitable, the magnitude should decrease as more cattle are kept as part of integrated crop/livestock enterprises in the riverine areas. Again, once a consistent and profitable market is established cattle supplies should be forthcoming.

Table 12: Summary Results of First Breed Characterization Trial

	North Eastern Province Boran	Improved Boran	Friesian cross	Hereford cross	North Eastern Province Boran	Improved Boran	Friesian cross	Hereford cross
High energy	.....10 weeks.....				.....16 weeks.....			
Average daily gain (grams)[1]	1,023	1,303	1,384	1,378	993	1,260	1,388	1,384
Kg feed/kg gain[2]	8.1	6.9	6.7	6.7	8.7	7.4	7.1	7.2
Grade score[3]	4.54	4.57	4.26	4.67	52.9	52.4	52.7	52.1
Dressing percentage[4]	51.2	51.1	50.7	49.2	52.9	52.4	52.7	52.1
Feed cost/kg gain (U.S. cents/kg)[5]	29.4	25.5	24.8	24.6	34.2	27.7	25.8	30.2
High roughage	.....10 weeks.....				.....16 weeks.....			
Average daily gain (grams)	815	890	868	795	883	1,098	1,060	1,047
Kg feed/kg gain	10.1	9.1	9.6	10.5	9.5	7.9	7.9	9.1
Grade scores	4.60	4.64	3.84	4.56	4.24	4.68	4.38	4.67
Dressing percentage	50.0	50.3	48.5	49.2	51.7	52.0	50.9	51.3
Feed cost/kg gain (U.S. cents/kg)	31.7	29.4	30.7	33.9	30.7	26.2	26.2	29.8

1 Based on carcass weight and a standard 51 percent dressing percentage.
2 Feed expressed on a dry matter basis.
3 6 = Prime, 5 = Choice, 4 = FAQ, etc. (Prime is the highest grade).
4 Based on unfed farm weights.
5 Daily added value minus daily feed and nonfeed costs (including interest and mortality).
SOURCE: Creek, 1972.

Table 13: Percent of Ration Composition
(On a 100 Percent Dry Matter Basis)

	High energy	High roughage
	.....Percent.....	
Maize grain	52.8	20.6
Maize silage	33.4	66.8
4 percent urea molasses	11.1	9.9
Cotton seed cake	2.7	2.7
TOTAL	100.0	100.0
Cost (in U.S. cents per kg dry matter)	3.1	3.7

SOURCE: Creek, 1972

A caveat noted by Sandford (1983) is relevant here. Given the predominance of fixed costs in commercial feedlot operations, periods of insufficient supply of feeder cattle which are typical in southern Somalia are economically damning. Commercial feeding operations require a constant supply of cattle inputs to operate profitably. In situations where cattle supplies are variable, small scale, household or farm-level feeding operations are preferrable because fixed costs are negligible. In southern Somalia, where many livestock are already integrated into the crop agriculture system and government policy calls for further integration, small-scale stall feeding operations might provide at least the conditioned, fattened, or even finished cattle needed to get a new chilled or frozen beef export trade underway.

Three important points emerge from this review of cattle supply constraints. First, there is nothing in the genetic potential of the indigenous cattle to limit the possibilities for fattening operations. Though these animals are not currently kept as beef animals, their performance in that regard has been demonstrated elsewhere (e.g. Kenya as noted on p. 2-34). Second, the availability of feeder cattle poses a serious constraint to the possibilities for cattle fattening at this time. Something will have to change to induce pastoralists to market such animals, and it will most likely be the demise of the live export trade and the resulting shift in market signals reaching the producers. Third, while lapses in the availability of feeder cattle might make commercial feedlot operations impossible because of the magnitude of fixed costs, stall feeding operations based on small-holder farms might provide the higher quality beef animals required by a privately operated KMF.

2.3.3 Price Differentials

The economic success of cattle fattening operations depends on the margin between buying and selling prices, other factors being equal. Such operations

have been attempted in Somalia in the past (see Mogambo Project noted in the Bibliography), but most have failed because the increased quality of fattened or finished carcasses was not reflected in premium prices on the available markets. Quality gains as well as weight gains must be compensated if fattening is to be profitable.

2.3.4 Prospects for Fattening Operations

The discussion of the importance of price margins points out again how essential market research is to the development of Somalia's livestock sector in general and to the prospects for KMF's contribution in particular; if markets for higher quality beef can be located, evaluated on an experimental basis, and proven profitable, internal production and marketing systems including, conditioning, fattening and finishing infrastructure, should develop quickly to exploit them. Somalia's private livestock sector has exhibited the ability to efficiently adjust to prevailing market conditions and generate considerable profits, and there is no reason to think that ability has been lost.

3.0 CURRENT STATUS OF THE KISMAYO MEAT FACTORY

3.1 General Comments and Background

The Kismayo Meat Factory (KMF) occupies 8 ha within the town of Kismayo. Its three major structures include a processing building (4176 M^2); an auxiliary building housing boilers, generators and workshops (1782 M^2); and a two-story building for offices, training rooms and a quality control (QC) lab (1782 M^2). There are a number of auxiliary structures for hide processing (1800 M^2), car repair and offices, in addition to fuel tanks, a water supply system, a refrigeration-water cooling tower, and cattle paddocks (1782 M^2). KMF estimates its land and buildings to be worth $0.7 million and its usable equipment to be worth $0.1 million (depreciated book value).

KMF was constructed between 1964 and 1968 by the USSR, to produce about 9 t/day of stewed canned meat and meat in its own juice, in 150 gm cans. In 1974-1975, the canned corned beef line was added and the canned meat line was expanded. Thus the daily production capacity after 1975 was:

- Stewed canned meat or beef in own juice (40,000 cans X 350 gm net wt.)[1] — 13.0 t/day
- Corned beef (20,000 cans X 340 gm net wt.)[2] — 6.8 t/day
- Sausage — 2.0 t/day

At capacity, KMF slaughtered 200 head of cattle per day to provide the meat for these items. Table 14 provides a summary of KMF production between 1975 and 1985. During 1969-1976, the factory operated at close to capacity. In 1973, it purchased some cattle for sale as frozen sides (1291 tons). In 1980-84, KMF

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[1] Cans of 150 gm, 250 gm and 350 gm are used.

[2] Cans of 135 gm, 200 gm and 340 gm are used.

Table 14: Production of the Kismayo Meat Factory (1975-85 in Tons)

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Canned Stew	2,004	1,597	995	2	10	0	80	151	95	0	19
Corned Beef	363	173	111	73	594	701	693	308	5	2	127
Meat in Gelatine	0	0	4	1,704	0	0	0	0	0	0	0
Fresh Meat	0	0	0	0	0	0	388	3	2	4	0
Frozen Meat	0	0	0	0	0	100	0	0	0	0	0
Tallow	125	77	17	ND	ND	ND	ND	ND	ND	ND	ND
Hides	420	366	256	ND	81	130	ND	ND	ND	ND	ND
Bone Meal	139	109	60	0	59	95	0	0	0	0	0
Sausage	0	0	0	0	0	0	0	0	0	0	0

KEY: ND=No data available at time of publication.

SOURCE: Kismayo Meat Factory, 1985.

continued to produce minor amounts (1-700 tons) of fresh meat and frozen cooked meat. Sausage produced by KMF proved unsaleable; this line decreased systematically after 1971 and ceased completely in 1976. By-products have included tallow, meat and bone-meal (none after 1980) and hides.

Overall production began to fall in 1977; KMF has operated only sporadically since then, working less than 50 days each in 1983-85. KMF has not covered its costs of production in any year over the past decade. The reasons for this decline are in part economic (the relation between cattle prices and price offers for the products) and in part technical (depletion of physical capital, spare parts from the USSR being unobtainable). However, not enough is known about world markets for canned meat or the physical state of the plant at various points in time to evaluate the relative importance of these two factors.

3.2 Status of Specific Plant Components[1]

Although the Evaluation Team did not observe the Kismayo Meat Factory (KMF) in operation, it was nevertheless possible for them -- based on a thorough review of the literature, interviews with plant staff and a careful analysis of the plant's equipment and facility -- to make the following observations and conclusions. These comments, regarding the operational status of the various plant components, are outlined below.

Holding Area. The existing fencing in the holding area is sturdily made of reinforced concrete posts and steel tubing. The entry way is flanked by a pen for isolating suspect animals; however it would be difficult to conduct ante-mortem inspection within the stream of animals and make the necessary isolations -- the way lacks 125 M of fencing, permitting animals to fan out throughout

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[1] For a description of the activities conducted within each of the unit processes of a typical slaughterhouse, see Annex C, Attachment C.

the entire plant site. The area contains a weighting station and thirteen pens (45 M X 2.21 each).

Maintenance, to date, has been haphazard; the hinges on many of the gates are in need of repair, and the majority of the concrete drinking troughs are broken. Gutters provide proper drainage and make it possible to wash waste material from the area. However, gutters are missing, from both sides of the last 20 M toward the kill floor. Yet, with a minor investment in fencing, troughs and general repair the area appears adequate for KMF's current needs.

Slaughtering Area. This area extends the full width of the processing building (20 M). It abuts the end of the building, fitting against the cold storage rooms on the other side. Although the slaughtering area is extremely crowded at present, it would be structurally difficult to expand.

The slaughtering house is provided with overhead railing for supporting carcasses and sides, with the shackle rail one M higher than the hook rail, requiring a manual transfer from the former to the latter. (The rail, in the Team's opinion, is inadequate for the isolation of suspect carcasses, head or body parts, and there is no way to maintain the identity of the various parts.) The hide puller is vertical (hurling five M of hair, manure and dust into the air on each pull), and a proper trap door into which the hide can be disposed once separated from the carcass was not observed. There is also a leaking vent shaft in the roof and inadequate screening against rodents, insects and birds. The paunch and viscera from different animals intermingle freely; they do not move with the carcasses. Both head and organ meat work-up spaces are poorly designed, since they are not mobile, thus preventing the proper identification of these parts. (See Chapter 5, regarding meat inspection for the significance of these latter points.)

The overhead scales, a centrifuge for tongue washing, a head breaker machine, a splitting saw and a cutting saw are suitably designed and in working condition. However, if the slaughter house were to properly support increased plant operations, every other piece of equipment would have to be replaced, due to unsanitary and/or obsolete conditions. Useable equipment, aside from the overhead line, is valued at roughly U.S. $6 thousand. The latter would have to be re-routed both to facilitate a counterflow of prime cuts to the cold storage area and to properly isolate suspect carcasses and parts.

Twenty-five persons man this area. With more efficient equipment, this number could be reduced to sixteen.

By-Products Room. The room contains a number of inoperative centrifuges (for washing) and a tank for paunch contents, for which the pump is inoperative. If markets outside the city of Kismayo can be developed for pluck, heart, tripe and viscera, this portion of the plant might be replaced completely.

Eight persons work in this area, of which five are representatives of local buyers of by-products. KMF's cost accounting apparently does not provide a clear picture as to whether the sale of these by-products (and other organs such as liver and kidney, which are also sold locally) contribute a profit to the firm.

Meat Cutting Room. This room is separated from the slaughtering area by a refrigerated 50-meter passageway in which the sides are held overnight prior to deboning. Deboning is performed a 4° C and after rigor mortis has set in. Normal practice, in the United States, is to debone meat immediately after slaughter, in order to: (1) increase yields of meat from the carcass, (2) reduce the likelihood of worker injury since heavy knife pressure is not required on hot meat, and (3) save energy by avoiding chilling. Meat is , however, often chilled before cutting (See Annex C).

Since the meat has heretofore proceeded down the line directly to the cookers, there is inadequate space, in the Team's opinion, to move it back to the cooling rooms, increasing the possibility of contamination and spoilage. The air conditioning system in this room is inoperative. The lay-out of overhead rails in the meat cutting room permits service of only one table.

Twenty-four persons are employed in deboning meat for production of beef stew and corned beef. This number could be reduced significantly through the installation of a more convenient lay-out of overhead rails and through the use of electrical deboning knives. (It should be noted that the General Manager of the plant believes that electrical deboning knives are too advanced for KMF's circumstances and would be difficult for workers to adapt in the near future.)

Canned Meat Production. The better cuts (from hindquarters) are segregated and placed in a cooker. The remaining meat is placed in a boiler. After cooking, the two portions are remixed and, for corned beef, mixed with curing chemicals. A concentrator, for drying meat juices which are used as soup stock, is apparently functional, but it has not operated since 1981 for lack of a market for the latter product. The corned beef is automatically filled into trapezoidal cans (which are not previously sterilized) and closed in a U.S.-made device which handles 20,000 cans per day. Like most equipment at KMF, this closing machine lacks spare parts. The closing machines for round cans (beef stew, meat in own juice) are currently in bad condition. They last functioned in 1981.[1] With regard to food safety, the Team saw no evidence of container closure evaluation (see comments below on the QC lab).

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[1] Under a grant agreement with the United Nations' Food and Agriculture Organization (FAO), -- totalling, overall, to $1,206,580 -- KMF will receive $210,000 with which to acquire spare parts for these filling and closing machines. (Under the agreement, FAO will acquire 200 tons of canned corned beef to be delivered to Mozambique.)

The real problem in this part of the plant is the condition of the still retorts -- twelve have been installed, of which only five are operational. Apparently the steam lines into the seven non-functioning retorts leak or are blocked. Process control is said to be automatic. However, the reliability of the automotive recording thermometers on the retorts is questionable given the fact that they are slated for replacement under the above mentioned FAO grant agreement.

When both lines (stew and corned beef) are operating, this portion of the plant employs 58 persons. Thirty are employed in producing corned beef. Small still retorts -- the ones at KMF hold about 1/4 ton of product -- are labor-intensive in relation to agitating cookers which provide continuous container handling.[1]

In rehabilitating this part of the plant, one would virtually have to start over. This could be extremely expensive, especially if the concrete floor were to be removed in order to replace the steam and/or water lines to the retorts.

Bone Meal - Rendering Plant. The five vacuum dryers for the bone and meat meal last functioned in 1981. The apparatus for drying and packing blood is also inoperative. Moreover, the pressure vessels for rendering tallow, filter press, and so forth do not function. This is fortunate since when in operation they reduce the steam pressure in the retorts for processing canned meat. This situation is dangerous, and is one more example, in the Evaluation Team's opinion, of the poor initial engineering design of KMF.

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[1] Agitating cookers save energy because of reduced processing times resulting from a faster rate of heat penetration, greatly cut down can damage and product loss, and produce a more uniform and higher-quality product. Even these machines, however, are becoming obsolete with the development of Ultra-High-Temperature (UHT) processing and aseptic packaging (see further comments on this process in Chapter 4).

Refrigeration System and Cooling Chambers. Ammonia compressors include one two-stage 200,000 K cal. and one one-stage 100,000 K cal. unit, motors and compressors in working condition with ample spare parts. The ammonia lines, however, leak badly and must soon be replaced. Also, the cooling tower requires repair. Moreover, these compressor units, totalling 3.75 tons of refrigeration, are undersized in relation to KMF's volume of cooling space -- one ton of refrigeration freezes one ton of ice at 0° C in 24 hours. (KMF contains 350 M^2 of cooling space, including the main hallway which serves to chill the meat before deboning. The cooling chambers include: four chilling coolers at 0 to 4° C, 20 tons of carcass; three freezing rooms at - 33° C, 20 tons of carcass; and two holding coolers at 18° C, 400 tons of carcass.) Thus, it is evident that KMF's cooling space is not all usable.

In most modern meat packing operations, sides are normally placed in chilling coolers for 18-24 hours. This practice facilities the cooling of the sides without actually freezing them. Relative humidity is held low, air is moved rapidly through the cooler, and air is removed from the cooler because the sides yield a great deal of moisture. If this is not extracted it will condense on ceilings and drip on the meat, with the danger of contamination and promotion of mold and bacterial activity. The actual chilling process is quite complex and practices as to final temperature desired, air velocities used and other factors vary from packer to packer. Although the plant manager at KMF believes the ventilation system functions properly, and is able to control the chilling of meat products, the Team is not certain of its suitability and suggests, for safety's sake, the replacement of the ten ventilators. Moreover, the doors to these rooms (22 in all) are in poor condition and must be replaced. Also, there are no fork lift trucks for moving palletized products. Finally, all of the cold storage area is not lined with impact resistant plastic tile as required in all United States Department of Agriculture (USDA)-approved slaughter houses.

Rehabilitation and modernization of this section of the plant would involve both a modification in the design of the unit (e.g., designing ducts and fans to evacuate the air from the chilling coolers) as well as a major investment in doors; linings and materials-handling equipment.

Power Plant. The power plant consists of three 600 hp diesel engines, driving turbines rated at 450 KVA.[1] Each consumes about 80 liters of diesel oil per hour. More recent models would consume 64 liters to generate the same amount of electrical energy -- because of lighter materials and more efficient engine design. They are estimated to have ten more years of serviceable life. The voltage regulator is manual, which requires close attention if engines are not to be destroyed.

Boilers. The boiler plant has three units, producing 13 tons of steam/hr at 3 atm. Each consumes 100 l. of heavy oil/hr. The safety valves in the boilers are in poor condition. Filtering material (for water filtration) and firebricks are in short supply. The entire pump station and piping for this unit must be replaced.

Can Making Machinery. The complete unit for producing round cans was installed in 1964 and is reported to be operational. However, the cutting dies are badly worn, and the seam soldering equipment does not function. If this unit is not upgraded or preferably replaced, round cans must hereafter be imported by KMF.

Metal-Working and Carpentry Shops. The metal-working shop is impressively equipped with five lathes, two drills and ample welding equipment. However these lathes are apparently too short to perform some of the repairs necessary at KMF.

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1 The plant can operate on just one of these units, which is fortunate since one unit is not serviceable. These units are fairly common in Somalia.

Quality Control Laboratory. The lab, under the direction of a graduate chemist, is said to test the following:

- o Chlorine and mineral content of the city water used in the plant,
- o Net weight of cans,
- o Seams and soldering of cans,[1]
- o Fat content of corned beef,
- o Titratable acidity and ph of canned meat,
- o Microbiology (plate smears) of can contents,
- o Protein content, and
- o Traces of heavy metals.

Test results dating more recently than 1974, or of all the tests listed above, were not available to the Team for review. It is hoped that more recent results are stored by the Director of the laboratory. (The Director, on leave at the time of the Team's visit, was unavailable for interview.)

Under the FAO agreement mentioned earlier, this laboratory will be refurbished. It needs equipment and reagents for preparing media, an autoclave for sterilizing utensils and media, a centrifuge, and suitably calibrated chambers for performing microbiological tests. Moreover, there may be some staff training needs, which also could be provided under the FAO grant agreement.

Hides Processing. The hides processing facility includes a soaking vat and racks for curing dry-salted hides. This equipment has not been used for a number of years. In 1976, a tannery was constructed adjacent to KMF which was transferred in 1981 to the Somali Hides and Skins Agency (SHSA). The latter institution monopolizes purchases and sales of these products. It currently

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1. Can closure is normally controlled within the processing unit, on a very rigidly determined schedule, in order to correct mechanical closure problems effectively.

purchases green cattle hides by quality as follows:

	So. sh/kg.
Grade I (50% of purchases)	9*
Grade II	6
Grade III	3
Grade IV	1.50

*Averages 50 So. sh/per hide.

KMF accounts for about half of the hides acquired by this tannery, which resells the tanned leather to the public at about a 50 percent mark-up. Its equipment is poorly designed and much of it is not operational.

3.3 Summary and Conclusions

The Team strongly believes that certain key items of equipment must be replaced for the minimal efficient operation of the thermal processing facility. Under the current grant agreement with FAO, this hopefully will be achieved. At the same time, the upgrading of the current facility will not necessarily improve the economics of the operation, due to its reliance on too narrow a range of final products.

As highlighted earlier, the KMF plant was constructed by the Russians to manufacture thermally processed meat products and has been operated for sixteen years almost exclusively for this purpose. It was not designed to produce chilled or frozen carcasses or wholesale or retail cuts of meat, and over the years the plant has sold only minor amounts of what is listed on KMF's books as "pure meat". Although in recent years there has been a strong downward pressure, world-wide, on profit margins of meat packers and processors, fresh meat products tend to be more profitable because their prices have been relatively firm, and because investment and labor costs per unit of output are lower.

If KMF is to be restored to profitability, therefore, it probably must produce a line of fresh meat. This change in the mix of KMF's final products

will require a major capital investment -- much more than that which is to be provided under the current FAO agreement. Nevertheless, alternatives for reequipping KMF for the purposes of chilling or freezing fresh meat and to diversifying its production to beef sides, wholesale cuts or deboned beef should be explored. This is particularly true given the fact that the profitmaking potential of the facility, and thus the real value of the plant and of any private investment which might be made in it, ultimately depends on market opportunities and cattle supply, both of which are particularly dynamic. It is in this light that Chapter 4 presents a number of options oriented towards the diversification of KMF's product line.

4.0 CONSIDERATIONS AND OPTIONS CONCERNING THE KISMAYO MEAT FACTORY FACILITY

This chapter focuses on a number of design options which would allow for the alteration of the Kismayo Meat Factory's (KMF) product mix.[1] The approaches vary in their complexity and their cost, and are outlined below.

4.1 Modification of the Kismayo Meat Factory's Thermal Processing Line

One option that might be considered is the modification of KMF's thermal processing line. Such a change would permit alteration of KMF's product mix to meet market demand, and facilitate continuous use of the slaughtering unit at close to capacity. In this case, the prime cuts from the hind quarters, about 45 percent of carcass weight, would be removed and the remainder of the carcass would be deboned and processed into such items as: canned, dried or smoked meat; sausage; and/or frozen ground beef chubs. The programmed assistance by the United Nations' Food and Agriculture Organization (FAO) to the KMF makes this option attractive as long as further investment in thermal processing equipment can be avoided, and as long as the fresh meat could be sold in Somalia. If these new canned products could not be sold at a profit, they could be phased out of KMF's product line in favor of other meat products. (Such items as rib roasts, boneless rump, chuck roasts and other cuts could either be prepared for roasting, or deboned and converted into smoked or ground beef.)

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1 It is important for the reader to note that these considerations are quite separate from the question as to whether KMF's current line for processed products should be separately refurbished and/or replaced; yet the condition of the latter also requires immediate attention. The factory cannot at this time be relied upon to produce a safe thermally-processed product. With programmed assistance from the United Nations' Food and Agriculture Organization (FAO), however, some of the more serious problems of food safety might be solved. If KMF continues to operate as a thermal processing plant, this would have far-reaching implications concerning overall demand for utilities, use of the labor force, types of cattle to be purchased, plant layout, management and marketing efforts -- it would be impossible to redesign for fresh meat without a prior decision as to retain or modify the current processing lines.

This approach would retain the rigid metal cans which are expensive to acquire, fuel-intensive to process, and heavy to transport, therefore expensive to the consumer. This form of packaging is rapidly losing ground to lighter, less expensive materials requiring less thermal processing. If the product is to be subsidized or given away (as it would be under government programs such as that offered by the FAO) KMF can profit from the production of thermally processed beef. Otherwise, its commercial future appears doubtful without conversion to less expensive forms of processing and packaging, such as the combination of Ultra-High Temperature (UHT) and antiseptic packaging in plastic or laminated cardboard. It would surely make sense to bear this option in mind since UHT technology is now sufficiently advanced to process chunk foods such as stewed beef as well as fruit chunks, fruit juices and milk.[1]

However, it does not appear likely that KMF would be able to convert to UHT in the near future. The volume of product required by such a process is very high (about 2,000 liters/hr.) and there is no indication that KMF could assemble beef or other products so that the unit could operate at capacity. The unit would also be very demanding as regards reliable supplies of steam, water, compressed air and electrical energy. The price of such units in developed countries has been falling rapidly and is now under $US 500,000. But a major investment in start-up costs and technical assistance, as well as improvement in the qualities of utilities, would be required in order for this new technology to be assimilated in Somalia. Moreover, these costs might exceed the actual price of the UHT unit.

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[1] Also, the Multitherm system, which is now in commercial use, processes chunk foods by means of both conventional and microwave heating, presenting a low-cost alternative to the metal can, retortable pouch or aseptic packaging. (See Food Engineering June 1985.)

4.2 Redesign of the Kismayo Meat Factory to Allow for the Production of Fresh and/or Frozen Meat

A second option that might be explored is that of redesigning KMF to allow for the production of fresh and/or frozen meat. KMF's current design presents major obstacles to the production of such products.[1] Moreover, the staff of KMF is untrained in the techniques of cutting and wrapping meat to wholesale or retail standards. Thus not only would most of the unit processes at KMF have to be redesigned and re-routed, but also almost every worker on the production line would have to be reassigned and retrained. At the same time rigorous meat inspection procedures would have to be instituted and observed by workers and supervisors (see Chapter 5).

Given the above, it is clear that it is extremely difficult to estimate the cost of the equipment and supervision which would be required to phase in a fresh/frozen meat line at KMF and recover a minimum of economically valuable by-products. Nevertheless for the purposes of discussion, and in the absence of a definitive feasibility and marketing study, the Evaluation Team tried to develop a ball-park figure for such an undertaking. As its starting point, the ISTI Evaluation Team chose a cost estimate provided by a Romanian Team in a report published in 1984. The report, entitled a "Feasibility Study on the Establishment

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[1]One should note, in passing, some varying opinions in this regard. A recent United Nations' Food and Agriculture Organization (FAO) Project Paper ("International Meat Development Scheme and International Scheme Coordination of Dairy Development", 1984) notes that "KMF . . . is designed for chilled and frozen beef production and also for other meat processing activities . . . according to some reports 'it is likely that by a more efficient organization an increased turnover can be realized even without any additional equipment', and that [obstacles to production of wholesome fresh meat] 'can be overcome by skilled and experienced manpower and instructions in proper slaughter techniques'". To achieve this end, the paper proposes a technical assistance project in the amount of $100,000, of which the only hardware is $24,000, denominated "tools, etc.".

In the opinion of the Team, these assertions cannot go unchallenged. KMF is a single purpose plant: it was designed to produce canned meat only. Its product line cannot easily be altered or expanded. Without major redesign and reconstruction, and replacement of major items of equipment, KMF could not produce fresh meat suitable for human consumption.

of a Somali-Romanian Joint Venture for Kismayo Meat Factory", projected a cost for rehabilitating KMF in order to produce the same product lines for which it was originally designed -- that is thermally processed meat products. The right hand column of Table 15 provides the Romanian report's estimate of U.S. $1,668,700. For comparative purposes, the ISTI Team, working in conjunction with the Accounting Department of the KMF, developed estimates of the depreciated 1985 value of each of the unit processes in the plant. These estimates appear in the left hand column of the table, and total U.S. $854,300.

If these numbers, are refined to take into consideration the cost of altering the plant lay-out to make possible the sale of wholesome fresh and/or frozen meat; of restoring the ammonia, steam and electrical systems; and of substituting price quotations of U.S.-designed equipment for the equipment costs quoted from Romania and other sources, it is sufficient to state that these changes would probably result in a tripling or quadrupling of the Romanian estimate, thus raising it to the neighborhood of $US 5 to 6 million. Under the circumstances, such a level of investment might be difficult to recover from the sale of the final product.

4.3 Construction of a Separate Plant Which Would Produce Fresh Meat

A third alternative, is the construction and operation of a totally new slaughtering and cold-storage unit along modern lines. (This suggested new plant would complement, not necessarily replace, the existing KMF facility.) The major product would be fresh and frozen beef. Evaluation of market studies might make

Table 15: Estimated Existing Value of the Kismayo Meat Factory and the Overall Cost of Refurbishing the Plant to the Original Design

($U.S. 000)

	Existing Value of Plant	Cost to Refurbish Plant to Original Design
Land, buildings, furniture a/	728.7	331.1 b/
Slaughtering area	5.6	143.2
By-products room	0.0	395.6
Meat cutting room	0.9	50.4
Canned meat production	17.1	585.1
Bone meal-rendering plant	0.0	209.5
Refrigerating system-cooling chambers	13.2	165.2
Power plant-boilers	52.1	139.8
Can-making machinery	0.0	--
Metal-working and carpentry shops	27.7	--
Quality control laboratory	0.0	--
Hides processing	0.0	--
Totals	854.3	1668.7

Key: a. Includes holding area

b. Site mobilization, dismantling and shut down

SOURCE: ISTI Evaluation Team and Kismayo Meat Factory for data regarding existing value of plant, 1985; and Institute of Studies and Designs for Agriculture and Food Industry Constructions for data regarding costs to refurbish KMF, 1984.

it appropriate to provide for processing of the product as sides as well as boxed beef (prime cuts, subprimals or retail cuts), and possibly, for dried, smoked or frozen products. The following discussion presents an overview of the types of factors that must be considered prior to the development, design construction and operation of such a plant.

Marketing Considerations. After a beef animal is slaughtered, the carcass must be divided into identifiable cuts to be sold at the wholesale or retail level. The packer may perform only the initial division, cutting the carcass into sides and fore- and hindquarters, or may complete the entire process and provide ready-to-cook cuts. There is no one "optimal system"; the choice of market channels is subject to a wide variety of technical, commercial, labor efficiency, sanitary, and other considerations.

Boxed beef results in easier handling, reduced shrinkage, marketing flexibility, more efficient labor use, improved sanitation and increased total carcass utilization. The latter is especially important first because some carcass parts such as outside flank muscle, diaphragm, hanging tender, neck meat and chuck trim may thus be removed while they are still fresh and wholesome.

Also, the packer is likely to obtain the highest value and quality from fat, trim and bone.[1] On the other hand, union tradition and contract position, as well as the cost of equipment changeover, may require retention of a system which is less productive.

At the same time, boxed beef has presented problems with regard to leakage of blood into the package over time, packaging failures and "color two-toning". With regard to this last point, there are many cuts which contain muscles, some of which are quite small, which are capable of becoming dark even when all processing steps are carefully controlled. This problem of multi-colored meat within the retail cut can be serious in beef marketing; it is essentially a characteristic of individual carcasses but it is also influenced by both air permeability of

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[1]A comprehensive study at Kansas State University quantifies the economic effects of these and other factors influencing alternative locations of the various functions sketched above. It also compared the cost of producing fresh or frozen retail cuts of beef. The Kansas State investigators assumed three possible disassembly points: the packer (Wichita, Kansas), central processor or retailer (New York City). Their results (expressed as cost/lb. at retail) were as follows:

* Packer (carcass) - central processor (retail cuts)	72.2
* Packer (sub-primal cuts) - retail	74.3
* Packer (primal cuts) - retail	74.8
* Packer (carcass) - central processor (frozen retail cuts)	76.0
* Packer (primal cuts) - central processor (primal cuts)	76.3
* Packer (carcass) - central processor (primal cuts)	76.4
* Packer (frozen retail cuts) - retail	76.5
* Packer (primal cuts) - retail	76.6
* Packer (primal cuts) - central processor (frozen r.c.)	78.2
* Packer (carcass) - retail	78.3
* Packer (carcass) - central distributor (carcass)	79.5.

See Kansas State University Publication 166 "Frozen Beef -- Its Distribution Costs, Acceptance and Eating Qualities", 1973. See also Iowa Development Commission, "New Developments in Meat and Meat-Packaging Technology, 1968". This publication predicts for the mid-1970s, the following distribution of sales of beef by packers: frozen, priced, retail cuts, 70 percent; primal cuts, boxed, vacuum packed, 20 percent; processed products, 5 percent; sides, quarters, 5 percent. It should be noted that industry change has not kept pace with predictions of major alterations in distribution patterns which are suggested by the large cost advantages of central processing, even in the United States. Frozen beef currently accounts for less than 10 percent of sales in the United States. Frozen hamburger chubs account for the bulk of these sales.

the various packaging films and light intensity at the retail level. Overall, however, "boxed beef" (prime cuts) is now the predominant fashion of marketing this product in the United States.

Transportation Considerations. In considering transportation technologies for a meat plant in Somalia, containerization would make possible more efficient cargo handling and transfer. This system would permit flexibility between the use of truck, sea, air and rail transport. Standard containers would have a 2.4 X 2.4 M cross-section with length from 1.5 to 12.2 M, and built-in refrigeration units for about ten days. Thus they preserve the meat at handling centers and at retail stores until the meat is sold. Transport costs per ton-mile of containerized shipments vary among different modes -- 0.3 cents for truck, 0.2 cents for sea, 2.7 cents by air (B-747), and 0.1 cents by rail; however, handling expenses are the same (2.7 cents per ton), so total operating costs by all modes are in fact rather competitive.

Engineering Considerations. Plant design considerations are numerous and interlock closely with marketing decisions. Only a few of the major questions can be addressed here so as to indicate the scope of the problems involved. Ancillary equipment of a meat plant includes electrical lines and pipe lines that carry steam, refrigeration, hot and cold water and compressed air. A 24 head/hour plant would require electric motors of 4160/3/60, steam of the order of 100,000 kg./hr (high pressure, low pressure and intermediate pressure), a refrigeration load of about 500,000 tons, 500 t/hr. of water at from 15.6° to 82° C at pressures from 50 to 300 psig., and 50 t/hr. of compressed air. The design of all of these systems is complicated by the fact that loads are highly variable over the working day. Clean-up times present peak requirements for steam and hot water. Coolers present a highly fluctuating load which reaches its peak hours after the coolers are full. Blast freezers only place a demand

on the refrigeration system when they are actually freezing. Conveyors require energy only when they are in operation. Thus there will be much reserve in most of the systems. But it must be available when required, otherwise food will spoil and/or further processing will be delayed.

In view of the complex nature of developing a product concept, designing the necessary production, transportation and distribution facilities, installation, start-up, staff training and other aspects of the project, the ISTI Evaluation Team believes that this could be successfully accomplished in Somalia only by an experienced firm that would provide a complete service to the client, following on through several years of operation. This firm would apply the latest system techniques for cost scheduling and control to all phases of the operation. One concept for achieving this goal was provided to the International Science and Technology Institute by the RMF Steel Products Company, Grandview, MO. RMF's technical and cost proposal is incorporated in this report as Annex C.

RMF's proposal is phased as follows:

- Phase I - Project Definition. Based on previous experience in establishing plants for slaughtering cattle and further processing beef, the contractor would apply its inventory of questions which would need to be answered prior to designing the facility. Among these: site inspection, raw material characteristics, marketing objectives, and so forth.

- Phase II - Facility Design. The contractor would prepare documentation, schedule materials and equipment acquisition, and prepare for project implementation.

- Phase III - Project Implementation. The contractor would undertake architectural design; install a management program; supervise facility construction; provide for training in operation, maintenance, quality control and plant sanitation; supervise plant start-up and plant commissioning; and undertake an active role in plant operation for a number of years following plant start-up.

5.0 MEAT INSPECTION AT THE KISMAYO MEAT FACTORY

The Kismayo Meat Factory (KMF) has sold fresh meat only sporadically. Hence procedures for inspecting for wholesomeness and quality have not been instituted there in a systematic way[1]. At present, ante-mortem and post-mortem inspection are the responsibility of a three-member veterinary team. The team, assigned to the KMF from the Ministry of Livestock and Forestry Resources (MLFR), use the facilities of a nearby regional laboratory.[2] The in-house KMF laboratory, operated by the plant's Sanitary Unit, is not properly equipped to perform microbiological analysis of the types required to assist in the diagnosis of animal disease -- or routine microbiological work of any kind for that matter. If KMF were to be converted to a plant which produces fresh meat, in whole or in part, rigorous meat inspection procedures would have to be instituted and observed by workers and supervisors alike.

As discussed in Chapter 3, KMF's current design presents a number of obstacles to the institution of proper meat inspection procedures. These include:

- Improper lay-out for admitting animals to the facility. Although there is a pen for isolating suspected animals, access to it is across the stream of traffic; there is no place for a meat inspector to stand outside that stream and there is no squeeze pen in which to take the temperature of any suspected animals and to closely inspect them.

- Improper lay-out of the slaughtering area. When the plant is operating at near to capacity, there would appear to be no way for a meat inspector to make his rounds and take the time to examine the various parts of the animal as required. Also, the lighting is insufficient in this area.

- Poorly designed meat work-up spaces in the slaughtering area. The current design prevents a clear identification of animal parts. If a cause for condemnation were found on a head or organ, for example, there would be no way to identify the carcass from which it came, and vice-versa.

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[1] See Annex A and B for a discussion of some of the issues involved in meat inspection and meat grading.

[2] The ISTI Evaluation Team was told that this MLFR regional lab was recently rehabilitated with foreign aid from West Germany. ISTI was unable to verify the status of this facility since the veterinary team was unavailable for interview during the time of ISTI's site evaluation.

- An inadequate system for isolating suspected carcasses or parts in order to remove them from the slaughtering area for further examination or disposal.
- Cold rooms which do not provide a separate area with high air circulation in order to prevent drip on the carcasses. Also, the cold rooms are not suitably lined with impact-resistant plastic tile.
- A building design which allows for the entry of birds, rodents and insects.
- Insufficient and inconveniently located sanitary facilities for KMF personnel (e.g. showers, toilets, washing facilities.)

Moreover, the staff of KMF is accustomed to working in an environment in which sanitation conditions can be somewhat downgraded because the product is subsequently retorted. A major obstacle to overcome, in the Team's opinion, is the fact that everyone who works in the plant is now accustomed to these conditions. It is infinitely more difficult to unlearn bad habits than to learn new ones to the point at which these become routinized. If KMF were to be converted to the production of fresh meat, not only would its design problems need to be addressed but the psychological setting would also have to be confronted. A "dress code" -- requiring white smocks and hard hats -- would perhaps be a way to start.

Even further in the future would be the need to institute a system at KMF which would grade meat according to quality. Quality grading must be performed by independent graders if the processing plant is to obtain some credibility. Overseas customers would certainly benefit from some quality definitions and the assurance that they would not be receiving mixed lots of bulls, older animals, and young, fattened animals. And, as importantly, price quotations by KMF would be made somewhat comparable to those of other suppliers. Finally, lots could be accurately priced, and better prices could be obtained by KMF for higher qualities of beef.

BIBLIOGRAPHY

Aziz, Abdel and A. Nabaa. 1984. Marketing in Saudi Arabia. Praeger.

Boston University, African Studies Center. 1985. "Resource Tenure Issues in Somalia" (Allan Hoben). Boston, Massachusetts. January.

Creek, M. J. 1972. "The Kenya Feedlot Project." World Animal Review. 3:23-7.

Dahl, G. 1979. Suffering Grass: Subsistence and Society of Waso Borana. Department of Social Anthropology. University of Stockholm.

Dahl, G. and A. Hjort. 1976. Having Herds: Pastoral Herd Growth and Household Economy. Department of Social Anthropology, University of Stockholm.

Dorman, A. E. "Report to the Government of Somalia on Cattle Exports and Quarantines." Food and Agriculture Organization. Rome.

Elliot Berg Associates. 1983. "A Program of Assistance for Livestock Marketing in Somalia." September.

Everds, Jackson. 1976. "Engineering Orientation to Meat Packing." Washington, D.C. American Meat Institute.

Food and Agriculture Organization of the United Nations. 1985. "FAO/Government Cooperative Programme Plan of Operation (Somalia)."

Food and Agriculture Organization of the United Nations. 1984. "International Meat Development Scheme and International Scheme Coordination of Dairy Develpment." Project Paper.

Frigeri, F. 1977. "Serologic Research on the Diffusion of Leptospira Icterohaemorrhiae in Cattle in Somalia." So. Clin Vet. 100 (3) 146-151. March.

Geosurvey International. 1984. "Landsat Interpretation Report of Natural Resources within the Jubba Valley Region." Nairobi.

Gottfried, Luther Mosebach. 1984. "Kismayo Integrated Agriculture Feed Mill Cattle Fattening Meat Processing Project." Federal Republic of Germany.

Hariharan, H. and A. A. Karrani. 1972. "Incidents of Pasteurellosis Among Cattle in Somalia Subsequent to Dual Vaccination." So. Bull. Epizoot Dis. Afr. 20 (3) 205-209. September.

Hollyer, J. A. 1971. "Report to the Government of Somalia on Livestock Development and Marketing." Food and Agriculture Organization.

Holtzman, John. 1982. "The Economics of Improving Animal Health and Livestock Marketing in Somalia." Prepared for the USAID Mission/Somalia. June.

Holtzman, John. 1982. "The Market for Livestock and Meat in Saudi Arabia, Implications for Somalia." Prepared for the USAID Mission/Somalia. June.

Holtzman, John. 1984. "Review of Livestock Marketing and Livestock Marketing Facilities in Somalia." U.S. Agency for International Development. March.

Iowa Development Commission. 1968. "New Developments in Meat and Meat-Packaging Technology."

Institute of Studies and Designs for Agriculture and Food Industry Constructions. 1984. "Feasibility Study on the Establishment of a Somali-Romanian Joint Venture for Kismayo Meat Factory." Bucharest, Romania.

International Science and Technology Institute, Inc. (ISTI). 1985. "Proposed Assessment of the Kismayo Meat Processing Plant." Washington, D.C. August.

Kansas State University. 1973. "Frozen Beef -- Its Distribution Costs, Acceptance and Eating Qualities." Publication 166.

Kismayo Meat Factory. 1985. "Present Value of K.M.F. Kismayo, Somalia. Sept.

Koch Supplies, Inc. 1985. General Catalog.

Kropf, Donald and B.C. Breidenstein. 1974. "Beef Operations in the Meat Industry." Washington, D.C. American Meat Institute.

Ministry of Industry. 1985. "A Report on the Establishment of a Joint Venture in the Kismayo Meat Factory." Somali Democratic Republic. April.

Mogambo Project. Local Experience in Feedlots and Other Livestock Activities. Annex 4: Livestock (Chapter 2). (Xerox)

Patterson, Glenn. 1984. "Survey of the Somali Food Industry and its Ability to Improve Utilization of Local Foods." November.

Resource Management and Research. 1985. "Southern Rangelands Survey (R.M. Watson, J.M. Nimmo). London.

Reusse, E. 1982. "Somalia's Nomadic Livestock Economy -- Its Response to Profitable Export Opportunity." World Animal Review. 43: 2-11.

RMF International. 1985. Brochure and Price List Re. Modernization of Meat Plant. Somalia. August.

Rweyemamu, M.M. 1981. Surveillance and Control of Virus Diseases -- Africa Livestock, Game Animals. Academic Press.

Sandford, S. 1983. Management of Pastoral Development in the Third World. New York. John Wiley and Sons.

_____. 1985. "Somalia Agricultural Sector Survey." Agricultural Statistics Handbook for Somalia. July.

Swift, J. 1977. "Pastoral Development in Somalia: Herding Cooperative as a Strategy Against Desertification and Famine." Desertification: Environmental Degradation In and Around Arid Lands. (Ed. M.H. Glantz). Boulder: Westview Press.

United Nations, Sudano-Sahelian Office. 1979. "Assessment of the Problem of Desertification and Review of Ongoing and Proposed Activities to Implement the Plan of Action to Combat Desertification in the Democratic Republic of Somalia." New York. October.

United Nations Development Programme. 1984. "Somalia Annual Development Report."

U.S. Agency for International Development. 1985. "Country Development Strategy Statement FY 1987." Mogadishu, Somalia. January.

U.S. Agency for International Development. 1985. "Project Paper: Livestock Marketing and Health." Somalia. July.

U.S. Department of Agriculture, Economic Research Service. 1983. "Food Import Demand of Eight OPEC Countries." June.

U.S. Department of Agriculture, Economic Research Service. 1985. "Outlook and Situation Report, Middle East and North Africa." April.

U.S. Department of Agriculture, Foreign Agricultural Service. 1985. "Egypt Importing More Beef." May.

U.S. Department of Agriculture, Foreign Agricultural Service. 1985. "Impact of the European Community's Beef Program on World Trade." May.

U.S. Department of Agriculture, Foreign Agricultural Service. 1985. "Saudi Arabia Importing More Beef." July.

U.S. Department of Agriculture, Foreign Agricultural Service. 1985. "World Livestock and Poultry Situation." Foreign Agriculture Circular. April.

World Bank. 1985. "Project Performance Audit Memorandum, Trans-Juba Livestock Project."

World Bank. 1979. "Somalia Country Economic Memorandum." Washington, D.C. January.

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ANNEX A: MEAT INSPECTION FOR WHOLESOMENESS

A.1 History of Meat Inspection

Meat inspection for wholesomeness has been practiced since Old Testament times (see Leviticus, attributed to Moses, 3500 BC). The procedures developed during the 19th century following knowledge of the germ theory of disease were instituted primarily to meet the requirements of international trade (i.e., exports from the United States, Argentina and Australia to Europe). These national regulations were systematized through an initiative undertaken by the United Nations Food and Agriculture Organization (FAO), the Codex Alimentarius, which has now been approved by virtually all countries belonging to the United Nations. Thus failure to follow the Codex Alimentarius procedures in detail will result in barring international shipments of fresh meat to any significant market.

The following discussion draws mainly from U.S. experience over the past 120 years; however, its major elements are virtually identical in all meat-exporting countries and incorporated in the Codex Alimentarius. Sanitary regulations of the European Economic Community (EEC) are in some minor respects more stringent than those of the United States or the Codex Alimentarius; but they apply only to beef to which the EEC physically takes possession for the purpose of exporting it. U.S. meat inspection legislation dates from the 1860s. In 1906, this legislation was made applicable to meat domestically slaughtered or imported and sold in international or interstate trade, under the Meat Inspection Act. These requirements were applied to intra-state trade (i.e., to meat sold domestically) only in 1967. (Individual states of the United States of course had instituted their own regulations. Some of these systems date to colonial times.)

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A.2 General Areas of Inspection

Meat inspection systems embrace a series of interlocking topics. These include first the physical plant, facilities and equipment of establishments where cattle or calves are slaughtered, transported, processed or sold to the final consumer. All plans and designs of establishments performing these functions must be approved prior to their construction, and provision must be made for their continuous inspection prior to initiating operations.[1] Second, the state of health of animals slaughtered must be determined. As a means of determining this, the animal is subjected to ante-mortem and post-mortem inspection in accordance with minutely-described procedures. Carcasses are inspected once more within the cooler, as described below. Meat inspection also extends to the processing department of any meat packing plant and to all levels of trade after the meat leaves the packing plant.

Other concerns of meat inspection include assurance that food additives used in meat and meat food products are wholesome and used within the limits prescribed by the meat inspection regulations. Labeling of fresh and processed meats is also closely monitored. Labels must be accurate and not deceptive in revealing the contents of any meat or meat products.

A.3 Inspection Procedures

A.3.1 Ante-mortem Inspection

An animal intended for slaughter must be examined on the premises by an inspector working under the supervision of a licensed veterinarian. Ample

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[1]This overview cannot cover in detail the U.S. Department of Agriculture (USDA) requirements for plant facilities and equipment which fill hundreds of pages of the Federal Register. For a summary, see Bonem, Frank L. and J. H. Everds: Engineering Orientation to Meat Packing, American Meat Institute, 1976.

lighting and a suitable suspect pen, with a squeeze pen where the temperature of the animal may be taken, must be provided. The slaughter floor must be separated with impervious material from (a) holding pens and (b) shackling areas. All pens, ramps, unloading chutes and runways must be paved and have sidecurbs of similar impervious material and suitable drainage facilities so that animal wastes can easily be removed from the premises.

On the basis of ante-mortem inspection, an animal may be: (a) passed for normal slaughter, (b) condemned or (c) labeled suspect. In the first and last cases, the animal proceeds through normal channels and is subjected to routine post-mortem inspection procedures, as described below. Suspect animals may be subsequently condemned; and if this occurs, the whole plant requires unusual clean-up measures because of possible contamination from condemned material. Also, all parts of the condemned animal must immediately be removed from the premises and appropriately disposed of. This requirement evidently places some special requirements on the lay-out of the slaughtering plant so as to permit the identification and rapid isolation and disposal of condemned meat.

Condemnation might occur because of physiological trauma, such as that associated with animal injury which might cause bone splintering or indicate infection of the animal or promote spoilage of the meat. Condemnation also results when, on ante-mortem or post-mortem inspection the live animal, carcass, carcass part, organs, meat or meat product is judged to be unfit for human consumption or capable of serving as a carrier for certain animal diseases that do not affect humans. A partial listing of causes for condemnation on grounds of human or animal health is shown in Table A-1.

In addition to the causes listed, Somali beef may also carry such diseases as rinderpest, hoof-and-mouth disease or trypanosomiasis; or be infested with external or internal parasites other than those listed. These conditions

Table A-1. -- Causes for Condemnation of Cattle Carcasses[1]
(Carcass Muscle Only)

Degenerative and Dropsical Conditions
- Anascarca (brisket edema)
- Emaciation

Infectious Diseases
- Actinomycosis (lumpy jaw)
- Anaplasmosis
- Listerellosis (circling disease)
- Necrobacillosis and Necrosis
- Tuberculosis

Inflammatory Diseases
- Enteritis, gastritis, peritonitis (inflammation of intestines, stomach or abdominal cavity lining)
- Eosinophilic myositis
- Mastitis (inflammation of mammary glands)
- Metritis (uterine inflammation)
- Nephritis (kidney inflammation)
- Pericarditis (inflammation of heart membrane)
- Pleurisy and pneumonia (inflammation of lungs)

Neoplasms (tumors)
- Carcinoma
- Epithelioma
- Malignant lymphoma
- Sarcoma

Parasitic Conditions
- Abscesses or pyemia (multiple abscesses)
- Septicemia (blood poisoning)
- Toxemia (generalized infection)

Other
- Immaturity (in calves)
- Arthritis
- Icterus (yellow jaundice)
- Uremia (urinary tract infection)

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[1]From U.S. regulations. Note that a number of diseases and parasitic conditions prevalent in Somalia do not exist in the United States. For a summary of Codex Alimentarius in this respect, see Annex 5 of the "Romanian Report" (Institute of Studies and Designs for Agriculture and Food Industry Constructions, 1984) listed in the Bibliography.

would require in-country research on the existence of such additional diseases or parasitic conditions and practical ways of screening for them, either ante-mortem or post-mortem. (In this connection, see references by Hollyer, Frigeri, Harihan and Rweyemamu in the study's Bibliography.)

Cattle organs are condemned for a much broader range of conditions than those listed for carcass muscle in Table A-1. This listing is omitted; but once more, it should be noted that in the case of Somali cattle, it would be somewhat broader than that listed in the U.S. regulations or the Codex Alimentarius.

With regard to condemnation of carcasses, there are questionable conditions, depending on the reason for being labeled "suspect"; and the animal, together with all its parts, may be properly labeled and:

- o Slaughtered, to enter channels of trade, or to be disposed of in accordance with the outcome of the post-mortem inspection;
- o Held under supervision and then either released or slaughtered; or
- o Removed promptly from the premises and appropriately disposed of.

Among the general conditions under which an animal may be identified as "suspect" are:

- o Immaturity (of either calves or cattle),
- o Suspected presence of condition or disease or parasitic infestation which would result in condemnation,
- o Serious crippling,
- o Reaction to tuberculin test,
- o Advanced pregnancy or immediate post-parturient condition, and
- o High fever of undetermined cause.

A.3.2 Post-mortem Inspection

At the time of slaughter, inspectors examine the lymph nodes in the animal's head, pluck (lungs), viscera and carcass. The heart is slit to examine

for tapeworm cysts; the liver and bile duct, for flukes and abscesses; and the abdominal contents, for tapeworm and other parasites. U.S. regulations provide that this be done under the supervision of a veterinarian. The identity of each animal's tail, head, thymus gland, and all viscera and all parts and blood to be used for human food must be maintained. There are several possibilities which may result from the disclosures during this inspection:

- All parts may be judged suitable for food use.
- All parts may be retained for more detailed inspection.
- Parts may be "passed for cooking" in accordance with specified process (time and temperature) schedules.
- All or part of the edible portion of the animal may be condemned and must be disposed of at once.

Regulations concerning slaughterhouse design and construction materials provide, inter alia, for adequate space and appropriate rates of slaughter, so as to compel the establishment to present carcasses, their viscera and parts, in an orderly and clean manner for inspection. Proper lighting must be provided at each inspection site; lighting conditions are laid out in detail. Floors, walls, ceilings, tables and equipment must be made of approved materials. The regulations also provide for segregation and handling of inedible and condemned material. Finally, it is mandatory that the shortest time elapse from the actual slaughter until the carcass enters the de-boning area or cooler; and within the cooler, until the internal temperature of the carcass descends to that of the cooler. This implies certain rigid conditions concerning materials handling systems and size of refrigeration systems, means of providing for air circulation and preventing condensation on cooler walls.

A.3.3 Inspection Within the Cooler

A sample of carcasses within the cooler is always inspected for contamination by hair, manure, paint or fragments, and lubricants from overhead rack; as well as for abrasion or other injury resulting from rough handling.

A.3.4 Miscellaneous Inspection Concerns

So as to ensure wholesomeness in meat and meat products, the inspection procedures evaluate the possibility of contamination by insect or rodent vectors. They also provide for adequate food-quality hot and cold water flows, steam availability and other design or environmental situations which could affect the wholesomeness of edible parts of the animal. There are other provisions concerning bathing, toilet and dress-changing facilities which impinge on the personal cleanliness of employees.

A.3.5 Product Inspection

Meat may be reinspected at any stage of processing, to ensure that it is still clean and wholesome and that it has not been adulterated or contaminated during processing or storage. As merely one example of such inspection, boneless manufacturing meat is subjected to a random sampling plan and thoroughly examined for blood clots, bruises, bone fragments, fecal material, ingesta, extraneous materials (glass, metal, etc.), hair, wool, hides and numerous other items considered defects. Minor defects (e.g., small bone fragments) are tolerated to a prescribed limit; however, a "critical defect" such as fecal material will result in condemnation of the entire lot of the product.

A.3.6 Imported Meat Products Inspection

U.S. regulations require that even before any foreign country can export meat to the United States, it must have an inspection program equivalent to that of the United States. These are regularly checked at each plant site to ensure that the product meets the same standards applied to U.S. meat packers. USDA veterinarians must certify each plant overseas which exports to the United States. They revisit each plant at least once a year.

Currently there are 1400 plants in 40 countries which are so certified.

ANNEX B: MEAT GRADING FOR QUALITY

B. 1 The Objective of Quality Grading

Cattle, like all other animals, come to market having diverse characteristics. Their grading involves a detailed notation of the characteristics of each individual according to standards of quality which are recognized by buyers of beef and beef products. Thus a system of quality grades greatly expedites the marketing process, so that buyers can compare price offers from various sources. The term "quality" in meat grading refers to those characteristics of the meat which are associated with eating satisfaction, notably with tenderness, juiciness and flavor. These criteria have been the subject of a great deal of research, world-wide, and are not now contended among researchers or buyers of beef and beef products.

B.2 The Technique of Quality Grading

The U.S. system of quality grades,[1] which has been adopted by all meat-exporting countries, classifies carcasses or parts of carcasses on the basis of:

- Sexual characteristics (sex at birth and age of males at time of castration),
- Age, and

---

1 This system is voluntary, but it is almost universally observed because it greatly facilitates marketing. There exist, in the United States and other countries, parallel systems of packer branding. The latter often include recognition of muscle development and trimness.

° Degree of marbling (disseminated fat in muscle tissue).[2]

Bulls and stags -- male animals castrated after the first year of life -- are placed in an altogether separate category (i.e., they are totally excluded from quality grades). All cattle (females or males castrated within the first year of life) under the age of 30-42 months are eligible for the top four grades -- of a total of seven grades. Cows -- female animals which have once lactated -- are not eligible for the top grade but may be included in the other top grades if they are sufficiently well-muscled and young. Virtually all cattle marketed as fresh beef are included in the top four grades.

In the U.S. system, meat included in the three lower grades -- "commercial", "utility" or "cutters and canners" are not sold fresh for human consumption, but are reserved for sausages or thermally processed products or more commonly, for dog and cat food, since thin-muscled animals cannot be converted into

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[2] To determine the quality of a carcass, it must be split down the back into two sides and one side must be partially separated into a hindquarter and a forequarter by sawing and cutting it, insofar as practicable, as follows: a saw cut perpendicular to both the long axis and split surface of the vertebral column is made across the 12th thoracic vertebra at a point which leaves not more than one-half of this vertebra on the hind-quarter. The knife cut across the ribeye muscle starts -- or terminates -- opposite the above-described saw cut. From that point it extends across the ribeye muscle perpendicular to the outside skin surface of the carcass at an angle toward the hindquarter which is slightly greater (more nearly horizontal) than the angle made by the 13th rib with the vertebral column of the hindquarter posterior to that point. As a result of this cut, the outer end of the cut surface of the ribeye muscle is closer to the 12th rib than is the end next to the chine bone. Beyond the ribeye, the knife cut shall continue between the 12th and 13th ribs to a point which will adequately expose the distribution of fat and lean in this area. The knife cut may be made prior to or following the saw cut but must be smooth and even, such as would result from a single stroke of a very sharp knife.

The degree of marbling on the ribeye muscle, from "slightly abundant" to "practically devoid" establishes the quality grade within each maturity group. The break point is 30-42 months. The older animals are always placed in the lowest three grades.

recognizable cuts of fresh beef. In other words, there is no market in the United States for fresh meat from bulls or stags, for small and thinly-muscled animals, or for meat from animals over the age of 30-42 months.

Within individual European countries, beef is not marketed according to quality grades -- European consumers are, in fact, rather undiscriminating consumers of beef -- witness the fondness of the French for flank steak (entrecote) which is a very tough cut from the fore-quarters of the animal. Significant quantities of high-quality beef are for that reason exported from European countries to more discriminating markets in the United States and Canada, and to selected markets in the Middle East as well, where the more tender cuts receive a significantly higher price. Since large amounts of intervention (surplus) beef have been purchased for export by the European Economic Community, the EEC organs have developed a quality standard for beef sides which incorporates both qualities and the proportion of the edible meat on the carcass. The latter element is separated in U.S. practice by means of a system of yield grades which overlaps the U.S. quality grades.

The EEC quality grading system is identical to that used in the United States as regards classification by sex. This determination can be made with a high degree of accuracy. The EEC system also eliminates all cattle aged over 30-42 months. Older cattle are not only less tender (they can be cooked only by application of moist heat) but also have a more intense flavor which many consumers in Europe and North America find disagreeable.

ANNEX C:

A PROPOSAL FOR THE DEVELOPMENT OF A MODERN BEEF PROCESSING FACILITY IN SOMALIA

Prepared by:

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October, 1985

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Summary

This document is based upon information available at this time concerning the Somalian Government's desire to modernize their beef processing operation. The preparation of a comprehensive plant design, accurate cost estimates and definitive project schedules are dependent on the accumulation of data that will permit us to do the engineering design and select the proper equipment to create an integrated processing system meeting the customer's requirements.

This proposal presents a systems approach for converting the herds of beef cattle presently being raised in Somalia into a variety of marketable products. RMF Steel Products Company provides management for the entire project from the initial planning through design, fabrication or purchase, installation, start up, commissioning and participative supervision of the operating plant until such time as local management is trained to operate the plant effectively. RMF uses the latest techniques for cost, scheduling and control.

Architectural design services can be furnished to design the facility in accordance to USDA standards for sanitation and quality assurance. Training programs covering operation, maintenance, quality control and sanitation can be provided. RMF also provides the capabilities, convenience and experience for single source responsibility to supply complete systems for processing beef.

The most economical and efficient method for accomplishing the tasks identified in this proposal will be to divide the tasks into three phases. The customer's interests will be protected by frequent project reviews during each phase of the program. These three phases: Project Definition, Facility Design and Project Implementation are discussed in the Scope of Work section of this proposal.

Additional information amplifing these discussions are contained in four Attachments:

Attachment A: Food Preparation System Questionnaire:

This questionnaire, when completed during discussions with the customer, can be used to outline the basic parameters for this project.

Attachment B: Task Descriptions: Phase II

Detailed descriptions of the various tasks to be accomplished during the Facility Design Phase are listed.

Attachment C: Typical 50,000 Beef Slaughter Facility

The plant is a single story building which is sized to slaughter 50,000 head of cattle per year at a rate of 25 head per hour, 8 hours per day and 250 days per year. Provisions have been made to fabricate beef products from these animals and store the products either fresh or frozen, plus handle the hides, offal and other by-products.

A budgetary cost estimate has been prepared for the equipment required for the kill floor, deboning and fabrication area of the plant plus the auxiliary equipment such as refrigeration systems, insulated doors, walls and air curtains needed to make the plant functional.

Attachment D: Budgetary Cost Estimate: Phase I & II.

Scope of Work

Phase I - Project Definition

A number of variables exist which must be correlated prior to defining an optimum plant design and selecting machinery systems for slaughtering cattle and further processing beef into a variety of consumer products. A Food Preparation System Questionnaire has been prepared (Attachment A) which can be used to outline the basic parameters for this project. These questions and hundreds more need to be investigated by RMF engineers prior to designing the facility. By mutually agreeing on these points, a basic concept can be prepared which will provide the customer with an optimum facility. We propose the following steps be taken to define the scope of this project:

Site Inspection:

RMF would send a two-man team to Somalia to inspect proposed sites and/or existing facilities. The questionnaire will be completed during consultations with the customer. Available information concerning local and export markets for fresh, fresh-frozen and canned meats will be collected. Local regulations pertaining to the plant design and operation will be obtained. Export packaging, labeling and product standards for the potential customer countries will be reviewed. If there are any questions that cannot be resolved during this meeting we will prepare recommendations.

Raw Material Characteristics and Supply:

Raw material characteristics and supply are of particular concern since the successful marketing of the products depends to a great extent upon the quality of the cattle available.

U.S. feeder cattle typically are sent to slaughter weighing approximately 445 Kg (1000 pounds) and a 'choice' grade animal will yield an average carcass weight weight of 268 Kg (590 pounds). Retail cuts yield approximately the following portions:

Table 1

BEEF CUT YIELDS

		Kilograms	Pounds
Beef Products:	Porterhouse, T-bone, Club Steak	15.4	34.
	Sirloin Steak	18.1	40.
	Round Steak	25.9	57.
*	Rib Roast	16.3	36.
*	Boneless Rump Roast	7.3	16.
*	Chuck Roast	49.9	110.
	Ground Beef	40.8	90.
	Stew Meat and Mixed Cuts	19.1	42.
	Retail Cuts - Total	192.8	425.
	Bone, Fat, Waste and Shrink	75.2	165.
	Original Carcass Weight	268.	590.

*Normally these cuts will be processed into ground beef, but they are available to be cut for roasting.

We understand that the average live weight for cattle being slaughtered in Somalia is 250 Kg (550 pounds) and it yields approximately 81.5 Kg (179 pounds) of deboned meat. The disparity between the weights and yields of the typical U.S. feeder cattle and the Somalian cattle raise serious questions in selecting suitable retail products which can be derived from the smaller cattle due to quality and taste factors of the fresh meat. Additional problem areas will be investigated and solutions will be proposed.

Further Processing

In addition to the retail cuts of steaks and roast shown in Table 1, the meat can be further processed to produce a wide variety of raw, cooked, smoked, dried and canned products such as:

- o Dried meats
  - Chipped Beef
  - Beef Jerky
- o Ground Meat Products
  - Hamburger Patties
  - Pizza Toppings
  - Meat Balls
- o Cooked Roast Beef
- o Smoked Meat
  - Frankfurters
  - Sausage
- o Luncheon Meats
- o Canned meats and Stews

These products can be packaged to satisfy a customer's specific requirements utilizing one or more of methods for packaging:

- o Film wrapped and sealed:
- o Foil wrapped and sealed:
- o Bags/Pouches
- o Metal/plastic/paper Trays
- o Chubs:
- o Bag-in-a-Box
- o. Canned:

Establish Project Criteria:

Prior to establishing the criteria for this facility it will be necessary to correlate the data obtained by this visit with the reports prepared by other organizations who have studied this activity. Available market studies will be evaluated in order to select viable products, determine their characteristics, and methods of packaging, establish a practical product mix and the quantities of each product needed to meet the demand of target markets. Technical information obtained during this survey will be evaluated by our

engineering staff. Criteria for site selection will be detailed. Specifications for the buildings, process equipment with options, product packaging and labeling will be prepared.

Facility Drawings:

Facility drawings, process schematics, process descriptions, equipment bill of materials and budgetary cost estimates will be prepared based upon criteria established by the customer and any current marketing surveys.

Design Review Meeting

A design review meeting will be held with the customer to finalize the project definitions and approve project concepts.

Phase II - Facility Design

RMF Steel Products Company will prepare detailed technical data and engineering documentation based upon information developed during the project definition phase. Subsequent visits by our technical staff will coordinate design and planning activities.

The Project Management office will oversee and control all activities required to meet RMF's contractual obligations in completing the project within the constraints of cost, schedule and customer's satisfaction. The Project Manager will have the authority to resolve contractual and technical questions that may arise.

Technical Documentation

Documentation prepared during the accomplishment of the tasks listed in Attachment B will be submitted to the customer for for review and comment in a timely manner.

Architectural Design Services

When requested by the customer, RMF will subcontract for architectural design and engineering services for the building and grounds. The building design will comply with the requirements of the U.S. Department of Agriculture for meat plant sanitation and quality assurance.

Process Design Review:

A design review meeting is then scheduled to evaluate the data package and modify the system as required.

Phase III - Project Implementation

Following the completion of Phase II, the customer and RMF will be in a position to negotiate contracts for the supply of the equipment and services for the construction, start up and operation of the food processing system. RMF Steel Products Company will be responsible for the following tasks during this phase of the program:

Project Management:

Project Management will be provided to assure all contract requirements are accomplished within the terms of the contract. Supervise the plant construction and equipment installation, training, start up and commissioning of the customer's plant.

Site Supervision

RMF can supply specialists during the two phases of plant construction. A team of construction specialists will supervise the plant construction from ground breaking until the buildings and grounds are complete. A second team of equipment specialists will move on site to supervise the installation, start up and commissioning of the plant. Quality Assurance, laboratory and sanitation specialists can be supplied during the start-up and commissioning periods to train plant personnel and supervise initial production phases.

Equipment Supply Contract:

RMF will provide complete processing lines for producting the specified products and guarantee that the quality and capacity of the equipment are suitable and appropriate for purpose intended. The equipment supplied shall be manufactured using high quality material, first-class workmanship, and will be complete when delivered in accordance with the terms of the contract.

Management Services - Plant Operation

RMF can supply a cadre of plant management personnel for a unspecified period of time after plant commissioning to assure continued efficient and economical production. Phasing out of the non-local personnel will evolve gradually, as operating experience and training programs produce qualified nationals. Expatriate personnel will be phased out from the lowest levels to the highest as qualified locals become available. No effort has been made to project the time required to reach this stage.

ATTACHMENT A

FOOD PREPARATION SYSTEM QUESTIONNAIRE

The preparation of an accurate cost proposal and project schedule is dependent on the accumulation of data that will permit us to do the engineering design and select the proper equipment to create an economical, integrated processing system meeting the customers requirements. The following information is essential for us in order to meet this goal.

SECTION I. General

A. Where will the plant be located?

B. What is the approximate date of implementation?

G. What is working schedule during plant operation?

1. What is the number of weeks per year of plant operation.
2. What is the number of days per week of plant operation?
3. Number of shifts?
4. Hours of work per shift?.
5. Hours available for plant cleaning and maintenance during down time?

H. What are Somalia's National Standards:

1. Raw Materials:
   a. Main ingredients
   b. Secondary ingredients
2. Products
3. Product packaging
4. Standards for utility piping and plumbing.
5. Electrical Standards.

J. Are the finished beef products for domestic use or export?

1. If export, what countries are being considered?
2. What are the required quality and health standards for these products?

SECTION II. Raw Materials

A. What types of cattle do you intend to process?

	Age	Number/Day	Average Live Weight
Steers			
Bulls			
Cows			
Oxen			

B. Source of cattle:

1. What is the average distance from source to plant?
2. Transportation method?
3. Time in transit?

C. Estimated Yield from cattle slaughtered:

	Dressed Weight	Fore Quarter		Hind Quarter	
	1/2 carcass	Bone	Meat	Bone	Meat
Steers					
Bulls					
Cows					
Oxen					

Section III. Finished Product

A. What are the characteristics of each finished product?

Boxed Beef
- Primals
- Sub-Primals

Retail Cuts

Roast Beef

Canned Corned Beef.

Ground meat patties for hamburgers.

Frankfurters (Hot Dogs).

Pizza Topping

Chipped Beef

Beef Jerky

Shredded Beef

Smoked Sausage

Luncheon Meats

B. Product Packaging:

1. How will each product be packaged?

a. Canned:

1) Size Can

2) Shape of can

3) Two piece or three piece can?

4) Labeled or embossed?

5) What is the availability of cans?

b. Film wrapped and sealed:

1) Type film? Trade Name:

2) Film thickness?

c. Foil wrapped and sealed:

1) Type foil?

2) Foil thickness?

3) Method used for sealing foil?

d. Bags/Pouches

1) Type film/foil? Trade Name:

2) Film/foil thickness?

3) Bag/Pouch size: dimensions:

4) Notched for easy opening?

e. Trays

1) metal/plastic/paper tray

a) dimensions

b) type edge

2) cover:

a) Type film/foil Trade Name:

b) Film/foil thickness?

f. Chubs:

1) Type film? Trade Name:

2) Film Thickness?

g. Bag-in-a-Box

1) Type film? Trade Name:

2) Film Thickness?

3) Dimensions of Box:

4) Net weight per box

2. Product Labeling:
   a. What type of printing/coding is desired
      2) Individual packages?
      2) Boxes?
3. Shipping containers:
   a. What type of carton/boxes
   b. What is the desired packing pattern in the box/carton
      1) Number of tiers
      2) Number of rows in each tier
      3) Number of packages per row
4. Do you want paper/cardboard dividers between the tiers
5. What type of sealing do you prefer?
   a. Cold glue
   b. Tape
   c. Staple
   d. Banding: metal: plastic:
   e. Hot wax
   f. Other
6. Do you desire to have the carton/box code-printed
   a. Top
   b. Sides: one side _____ two sides _____ four sides _____
   c. Bottom
   d. Combination: Specify pattern.
7. Will the boxes be:
   a. Already set-up
   b. Knocked-down (flat) to be mechanically/hand set up

8. What is the availability of the cartons/boxes
   a. Existing manufacturing facility
   b. New manufacturing facility
   c. Imported
   e. How soon can we obtain samples
9. Specifications of Boxes/cartons:

IV. Site Development

A. Plant Facilities:
   1. Production Building
      a. Existing
      b. To be modified
      c. To be built
   2. What facilities are existing or planned?
      a. Production
      b. Raw Material Storage
      c. Laboratory
      d. Warehousing
      e. Freezing and cold storage
      f. Maintenance and repair
      g. Fuel receiving and storage
      h. Guard stations
   3. How soon can we get layouts of existing building?
   4. The building layouts should include:
      a. Elevations
      b. Allocated floor space
      c. Locations of columns, partitions, walls, ceilings
      d. Locations of heating and ventilation vents and duct work
      e. Locations of utility entrance points
      f. Location of raceways
   4. Do you desire us to design the building?
   5. Do you desire us to design the modifications?
   6. Will there be a fire warning and protection system?
   8. How many days production will be stored?

9. Is power available at the site.
   a. Is high voltage power available in the vicinity?
      1) Volts ____ Hertz ____ Phase _____
      2) Is this a steady current?
   b) Distance from power source to building site?
   c) Should we supply auxiliary diesel motor generators?

10 Potable Water:
   a. Will there be sufficient quantity of water?
   b. What is the average depth of wells to provide potable water?
   b. What is the quality of water?
   c. What water treatments are used?

11 Will air compressors be available? Should we supply?

12 What is the quality of steam?
   a. What water treatments are used?
   b. Should we supply boilers?

13 What provisions are made for waste water?
   a. Collection
   b. Treatment
   c. Disposal

14 Will natural gas be available?
   a. Quantity
   b. Heating value.

B. Local Environment

1. Wind:
   a. Summer - direction velocity
   b. Winter - direction velocity
2. Ambient temperature
   a. Summer - high low
   b. Winter - high low
3. Relative humidity.
   a. Summer - high low
   b. Winter - high low
4. What are the seismic conditions.
5. Site Conditions:
   a. What is the level of surface water.
   b. What is the annual rainfall.

ATTACHMENT B

PROJECT MANAGEMENT TASKS - PHASE II

The RMF Project Management office will be responsible for the accomplishing the following tasks:

Administrative

Cost and schedule control is maintained by a variety of techniques appropriate to each project which will integrate cost, schedule and earned value into project status reports; high-lighting items requiring corrective action.

Equipment specifications are prepared for each major piece of equipment that is identified by an assigned item number. These specifications expedite competitive procurement of the process and auxiliary equipment to assure an integrated system.

Contact process equipment suppliers to obtain competitive quotations for each item of equipment in the process. Vendor data will be analyzed both technically and economically (functionally initial cost, utility requirements, service and maintenance) prior to final selection.

Technical Documentation

Technical documentation consists of drawings, specifications, instructions and schedules for the project. RMF will prepare and deliver the following technical documents to the customer in accordance with the project schedule:

RMF Engineering Department utilizes CAD (computer aided drafting) systems to prepare all schematics, assembly and detailed drawings, isometrics and parts lists. Dimensions on drawing will be in metric and english systems of measurement. The following engineering drawings are prepared to comply with contract requirements. A plot plan of the site will be prepared (scale 1 to 100) showing buildings, utilities, roadways, drainage, fencing and external lighting). A General Arrangement Drawing will be prepared (scale: 1 to 100) of building showing process areas and areas where seller supplied auxiliary equipment will be installed. Engineering drawings (scale: 1 to 50) will be prepared for each section of the process area in each of the following categories:

a) Process Flow Schematic
b) Utility Schematic
c) Equipment- Plan and Elevation Views
d) Footings and Foundations
e) Piping - Typical Plan and Elevation Views
f) Electrical Control Panels
g) Electrical Wiring Schematics
   1) Power Wiring Schematics
   2) Electrical Instrument Control Schematics
h) Pneumatic Instrument Control Schematics
i) Utility Connections

Drawing Notes:

a) Drawings will be in accordance with U.S.A. American National Standards Institute (ASNI).
b) Drawings will have cross reference notes to relate drawing information
c) Legends will be added for non-standard terminology

Spare Parts

A recommended list of spare parts will be prepared identifying spare parts required for each equipment item and will be furnished at the time of equipment delivery.

Electrical Specifications for Seller Supplied material.

Technical Characteristics (type, size, etc) for Seller furnished electric cable and wire will be identified in terms of National Electrical Manufacturers Association (NEMA) Standards.

Technical Manuals:

Technical Manuals will be prepared which will contain information on each major equipment item covering its installation, operation and maintenance.

Pressure Vessel Certification:

All pressure vessels will be designed and fabricated in accordance with the American Society of Mechanical Engineers (ASME) Pressure Vessel Code, Section VIII.

Safety Precautions:

A safety manual will be prepared detailing safety precautions, warnings and recommendations that should be followed during the maintenance and operation of the process equipment.

Quality Assurance Documentation

The quality control manual will include approved procedures for sampling, chemical and biological analysis and itemized lists of the laboratory equipment required to do the sampling and analysis.

Plant Sanitation Procedures

The sanitation manual will include instructions for both plant sanitation and personal hygiene

Attachment C

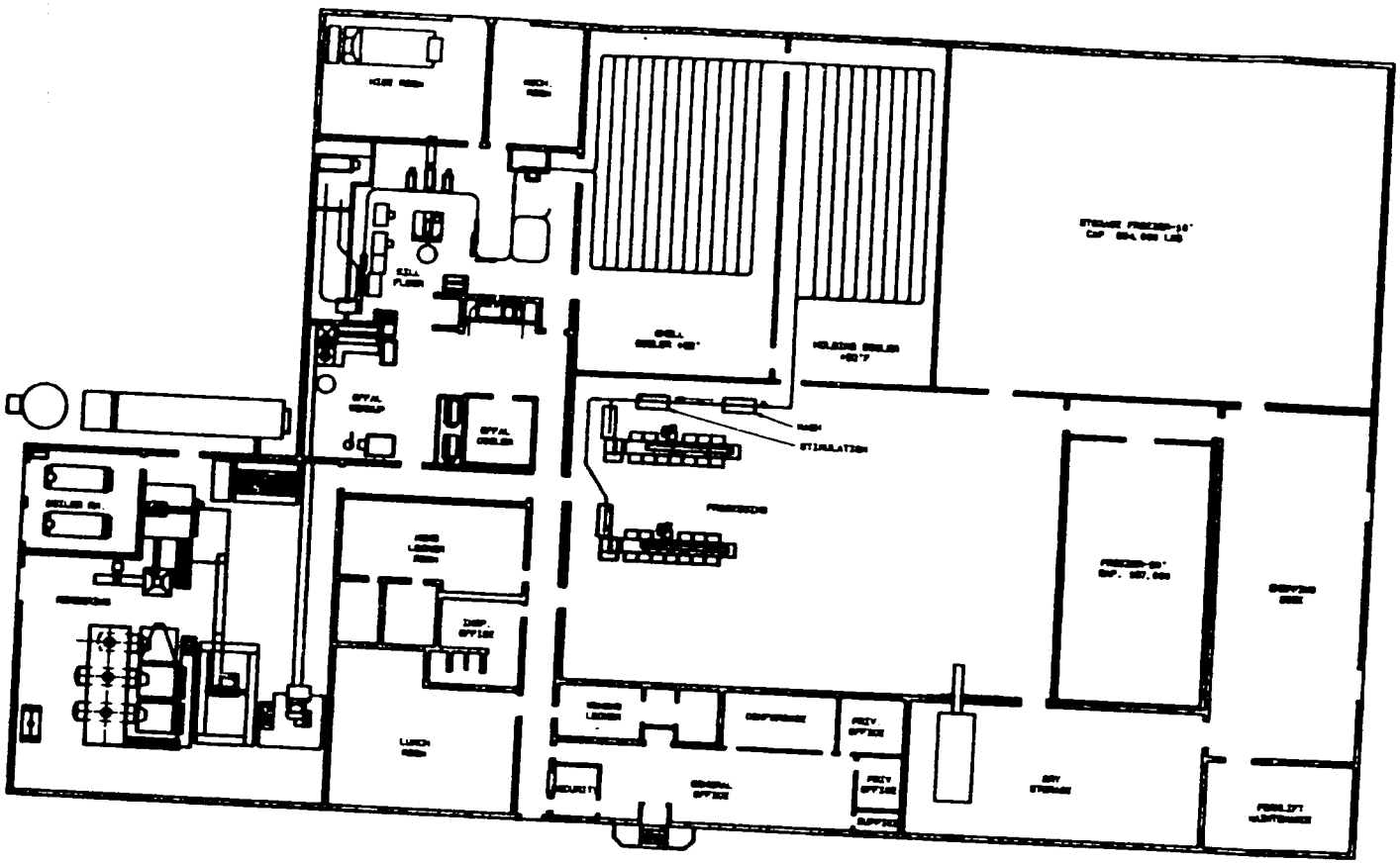
Typical 50,000 Head Per Year Slaughter Facility

The plant, as drawn, but subject to change after discussions, is a single story building. The plant is sized to slaughter 50,000 head of cattle per year at a rate of 25 head per hour, 8 hours per day and 250 days per year. Provisions have been made to cut up and process the meat from these animals, freeze and store the products, plus handle the hides, offal and other by-products. This design represents one of the many options for kill floor arrangements. Loading of inedible material is totally in the back of the plant, while the loading of all meat is in the front of the plant. This enables all inedible, dirty material to be kept in one end, separate from the clean, finished meat. The main plant is built of precast concrete, without windows, and is totally air conditioned.

Holding pens, a truck maintenance and wash building, and machine maintenance building are not shown. Pens should be provided to hold 600 head of cattle (three days supply). Cattle are brought the unloading ramps and unloaded into the pens. As they walk to the pens, they are weighed on a platform scale by lot. The animals are stored for a minimum of 12 hours in an area of at least 2.5 square meters per head and given anti-mortem inspections just before leaving for the kill floor.

Meat Processing

The slaughtering process begins with the animals walking through a disinfecting bath approximately 1.8 meters deep where they are sprayed and then to a drainage area in the chutes where the cattle



RMF STEEL PRODUCTS
8045 INDIANA
KANSAS CITY, MO. 64132
U.S.A.

SCALE	3/4=1'-0
DATE	10-10 85
DRAWN BY	VMC
CHECKED BY	

TYP. 24 HEAD PER HOUR
BEEF SYSTEM

NO	REVISION	BY	DATE

JOB NO

DRWG NO B-15080-1

drip while walking up an inclined ramp up to the slaughtering floor. The animals are stunned in the knocking pen, shackled and hoisted to the bleeding rail where the animal is allowed to vomit and then it is stuck. After sticking and bleeding, the carcass is washed and then conveyed to the area of deheading and skinning.

On-the-rail cattle dressing operations are performed in the same manner as in all the rail systems. Mechanical means of transportation of the carcasses through these various operations vary with each system due to capacity and space availability. Assignment of operations to workers will vary from plant to plant due to capacity and the amount of mechanical function obtained from the system. After the 1/2 carcasses are inspected and washed, they pass through a electrical stimulation chamber then are weighed and sent to the coolers. The cooler has variable speed fans in it so the air movement is greatest in the beginning and reduced as the product becomes more chilled. The cooler capacity holds three days' kill. Normally, only a two-day kill is needed for bagged, vacuum packaged beef products.

Fabrication

The 1/2 carcasses are moved to the primal break-up room after remaining in the cooler for 48 hours. Each 1/2 carcass is separated using on-the-rail breaking saws. The hindquarters are moved to the first deboning tables where men bone out and prepare the sub-primal cuts. The sub-primal cuts can be stored in containers and moved to the cooler while waiting further processing or be conveyed to a bagging machine where the product is put in the bag and then vacuum packaged. The product can be put in baskets, stored up to 21 days, or it can be put in boxes and shipped out. The same process happens in the forequarter line as in the hindquarter line.

BEEF CHART

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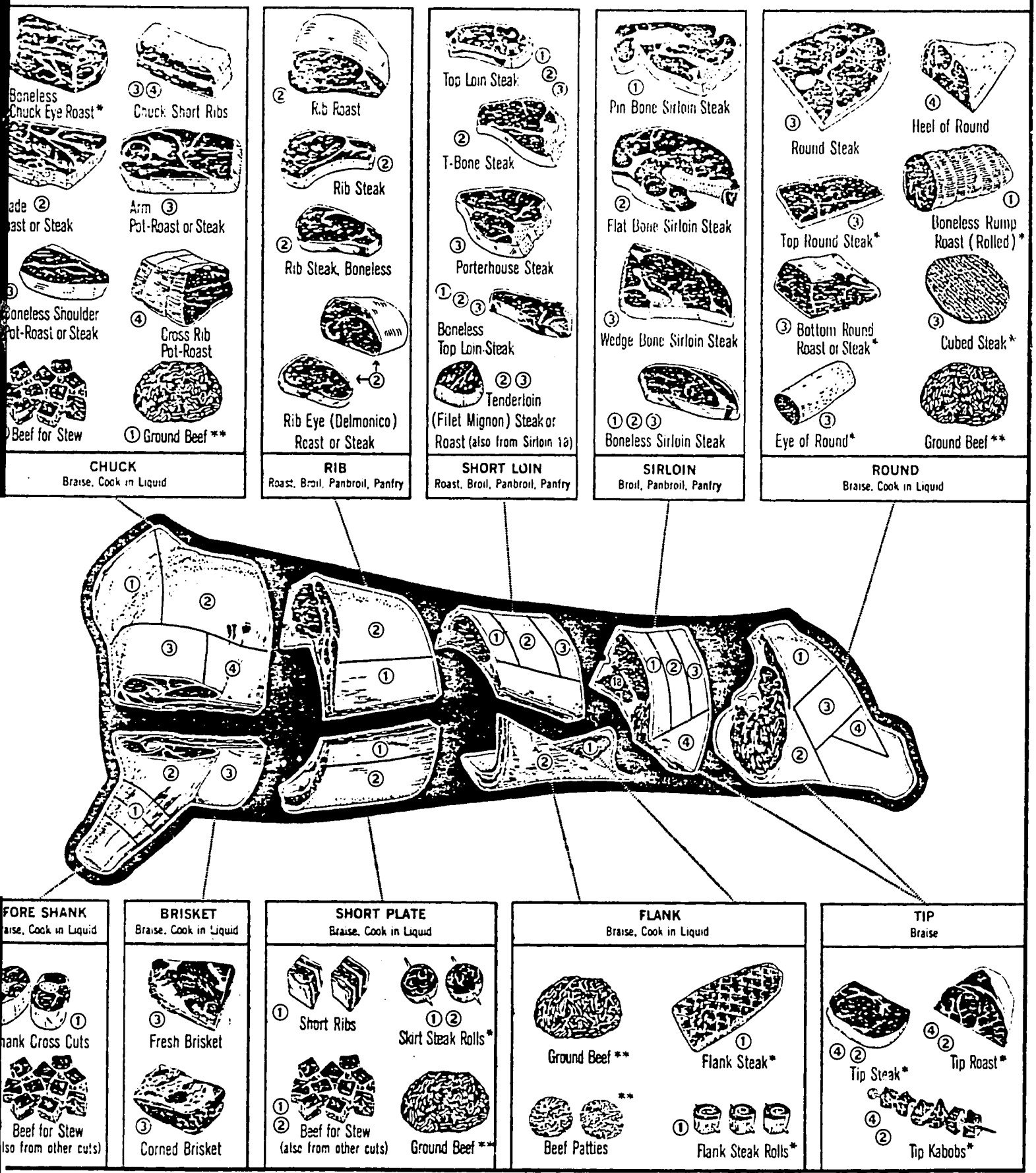
RETAIL CUTS OF BEEF — WHERE THEY COME FROM AND HOW TO COOK THEM



be Roasted, Broiled, Panbroiled or Panfried from high quality beef.
be Roasted, (Baked), Broiled, Panbroiled or Panfried.

This chart approved by
National Live Stock and Meat Board

© National Live Stock and Meat Board

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Boxes are automatically brought to the areas where they are used in order to reduce truck traffic on the floor to a minimum. The bones are then sent across the trimming table where all the operators trim the bones of the finer meats. The bones are packed for shipment or for further processing in the edible rendering department.

Further Processing

The portion control section has not been laid out in detail because it was not certain what types of retail are desired. Space is available for producing:

- o Retail cuts of steaks and roasts
- o Cooked Roast Beef
- o Ground Meat Products
- o Frankfurters
- o Chopped Beef, Shredded Beef and Jerky
- o Sausage and Luncheon Meats
- o Pizza Toppings
- o Canned meats and Stews

By Products Processing

Provisions have been made to provide two to three days storage in the meat coolers 20 days in the shipping coolers for boxed meat and other processed meats. The hides have only a two-day storage capacity. These holding capacities are based on what is generally believed to be the median amount of holding capacity for an efficient operation. Accurate scheduling is needed, but it is not critical at all times. The entire process is similar to those on-the-rail killing systems in the United States and throughout the world. Either fresh or frozen sub-primals can be produced.

The inedible and condemned products are conveyed to into the rendering system. After having been ground, it ends up being pressed with a screw press and deposited in a crackling holding storage area after being milled. The tallow is moved over a shaker screen and to storage.

If desired, the edible materials to be rendered, that is fats and bones, also are handled in the same way, but separately from the inedible. The edible materials are processed in a manner so that soup stock or meat extract, edible bone meat and, of course, edible tallow is produced.

The hides from the hide-puller (located on the kill floor) would drop unto a belt conveyor and be conveyed to an automatic washer. After thorough washing, they are conveyed to the hide processing and curing equipment. 24 hours. The hides are then removed and put on racks where they are allowed to drain for 48 hours. After weighing, grading, typing, bundling, grouping and palletizing, the hides are ready for shipment.

The edible offal, such as hearts, livers, etc., is processed on the kill floor, moved to the packaging area and packed immediately. The packaged meat is sent to a blast freezer were it is hard frozen. From the blast freezer they move into a storage freezer.

50,000 HEAD PER YEAR CATTLE PLANT

EQUIPMENT - BUDGETARY COST ESTIMATE SUMMARY

Beef kill equipment:	$ 406,302.00
Beef processing equipment:	406,302.00
Beef kill supplies:	20,798.00
Beef processing supplies:	27,038.00
Beef bleed rail system:	2,345.00
Hide curing equipment:	132,140.00
Hide processing equipment:	80,202.00
Rendering equipment:	501,387.00
Tracking system:	28,735.00
General supplies:	66,404.00
Refrigeration systems:	353,910.00
Cold storage doors:	76,418.00
Air curtains:	22,263.00
Therma-Seal insulated liner panels:	417,441.00
Racking system:	33,235.00
Trucking equipment:	105,712.00
Laundry equipment:	7,082.00
Maintenance tools:	43,633.00
TOTAL - PROPOSED EQUIPMENT - EX U.S. FACTORY:	$ 2,731,103.00
Estimate 48 containers will be necessary for this shipment. Estimated loading and containerization fees (48 x $400):	19,200.00
Estimated inland freight:	43,200.00
TOTAL - F.A.S. U.S. PORT:	$2,793,503.00

NOTE: The following items are not included in this budgetary cost estimate:

- Oil-fired boiler (one 350 horsepower unit)
- Electric transformer wiring
- Motor control centers
- Plumbing materials
- Masonry, concrete, tile, etc.
- Water treatment system
- Sewage treatment system
- Pre-engineered metal building
- Office equipment
- Holding pen materials
- Building materials (with the exception of the cold storage doors, insulated panels and support steel)

ATTACHMENT D

BUDGETARY COST ESTIMATE

Phase I - Project Definition

1. Project Management		
Professional	100 hours	$ 5000.00
Administrative	50 hours	2040.00
Clerical	30 hours	1250.00
2. Site Inspection		
Professional	240 hours	12000.00
Travel Time	64 hours	3200.00
Transportation (2 persons)		7250.00
Expenses (46 man days)		4600.00
3. Establish Project Criteria		
Professional	280 hours	14000.00
Clerical	80 hours	2600.00
4. Prepare drawings for a new facility		
(a) Facility drawings.		
Professional	80 hours	4000.00
Drafting	140 hours	5660.00
(b) Process schematics and descriptions.		
Professional	80 hours	4000.00
Drafting	60 hours	2437.00
5. Project Definition - Design Review Meeting - Somalia		
Attendance of RMF personnel at design review meeting		
Professional (20 man days)	160 hours	8000.00
Travel time (8 man days)	64 hours	3200.00
Transportation (two persons)		7250.00
Expenses (34 man days)		3400.00
Sub-total - Labor		$ 67387.00
Fee		6740.00
Transportation & Expenses		22500.00
Total - Phase I - Project Definition		$ 96627.00

Phase II. Facility Design

Following the design review meeting and approval of the feasibility study by customer, RMF Steel Products Company will provide:

1. Project Management

Professional	200 hours	$10000.00
Administrative	100 hours	4080.00
Clerical	60 hours	2500.00

2. Process Design:

Design a complete processing line for cattle slaughter and further processing of beef. Prepare facility drawing.

Professional	200 hours	10000.00
Drafting	110 hours	4470.00

3. Technical Documentation

a. Engineering Drawings

(1) Process Flow Schematic

Professional	40 hours	2000.00
Drafting	80 hours	3250.00

(2) Utility Schematic

Professional	80 hours	4000.00
Drafting	80 hours	3250.00

(3) Equipment- Plan and Elevation Views

Professional	60 hours	3000.00
Drafting	120 hours	4875.00

(4) Footings and Foundations

Professional	16 hours	320.00
Drafting	20 hours	815.00

(5) Piping - Typical Plan and Elevation Views

Professional	80 hours	4000.00
Drafting	96 hours	3900.00

(6) Electrical Control Panels

Professional	80 hours	4000.00
Drafting	96 hours	3900.00

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d. Safety Precautions

The safety manual will detail safety precautions, warnings and recommendations that should be followed during the maintenance and operation of the process equipment.

Professional	100 hours	5000.00
Clerical	40 hours	1250.00

e. Quality Control Documentation

The quality control manual will include approved procedures for sampling, chemical and biological analyze and laboratory equipment required to do the sampling and analysis.

Professional	220 hours	11000.00
Clerical	100 hours	3125.00

e. Plant Sanitation

The sanitation manual will include instructions for both plant sanitation and personal hygiene

Professional	180 hours	9000.00
Clerical	80 hours	2500.00

f. Engineering Design Review

Attendance at Facility Design Review Meeting - Somalia

Professional (3x5 man days)	120 hours	6000.00
Travel time (6 man days)	48 hours	2400.00
Transportation (3 persons)		10950.00
Expenses (21 man days)		2100.00
Sub-Total		$ 187885.00
Fee		18790.00
Transportation and Expenses		13050.00
Total - Facility Design		$ 219725.00