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A REPORT ON THE LIVESTOCK-MEAT SUBSECTOR: CONSTRAINTS AND OPPORTUNITIES FOR PROFITABILITY IN THE BEEF INDUSTRY IN INDONESIA

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GLOSSARY

ADG	Average daily gain
ADP	Agribusiness Development Project - USAID
APFINDO	Feedlot Association
AMLC	Australian Meat and Live-Stock Corporation
CL	Chemical lean
CRIAS	Central Research Institute for Animal Sciences
DLS	Directorate of Livestock Services
DM	Dry matter
GOI	Government of Indonesia
HACCP	Hazard Analysis of Critical Control Points
HD	Head
KUD	Koperasi Unit Desa (Village Cooperative Unit)
MITI	Ministry of Industry and Trade
MOA	Ministry of Agriculture
MT	Metric ton
TDN	Total digestible nutrients
USAID	United States Agency for International Development
USMEF	United States Meat Export Federation
Rp	Rupee, Indonesian currency; US$1.00 = Rp2190 at time of report

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EXECUTIVE SUMMARY

The beef business in Indonesia has experienced rapid growth in the last ten years due in large part to an increase in per capita income. Consumption per capita has risen from 1.23 kg/year in 1986 to 1.5 kg/year in 1995. Given the current economic conditions and government policies toward agriculture, the outlook for the beef industry is one of continued expansion and profitability.

Livestock producers and private sector companies have responded to market conditions by investing capital and resources in livestock production, processing capacity, and market facilities. The profitability of the beef business relies heavily on improving efficiency in the production, processing, and marketing of livestock and meat.

The following conclusions were drawn from interviews conducted with livestock producers, feedlot owners, meat processors, and retailers:

- Productivity and commercialization in the domestic livestock industry is inadequate to meet the increased demand for animal protein in Indonesia.

- At current levels of cattle feeding in Indonesia, there are adequate supplies of local feedstuffs; however, significantly increasing the confinement feeding of livestock could result in inadequate supplies.

- Government policies are favorable to expansion of the beef industry and feedlot finishing of cattle, partly because of the employment and income goals of the nucleus/plasma scheme for feedlot operations and local farmers.

- Fees, levies, and other hidden transaction costs are disincentives to the efficient production and marketing of livestock from production areas to feeding and consumption areas.

- Meat processing by the private sector is advancing to keep pace with the rapid expansion in meat demand. Private investment of capital in slaughter and processing facilities will increase in the future.

- Beef merchandising in Jakarta retail markets is equivalent to that in the U.S. and Australia. Uniform grades and standards are needed to assist in transfer of market information between livestock producers, processors, and consumers.

Production constraints and marketing risks exist in the beef industry, and recommendations are made to address these issues. Recommendations are prioritized to allow for development of a strategic plan.

First Priority - Immediate Attention

- Undertake a strategic plan to identify current constraints and opportunities in the livestock-meat subsector.
- Improve the condition of feeder cattle entering feedlots in Indonesia by reducing stress and mortality during the handling, shipping, and quarantine of cattle.
- Implement animal waste management systems in feedlots and plasmas.
- Develop regulations on sanitation and hygiene practices.
- Develop building codes for meat processors, including those involved in boning, packaging, and sausage and meatball production.
- Develop microbial and lean/fat ratio standards for processors using imported boxed beef.

Second Priority - Actions Completed within Two to Three Years

- Develop specific grades and standards for livestock and meat to improve the production and marketing of beef in Indonesia.
- Research cattle performance in feedlots and perform economic analysis on technical packages for improving the production, processing, and marketing of quality beef.
- Initiate feedlot management training programs for managers of nucleus and plasma operations.
- Design labeling standards for processed meat.

Third Priority - Long-term Initiative Required

- Privatize meat slaughter facilities and wet markets and improve wet market facilities for chilled beef.
- Develop strategic alliances with regional trading partners in the beef industry.
- Develop new products, applications, recipes, and sterilization treatments of spices. Develop merchandising strategies for value-added products and lower-valued beef cuts.

Indonesia will continue to be a net importer of animal protein products. The beef industry has a role to play in supplying protein to a growing Indonesian population, as well as in providing employment opportunities for rural farmers. The profitability of the industry will rely on continued favorable economic conditions and supportive government policies.

The close working relationship presently existing between government and the private sector is encouraging. Each entity has an important role to play to ensure that the Indonesian beef industry continues to grow and prosper.

1. MARKET ASSESSMENT OF THE DEMAND FOR BEEF

1.1. Overview

The gross domestic product (GDP/cap) of the Indonesian economy has grown by 7 percent annually for the past several years (USDA/FAS). There is a noticeably growing demand for better quality foods, especially value-added products. There is an increased demand for beef. Per capita consumption of beef is estimated at 1.5 kg/cap with an annual growth rate of 2 percent per year. Human population growth also is a factor in increased demand for animal protein in Indonesia.

Important protein products competing with beef include poultry, sheep, goat, and fish. These products also have seen an increase in importance to the local diet. Poultry consumption has had a 4 percent annual growth rate, but unlike beef, poultry requires the feeding of corn which is also used for human consumption. Compared to the U.S. beef market, the Indonesian market is experiencing greater expansion in per capita consumption of animal protein.

1.2. Market Segments

The Indonesian beef market can be categorized into key segments for better understanding and targeting of marketing activities. Two key market segments are:

- Retail
- Hotel, restaurant, and institutional

These same broad categories are used in the U.S. to track consumer preference regarding beef consumption. Within each broad category consumers can be further differentiated by age, income level, and other socioeconomic variables.

1.2.1. Retail Market

Consumers in the Jakarta market consume approximately 60 percent of the red meat produced in Indonesia. There are three types of market outlets from which consumers purchase their meat: wet markets, supermarkets, and specialty meat shops.

> Wet market: market for the sale of hot carcasses. The majority of fresh beef is sold into this market. In one wet market, an average of six to eight carcasses are sold each day. The wet market will be the major outlet for feedlot cattle until other market channels and segments gain in volume.

Supermarkets and super stores: markets where beef is targeted to middle- and upper-income Indonesians. These stores are comparable in management, size, and merchandising techniques to supermarket stores in the U.S. and Australia. Large super stores sell in volume and at lower margins, and their products require a long shelf life. Makro, a large discount outlet, is aggressively opening new stores in Indonesia to tap into growing demand from the middle class. It currently has six stores.

Specialty meat shops: stores catering to high-income consumers. These stores are beginning to appear in the Jakarta market but are fewer in number. They specialize in high-quality beef for the high-income consumer.

Beef is primarily used in traditional dishes that are soup-based. Consumption per capita is low because only small amounts of beef are used as a flavoring ingredient in these soups.

1.2.2. Hotel, Restaurant, and Institutional Trade

Hotel meat consumption in 1995 is estimated at 2,250 kg daily, of which 1,694 kg is from prime beef cuts. The hotel industry represents annual sales of 824 MT of meat, providing a lucrative market for the beef industry.

The rapid growth in the Indonesian economy has led to a plethora of companies providing beef products to consumers. A number of fast food restaurants like McDonalds and Wendy's use manufactured beef, primarily from Australia and New Zealand. Volume of beef sales in restaurants is estimated at 9,077 kg per day, of which 4,089 kg is from prime cuts. The restaurant trade is estimated to use 3,300 MT per year.

Also included in the institutional trade are expatriate companies that purchase beef for their employees. These companies expect a level of quality in beef similar to that found in Western countries. High-value cuts are targeted to this market.

1.3. Imports of Beef Products

The rapid rise in demand for beef by fast food restaurants has resulted in the increase of beef imports from 3,050 MT in 1993 to 4,309 MT in 1995 (Table 1.1). The imported beef is primarily from Australia, New Zealand, and the U.S., but also from Japan, China, Singapore, Malaysia, Canada, and the Netherlands. The supply of manufacturing-type cuts and bulk packed meat in Indonesia is targeted to these restaurants. The volume of beef imports is currently at a level to fill the deficit between domestic production and live cattle imports and the quantity demanded. The price of manufactured boxed beef

currently is Rp7,000/kg plus taxes and tariffs. According to industry experts, this landed price of manufactured boneless cow beef is currently under the cost of Indonesian feedlot beef. Manufactured boxed beef is restricted to the fast food industry and cannot be sold in the wet market, though some believe cross-over selling is occurring. It would be difficult and costly to segregate these markets.

Table 1.1 Volume and value of meat imports, 1993-1995

Commodity	1993 ton/$,000	1994 ton/$,000	1995 ton/$,000
Beef	3,050/6,128	3,599/7,502	4,309/8,277
Goat and sheep	519/897	2,153/3,724	712/890
Pork meat	45/48	872/939	65/62
Poultry meat	619/779	6,315/8,270	1586/1,728
Liver and offal	5,847/5,191	7,908/7,699	6,238/6,025
Total	10080/13043	20847/28134	12910/16982

The U.S. exported US$3,854,000 and US$9,858,000 in 1994 and 1995 respectively of fresh, chilled, or frozen red meat. In 1995, the U.S. export value was approximately 50 percent of the value of meat imports.

1.4. The Outlook for Beef in Indonesia

The outlook for beef is excellent if the current economic conditions remain in effect. Domestic beef production faces competition from imported beef, but the impact is marginal at the present time because of government policy intervention. The world outlook for beef is for continued large amounts of production in Australia, the United States, and South America into 1997. The world supply of beef will continue to make Indonesian beef less price competitive than Australian beef.

International trade barriers in beef will decline because of GATT changing the terms of trade in beef, forcing domestic production to become more price competitive than beef from exporting countries, particularly Australia.

In the U.S., beef consumption has lost market share to other competing meats because of a lack of price competitiveness as well as dietary changes. U.S. beef production is approximately 26 billion pounds a year (11,800,000,000 kg).

Per capita consumption of beef in the U.S. has lost market share in the consumer's food budget to poultry and other competing meats. The U.S. beef industry has sought to counter the decline by aggressive promotion and advertising programs. Producers in Australia and New Zealand also participate in these U.S. promotion programs.

Market conditions in Indonesia favor increased consumption of beef because of projected continued growth in the economy and per capita income. A middle class is emerging in Indonesia which is a positive sign for the beef industry. Market research by the private sector and the GOI could assist in establishing new companies in the industry (producers, feeders, and retailers) and help them adapt to the current market opportunities.

2. MEAT MERCHANDISING AND MARKETING

2.1. Overview

The key market segments identified in section 1 represent opportunities for marketing and merchandising strategies for the industry. In Indonesia, the unique nature of the wet market distinguishes it significantly from marketing systems in the U.S. and Australia. Because lower-income consumers lack refrigeration, the sale of hot carcass meat is the predominant method of sales. Operation of these local markets presents a challenge to local municipal governments and the GOI.

In the U.S., beef marketing is conducted by meat brokers and wholesalers who link meat packers and processors to the retail and HRI markets. These marketing companies assist in the efficient flow of products. Brokers use market reporting services to determine current prices for specific cuts and grades of beef. Prices are given for carlot and less-than-carlot loads of beef.

In Indonesia the use of meat brokers is only now emerging. As the market becomes more advanced the role of these agents will increase. Direct marketing by meat processors is currently the preferred method of marketing beef. This vertical linkage between processor and retailer will continue to be important and will require processors to become more specialized. Opportunities exist in Indonesia for greater use of brokers and wholesalers. Feedlot owners may wish to vertically integrate to include feeding, processing, and retailing. Economic conditions will dictate whether this form of business organization occurs.

2.2. Central Fabrication and Meat Packaging

In several visits to meat outlets, severe purging of the product in the package was observed. The purging can be due in part to packaging beef that has not been cooled down properly. Both packaging beef cuts before rigor mortis sets in and using warm retail display cases will speed up the purge in packages. Simple techniques to eliminate the purging and prevent unnecessary rewraps include using absorbent tissue in the tray pack; maintaining better temperature control; and improving the cutting and handling of the carcass and boning of the meat.

In the U.S., the industry has moved to central processing of carcasses and primal cuts for retail markets. The central facility reduces labor costs, improves inventory control, and enhances cutting specifications. There are examples of the industry following suit in Indonesia and this should be more the case in the future. The opposite of this is seen in the wet market where quarter carcasses are brought to the market and prepared for sale to consumers.

In one processing plant, it was noticed that the boning room was about 50°F, which speeds up bacterial counts and reduces shelf life of the product. Effort should be directed toward processing, storing, and distributing meat in a timely and efficient manner to retain the quality of the beef.

2.3. Grades and Standards

There is a need for clear understanding of grades and standards in the meat processing industry. For example, product specifications in the U.S. include the amount of external and internal fat in the product. In the U.S., grades and standards of beef have been developed over the last eighty years and continue to evolve as market conditions change. The USDA, in conjunction with trade associations like the United States Meat Export Federation (USMEF), the National Livestock and Meat Board, the Beef Board, the National Cattlemen's Association, the Texas Cattle Feeders Association (TCFA), the National Association of Meat Processors, the American Association of Meat Processors, and Meat Importers Association, works to improve the language of carcass and meat specifications. In Australia, AUS-MEAT is the organization with the authority to define similar language. Indonesia has the opportunity to sample from the best of the two systems and develop a program to suit Indonesian conditions.

In Indonesia, beef fat is not desirable to consumers. Grades will need to adequately express qualities preferred by Indonesians. Accurate specifications will benefit the end-user at retail as well as cattle producers and feedlot owners, who will be able to properly breed and feed to produce the desired products.

The industry will need to clarify terms like prime, regular, and imported beef currently in use in supermarkets. "Prime" grade for beef in supermarkets indicates some feeding but is not tied to a carcass classification. In the U.S., live cattle grades, carcass yields, and meat grades denote the quality and tenderness of the meat. U.S. grades and standards are based on the content of marbling and the age of the animal when slaughtered.

In a visit to the Jakarta slaughter house, carcass weights were taken and inspection made of fat cover. In Australian cattle fed in Indonesia, no marbling was visible and fat cover over the hindquarter was thin. Weights of Australian steer carcasses in the Jakarta market are illustrated in Table 2.1. Carcass yields for Brahma cross cattle from Australia tend to be in the range of 52-55 percent and carcass-to-meat cut-out about 72 percent.

The carcass weight of local Indonesian cattle is lower than that of imported cattle. Carcass weight can average 200 kg per carcass. The daily slaughter averages 600-700 head to supply a Jakarta market which requires 1,000 head (approximately 150 MT).

Table 2.1 Carcass weight of Australian steers from Jakarta slaughter market, April 1996

Carcass	Weight kg	Left half	Right half
#1	234	115	119
#2	281	139	142
#3	256	126	130
#4	256	125	131
Average	256	126	130

2.4. Health and Hygiene

The wet market where hot carcasses are processed and sold requires attention. These markets are run by the local municipality, and the methods, fees, and accountability of these markets is not clearly understood. The hygiene standards in the wet markets are not up to those in Australia or the U.S. Efforts to improve these conditions and reduce bacteria levels are long-term. Simple techniques are possible but will require training and supervision by the local municipality. One strategy is for the local government to turn these markets over to a private sector company.

In the U.S., meat health standards are regulated by the USDA and the Food and Drug Administration (FDA). Recently, meat plants in the U.S. have come under scrutiny by the general public because of the e.coli outbreak. The meat industry and the USDA are implementing Hazard Analysis of Critical Control Points (HACCP) guidelines for improving the quality and safety of food products. A team from the FDA recently visited Indonesia to explain U.S. regulations regarding HACCP for the fish industry. It is recommended that the Indonesian meat industry form a task force to examine ways to adopt the HACCP program.

2.5. Meat Prices

In visits to meat retail outlets, prices were collected on types of meat being sold in the marketplace. Interestingly, local beef that has not been fed commands as high a price as feedlot beef. The local beef is used in the preparation of "rendang", an Indonesian traditional dish, and is preferred for meatballs.

Table 2.2 Meat prices for selected items in Jakarta, April 1996

Local beef for rendang	Rp19,300/kg
Prime beef from Australian fed cattle	Rp19,350/kg
Imported ribeye (Australian)	Rp37,500/kg
New Zealand minced beef	Rp20,000/kg
Prime minced beef	Rp16,500/kg
Local minced beef (nonfed)	Rp21,300/kg

The price for imported beef for processing (not including transport and taxes) is lower than for locally-produced Indonesian beef (Table 2.3). Carcass value of Indonesian beef is higher than current world prices.

Table 2.3 U.S. prices (approximate) for beef for processing

U.S. 90% frozen CL	US$1.80/kg
Australian blend 90% frozen CL	US$1.84/kg
New Zealand blend cow 90% frozen CL	US$1.83/kg

Table 2.4 Local prices for processed meat products in retail outlets

Frankfurters (Bandung)	Rp12,000/kg
Frankfurters (Supermarket Jakarta)	Rp14,750/kg
Meatballs (Bakso)	Rp8,800/kg

Table 2.5 Beef prices in the Jakarta wet market, April 1996

Item	Price (Rp/kg)
Tenderloin	15,000
All other meat cuts	13,000
Liver	13,000
Tripe	6,000
Hoof (Rp/pc)	10,000
Hide (wet weight)	2,800
Bones	250

2.6. Market Reporting Services

In the U.S., market reporting services track information on the volume and price of beef sales by key market outlets. These market reporting services provide valuable information on changes in consumer buying habits. The USDA publishes quarterly reports for the meat industry on the meat situation for beef, pork, and chicken. Private sector companies and trade magazines (National Provisioner, Meat Business, Urner Bary's Yellow Sheet) publish livestock and beef prices on a daily, weekly, and monthly basis. In Australia, the AMLC reports prices in their Meat and Livestock Review, an important document for Indonesian producers and marketing companies.

2.7. Market Promotions

The Indonesian retail meat industry, other than the wet market, is comparable to the U.S. and Australian industries in the areas of display and presentation. Marketing strategies to increase sales will require greater efforts. One store manager mentioned that in-store sales increased during and shortly after a cooking demonstration in the store. A program coordinating mutimedia marketing and pricing can have a positive effect on a store's cash flow. As new specialty shops open, greater awareness of sales, costs, and appropriate marketing strategies will be needed. The shops will need to perform store analysis that addresses products, sales, and a product's contribution to overhead or square footage in the store. In-store promotions and education programs can be better tailored with shelf talkers or recipes for distribution to consumers.

Opportunities exist to form alliances with the Australian Meat and Live-Stock Corporation (AMLC) and the United States Meat Export Federation (USMEF). Both

organizations are conducting beef promotions for their imported beef in Indonesia, and opportunities exist for the private sector to coordinate generic beef promotions with these organizations.

2.8. Market and Merchandising Opportunities

The wet market is the major market segment for sale of beef to Indonesian consumers and dominates market interactions. Local cattle and feedlot cattle are both sold to butchers who supply this market segment. Meat is sold on a hot carcass basis. The supermarket and HRI (hotel, retail, and institutional) trades are much smaller segments, but are growing as middle- and high-income consumers look for quality meat and understand the freshness that can be obtain from chilled beef. These segments will grow, but their growth will require promotion and education on the quality of packaged meat versus hot meat from the wet market. If the industry takes the long-term view, opportunities exist for beef promotion in collaboration with organizations like the USMEF and the AMLC.

Meat processors face the difficulty of maximizing return from line animals after slaughter. Trimmings, mince, and parts of the hindquarter can be slow-moving items. Merchandising strategies are needed to educate consumers on the value of aged beef, mechanical tenderization, and packaging that extends shelf life, and on other advantages of value-added processing such as consistent supply and quality. Meat processors will need to provide a consistent and uniform product coming out of the feedlot for the market.

3. MEAT PROCESSING FOR SAUSAGE AND MEATBALL PRODUCTION

3.1. Meat Processing Objectives

The primary goal for this phase of the study was to address the following objectives:

1. To observe and appraise the current methods used by manufacturers of sausage and other value-added products such as meatballs. To identify the industry's major constraints and unrealized potential and make recommendations on overcoming the constraints and maximizing the unrealized potential.

2. To compare current technical developments in sausage processing in Indonesia with those at small- and medium-sized plants in the U.S.

3. To review the meat processing ingredients and supply industry of Indonesia and make recommendations for developing seasoning manufacture and formulations using local spices.

4. To make recommendations based on these findings, in order to improve the current processing and marketing practices for short-term and long-term development in the industry.

3.2. Production Similarities

The current method of sausage production in Indonesia is, in general, very similar to that used in small to medium operations in the U.S. Most of the processing equipment, casing, and ingredients are used worldwide; however, there is a rather wide variation in other areas of production. Meat processing facilities in the U.S. must comply with USDA construction code specifications. The construction codes focus primarily on sanitation requirements. The sanitary construction of the various plants visited in Indonesia varied from poor to good, a situation which could result in major microbial problems, particularly in plants that do not have tile or plastic wall sidings and tile on the cement floor. All plants should have a large supply of hot water and chemical sanitizers to clean the plant thoroughly at the end of the production day.

3.3. Equipment

The smoke houses observed in Indonesia are of an older vintage and are not designed to give the processor maximum throughput with maximum yield. The latest technology in smoke house design will provide a large volume of uniformly heated air throughout

the house, as well as humidity controls which allow for increased throughput and maximum yields.

3.4. Formulation

A major difference between Indonesian and U.S. processing is in the variety of formulations in sausage and meatball production. A much larger variety of sausage types is produced in the U.S. than in Indonesia. The difference in variety is partly due to differences in the age and maturity of the sausage industry, as well as in the culture, of each country.

Formulations of various sausage products vary widely around the world. The U.S. has standards of identity that must be complied with in order for the product to be sold under a specific name and label. For example, a beef frankfurter produced, labeled, and offered for sale in the U.S. must be all beef. A product with soy protein, starch, milk protein, etc., added cannot be labeled "beef frankfurter" or "hot dog." A beef frank must contain beef, seasoning, and cure ingredients. Small amounts of phosphate may also be used to improve texture and color stability.

Formulations in Indonesia do not have standards of identity. A beef frankfurter may contain soy protein, starch, and other ingredients which could dilute the beef content down to 50 percent or less. To have long-term growth in sausage production, standards must be made and enforced, and specific labeling requirements must be implemented.

3.5. Meatballs

The production of meatballs in the U.S. and in Indonesia is similar in name only and therefore cannot be meaningfully compared, except in the area of bacterial contamination. Producers of sausage and meatballs in the U.S. must meet microbiological specifications. The beef must have a very low bacterial count and be produced by equipment rather than formed by hand. Meatballs produced this way have an extended shelf life and provide little or no health risk. Meatballs formed by hand without the use of plastic gloves may be contaminated, posing a greater health risk.

Meat processors are very responsible when producing a meat product with their name on it. However, it takes only one processor who is not responsible to create problems for the entire industry.

3.6. Spice and Seasoning

Time did not permit obtaining enough information to evaluate the use of spice and seasonings and make recommendations. The meat processors did discuss spices used and their sources. Most of the seasoning is produced by purchasing individual spices and blending them in the meat plant. The meat processors prefer to purchase locally-produced spice rather than imported, providing the quality and price are comparable.

Spice is a major source of bacterial contamination in meat processing. The meat processing industry in the U.S. requires that the spice and/or seasoning blends be sterilized. Sterilized spice has been proven to add several days to a week or more to the shelf life of fresh sausage. Most of the spice sold in the U.S. meat processing market is produced by ingredient suppliers who custom blend sterilized spice.

3.7. Beef Composition

Standards, specifications, label requirements, and education are the primary ingredients for long-term growth of the sausage industry regardless of where the sausage is produced. For example, meat will vary considerably in protein, fat, moisture, color, and emulsifying and binding capabilities depending on species, sex, and carcass. Table 3.1 demonstrates these differences based on beef produced in the U.S. It is offered as a guide for developing standards and specifications for imported and local beef supplied to Indonesia.

Frankfurters, wieners, luncheon meats, and bologna are emulsified products. Selection of the type of meat used in the formula is important to the production of acceptable emulsions. Some meats are strong in their emulsifying ability and others are not. Bull meat and cow meat are very comparable, with the bull carcass having a slight edge in protein and color. However, as can be observed, the cuts vary significantly.

Table 3.1 Composition of beef

	Protein %	Moist %	Fat %	Collagen %	Color %	Bind %
Bull meat full carcass	20	68	11	20	100	100
Cow meat full carcass	19	70	10	21	95	100
Beef shank	19	73	7	66	90	80
Beef chuck	18	61	20	30	85	85
Beef trim 90% L	17	72	10	30	90	85
Beef trim 75% L	15	59	25	38	85	80
Beef plate	15	34	50	--	--	--
Beef flank	13	43	42	--	55	50
Beef head meat	17	68	14	73	60	85
Beef chuck trimmed	17	68	14	59	10	85
Beef tissue	20	59	20	--	30	25

Source: Hickey and Brant.

3.8. Grades, Standards, and Labels

Imported beef animals, imported cows, and local animals are currently being slaughtered for the beef market, but the three types are distinguished only as either "local" or "prime." It is recommended that a more defined grading system be established to identify local animals from both imported high-quality beef animals and imported lower-quality cows. A possibility might be "utility" for cows, "standard" for local and "prime" for imported. Utility grade, being the lowest grade and used for sausage and other comminuted products, would have the lowest price of the three grades.

To take this system to the next step would be to develop standards for the manufacture and sale of specific sausage types. For example, a typical formula for beef frankfurters is shown in Table 3.2.

Table 3.2 A typical formula for beef frankfurters

Item	Weight	Lean
Bull or cow meat	22.68 kg	90% lean
Beef trim	22.68 kg	75% lean
Water	11.34 kg	
Salt	1.25 kg	
Corn syrup	.91 kg	
Dextrose	.45 kg	
Mustard	.45 kg	
Ground white pepper	141.0 gr	
Coriander	85.0 gr	
Nutmeg	57.0 gr	
Paprika	113.0 gr	
Sodium erythorbate	25.0 gr	
Sodium nitrite	7.0 gr	

The ingredient label would read, " Beef, water, spices, sodium erythorbate, and sodium nitrite." All-beef franks would demand a higher price than sausage with fillers.

4. LIVESTOCK PRODUCTION, MARKETING, AND FEEDLOT FINISHING

4.1. Overview of Livestock Production

The number of beef cattle in Indonesia is approximately 11.5 million head. The national herd is increasing slowly at about 3 percent per year. (McEvoy) The major breeds are Bali (Bos Zondaicus), Madura, P. Onggole, and Sumbwa Onggole cattle. Java, which contains 7 percent of the land area, has 40 percent of the livestock, including cattle and sheep. On Java, the majority of cattle are located in East Java (over 3 million head) and are away from the major consumption area of Jakarta and West Java. The logistics of linking production and consumption areas are a challenge for the industry as it seeks to respond to increased demand for beef.

4.2. Livestock Marketing

Reducing shipping costs in the movement of cattle from Australia to Indonesia requires further investigation. Feedlot managers complain about the stress cattle suffer from lack of feed and water while in transport.

In cooperation with agricultural experiment stations, the U.S. livestock industry has researched transport systems for cattle and appropriate trucks for handling and moving cattle. Trailers have been designed specifically for ease of handling and moving cattle. Opportunities to improve the shipment of cattle should be further investigated.

Quarantine regulations and facilities in Indonesia need to be examined to determine if they are keeping pace with the volume of imported cattle entering Indonesia. In 1995, Australia exported 500,000 head of live cattle; of these, Indonesia imported approximately 200,000 head (40 percent). The Philippines was the other major importer (AMLC). Imports of feeder cattle to Indonesia in 1996 are expected to exceed 270,000 head. Industry representatives report that the Cilicap quarantine is not capable of handling the increased volume of feeder cattle destined for West and Central Java.

The feedlot industry in Java and Lampung needs more Indonesian cattle. A key factor is sourcing these cattle in a cost effective manner. There is a large margin in prices received for live cattle between cattle production areas and Jakarta (Table 4.1).

Table 4.1 Price differentials between Jakarta and selected production areas

Location	Rp/kg	Price differential
Jakarta	4,283	--
Denpasar	4,000	283
Ujung Pandang	2,900	1,383
Kupang	2,900	1,383

The price spread between Ujung Pandang and Jakarta is large enough that cattle should move to Jakarta. It is important to note that the cost for transportation by ship from Nusa Tengara Timor can be as high as Rp125,000 per head. Data on shipping costs needs to be updated to determine the price differential between cattle surplus areas and meat deficit regions. It is necessary to investigate the reason for these high transport costs and whether taxes, levies, and hidden transaction costs depress the price for live cattle in the outer islands.

4.3. Feedlot Production

Seven feedlots were visited--three in Lampung and four in West Java. The feedlots had similar design and operation with some variability in feed ration and facility structures. The operational management of the feedlots visited was efficient and death losses were at a minimum. Feedlots are relatively new in Indonesia. In 1992 there were five commercial feedlots and now there are approximately thirty-five.

Approximately 200,000 feeder cattle were imported from Australia and New Zealand in 1995. The majority of cattle originate from the northern provinces in Australia. Brahma is the breed of feeder cattle preferred by feedlot owners because of its adaptability and average daily gains (ADG). The initial entry weight of Australian cattle is 350 kg and the exit weight approximately 450 kg. The feeding period averages 90 days, with a range from 60 to 120 days. Average daily gain can vary from 1.2 to 1.4 kg for Australian compared to a maximum 1.0 kg for local cattle. For short feeding periods the effect of compensatory weight gain needs to be clarified in order to evaluate a ration.

Operational practices varied by feedlot, and it would be valuable if there could be an assessment of facility types, rations, and management practices to guide the industry. Some of the variables to evaluate are:

- shade structure in the feedlot
- growth implants in cattle
- backgrounding of cattle before feeding (preparation for feedlot)
- feeding systems of growing cattle before finishing
- feeding of local steers versus local bulls
- carcass fat in heifers versus steers on feed

The typical cost of feed bunks and roof is Rp80,000 per square meter. This is for a closed canopy structure. Cattle require about two to three square meters per animal so that the construction cost per head is Rp160,000. The cost per square meter can be reduced by changing the shade configuration and depends on whether gravity flow or manual removal of manure is used. The cost can be reduced to Rp40,000 per square meter.

Labor cost allocation for the feedlot is approximately one person for fifty head. The salary per person per day can range from about Rp4,000 to Rp6,000. Labor and facility costs are important considerations in running an efficient feedlot.

Animal health is an important aspect of the feedlot system. Most feedlots had a quarantine area for arriving cattle. Sick pens were designated. Health maintenance is budgeted at Rp25 per day while cattle are on feed. Some of the feedlots had a veterinarian on site while others did not. During quarantine cattle receive vaccinations for ticks, ece parasites, anthrax, septicemia, and S-A.

4.4. Feedstuffs

Feeding trials have been undertaken by universities in Indonesia. (Nitis, et al.) It is suggested that an extensive literature review be conducted of all the various cattle feeding trials that have been conducted. After review of this information, research programs on feeding systems should be designed and carried out in cooperation with GOI, AFFINDO, and animal science departments.

Feedlots use different compositions for their rations. Some have rations for starting, growing, and then finishing the cattle with energy ranging from 2.4 MgCal to 2.65 MgCal and TDN from 70-80 percent.

4.4.1. Concentrate

Cattle are typically fed 2.5 to 3.0 percent of their body weight on a dry matter basis. The daily feed levels should be in the range of 12-15 kg dry matter per head. Concentrate is approximately 85 percent dry matter.

Ingredients for the concentrate ration are readily available in Indonesia. Concentrates fed per day are approximately 8-9 kg per head. Common ingredients in a typical ration are listed in Table 4.2. Cracked corn is used in only a few feedlots and only then on a limited basis. Rice bran, an abundant feed source, sells for Rp150/kg.

The by-product from the processing of cassava for tapioca is an excellent cattle feed and high in protein after it is fermented. The fermentation process take about three to five days with the required starter. More research is needed on the use of this important by-product for animal feed.

4.4.2. Forage and Roughage

In addition to the example concentrate ration described above, the feeder would provide forage or roughage to the animal. Feedlots and farmer plasma have access to forage. Typical forage species are star grass, king grass, and elephant grass. The cost of grass is Rp25-50 per kg. The daily ration consists of approximately 5 kg per head per day, and dry matter content of green chop is 15 percent. Some silage is also being made, with a dry matter content of approximately 30-35 percent. The fermentation process takes about one week.

4.4.3. Other Feedstuffs

Other feedstuffs which are used in addition to concentrate and roughages are brewery waste and pineapple by-products. These items are inexpensive and available in particular locations. The dry matter content is fairly low for these products.

4.4.4. Minerals and Vitamins

Minerals and vitamins can be difficult to buy. Some feedlots buy premix from Australia. No antibiotics are in the feed.

Table 4.2 The ingredients and cost of a typical feed ration

Ingredient	Cost (Rp)
Cassava	800
Wheat milling	150
Rice bran	260
Cocoa by-product	200
Coffee by-product	150
Palm nut by-product	120
Fruit by-product (karet)	40
Kopak seed processed	200
Limestone	29
Urea	20
Salt	10
Starter for fat	8
Soda	8
Premix	4
Sodium bicarbonate	1
Cost for a daily ration	2,000
Crude protein (%)	12
Dry matter (%)	85

4.5. Nucleus/Plasma Scheme

The GOI has developed a policy that encourages private feedlots to develop small feeding programs by farmers in surrounding villages. The GOI has set as a target that 25 percent of all live cattle imported by private feedlots be distributed and fed by farmers (the "plasma"). The plasma receives cattle and feed from the nucleus and the feedlot provides technical assistance during the feeding period. ADG can range from 7-9 kg. The net return to cattle feeding by a plasma is presented in Table 4.3. Opportunities

exist for greater involvement in education and training by the GOI, private feedlots, and KUD.

Table 4.3 Net returns per head to farmer for 4-month feeding program of Australian feeder cattle

Cost of feeder cattle (350kg x Rp3,950)	Rp1,382,500
Cost of feed to farmer (120 days x Rp2,188)	Rp262,560
Cost of cattle and feed	Rp1,645,060
Interest (120 days at 9%/yr)	Rp48,675
Cattle, feed, and interest	Rp1,693,735
Transport cost	Rp5,000
Lay-in and feed cost	Rp1,698,735
Total live weight gain (kg)	108
Gross revenue (458 kg x Rp4,050)	Rp1,854,900
Net returns to management, labor, land, and facilities	Rp156,165

4.6. Animal Waste Containment

The control of animal waste varies among the feedlots visited. Some of the feedlots have adequate lagoon systems for capturing and containing animal waste. In one case a feedlot was bagging manure for sale to nursery producers. The feedlot manager was interested in ways to market the manure. Some feedlots and a plasma did not have a waste containment system in place and waste was draining out the feedlot. The opportunity exists for fecal matter to enter the fresh water system.

4.7. Profitability of Livestock Feeding

The profitability of the cattle feeding business can be assessed by evaluating the live animal slaughter price and the cost of feed, and determining if the ratio is favorable for livestock feeding. An estimated feeding cost, including concentrate (Rp 2,000/day) and

forage (5 kg/day x Rp50 = Rp250), is Rp2,250 per day. The current price for slaughter cattle is approximately Rp4,000/kg to Rp4,100/kg. The ADG is 1.3 kg/day. The ratio of slaughter price x ADG : cost of feed per day is 2.34 (Rp5,265/2,250) and indicates current profitability of feeding cattle in Indonesia. An example is given in the formula below:

$$\text{Profitability ratio} = \frac{\text{live slaughter price x ADG}}{\text{concentrate cost + forage cost}}$$

$$\text{Profitability ratio} = \frac{4{,}050 \text{ x } 1.3}{2{,}000 + 250}$$

$$\text{Profitability ratio} = 2.34$$

5. RECOMMENDATIONS AND CONCLUSIONS

Recommendations for improvement of the profitability of the beef industry are suggested based on field observations. The recommendations are grouped by priority and time frame in which they are to be conducted.

5.1. Recommendations

5.1.1. First Priority -- Immediate Action

Strategic Planning for the Livestock Subsector

The last major study of the livestock subsector was published in 1986. Since then there has been major growth in the demand for livestock and meat products. Structural changes have occurred with the emergence of a feedlot industry in Indonesia. An updated study is recommended to guide the industry for the next ten years.

Health Management of Feedlot Cattle

There is a critical need to examine the procurement system for feeder cattle from Australia. The reduction of sickness, weight loss, and mortality should be a priority of the industry. Better coordination in shipment of cattle among Australian brokers, Indonesian feedlot owners, and GOI officials could minimize the stress and mortality in shipment, in quarantine, and in the feedlot. Australian exporters need to be encouraged to improve the backgrounding of cattle before shipment and improve watering and feeding systems for cattle in transit. Because current market conditions favor the buyer, this is the best time to request improvements in shipping and handling of cattle that Indonesia purchases from Australia.

Animal Waste Management in Feedlots and Plasma

The DLS, working with AFFINDO, needs to implement a certification program for existing and new feedlots that involves proper siting, design, and construction of animal waste systems. The DLS should be responsible for monitoring these waste containment systems.

Regulations on Standards for Sanitation and Hygiene Practices

The GOI needs to formulate a list of minimum standards for sanitation and hygiene practices in meat slaughter, processing facilities, and markets. One standard recommended is to install air doors to keep flies out.

Building Codes for Meat Processing Plants

There is a wide variability in the condition of meat processing plants. It is recommended that a simple set of codes be introduced for improving the hygiene and sanitation of these plants. ADP will have copies of USDA and FDA guidelines for meat processing construction, sanitation, and hygiene.

Microbial and Lean/Fat Ratio Standards for Meat Processors Using Imported Boxed Beef

Specific standards on microbial levels and lean/fat ratio are necessary to insure that quality meat is being used in the manufacture of processed meat products.

5.1.2. Second Priority -- Programs Completed in Two to Three Years

Specifications of Grades and Standards for Livestock and Meat

It is recommended that a private sector association collaborate with GOI officials to design and implement a set of simple grades and standards for livestock and meat products. DLS could publish a book on acceptable cuts and combine this effort with establishment of grades and standards.

Research Program on Cattle Performance in Feedlots

The response rate to cattle on feed in Indonesia varies among feedlots and plasmas. The key variables are cattle types, structural design of feeding pens, and feeding programs. It is recommended that a set of research projects be undertaken to assess the impact of these production variables. Research needs to address better feed, better ADG, and improved animal genetics. The research could be conducted by CRIAS in conjunction with the feedlot industry.

Economic Analysis of Production and Marketing Improvements in Feedlot Operations

A series of economic studies are needed on alternative management systems for backgrounding, growing, and finishing cattle. For example, applied research on optimum size of feedlots, shade facilities, growing and finishing rations, growth implants, etc., is needed. The research could be conducted by CRIAS, AFFINDO, and DLS.

Feedlot Management Training Program for Nucleus and Plasma

A specialized training course on cattle production, feeds and feeding, and health maintenance should be implemented. The training course would be in cooperation with DLS, KUD, and AFFINDO and directly involve farmers/feeders.

Labeling Standards for Processed Meat

The consumer should know the ingredients that go into producing a specific sausage product such as beef frankfurters. Processors will benefit from consumers willing to pay for known quality.

5.1.3. Third Priority -- Long-term Initiatives

Privatization of Meat Slaughter Facilities and Wet Markets

The long-term development of the beef industry requires that critical functions in the meat marketing systems need to be examined and upgraded. The privatization of the Jakarta slaughter house would allow the GOI to focus its efforts on meat sanitation and hygiene and allow the private sector to operate the facilities to meet consumer demand. Slaughter, handling, and processing of meat can be done more efficiently by private firms. The current slaughter fee is Rp23,000 per head and this fee would likely increase if a private sector consortium took over the operation of the plant. The slaughter fee per head in the U.S. can be US$25 to $30 per head.

The GOI needs to consider ways to upgrade the wet markets. Wet markets need to be equipped with freezer facilities in order to carry chilled beef. Wet markets could be an outlet for the lower-quality carcasses and lower-valued cuts.

Strategic Alliances with Regional Trading Partners in the Development of the Beef Industry

The demand for beef has increased significantly in the past five years as per capita incomes have increased. The need will continue for market promotion to enhance the image of beef in the diet.

Efforts by associations representing feedlot owners, cattle and buffalo producers, meat importers, and meat processors could enhance the overall demand for beef products.

Wet markets require in-depth study to determine if joint ventures or partnerships are needed to improve the operation of these facilities.

New Product Development and Applications

The industry needs to be encouraged to remain innovative with new products, applications, and treatment and use of spices. Regular training courses on merchandising techniques and product development can be offered to the industry.

5.2. Conclusion

The market outlook for the beef industry in Indonesia is good, with the market demand for beef growing as personal disposable incomes increase and a larger middle class emerges. The private sector has taken an aggressive position in building feedlots and meat processing facilities to meet this expanding demand. A few specialty beef shops are even beginning to appear in Jakarta.

The Government of Indonesia is playing an important role by reducing barriers to the importation of live cattle and facilitating the creation of the nucleus/plasma scheme. The GOI has a critical role to play in facilitating the creation of standards and grades appropriate to the Indonesian market. Hygiene and sanitation of wholesome meat will play an important role as the beef industry continues to expand.

A cloud of uncertainty lurks on the horizon involving international trade issues. The liberalization of trade will certainly see greater access to beef in Indonesia. The implication is that the Indonesian industry will need to be as efficient and competitive as possible in the cost of production, feeding, processing, and marketing of beef. Domestic production and marketing of live cattle will need to be improved to remain competitive. Indonesia will be a net importer of beef because of the size and productivity of its domestic herd, but the feedlot industry can prosper if the costs of production, processing, and marketing can be improved.

The GOI needs to continue to monitor its policies toward the livestock-meat subsector in general, and the beef industry in particular, to ensure that unnecessary transaction costs and policies do not place the emerging industry at an economic disadvantage to its regional trading partners. Training and education programs will be a key mechanism for keeping the beef industry in a competitive position relative to its trading partners.

The recommendations in this report and their priority for implementation are linked directly to addressing critical constraints. The agenda proposed will require the participation of the private sector, DGL, KUD, and other agencies responsible for agribusiness development in Indonesia. The success of the beef industry in Indonesia will have a significant widespread impact on the economic development of Indonesia.

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Appendix A Itinerary of Team Members

3/31	Sun	1330	Team members Henry and Sullivan arrive in Jakarta.
4/1	Mon	0800	Team members hold introductory briefing with Agribusiness Development Project personnel.
		1000	Team receives briefing from Ministry of Industry and Trade and Ministry of Agriculture personnel.
		1300	Team visits Tippindo Meat Processing Plant.
		1600	Team visits the Jakarta Slaughter House.
4/2	Tue	0600	Team and AFFINDO staff visits the Wet Market for fresh beef with staff from AFFINDO.
		0830	Team, AFFINDO, MOA, and MITI staff visit Kem Foods Meat Processing Facility.
		1100	Team, AFFINDO, MOA, and MITI staff visit HERO Supermarket.
		1330	Team, AFFINDO, MOA, and MITI staff visit Kem Chick Supermarket.
		1500	Team, AFFINDO, MOA, and MITI staff visit Makro Wholesale Outlet.
4/3	Wed	0900	Team, AFFINDO, MOA, and MITI staff visit Simptico-Kariyana Meat Processing Facility outside Jakarta.
		1200	Lunch hosted by Kariyana Feedlot personnel for team, AFFINDO, MOA, and MITI staff.
		1330	Team, AFFINDO, MOA, and MITI staff visit Kariyana Feedlot.
		1500	Team, AFFINDO, MOA, and MITI staff visit plasma farmer/feeder near Sukibumi.
		1930	Team arrives in Bandung for overnight stay.

4/4	Thu	0900	Team visits meatball manufacturer in Bandung.
		1030	Team visits sausage manufacturer and small supermarket.
		1500	Team visits Dilamo feedlot outside Bandung.
		2100	Team returns to Jakarta.
4/5	Fri	0900	Team visits mall and specialty meat shop.
		1200	Hermann and Sullivan visit feedlot in Serang.
		1330	Henry flies to Surabaya to visit meat processor.
		1900	Sullivan, Mr. Hermann of ADP, and Mr. Muhammad of Tippindo arrive in Lampung.
4/6	Sat	0900	Henry visits PT. Eloda Mitra, a processed meat manufacturer in Surabaya.
		0930	Hermann and Sullivan visit PT. Great Giant feedlot.
		1300	Hermann and Sullivan visit Suntory Food Company feedlot.
		1700	Hermann and Sullivan visit Tippindo feedlot near Jabung.
4/7	Sun	0900	Hermann and Sullivan leave by car to Jarkata and arrive at 1500.
4/8	Mon	1000	Henry visits Harryanto and Adrianto Malia of Aroma Meat Processing in Bali; Hermann and Sullivan meet with Chairman Jan Nari of Indonesia International Animal Science Research and Development Foundation in Bogor.
		1145	Hermann and Sullivan meet with Dr. Rangkuti and Dr. Subandryo of CRIAS in Bogor.
		1900	Hermann and Sullivan attend dinner hosted by AFFINDO with guests from the GOI's Livestock Services.
4/9	Tue	0900	Meeting at MITI to discuss agenda for the seminar.
4/10	Wed	0800	Team works on seminar presentation and writing the final report.

4/11	Thu	0900	Seminar by Henry and Sullivan at Hotel Kemang.
4/12	Fri	0800	Henry and Sullivan finalize the report.
4/13	Sat		Henry and Sullivan depart for the U.S.

Appendix B.1 Spices, sources, description, flavor, and typical uses from the reference book, The Meat We Eat.

Spice and sources	Description	Flavor	Typical uses
Allspice Jamaica Honduras Mexico	Reddish-brown pimento berries, nearly globular; 1/8" to 5/16" in diameter Available whole and ground	Pungent, clovelike odor and taste	Bologna, pork sausage, frankfurters, hamburger, mincemeat, potato sausage, headcheese, and many other meat food products
Anise seed Spain Netherlands Mexico	Greenish-brown, ovoid seed; 3/16" long Available whole and ground	Pleasant, licorice-like odor and taste	Dry sausage, mortadella, and pepperoni
Basil California Hungary France Yugoslavia	As marketed, small bits of green leaves Available whole and ground	Aromatic, faintly anise-like, mildly pungent taste	Pizza sausage, certain poultry products
Bay leaves Turkey Portugal	Elliptical leaves up to 3" long; deep green upper surface, paler underneath Available whole	Fragrant, sweetly aromatic, slightly bitter taste	Pickling spice for corned beef, beef tongue, lamb tongue, pork tongue, and pigs' feet
Caraway seed Netherlands Poland	Curved, tapered brown seeds, up to 1/4" long Available whole	Characteristic odor; warm, slightly sharp taste	Polish sausage

Cardamom seed Guatemala India	Small, angular, reddish-brown seeds, often marketed in their pods, which are greenish or buff-colored (when blanched) Available whole, decorticated, and ground	Pleasantly fragrant odor; warm, slightly sharp taste	Bologna, frankfurters, similar products
Celery flakes California	Medium- to dark-green flakes about 3/8" in diameter Available in flakes, ground, and as salt	Sweet, strong, typical celery odor and taste	Chicken and turkey products
Celery seed India France	Grayish-brown seeds up to 1/16" in diameter Available whole, ground, and as salt	Warm, slightly bitter celery odor and taste	Beef stews, meat loaf, chicken and turkey products
Chili powder California	Red to very dark red powder; contains chili pepper, cumin, oregano, garlic, salt, and sometimes other spices	Characteristic aromatic odor, with varying levels of heat or pungency	Chili con carne, taco meat, some Spanish and Mexican sausages
Cinnamon Indonesia Seychelles Taiwan Ceylon	Tan to reddish-brown quills (stock) of rolled bark; varying lengths Available whole and ground	Agreeably aromatic, with sweet, pungent taste	Ham loaf, other pork loaves, pastrami rub, and sometimes in bologna, mortadella, and blood sausage

Cloves Madagascar Indonesia Tanzania	Reddish-brown; 1/2" to 3/4" long Available whole and ground	Strong, pungent, sweet odor and taste	Bologna, frankfurters, headcheese, liver sausage, corned beef, and pastrami; whole cloves often stuck into hams when hams are baked
Coriander seed Morocco Rumania Argentina	Yellowish-brown, nearly globular seeds, 1/8" to 3/16" in diameter Available whole and ground	Distinctly fragrant, lemon-like taste	Frankfurters, bologna, knackwurst, Polish sausage, and many other cooked sausages
Cumin seed Iran India Lebanon	Yellowish-brown, elongated, oval seeds, 1/8" to 1/4" in diameter Available whole and ground	Strong, aromatic, and somewhat bitter	Chorizos, chili con carne, and other Mexican and Italian sausages; its principal use is in making curry powder
Dill seed India	Light brown, oval seeds, 3/32" to 5/16" long Available whole and ground	Clean, aromatic odor; warm, caraway-like taste	Headcheese, souse, jellied tongue loaf, and similar products
Fennel seed India Argentina	Green to yellowish-brown, oblong or oval seeds, 5/32" to 5/16" long Available whole and ground	Warm, sweet, anise-like odor and taste	Italian sausages, pizza sausage, pizza salami

Garlic, dried California	White material, with standard particle size ranging through powdered, granulated, ground, minced, chopped, large chopped, sliced, and large sliced	Strong, characteristic odor; extremely pungent taste	Polish sausage; most beef sausages; salamis; subtle amounts in bologna, frankfurters, and similar products
Ginger Nigeria Sierra Leone Jamaica	Irregularly-shaped pieces ("hand") 2-1/2" to 4" long; brownish to buff-colored (when peeled and bleached) Available whole, ground, and cracked	Pungent, spicy-sweet odor; clean, hot taste	Pork sausage, frankfurters, knackwurst, and numerous other cooked sausages
Mace Indonesia Grenada	Flat, brittle pieces of lacy material, yellow to brownish-orange in color Available whole and ground	See nutmeg; but somewhat stronger, less delicate	Bologna, mortadella, bratwurst, bockwurst, and many other sausages, both fresh and cooked
Marjoram France Portugal Greece Rumania	As marketed, small pieces of grayish-green leaves Available whole and ground	Warm, aromatic, pleasantly bitter, and slightly camphoraceous	Braunschweiger, liverwurst, headcheese, and Polish sausage

Mustard Denmark Canada U.K. U.S.	Tiny, smooth, nearly globular seeds, yellowish- or reddish-brown Available whole and ground	Yellow: no odor, but sharp, pungent taste when water is added Brown: with water added, sharp, irritating odor; pungent taste	Bologna, frankfurters, salami, summer sausage, and similar products
Nutmeg Indonesia Grenada	Large, brown, ovular seeds, up to 1-1/4" long Available whole and ground	Characteristic sweet, warm odor and taste	Frankfurters, bologna, knackwurst, minced ham sausages, liver sausage, and headcheese
Onion, dried California	White material ranging in particle size through powdered, granulated, ground, minced, chopped, large chopped, sliced, and large sliced	Sweetly pungent onion odor and taste	Braunschweiger, liver sausage, headcheese, and backed luncheon loaves, including Dutch loaf and old-fashioned loaf
Oregano Greece Mexico Japan	As marketed, small pieces of green leaves Available whole and ground	Strong, pleasant, somewhat camphoraceous taste	Most Mexican and Spanish sausages; fresh Italian sausage; sometimes frankfurters and bologna
Paprika California Spain Bulgaria Morocco	Powder, ranging in color from bright rich red to brick red depending on variety and handling	Slightly sweet odor and taste; may have moderate bite	Frankfurters, bologna, and many other cooked and smoked sausage products; also fresh Italian sausage

Pepper, black Indonesia Brazil India Malaysia	Green (unripe) pepper berries or brownish-black, wrinkled berries, up to 1/8" in diameter Available whole, ground, cracked, and decorticated	Characteristic penetrating odor; hot, biting taste	Most used of any spice. Frankfurters, bologna, pork sausage, summer sausage, salamis, liver sausage, loaf products, and most other sausages
Pepper, red Japan Mexico Turkey U.S.	Elongated and oblate-shaped red pods, varying in size from 3/8" to 1/2", depending on variety Available whole and ground	Characteristic odor with heat levels ranging from mild to intensely pungent	Chorizos, smoked country sausage, Italian sausage, pepperoni, fresh pork sausage, and many others
Pepper, white Indonesia Brazil Malaysia	From ripe, yellowish-gray pepper seeds, up to 3/32" in diameter Available whole and ground	Like black pepper, but less pungent	Used where black pepper specks are not desired; e.g., in pork sausage and deviled ham
Rosemary France Spain Portugal California	Bits of pine-needle-like green leaves Available whole and ground	Agreeable, aromatic odor; fresh, bittersweet taste. Somewhat like sage in flavor	Chicken stews and a few other poultry products
Saffron Spain Portugal	Orange and yellow strands, approximately 1/2" to 3/4" long Available whole and ground	Strong, somewhat medicinal odor; bitter taste	The most expensive of all spices; used primarily for color, but in very few sausages

Sage Yugoslavia Albania	Oblanceolate, grayish-green leaves, about 3" long Available whole and ground	Highly aromatic, with strong, warm, slightly bitter taste	Pork sausage, pizza sausage, breakfast sausage, and old-fashioned loaf
Savory France Spain	As marketed, bits of dried, greenish-brown leaves Available whole and ground	Fragrant, aromatic odor	Used primarily in pork sausage, but good in many sausages
Thyme Spain France	As marketed, bits of gray to greenish-brown leaves Available whole and ground	Fragrant, aromatic odor; warm quite pungent taste	Pork sausage, liver sausage, headcheese, and bockwurst
Turmeric India Jamaica	Fibrous, orange-yellow roots, 1/3" long Available ground	Characteristic odor, reminiscent of pepper; slightly bitter taste	Used more for color than flavor; constituent of curry powder

Appendix B.2 Quality grade standards for slaughter steers, heifers, and cows

Grade	Age/months	Fat covering *	Fullness	Firmness
Prime	< 30 30-42	Moderately thick Tends to be thick/smooth	Marked Upper full	Firm Very firm
Choice	< 30 30-42	Slightly thick Moderately thick	Moderately full Marked	Moderately firm Firm
Select	< 30 30-42	Thin Slightly thin	Slightly Some	Slightly Firm
Standard	< 30 30-42	Very thin Very thin	--- ---	--- ---
Commercial	Younger Mature	Slightly thick Moderately thick	--- Moderately full	Moderate Firm
Utility	Younger Mature	Very thin Slightly thick	Slightly thin Slightly full	--- ---
Cutter	Younger Mature	Practically none Very thin	--- ---	--- ---
Canner	Inferior to above			

* Over chops, back, ribs, loin, and rump. In lower-quality grades applies only to back, loin, and upper ribs.

Appendix B.3 Maturity and firmness in beef quality grade standards

Grade		Chine bones	Ribs	Firmness
Prime	A	Slightly red and soft	Slightly wide and flat	Moderately firm
	B	Tinged with red	Slightly wide and flat	Firm
Choice	A	Slightly red and soft	Slightly wide and flat	Slightly soft
	B	Tinged with red	Slightly wide and flat	Slightly firm
Select	A	Slightly red and soft	Slightly wide and flat	Moderately soft
	B	Tinged with red	Slightly wide and flat	Slightly soft
Standard	A	Tinged with red	Slightly wide and flat	Soft
	B	Slightly red and soft	Slightly wide and flat	Moderately soft
Commercial	C	Moderately hard and rather white	Moderately wide and flat	Slightly firm
	E	Hard and white	Wide and flat	Firm
Utility	B	Slightly red and soft	Slightly flat	Soft and slightly watery
	D	Moderately hard and rather white	Moderately wide and flat	Moderately soft
	E	Hard and white	Wide and flat	Slightly firm
Cutter	C	Moderately hard and rather white	Slightly wide and flat	Very soft and watery
	D	Moderately hard and white	Moderately wide and flat	Soft and watery
	E	Hard and white	Wide and flat	Soft and slightly watery
Canner	E	Inferior to listed standards	Inferior to listed standards	Inferior to listed standards

Appendix B.4 Quality grades for carcass beef based on maturity of animal and degree of marbling

Degree of Marbling	Maturity** A*	B	C	D	E
Slightly abundant	Prime				
Moderate			Commercial		
Modest	Choice				
Small				Utility	
Slight	Select				
Traces	Standard				Cutter
Practically devoid					

* The A maturity portion is the only portion applicable to bullock carcasses.
** Maturity increases from left to right.