Feasibility Study For A Niche Multiple Species Meat Plant Located in Northeast Iowa

Project sponsored by Upper Mississippi Family Meats Cooperative In Partnership with Blooming Prairie and CROPP Cooperatives
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Study Conducted by:

Food and Livestock Planning, Inc.
and
ProAnd International Ltd.

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Table of Contents

Table of Contents (continued)

Section 1. Executive Summary

Upper Mississippi Family Meats (UMFM) is organized as an Iowa cooperative that will process beef, pork and lambs into meat as a service to individual livestock producers or their marketing organizations. This processing cooperative is unique because it will predominantly process meat from livestock produced in specific ways such as organic and natural. The plant will potentially market offal, byproducts, non-needed meat products, and potentially further processed items as a service to their owners.

A survey was conducted by the steering committee of interested livestock producers within a 100-mile radius of Monona, IA to determine the level of interest and the potential amount of livestock that could be processed in a new plant. The total numbers in the following table reflect the respondent's projections for the year 2004.

Species	Survey of individual producers, # hd/yr	# of producers returning surveys	CROPP interview
Beef	3,318	43	3,900
Pork	10,405	12	4,400
Lambs	4,068	16	Not reported

It is expected that one or two other producer groups marketing beef cattle will provide significant numbers of cattle for the plant. ProAnd International, a meat plant design firm from New Zealand, designed a multi-species facility with the annual capacity to process 14,000 beef cattle per year, 17,500 market hogs and 7,500 market lambs in a single shift.

ProAnd International designed the plant with optimum hygiene technology and processing efficiency. The plant, designed with the above capacity, was estimated to cost $7.1 million for the property, plant and equipment (PPE). A further processing addition to the plant is estimated to cost $2.74 million for the plant and equipment.

Expected expense to run the facility was configured using the ProAnd design. Upper Mississippi Family Meats could charge fees according to the following table for total fresh processing (slaughtering, boning, cutting and vacuum packaging subprimals). These fees include a 15% margin:

Species	$/hd at full plant capacity	$/hd at 80% plant capacity
Beef	$148	$185
Hogs	$44	$55
Lambs	$31	$38.50

The fees listed in the above table will be reduced by drop credit (hides, offal, byproducts) values, which are detailed in this manuscript. The impact on these processing costs by increasing the pay rate of workers was evaluated in this study.

An important part of the plant is a further processing addition that will manufacture ground meats, sausage, cured and cooked/smoked meats, and portion controlled case-ready fresh meats. The following table includes expected fees to further process according to the following categories. These fees include a 15% margin.

Process	$/lb at full plant capacity	$/lb at 80% plant capacity
Grinding/sausage manufacture	$0.22	$0.26
Marination/cooking	$0.35	$0.41
Case-ready packaging	$0.55	$0.62

These calculated processing costs were compared to several custom plants in the region that have the capability of processing beef, pork or lamb. With the plant running at or near capacity, the costs to slaughter, fabricate and package fresh meat products for Upper Mississippi Family Meats including a 15% margin were similar in cost to comparative custom plants. When the plant is at 80% capacity, the charges to process are higher than comparable plants. Aggressive marketing of offal and hides to provide significant drop credits are required to bring the high processing costs when processing at 80% capacity into range with comparative plants. Therefore, the goal of the planners must be to achieve at least 80% of plant's rated capacity of animals designed for the plant.

The Upper Mississippi Family Meats potential further processing charges including a 15% margin were lower compared to regional custom processing plants both at plant capacity and at 80% capacity.

The overall plan for Upper Mississippi Family Meats to build a specialty multi-species plant slaughter/fabrication/further processing plant is feasible provided the following core competencies are met:

a). Money can be raised by producers and producer groups to account for at least 50% of plant and equipment costs and working capital needs.
b). Adequate numbers of livestock can be enrolled in an agreement with the plant to assure a high percentage of daily processing capacity.
c). Skilled management and labor can be hired and maintained.
d). Individual producers and marketing groups using the plant can sustain their own operations.
e). The skillfully marketing of hides, byproducts, offal and specific meat products by plant personnel to collectively bring more revenue from

these products than what individual producers and marketing groups could accomplish themselves.

f). Tremendous organization, communication, and cooperation developed between users of the plant and the plant's management.

g). Skillful workmanship and production to customer's specifications of all products manufactured and sold from the plant.

h). Skillful combination of supply change management and plant operations.

i). Producers conscience about the delivered animal's health, overall condition, cleanliness, and quality.

Section 2. Introduction and UMFM Guiding Principles and Values

Upper Mississippi Family Meats (UMFM) is a cooperative that was organized in Iowa in March 2001. Several separate livestock groups desiring the investigation of a meat processing facility to collectively process their livestock formed this cooperative. The uniqueness of this processing cooperative is their guiding principals and values that is a basic requirement of any future business venture. These principals and values are as follows:

1). Sustainability and humane production.
Both the future processing of animals and the production practices in which the animals were raised must follow current and future sustainable practices sensitive to the environment and natural resources. UMFM believes in focusing a facility on sustainably produced livestock (organic, grass-finished, free-range, natural, etc), building partnerships with cooperatives, marketers, and distributors of these foods and in the process encouraging more sustainable practices in the region.

2). Local ownership structure.
UMFM believes in an ownership structure controlled by producers and local partners with built-in guarantees to stay that way.

3). Appropriate scale facility
UMFM's farms and communities are small and diverse. UMFM believes in a small-scale facility that will not overwhelm or dominate the communities and landscape, and a facility that can process multiple species grown in the area.

4). Sustainable processing facility.
UMFM believes in a facility that fits into the landscape, is self-sufficient, fouls neither air nor water, and achieves high levels of synergy with co-located business or industry.

5). Humane and hygienic practices.
UMFM believes in a facility that practices both humane handling and slaughter techniques and achieves the highest levels of hygiene found anywhere in the world.

6). Community and worker friendly.
UMFM believes in a facility and management that values workers, families, and communities, and is rewarded with efficiency and productivity.

Why a meat processing facility based on the above values?

1). Contiguous flow of the above principles to the consumer.
The plant will operate with the same standards, principles, and values as that of the producers.

2). Marketability.
   a). The values listed above should have market appeal.

b). There should be an advantage in the marketplace to having a facility owned and controlled by the producers raising the livestock rather than a large corporate entity.

c). The plant itself will improve the marketability of the products produced in it because of ProAnd International technology resulting in superior hygiene, food safety, and longer shelf life.

3). All encompassing control of products.
Customers could find comfort in that all processing systems are under control of the company. This is typically not the case with custom processing.

4). Integrity of specific meat and byproducts for specific marketing programs.
Because all major processes are done under one roof and most products come from animals that are specially raised and are targeted to a specialty market, there would be little chance of contamination with conventional meat products.

Section 3. The Influence of Processing On The Marketplace

It is anticipated that the largest users of the proposed plant will individual producers and livestock marketing groups that have invested in the plant. These individuals or groups may already have established or emerging marketing programs and designated customers. The current prevailing thought is that Upper Mississippi Family Meats would only provide marketing services where these individuals or groups would have difficulty because of limited supply and resources. Therefore, the discussion in this marketing section is provided only as a supplement to current marketing efforts and is designed to concentrate on opportunities with a new processing facility.

3.1. Natural and Organic Marketplace

There exists a rapidly growing market called “natural” or “organic” that caters to individuals who are sensitive about the food they eat. The most common “natural” labeled meat products claim that the animals were raised with no added hormones, without the use of sub therapeutic antibiotics, and without the feeding of animal derived proteins. Currently, the words “natural” and “organic” mean different things according to the USDA and marketing companies. “Natural” means: containing no artificial ingredient or added color and is only minimally processed. Regulations also state that the label must explain the use of the word ‘natural’.

A requirement to get a “natural” label approved by the USDA and to ensure that the product is what the label says it is, a disciplined procedure must be written and followed. There must also be documents to verify that these procedures were followed and these documents must be current and available because the USDA could order an audit at any time.

Only a very small volume of beef and pork is sold with organic labeling and most of that product is frozen. There are several labels of frozen organic poultry products available today. It has been suggested that the use of organic labels with beef and pork will grow because of increasing quantity of certified organic acres. Comparatively speaking, most of the beef and pork is sold under natural labels.

On December 21, 2000 the final national organic standards were published in the Federal Register. According to the Organic Trade Association, organic livestock must be fed organic feed. Conventional feed will be allowed only if the organic feed supply has been compromised by a national, state, or local weather emergency, or by fire or flood on an organic farm. Growth promoters and hormones are prohibited. Synthetic vitamins and minerals are allowed. Animals must not be overcrowded, and must be allowed periodic access to the outdoors and direct sunlight. Antibiotics, wormers and other medications may not be used routinely as preventative measures. Antibiotics or other medications, however,

cannot be withheld if such treatment would save an animal's life. If antibiotics or other medications are used, the animal must be sold as conventional, not organic.

The "all natural" and "organic" marketplace is growing and demands higher premiums for both raw materials and finished goods. According to Supermarket News (September, 1999), sales of natural foods went above 8.3 billion dollars in 1998, which was 8 percent above the previous year. Sales of meat within these stores are unknown.

The following comments relates to this author's previous work analyzing the "all natural" meat marketplace. This author found that the greatest market opportunity with "all natural" or "organic" meat products to be in retail and some export markets. Little interest was found in the food service, both institutional and industrial (restaurants). Of interest and surprise was that institutional food service companies catering to health care institutions, found limited value and little interest in these products. As part of a study, two large retail markets specializing in exclusively "all natural" and "organic" products and several retail markets that offer both the above and traditional products were interviewed. One of the specialized "all natural" retail chains predicted a rate of growth of 30% over the next 5 years. Another chain was concerned about the growing competition of traditional retail beginning to carry "organic" or "all natural" products.

Why are livestock producers becoming more active participants in natural and organic meats?

The natural meat markets are more complicated, difficult and costly to produce for. However, there are at least five excellent reasons why producers would want a financial stake in a business involving natural meats.

a). The natural meat marketplace is rapidly growing. There has been rapid growth of retail companies specializing in natural and organic products. There also has been a rapid growth of traditional retail supermarkets that have added natural and organic food sections.

b). Natural products are less sensitive to price and demand much greater prices from the consumer than conventional products. In many retail stores the price per pound of natural meats is double that of convention products of similar quality.

c). It is much more difficult for large meat companies to control the natural meat business. Production and processing require very specialized and disciplined procedures and documentation. The larger the company, the more difficult it is to control the processes involved especially in animal production.

d). If producers owned the company, the disciplined production procedures would be much easier to control. The owners of the company would then

have a stake in how tight the process was controlled and would be incentified to follow procedures.

e). Owning a natural meat company is a natural fit for livestock producers because they are environmentally and animal welfare conscious. Consumers who buy natural food should be attracted to a producer owned and controlled company.

3.2. Other Niche Market Opportunities

3.2.1. Sustainable agriculture

There has been an increase in the use of sustainable farming practices by recognizing farmers who produce food in environmentally and socially responsible ways through a “Seal of Approval” program. Several producers and producer groups are using guiding principles with livestock by “raising livestock in healthy and humane conditions, without administrating either growth stimulating hormones or sub-therapeutic antibiotics”. Some examples of healthy and humane living conditions include providing livestock with grazing in fresh air on pastures and/or range, providing swine with deep bedded lodging, designing animals holding areas and animals movement strategies that allow for the expression of normal animal behaviors. The Midwest Food Alliance is an example of an independent third part guide, reviewer and auditor of these production practices.

3.2.2. Grass finished beef

There is a defined market for free-range beef but today the market and supply is small. New marketing efforts have had some success because of potential health benefits of grass-finished beef primarily because grass-finished cattle are leaner than grain-finished cattle and contain a higher concentration of conjugated linoleic acid (CLA), a natural occurring fatty acid in the family of beneficial Omega 3 fatty acids.

There are specific reasons that the supply for grass-fed, free-range beef is small. The greatest difficulty is achieving year-round production. Grass pastures produce decent weight gains with cattle provided that the grass remains in a vegetative state. This is a big problem in the Northern, Mid-Western and Western States of the U.S. These areas have excellent grass but not year-round grazing. New Zealand and Argentina are well known for their grass-finished beef. These countries have an advantage in year-round grazing opportunities. A four-year-old cooperative of beef producers in Kansas (Tallgrass Beef), selling beef using a free-range grass finished label, recently suspended operations partially because they could not supply customers on a year-round basis.

The other major reason grass finished beef is not commonly found in the U.S. marketplace, is because of palatability concerns. There has been much

discussion about flavor and tenderness differences between grass-finished beef and grain-finished beef. There have even been some research trials analyzing flavor compounds and tenderness between these products. However, the research is limited and in some cases inconclusive.

Producing and marketing grass-finished, free-range beef could be a marketing opportunity for producer groups in the US. Grass-fed, free-range beef from Argentina did make a significant presence in U.S. markets and was even featured in some Whole Foods retail outlets until Hoof & Mouth Disease interrupted the exports. This country is now cleared to export to the US again. There are only a few beef companies that produce and sell beef products labeled as free-range or grass-finished on a regional or national basis. They include: Lassater Grasslands Beef, Matheson, CO.; Ervin's Natural Beef, Safford, AZ. (claims for predator friendly and humanely produced); and. Conservation Beef, Lander, WY (beginning program sponsored by the Nature Conservancy).

To be successful selling free-range, grass-finished beef, customers have to realize that fresh beef may only be available six months of the year. Therefore, to get adequate supply year-round, the customer must be able to receive frozen products during the winter and early spring months. Also, it is this author's opinion that genetic selection will become even more critical. For this system, selection for an early-maturing beef animal with the propensity for marbling would be advisable. Although, there may be a legitimate market opportunity for grass finished, free-range beef produced by American beef producers; there will be a need for disciplined production system and market development.

3.2.3. Locally grown by family farmers

Many customer intercept studies and focus interviews show a powerful draw to products that are locally grown by family farmers. Farmland Industries' logo of 'Proud To Be Farmer Owned' has been considered by company executives to be one of the company's most valuable assets. Consumers have a genuine trust and respect for the American farmer. This trust and respect can often be used successfully as a marketing tool.

3.2.4. The plant as a selling tool

The meat industry has had a somewhat bad historical reputation of pathogenic bacteria contamination of its products, unsanitary conditions, and bad working conditions for its workers. There are few relatively new modern smaller plants in the US. The prospective plant represented in this study is not only new; it is highly innovative resulting in efficient production and superb hygiene. The Booze-Allen and Hamilton report on international beef processing efficiency in 1992 concluded the New Zealand new generation plant to be most efficient and best in class. Comparisons were done with meat processing units in five of the world's major processing nations.

Research conducted by the Meat Industry Research Institute of New Zealand (MIRENZ) has shown that the average shelf life for beef in New Zealand plants is in excess of 80 days; whereas, American beef is slightly over 60 days. This comparison is an example of superior hygiene practices used by New Zealand meat firms.

Features/Benefits Of The New Zealand Processing System:

- Minimal complex equipment
- Minimum overhead costs
- High productivity. Maximum utilization of skilled labor. People work smarter.
- Compact size.
- Lateral thinking applied to process design and operation.
- Flexible design. Additional product recovery as and when required.
- Small package but high annual throughput.
- Minimum facilities at start-up. Add operations without interrupting the on-going process.
- Direct production costs reduced 40%.
- Processing rates 20-35 cattle per hour.
- No water on carcasses.
- Hot, warm or cold boning options.
- Side or quarter on rail boning.
- US plants have maintained manning levels but dropped throughput rate. Post slaughter steam sterilizing cabinets is acceptance of contamination.
- Fewer hands touching carcass.

3.3. Customer Profiles

3.3.1. Potential users of the plant

The potential users of Upper Mississippi Family Meats plant could be the following:

3.3.1.1. Individual marketing group investors

It is anticipated that the largest user of this plant will be the individual livestock marketing groups that have invested in the Upper Mississippi Family Meats plant. As will be further discussed, these marketing groups could represent different species groups. It is also anticipated that most of these marketing groups will be producer-owned or influenced; however, there are other private niche marketing groups that purchase raw materials from producers that could be an investor in the plant as well. A board of directors representing the investors would be responsible for the overall management of the plant.

3.3.1.2. Individual producers

Individual farmers who currently do not belong to a marketing group but are direct marketing their own meat products may be potential investors in the plant.

3.3.1.3. Non-investor producer marketing groups

It may be possible that the capacity of the plant is greater than the sum of the investor's represented raw materials. Excess plant capacity may be available during certain times of the year. Non-investors could use the plant during available excess capacity but at a use rate greater than that of the investors.

3.3.1.4. Upper Mississippi Family Meats with purchased livestock.

It is usually a good business decision to run the plant at or near capacity to keep trained labor with the company and to optimize production efficiencies. If the market allows, it may be a good policy that that the plant itself would actually purchase outside livestock for processing and selling during periods of the year when there is excess capacity in the plant.

3.3.2. Potential purchasers of products from the plant

It is anticipated that the individual marketing groups who own a portion of the Upper Mississippi Family Meats plant will bring their own customers as target markets. There may also be cases where the plant can help develop and sustain new markets. These customers could include one or more of the following:

- Local and national retail chains
- Local retail markets
- Retail distribution companies
- Industrial food service distribution companies
    - Restaurant service companies
- Institutional food service companies
    - Health care institutions
    - Schools

- Export companies
- Other natural/organic meat marketing companies
- Direct marketing companies

3.4. Other Competing Producer Owned Processing Operations

There are becoming an increasing number of companies started that are owned and controlled by the producing members. These companies are potential competitors of UMFM for livestock and niche markets. Perhaps the only groups that would not be competitors of other producer owned plants and marketing companies would be small individual direct marketers. A partial listing of producer owned companies with their own processing facilities include:

Farmland Industries, Kansas City, MO. Farmland Foods is currently the 9th largest meat company in the world with $4.4 billion in sales annually. Farmland Foods slaughters and further processes including case-ready packaging of beef and pork. They are a farmer cooperative with "Proud To Farmer Owned" as their sales motto. Farmland has large pork plants in Denison, IA, Monmouth, IL and Crete, NE. Because of their large size, Farmland does not custom process for other livestock producers. Farmland beef and pork products are heavily found in most markets in the Midwest.

U.S. Premium Beef is a producer-owned closed cooperative of beef producers in its fifth year of operation. In conjunction with Farmland Industries, US Premium Beef owns National Beef Packers with two beef packing plants in Kansas. The members are paid a base price for their animals with additional incentives for quality and yield. These financial incentives coupled with the information feedback have allowed the members to more than double per head quality premiums in this short amount of time ($8.18 to $18.59 per head). Patronage dividends have also increased in each of the four years. The members with genetic knowledge of their cattle and a herd carcass grading history have been consistently able to receive premiums in excess of five times the average premium.

Ellison Meat Company, Pipestone, MN. Ellison Meat Company is a pork and beef further processing plant owned by 80 pork producers. This company's producer support group, the Pipestone, MN System, is made up of 250 producers. Besides the smaller Ellison Meat Company, the Pipestone System has a marketing relationship with Swift & Co. Genetics and production of weaned pigs are tightly controlled in this system.

Prairie Farmers Cooperative, Dawson, MN. Eighty-two mid-sized Minnesota pork producers invested in a new 80,000 head per year pork packing and further processing plant. This group has raised $2.6 million in equity capital and has committed 65,000 pigs annually to be processed by Prairie Farmers Cooperative.

The company plans to ramp-up their business by starting with the marketing of commodity fresh pork and the co-packing of processed pork for other marketers.

Pork America, New Liberty, IA. Pork America designates itself as the new national producer-owned cooperative marketing association and that collectively represent approximately 10 percent of total national pork production. Pork America is in the process of renovating the former Ace Union hog slaughter and processing plant in Estherville, IA. A limited liability corporation, American Pork of Iowa (APIA) was formed as a subsidiary of Pork America to operate the plant. The plant will begin with only 100 head of pigs per day with plans to increase to 600 head per day. The intent of the plant is to be custom processor of pork for Pork America members. The plant is estimated to begin operations during the first quarter of 2002.

Dakota Halal Processing Company, Maddock, ND is owned in part (60%) by Central Dakota Beef, which is a limited liability company made up of 56 beef producers. A new beef slaughter/processing plant was built that will slaughter 5,000 head of fed cattle and cows per year for Muslim markets.

Iowa Lamb Corporation, Hawarden, IA. Iowa Lamb Corporation is owned, in part, by lamb producers that supply it. The producer-owners supply the plant during the typical Midwestern delivery season (result of spring lambing) of August to February. The plant slaughters 450,000 head per year and is one of the largest lamb processing plants in the US. The company advertises its meat as coming from a vertically integrated and controlled company.

3.5. Selling Of Slow Moving Or Difficult Parts Of The Carcass

Regardless of the species of animal, there are portions of the carcass that are either undervalued or difficult to sell. These generally are the offal products, trimmings generated from boning of the carcass, and the muscles of locomotion that are less tender and that have more connective tissue than muscles of the loin and rib areas of the animal. Offal is usually sold to companies specializing in the export of frozen meat items. The trimmings are generally marketed to meat companies that manufacture ground meat products such as ground beef, pork and lamb patties, sausage products and restructured products. The whole muscle products from the arm, shoulder and leg regions are often sold to retail companies that display them in the fresh state for resale as roasts. Some meat companies purchase these products for pre-cooking purposes for resale to the food service and retail industries.

Often, a meat marketer representing more than one species has an advantage over those that offer a single species. Also, volume is an advantage in selling meat products. It may be possible that Upper Mississippi Family Meats plant would be responsible for representing in the marketplace all of these undervalued products from the various species of animals processed.

The greatest potential revenue generators of undervalued or difficult-to-sell meat items from all of the various species are to add value to them by further processing. Further processing could be in the form of grinding into a variety of fresh and frozen products such as ground patties and sausages. It could also include cooking for the selling of precooked roast products. With pork, curing and smoking of hams, picnics, and bacon typically add significant value to undervalued legs, picnics, and bellies. Unfortunately, further processing only becomes possible with further investment into facilities, labor and equipment, which will be discussed in detail in Section 7.

Section 4. Distribution To Target Markets

4.1. Distribution Methods

Delivery of meat products from the warehouse of the processing plant or its cooperating marketing company to the dock of the customer is typically done: a) 'in-house' by the meat company with their own trucks (owned or leased); or, b) 'out-sourced' by a distribution company.

4.1.1. In-house distribution

In-house distribution requires attention to be placed on the following overhead criteria:

a). Truck or trucks equipped with refrigeration units
b). Labor (truck drivers)
c). Insurance
d). Truck maintenance
e). Fuel costs

4.1.2. Out-sourced distribution

There are two methods to outsourced distribution:

4.1.2.1. Companies that will pick up meat products and deliver them to a company's customers for a fee per pound or a fee per drop.
4.1.2.2. Companies that will purchase the meat products and then resell them to the customer.

UMFM will probably use a combination of the methods described above. Several small trucking companies are available for pick up and drops to several cities for a pick-up and drop charge. There is the possibility of UMFM exclusively using Blooming Prairie Warehouses, Iowa City and Minneapolis, representing the various marketing groups to their customers. This relationship and its requirements will be discussed further in Section 4.3.

4.2. Warehouse and Distribution Requirements

With the advent of better vacuum packaging and better hygiene practices during processing, one would expect that the shelf life and distribution life of fresh meat to be much better than even a few years ago. Shelf life is defined as the length of time before spoilage bacteria deteriorates the product beyond use. Distribution life is the length of time that is reasonable to distribute the product from packaging to display so that the consumer has adequate time under normal refrigeration temperatures to store the product at home without spoilage concerns. An average number of days that a retailer displays product is 2 to 3 days. The length of time between distribution life and shelf life differs among the species with beef being the longest and poultry being the shortest. A processor

who manufactures and labels the meat product often prints a “sell by” date that is reflective of that product’s distribution life.

The four factors that have the biggest impact on fresh meat shelf life are, temperature, oxygen, meat pH and beginning bacteria load. Storage temperatures for the carcass, boxed meat storage and transport temperatures should always between 28° and 32° F. The retail display temperature should be 33° to 34° F. Under 28° F, meat starts to freeze and over 34° F weepage begins to effect net weight and eye appeal plus bacteria rapidly multiples.

4.2.1. Beef

Boneless beef has a normal shelf life of 62 days under a vacuum package. If the product contains a bone, the shelf life is reduced 7 to 10 days. The distribution life of boneless beef and bone in beef should be around 21 days and 14 days, respectively. Fresh ground beef has a shelf life of only 14 to 16 days from the date of pack and should be distributed to the retailer within 7 or 8 days of packaging.

4.2.2. Pork

Typical “used by” dates for bone-in pork is 17 – 21 days post slaughter and 28 – 32 days for boneless pork. Ground pork would have the same shelf life and distribution life as ground beef.

4.2.3. Lamb

Fresh boneless and bone-in lamb has a shelf life and distribution life slightly under that of beef.

4.3. Blooming Prairie Warehouse Considerations

4.3.1. Background

Blooming Prairie began operations in 1974 and is a wholesale distributor of natural and organic foods and products. It serves retail natural food stores, buying clubs, buying services and other accounts such as restaurants, food service kitchens, and bakeries. The predominant customers are retail stores (approximately 80% of business) followed by buying clubs (18%). Early in the history of the company, buying clubs were a much larger segment of the business. Blooming Prairie operates from two locations, Iowa City (headquarters) and Minneapolis. The current trade territory is the Upper Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin and Wyoming.

Blooming Prairie currently sells 46 SKU’s of frozen pork, beef and poultry products. These include two poultry suppliers, two beef suppliers and two pork

suppliers. Blooming Prairie Warehouses financial issues will be used as part of this manuscript because:

a). Blooming Prairie is a cooperative and has been very supportive of Upper Mississippi Family Meats since their inception.

b). Blooming Prairie already distributes Organic Valley's 'Valley's Finest' products.

c). Blooming Prairie has in-roads into most of the natural food stores in the upper Midwest.

d). Blooming Prairie has expressed desire to be part of a possible Upper Mississippi Family Meats entrance into fresh, frozen and further processed natural and organic meat products.

4.3.2. Facility, overhead, cost, and return expectations

4.3.2.1. Facility requirements

Assuming 126,000 pounds per week distribution split between Iowa City and Minneapolis warehouse facilities. Capital expenditures to add a meat line will require two more cooling units plus compressors = $30,000 per location = $60,000. Drop curtains to separate compartments, thermostats, cost overruns and contingencies could result in $100,000 capital expenditure. Depreciation per year for the first years would be approximately $20,000 per year.

4.3.2.2. Labor requirements

Assuming 126,000 pounds per week, labor rates at $12 / hr + 40% benefits = $850 to $1,000 / week added labor requirements.

4.3.2.3. Marketing costs

This is difficult to predict because current staff will absorb some of the marketing tasks. Assume $50,000 / yr.

4.3.2.4. Utility requirements

Estimated to be $35,000 / yr

4.3.2.5. Operating costs (warehouse labor, maintenance, etc.)

Assume 3% of sales
Assume $4 / lb average meat item & 126,000 lbs / wk.
= $786,240

4.3.2.6. Transportation costs

Currently 82 routes, assume 30,000 lbs/route, $1.75/ mile, avg. distance = 1,000 miles/route.
Meat will be shipped in multiple temperatures trailers with other product.
Assume two new routes to be added = $200,000 / yr.

4.3.2.7. Breakeven volume (with facility capitalized in first year)
Assuming gross margins of $0.40 per lb
Total 1st year expense = $1,241,240
Breakeven volume per week (1st year)= 59,675 lbs.
Total 2nd year expense = $961,240
Breakeven volume per week (2nd year) = 46,213 lbs

4.3.3. Cross-docking considerations

The major change for Blooming Prairie is the handling of fresh meats. Blooming Prairie currently handles refrigerated dairy products and produce. Storage temperatures in the warehouse can be manipulated so that fresh meat is stored at 28° to 32° F; whereas, dairy products and produce are stored closer to 38° F. The multiple temperature trailers consist of three temperature gradients. Dairy products and produce could be stored for short periods of time at the lower temperatures but could freeze during long hauls. Therefore, each load that contains fresh meat must be strategically loaded to protect the condition of the load. Frozen meat products can be stored and shipped with other frozen food items.

Section 5. Animal Production

The steering committee of Upper Mississippi Family Meats distributed a survey to potential interested livestock producers in Iowa, Minnesota, and Wisconsin. A copy of the survey instrument is included in Section 11, Appendix A. This survey covered a 100-mile radius of Monona, IA. A map of this area is located in Section 11, Appendix B. Also, an interview with CROPP/Organic Valley meat program directors was conducted to gauge their program's current and future needs for processing facilities. Based on the results of these surveys and interviews, a prediction was made as to the size and type of facility that would be needed.

5.1. Expected Livestock Groups/Producers To Utilize The Plant

Many of the survey respondents did not claim to be affiliated with any organized marketing group but direct market their own organic or natural meat or sell their animals after finishing.

The CROPP/Organic Valley cooperative was the principal organized marketing group that represented a majority of the individual producers and their livestock.

Glacier Beef of Morrison, IL responded with the largest numbers of cattle in the survey. They are a cooperative consisting of 22 feedlots in Western Illinois with 500 to 2,000 head of feedlot capacity. They currently are getting their cattle custom processed and sold under 'process verified' labels through PM Beef at Windom, MN. Their numbers are not reflected in the table in Section 5.2 because of a high level of uncertainty whether they would participate.

Niman Ranch was the second most frequently mentioned organized marketing destination for producers in the survey.

Other new or small marketing groups or cooperatives mentioned include: Wholesome Harvest, Farming With Nature, Delaware County Meats and an unnamed project with Iowa Farmers Union. Several steering committee members have been working towards, but have no official organization as yet, a grass-finished, free-range beef production plan. A lamb-marketing group was represented in the survey. Some of the committee members have experience marketing to Laura's Lean Beef and feel that this program could be a candidate to use the UMFM plant.

5.2. Expected Numbers and Species Utilizing The Plant

5.2.1. Current

The survey asked the number and type of species in production now and how many were expected to be produced every year through the year 2006.

Year 2002 survey and CROPP interview results (hd/yr)

Species	Survey of individual producers, #hd / yr	# of producers returning surveys	% organically produced [a]	CROPP interview
Beef	2355	43	24%	1,700
Pork	10,915	12	8%	3,000
Lambs	3,745	16	2%	Not reported
Chickens	54,850	6	93%	Not reported
Turkeys	380	4	79%	Not reported
Bison	270	2	0%	Not reported
Ducks	5,000	1	100%	Not reported
Emu	150	1	0%	Not reported

a. Percentage certified organic or soon to be certified organic

5.2.2. Growth plan

Today's livestock production numbers are not as important as those projected two years from now. It typically takes two years to develop the plan, raise money and build a production facility. Therefore, the projected numbers in 2004 would be more meaningful than the numbers of livestock available today.

Year 2004 survey and CROPP interview results (hd/yr).

Species	Survey of individual producers, # hd/yr	# of producers returning surveys	% organically produced [a]	CROPP interview
Beef	3,318	43	40%	3,900
Pork	10,405	12	10%	4,400
Lambs	4,068	16	6%	Not reported
Chickens	155,850	6	97%	Not reported
Turkeys	1,120	4	89%	Not reported

a. Percentage of animals/birds in survey organically certified or soon to be certified

Survey information is helpful to capture information about the raw materials for a future processing plant but can seldom provide total accuracy. A critical question is – 'how does these numbers reflect the overall population of naturally or organically produced livestock within a 100 mile radius of some point in NE Iowa'? This is a very difficult question to answer. It is also very possible that producers raising livestock using conventional production practices would switch to raising livestock using natural or organic standards.

5.2.3. Overall population of livestock from same geographical region

The following table provides an estimate as to the total population of cattle, hogs, and lambs within the approximate area shown in Section 11, Appendix B (100-mile radius from Monona, IA). This information was obtained from county reports from Iowa, Wisconsin and Minnesota regions of the National Ag Statistics Service. The different states report this information in different methods and have livestock census information from different years.

Iowa (29 counties) **fed cattle marketings - 2000**	**Iowa (29 counties)** **hogs marketed 1997**	**Iowa (29 counties)** **Sheep and lamb marketings 1997**
417,200	8,758,852	62,660
Minnesota (8 counties) **Cattle & calves on feed 2001**	**Minnesota (8 counties)** **Annual pig crop 2000**	**Minnesota (8 counties)** **Total Sheep & Lamb inventory**
31,400	1,046,000	13,000
Wisconsin (23 counties) **20% of total cattle & calves 2001**	**Wisconsin (23 counties)** **All hogs & pigs 1999**	**Wisconsin** **Entire state market lambs 2002 (No county statistics kept on lambs)**
329,400	449,000	15,000
Total = 778,000	Total = 10,253,852	Total = 90,660
UMFM anticipated capacity as % of total	**UMFM anticipated capacity as % of total**	**UMFM anticipated capacity as % of total**
1.80%	0.17%	8.27%

Section 6. Processing

6.1. Processing Requirements To Meet Market Demands

The beauty of a new processing facility is that one can design and build the facility to match specific market needs. One must also consider future technologies and requirements of the marketplace. The purpose of this processing section is to lay out the plant along with appropriate assumptions so that the plant design accommodates processing needs of special markets that were previously discussed.

6.1.1. Certification

Many specialized markets require certification that certain procedures were following in the production of the animal with harvest and processing follow-through. The only definite certification requirement known at this time is organic. To meet the requirements of organic markets, the plant will have to be certified by whatever certifying agency that the marketing company uses for production and labeling. It is also possible that other third party certifying agencies would have to certify the plant for special market programs other than organic. Certain export programs such as the European Union (E.U.) certification require a great deal of monitoring and verification exercises. All of these requirements should be fairly simple to meet with a new facility. Halal and Kosher certification will be addressed in Section 6.1.4 and 6.1.5.

6.1.2. Humane Slaughter

There has been a great deal of publicity of late that the Humane Society and People For The Ethical Treatment of Animals (PETA) have been challenging chain restaurants such as McDonalds and Burger King to more closely monitor the harvesting practices of their suppliers. The USDA Food Service Inspection System (FSIS) has always had strict standards on humane slaughter in packing plants but there has been public pressure for this agency and the packing companies to do more to insure humane handling and harvest procedures of livestock.

Because meat products sold from the plant will be going to specialized markets with customers sensitive to things such as animal welfare and humane treatment of animals, extra precaution and care should be given to animal holding pen conditions (adequate space, soothing environment), movement of the animals to the knocking chute (small numbers at a time in a facility that eases their movement and reduces the desire for flight), and humane stunning. Properly designed facilities and careful operating procedures also benefit the processing company by improving meat quality. The design of the plant (Section 11, Appendix D) and the process description (Section 6.3) were done with humane animal handling and harvesting in mind.

6.1.3. Source Verification or Identity Preserved

Many of the meat customers will expect or require that the meat is source-verified. In other words, the meat customers will expect that Upper Mississippi Family Meats would be able to match their meat to the specific farm that produced it. To accomplish this, the fabrication room will need to be able to match a particular carcass number to its corresponding parts that are either sold or further processed. Because this plant is small and will be equipped with a computerized inventory system, source verification is achievable.

6.1.4. Halal Slaughter

The word "Halal" to the Muslim community means proper or permitted by Allah. A Halal process requires certified operators practicing their faith and under the authority of a Muslim organization. Acceptable species are lamb, goats, and beef. Pork is considered Haram meaning prohibited or forbidden.

6.1.4.1. Pork.

If pork is processed, it must be totally segregated from Halal carcasses/meat and the area must be washed/sanitized/inspected before any Halal carcasses/meat goes through that area.

6.1.4.2. Technique.

Slaughter requires that the throat and jugular veins are cut across but not the spinal chord so that death is by bleeding with the heart operating. The animals have to face Mecca when expiring. The captive bolt stun has to be modified with a mushroom head so that the animal is rendered insensible to pain before the Halal cut is made. A documented procedure will be required to be written and approved by the Muslim Authority.

6.1.4.3. Strategy.

To process animals for the Halal market would require an additional slaughter man (Muslim) and a change in processing to isolate hogs for slaughter. Hogs would either have to be eliminated in the weeks that Halal slaughter was conducted or perhaps be done on a Friday for fresh pork load-out on Monday to prevent any cross-contamination with the Halal lambs and/or beef that was processed earlier in the week.

6.1.4.5. Cost

The cost to process Halal will involve the expense of hiring a Halal slaughter man and the annual service free to the Muslim Authority Certification.

Halal slaughter man -	$35,000 / yr
Muslim Authority Certification fee – assume	$10,000 / yr
Total	$45,000 / yr

6.1.5. Kosher Slaughter

Kosher is to the Jewish religion what Halal is to the Muslim religion. Kosher certification has stricter guidelines and requirements than Halal Certification. Making a claim of kosher on a product is a "legal" claim. The Federal Register (21CFR101.29) has a paragraph indicating that such a claim must be appropriate and approximately 20 states, some counties, and some cities have laws specifically regulating the claim of "kosher."

6.1.5.1. Acceptable species

Ruminants with split hoofs, the traditional domestic birds, and fish with fins and removable scales. Non-acceptable species are: pigs, wild birds, sharks, dogfish, catfish, monkfish, and similar species along with all crustacean and molluscan shellfish. If pork is processed, it must be totally segregated from kosher carcasses/meat and the area must be washed/sanitized/inspected before any kosher carcasses/meat goes through that area.

6.1.5.2. Parts of the carcass

The kosher marketplace represents only the forequarter of the animal. In beef, this represents the brisket, chuck, navel, and part of the rib primal. In lambs, this represents the fore-saddle.

6.1.5.3. Technique

Kosher slaughter requires rabbinical services to inspect the animal alive, perform the actual “sticking procedure” and to inspect the internal organs. This requires special welfare area for the rabbis and special neck restraining equipment for cattle. The throat and jugular veins are cut across but not the spinal chord so that death is by bleeding with the heart operating.

6.1.5.4. Rabbinical Services

There is a full range of rabbinical services for a company wishing to produce kosher meats. A company can develop their own market and labels for Kosher products and use the rabbinical services only to certify the meat for sale. To the opposite extreme is the rabbinical service providing financing for their services and assistance in selling kosher meat products. The first is a high risk; high reward approach to the kosher market by the packer and the latter is a low risk, low reward approach. Most Rabbis in the meat business will admit to the kosher market being highly political.

6.1.5.5. Cost

The cost of rabbinical services can vary with special arrangements with packers but can run as high as $100,000 per month. As mentioned in 6.1.5.4 above, a lower cost, lower risk, lower reward marketing program can be worked out with specific rabbinical services.

6.2. Size and Scale Of Proposed Facility

The size of the plant was determined using the year 2004 survey results (Section 5) to gauge the possible use of this plant adjusted for animals or producer groups not covered by the survey and normal growth coupled with ProAnd International's expertise in optimum plant throughput. The plant is designed to process approximately 14,000 beef cattle per year, 17,500 market hogs and 7,500 market lambs in a single shift. This design provides 280 cattle, 350 hogs and 150 lambs per week.

Bison could be processed in place of beef animals on a special-case basis. Poultry will not be slaughtered in the same federally inspected facility as beef, pork and lambs. Poultry can be boned and further processed in the same fabrication facility provided the facility receives poultry inspection approval from USDA FSIS. There are concerns of salmonella cross contamination from poultry to other species and a compete fabrication room clean up and sanitation is required after poultry has been processed. While waiting processing, poultry will have to be kept completely segregated from the other meat species.

Although, it is possible to bone and further process poultry and meat in the same facility, this feasibility study will only cover beef, pork and lambs. Fabrication and further processing will be designed to match slaughter. Poultry processing will complicate the study to a point that may risk accuracy.

6.2.1. Proposed Kill Pattern

	Mon.	**Tues.**	**Wed.**	**Thurs.**	**Fri.**	**Head/ Week**
Beef	56	56	56	56	56	280
Hogs	87	87	88		88	350
Lambs	-	-	-	150	-	150

6.2.2. Proposed Line Speeds

- <u>2 crews – 1 for beef and 1 for small stock on slaughter floor</u>

Beef	7.5 per hour	x 7.5 hours = 56
Hogs	11.6 per hour	x 7.5 hours = 87
Lambs	20 per hour	x 7.5 hours = 150

- Could still offer a specific branded beef company slaughter space on a night shift - capacity is reduced to 14,000 per year.

- A further option not discussed in detail for this report is to commence operations with a 12/hour beef only kill/cool/fabrication. This would enable:

- Hogs and lambs to be added as modules.
- A double shift (5 days per week) gives a capacity of 45,000 cattle/year.

6.3. Process Description

6.3.1. Stockyards

- Livestock are received by road transport; unloaded, tallied, recorded and then cattle are washed prior to slaughter.

6.3.1.1. Holding pens and delivery recommendations

- The holding pens for the various livestock species should always have water available for animals awaiting harvest.

- Feed is not required unless a set of livestock is delivered after a period of extreme stress or an excessively long haul (> 10 hours). In this case, the animals should rest for a period of greater than 24 hours.

- The target time for harvest is within 8 hours after animals are loaded onto trailers on the farm (previous research conducted and published by the author).

- Following cattle washing and resting the livestock are driven up the kill race for stunning.

- The lambs and pigs will be electrically stunned whilst the cattle will be manually stunned, using a captive bolt.

6.3.2. Slaughter

- Beef

6.3.2.1. Stunning

For humane stunning (pain insensitive) there are two systems:

System (i) Percussion
- (a) Captive bolt
- (b) Mushroom head

System (ii) Electrical
- (a) Head
- (b) Head and brisket.

Note: In (ii)(b) the heart is stopped and motor reflexes eliminated.

Stunned Phases

There are two distinct phases:

Phase (i) Tonic or rigid lasts between 10 to 15 seconds

Phase (ii) Clonic or kicking lasts between 15 to 45 seconds.

Note: Phase (ii) eliminated in System (ii)(b).

Effects of stunning

System (i) (a) and (b)

- Stunning is achieved by the energy that the bolt or mushroom impacts to the head. The penetration of the bolt does not cause unconsciousness on its own.
- The heart can carry on beating for many minutes and will eventually stop.
- Shackling and hoisting must be done in the 10 to 15 second Tonic phase.
- Sticking should be within 2 minutes of stun.

System (ii) (a)

- Stunning is achieved by a head only stun.
- The heart remains beating and the animal could regain sensibility.

*

System (ii) (b)

- Stunning is achieved by a head to brisket stun.
- The heart is stopped and motor reflexes eliminated.
- Stick after hoisting.

Problems

Captive bolt stunning

- Aim is to achieve 99-100% stun with first shot.
- Lower results indicate maintenance need on stunner.
- Animal even when correctly stunned will spasm and can be a safety issue at sticking.
- USA researchers report finding brain tissue in hearts from air injected.
- Captive bolt stunners – potential B.S.E. risk.

Electrical

- With all electrical stunning systems contact between electrodes and

animals is critical.

- Use a captive bolt stun if electrical stun is not effective first time.
- Blood splash – hemorrhages inside the muscle.
  Correction: Lower current
- Stun to stick within 6 seconds
- Electrical contact.
- Speckle – similar to blood splash but along sides and back.
  Correction: Shorter stun time
  Lower current
  (Sheep and lamb) open v restrainer.

6.3.3.2. Post-stunning

After stunning the body rolls onto a dry landing area and is shackled and landed. Electrical stimulation clip is applied to the nose (tenderness). The next operation is to stick, free, ring, rod and tie (plastic clip to prevent contamination) the weasand (esophagus), then remove the head on to the head rail. The carcass is then lowered onto the dressing bed for trotter removal, opening up the brisket area (flanking), opening cuts on both legs and brisket sawing. The beef hooks are inserted into the hind legs and attached to a tree.

The carcass is pulled to the back of the dressing bed. The carcass is ringed and the bung tied (using elastrator ring and covered with a plastic bag to prevent contamination). The hide is rumped out in preparation for hide pulling.

Hide pulling is downwards by attaching the hind leg flaps to floor rings and hoisting the carcass. Evisceration is into a buggy where the offals are transferred to the collection points for recovery. The carcass is then hoisted and landed. A spreader moves it into the sawing position.

The hide is removed from the head. The carcass, head and offal is then inspected. Any carcass that requires any further inspection or trimming shall be directed to the detain rail. Sides are trimmed and internal and external fat is removed.

Carcasses are identified and weighed as sides. The information is then recorded and tickets are attached to each side for cooler identification. Beef sides are then railed to the coolers.

- Lambs

Stunning is electrical with hand held stunner. The carcasses fall out into a catch tray where the hind leg is shackled. The neck is opened and a clear cut made to open, expose and clip the weasand prior to carcasses being hoisted by the hind leg. Low voltage electrode nose clip to carcass, stimulate for 90 seconds (tenderness). The carcass bleeds out on the walking rail. Carcass is then transferred to the solo-dressing rig by pneumatic walking beam conveyor. Fore legs are placed in fore leg spreader attachments. Hind legs are removed from the bleed shackle and while in the inverted position the pelt and hocks are removed and the carcass re-inverted for gambrelling.

The carcass is suspended from the dressing rail by the hind legs and presented for evisceration by the pneumatic walking beam conveyor. Offal is placed in the rotary viscera table for inspection. The brisket is cut. The carcasses and offal are then inspected. Any carcasses which require further inspection or trimming are transferred to the detain rail. Offals are placed on the rotary viscera table for delivery to the recovery room. Carcasses are weighed, graded, tickets attached to their hind leg and manually transferred to the wash cabinet, sprayed with potable water to remove any minor contaminants and transferred to the carcass cooler.

- Pigs

Pigs will be electrically stunned using a hand held stunner. The stun box will be the same for pigs and lambs.

The stunned pigs will discharge from restraining box. One hind leg is shackled and the carcass is lifted to the receiving table where it is stuck. After bleeding the carcass is lowered into the scalding and dehairing machine. The carcass is then ejected to the shave table where any excess hair is removed by scraping or a manual blowtorch. Carcass is then washed and scrubbed before ears, eyelashes, toe nails and trim around the stick wound.

Carcass is transferred to the lamb chain for evisceration on the rotary viscera table. Inspection of the carcass and offal takes place. Any carcass which requires further inspection or trimming will be transferred to the detain rail. The offals are transferred to the recovery room. Carcass is now ready for grading and weighing. All weights and grades will be recorded with tickets applied to the hind leg. The carcasses will then be transferred to the carcass cooler.

6.3.3. Carcass coolers

- Hot dressed carcasses (lambs/pigs) and sides (beef) are conveyed to the carcass coolers for overnight chilling (pigs/lambs), 48 hours for beef.

- To minimize cooler weight loss all active beef carcass coolers will be fitted with spray chilling.

6.3.4. Fabrication (Beef, pigs and lambs all processed in the same room)

- Beef

  - Chilled sides are conveyed into the fabrication room where they are quartered and undergo a pretrim to remove any contaminants.
  - The boning system is an on the rail quarter boning conveyorized system. Beef quarters are hung by the fores and hinds and the primal cuts are removed by following the natural seams. This system uses gravity to assist with the removal of each cut. The cuts are removed and placed on trimming tables to remove excess fat and prepare the cuts for packaging.

    Sub-primal cuts will be conveyed to the vacuum packaging machine for bagging, vacuuming and packing into boxes before being transferred to the box cooler and sold fresh.

    Bulk pack meat, e.g. grinding, will be conveyed and packed into combo bins by lean type for further processing or sold fresh.

  - All product is weighed and recorded prior to transfer from the fabrication room.

- Lamb

  - Chilled carcasses are conveyed into the fabrication room where they undergo pre-trim to remove any contaminants.

  - The carcass is then passed through a bandsaw to separate the carcass into the three primal cuts – fores, middles and hinds. The portions are pushed onto a conveyor.

  - Depending on the required specification cuts will be boned into sub-primal cuts and trimmed to remove excess fat. Some bone-in cuts will also be produced.

  - After cutting, boning and trimming the sub-primal cuts will be conveyed to the vacuum packaging for vacuuming and

packing into boxes before being transferred to the box cooler and sold fresh.

- Product that is not vacuum packed will be bulk packed into combo bins and stored in the cooler, either for further processing or sold fresh.

- All product is weighed and recorded prior to leaving the fabrication room.

• Pigs

- Chilled carcasses are conveyed into fabrication where they undergo a pre-trim to remove any contaminants.

- Carcasses are sawn into shoulder, middle and leg.

- The portions are then pushed onto a conveyor where the operators select the cut and process it according to the required specification.

- After deboning and trimming sub-primal cuts are vacuum packed into boxes or combos. Trimmings are packed into combo bins. All product is stored in the cooler and is either sold fresh or further processed.

- All product is weighed and recorded prior to leaving the fabrication room.

6.3.5. Box cooling, freezing, cold storage, and product load-out

• Following fabrication boxed product is dispatched to the blast cooler for cooling.

• All boxed edible offal will be frozen on site in the proposed blast freezers prior to dispatch.

• Provision has been made for hygienic load-out of carton/combo bins as shown via an environmental (temperature controlled) load-out facility (ELO).

6.3.6. Edible offal

• The assumption is made that most edible offal items will be saved and include:

Beef	Pigs	Lamb
Tongue	Heart	Tongue
Liver	Tongue	Liver

Head meat	Liver	Cheek meat
Cheek meat		
Tail		
Sweetbreads		
Heart		
Kidneys		
Weasand (esophagus)		
Pancreas glands		
Salivary glands		
Lips.		

- All edible offals are chuted from the kill floors following washing and trimming to the ground level where they are boxed and sealed.
- After boxing the boxes of edible offal are conveyed by a mechanical conveyor to the racking area of the fabrication room for racking and freezing.

6.3.7. Green offal / other byproducts

- The assumption is made that the full range of green offal (from digestive system) and pig items will be saved:

Beef	**Pigs**
Tripe	Neck bones
Omasum	Hock
	Snout
	Ears
	Fat.

- All tripe is processed through an automatic tripe processing system (washing, refining machines).

- Following cleaning tripe is chuted to lower level and packed into poly lined boxes, weighed, labeled and sealed prior to dispatch by conveyor to freezing.

- Neck bones and fat sold either fresh or frozen.

- Hocks frozen.

- Snouts and ears frozen, pet or rendering.

- Fat fresh or rendering.

6.3.8. Non-food material collection

- All non-food material from slaughter and fabrication operations is collected and assembled in the lower level basement under the kill floors. This area is fully separated from adjacent facilities.

- The area is ventilated to the exterior in such a way that **NO** smells enter the kill floor.

- Hides, skins and other non-food material are collected in bins/bulk containers.

- Condemned carcasses and offal are collected in lockable areas. At the end of processing these products are denatured with dye, placed in sealed containers and dispatched off site.

- Forklift access is provided to the basement area.

- All hard rendering material (from slaughter, boning) will pass through a prebreaker to reduce particle size prior to entering bulk non-food collection bins/trailers.

- All paunches will be opened and screened and paunch material collected, dewatered and conveyed to a paunch material trailer for off site dispatch on a daily basis.

- Provision is made for cooling of green hides and skins for daily off site dispatch in bulk leak-proof bins (water cooling).

- Blood will be stored in an enclosed collection tank and subsequently pumped to the collection company's truck.

- All process wastewater from the slaughter floor is passed through a rotary screen to separate any solids with resultant solids conveyed by screw conveyor to non-food collection.

- Screened effluent pumps and pipe system will convey screened process wastewater to the proposed effluent treatment system (TBC).

- A rotary screen located adjacent to the stockyards will screen all yard wastewater allowing manure to be collected and screwed into a small trailer for off site dispatch.

6.4. Product Yields

The following are indicative plant yields expressed on a per pound per head basis and include offal, bones, fat and non-food material. There are many different styles of cutting up these animals and different target products capable of being produced. However, the author has chosen the following as a representative sample.

6.4.1. Yields

- Beef
  - Average carcass weight = 700 lbs (hot weight).
  - Expected live weight to carcass dressing percentage = 63.5%. (it is expected that several different carcass weights and dressing percentages will be used in this plant, the exact dressing percentage is not critical for planning purposes)
  - Yield of boneless meat = 70%.
    (in the situation of this plant the exact dressing percentage is not critical)

Marketing Outlet – Boneless Weight Pounds

Beef	**Sell Fresh lbs**	**Grind &/or Sausage lbs**	**Cook lbs**	**Case Ready Products lbs**
Tenderloin	11.40			8.0
Ribeye	24.09			18.0
Striploin	23.07			15.5
Top sirloin	22.27			14.0
Brisket	19.83			10.0
Bottom sirloin tritip	5.23			4.5
Back ribs	11.64			-
Inside skirt	8.48			7.0
Flank steak	3.61			3.0
Cap and wedge meat		31.29		
Bottom sirloin flap		6.99		
Bottom sirloin balltip		4.56		
Shoulder clod			38.42	
Chuck roll			56.67	
Knuckle, bottom round		19.80		
Inside round			40.54	
Gooseneck round		51.44		
Lean trim 75%		63.73		49.0
Trim 50%		46.93		
Total	**129.62**	**224.75**	**135.63**	**129.00**

70% of hot weight

- Pork
  - Average carcass weight = 190 lbs.
  - Expected live weight to carcass dressing percentage = 74%.

Marketing Outlet

Pork	**Sell Fresh lbs**	**Grind &/or Sausage lbs**	**Process Bacon/ Ham lbs**	**Case Ready Products lbs**
Whole loin	35.95			
Whole loin boneless	20.00			19.50
Spare ribs	6.46			
Whole legs			46.42	
Whole legs boneless			23.21	
Boston butts boneless	16.00			
Jowls	5.40			
Bellies boneless			21.09	
Picnic boneless			21.00	
Lean trim		3.80		0.30
Regular trim		2.70		
Total		**6.50**	**56.30 Boneless**	**19.80**

- Lamb
  - Expected carcass weight 70 lbs.
  - Expected live weight to carcass dressing percentage = 54%.

Marketing Outlet

Lamb	**Sell Fresh lbs**	**Grind &/or Sausage lbs**	**Cooked lbs**	**Case Ready Products lbs**
Shoulder bone in	23.0			
Shoulder boneless		14.72		
Shoulder square cut	18.66			4.34 b/in
Shoulder square cut b/less	11.94			
Legs B.R.T.	11.7		10.0	
Loin bone in	7.7			3.70 b/less
Rack bone in	7.7			3.20 b/less
BR/FI/NK	9.8			
Shank	2.1			
Trim		14.70		1.15 b/less
Total		**29.42**	**10.0**	**12.39**

6.4.2. Beef

- Live carcass weight is 1,102 lbs (63.5% live weight).

- Dressed carcass weight is 700 lbs.
- Boneless meat yield based on production to further processing stage is 490 lbs per head, i.e. 70% yield.
- Cooler weight loss is estimated at 0.5% with spray chilling, i.e. 3.5 lbs per head.

	% Yield	Per Head lbs
• Edible offal		
Tongues	0.40	2.80
Cheek meat	0.40	2.80
Head meat	0.10	0.70
Tails	0.04	2.80
Kidneys	0.40	2.80
Hearts	0.50	3.50
Thick skirts	0.10	0.70
Livers	1.80	12.60
Tripe and honeycomb	1.20	8.40
Omasum	0.40	2.80
	5.34	39.90
Beef feet		18.0
• Pet food		
Lungs	2.1	14.7
• Non-Food Material		
Rendering material ex slaughter		162
Rendering material ex fabrication		206
Blood		39
Hides		56
Paunch content		73
• Summary of Plant Yields		
- Boneless meat production		490
- Edible offal @ 90%		36
- Beef feet		18
- Pet food		15
- Renderables slaughter/fabrication (offals @ 90%)		368
- Blood		56
- Hides		539
- Rumen content		73
• Weekly Production Prediction		
- Throughput 280 head from single shift		
- Boneless meat		137,200 lbs
- Offal		10,080 lbs
Beef feet		5,040 lbs
- Pet food		4,200 lbs

-	Hides	15,680 lbs
-	Blood	10,920 lbs
-	Rumen content	20,440 lbs
	Predicted Total Beef Output	203,560 lbs

6.4.3. Pork

- Live carcass weight 256 lbs (74% live weight)
- Dressed carcass weight is 190 lbs
- Meat yield 119.2 lbs.

	% Yield	Per Head lbs
• Edible offal		
Heart	0.34	0.65
Tongue	0.47	0.90
Liver	1.47	2.80
	2.38	4.35
• Other items		
Neck bones	1.91	3.63
Hock	0.60	1.14
Snout	0.33	0.63
Ears	0.33	0.63
Fat	11.83	22.48
	15.00	28.51
• Meat Yield		
Loin	10.30	19.5
Leg	12.20	23.21
Boston butts	8.40	16.00
Jowls	2.80	5.40
Bellies	11.10	21.09
Picnic	11.10	21.00
Lean trim	2.00	3.80
Regular trim	1.40	2.70
Spare ribs	3.40	6.46
	62.70	119.16
• Renderables		59.0
• Blood		7.7
• Rumen content		16.7
• Hides		20.5
• Weekly Throughput		
- Throughput 350 head from single shift		
- Meat yield		41,720 lbs
- Offal		1,540 lbs

-	Renderables	20,650 lbs
-	Blood	2,695 lbs
-	Rumen content	5,845 lbs
-	Hide	7,175 lbs
	Predicted Total Pork Output	89,600 lbs

6.4.3. Lamb

- Live carcass weight 133 lbs (52.5% live weight)
- Dressed carcass weight is 700 lbs
- Boneless meat yield on production to further processing stage is 51.8 lbs per head, i.e. yield 74%.

		% Yield	**Per Head lbs**
•	Edible offal		
	Tongue	0.57	0.40
	Liver	1.57	1.10
	Cheek meat	0.64	0.45
		2.78	1.95
•	Meat yield	74.00	51.80
•	Renderables		45.50
•	Blood		5.90
•	Skin		15.20
•	Feet		1.30
•	Rumen content		11.30

- Weekly Production Prediction
  - Throughput 150 head from single shift
  - Meat yield 7,770 lbs
  - Offal 300 lbs
  - Renderables 6,825 lbs
  - Skin 2,280 lbs
  - Feet 195 lbs
  - Rumen content 1,695 lbs

  Total Predicted Lamb Output 19,065 lbs

6.5. Offal / Rendering / Byproducts

6.5.1. Offal

Many of the offal items listed in Section 6.4 should be marketed by either the plant or the individual marketing groups or producers to maximize income potential. Because many customers for these items prefer purchasing them in larger volumes and the freight costs will eat up much of the profits for low valued items, the plant is in a better position to collectively market offal and byproducts as a service to the producers. The following table provides expected ranges in value of these products.

Species & item	Offal/Byproduct Value Range, $/hd
Beef Offal	15 - 25
Beef Hides	35 - 65
Beef Total	50 - 90
Pork Offal	3 - 5
Lamb Offal	2 - 5
Lambs Hide	3 - 9
Lambs Total	5 - 14

6.5.2. Rendering products

The following material is destined to be rendered off site (as there are no on site facilities planned) can originate from many areas within the plant. They include:

(i) Slaughter Floor
- Beef feet, hooves
- Udders, pizzles, testes and some offals and tails
- Trimmings
- Condemned material
- Gall (saved by collecting the contents of the gall bladder)
- Fat
- Heads.

(ii) Offal Rooms
- Trimmings
- Condemned material.

(iii) Fabrication Rooms
- Bones
- Trimmings
- Fat
- Condemned material.

(iv) Added Value Rooms

- Waste
- Condemned material.

(v) Non Food Areas
- Hide trimmings
- Calf fetus
- Condemned material.

6.5.3. Rendering customers

Two rendering companies have expressed interest in picking up rendering products from a future packing plant in NE Iowa. The products picked up would be bone, meat scraps, and fat waste products from the slaughter floor, and fat and bone products from the fabrication floor. These companies are: National Byproducts, Clinton IA and Darling International, Blue Earth, MN. Darling International will not take any sheep rendering material. National Byproducts will take sheep rendering material. There is no guarantee that these companies will pay a positive value for these rendering products. On today's market, there would be a small positive value.

Because the proposed plant is small, blood products could be added to the dry rendering materials and picked up by these two companies. However, there would be a charge to accomplish this. American Proteins, Ames, IA is in the market for liquid blood from packing plants. Depending on the current market for blood products, this company would pay a small premium for the blood, pay a net zero value, or actually charge to pick up the blood.

Also, because this plant is small, the above two rendering companies will pick up the paunch (material from the rumen of cattle and sheep) and add it to the other rendering material. However, there will be a charge to accomplish this. It may be accomplishable and advisable for the plant to collect the paunch material and have a local farmer haul it away on a daily or every-other-day basis for the purpose of fertilizer or animal feed.

6.5.4. Pet food opportunities

Products	Manufactured items	Investment
Sale of frozen pig snouts, ears, feet to pet food company	Chew toys	Non other than adequate frozen storage space
Sale of frozen offal to canned pet food companies or their suppliers	Canned pet food	Non other than adequate frozen storage space
Sale of natural or organic meat & bone meal	Certified natural or organic meat & bone meal & animal fat	Investment into a rendering plant to grind and dehydrate meat scraps and bones and cook/separate fat
Sale of semi-moist pet food	Semi-moist pet food rolls	Investment into processing equipment to cook, grind and emulsify meat, fat and bones and mix with dry ingredients.

The first two items listed in the above table require little or no extra investment. The last two items require investments that would have to researched and analyzed for the size of plant included in this study. In other projects with larger plants, these investments exceed $1 million.

6.6. Plant Manning

6.6.1. Assumptions

- Plant manning is preliminary and indicative of what can be achieved under a modern enterprise industrial environment.
- Proposed manning covers administration and operational and process labor encompassing slaughter, cooling, fabrication, by-products and product load-out.
- Inspection and livestock procurement are excluded.
- Manning reflects emphasis on the recovery of all edible offal.
- No allowance has been made for spare labor. Casual staff can be called upon on an as-required basis.

6.6.2. Base data

- Preliminary manning per hour is based upon the following:

	Beef	**Hogs**	**Lambs**
Kill floor	12	30	45
Fabricate	12	47	66

- 7.5 hours per shift x 50 weeks = 250 working days.

6.6.3. Preliminary manning (2 crews kill floor – 1 beef and 1 hog/lambs)

	Beef	Lambs/ Hogs
Yards/stun	0.5	0.5
Kill floor	4.0	4.0
Edible offal	1.0	1.0
Non food (includes stock receipt, effluent screens)	0.5	0.5
Tripe/Omasum, lamb casings	1.0	1.0
Hogs – other items (hocks, snouts, ears, fat, tails)		
Cooler in/out	0.5	0.5
Sub-Total	**7.5**	**7.5**
TOTAL BEEF, HOGS AND LAMBS	**15.0**	
Fabricate (1 crew)		
Pre-trim/quarter	1.0	
Boners	4.0	
Saw/pre-trim		2.0
Trimmers	4.0	
Bone/trimming		4.0
Packing	5.0	3.0
Bone trim	1.0	
100 lean	1.0	
Bone/roll/tie/special cuts	1.0	1.0
Weigh/record/carton room/floor	2.0	2.0
Sub-Total	**19**	**12**

Dispatch	**Beef**	**Lambs/ Hogs**
Sort and load into box cooler, blast cooler, frozen storage, cold storage	0.5	0.5
Order make up, load-out	0.5	0.5
Sub-total	**1**	**1**
TOTAL	**2**	
Maintenance		
Refrigeration, electrical, fitter (To recruit a person with all these skills may be difficult, in which case may need to outsource.)	0.5	0.5
Sub-total	**0.5**	**0.5**
TOTAL	**1.0**	
Administration		
Plant Manager	0.5	0.5
Accountant/Clerk	0.5	10.5
Supervisors kill floor	1.0	1.0
Quality assurance	0.5	0.5
Livestock co-ordination	0.5	0.5
Marketing/sales/production co-ordination	1.5	0.5
Sub-total	**4.5**	**3.5**
TOTAL	**8**	

Summary of Plant Manning

	Beef	Lambs/ Hogs
Total process staff	36	29
Total maintenance	1	1
Total administration	8	8
TOTAL PLANT MANNING	**45 ***	**38 ***

There is a difference of seven people between the days that beef are processed and that when lambs and hogs are processed. There may be several options on how to handle the days in which less labor is required.

- Some of these employees could float and assist in one of the further processing rooms on the days that lambs and/or hogs are processed.

- There could be a reserve of part-time workers used in the plant. These part-time workers could come from farms or other local community based occupations and may prefer less than forty working hours per week.

6.7. Plant Utilities

Plant utilities include water, electricity, gas, compressed air, ventilation and effluent treatment. (See Section 9.2 for a table summary of utility usages).

6.7.1. Water

- The assumption is made that a potable water supply will be available at site, in sufficient quantities, requiring no more than in-plant chlorination.

- Potable water requirements for the proposed new plant development are based upon:
  - Stock washing (beef only)
  - Slaughter
  - Fabrication
  - Offal processing
  - Plant sanitation.

- Allow approximately 530 US gallons per head beef
  160 US gallons per head hogs
  80 US gallons per head lambs.

6.7.2. Water heating

- Water temperatures required will be 180°F for sterilizing, 110°F for hand, boot and apron washing, and cold water for general use.

- The assumption is made that gas will be available at site for water heating. Hot water would be produced by a hot water generator of approximately 800 kW capacity and circulated through the plant at 196°F to provide water at 180°F at point of use. Where 110°F is required, the temperature would be adjusted (mixing valve) to suit at point of use.

- Water temperature breakout is estimated as follows:

	Break out
Cold	56%
110°F	22%
180°F	22%

- Assuming heating of water from ambient temperature to the required volumes and temperatures, water-heating requirements will be approximately 0.19 kWh/ lbs of hot dressed carcass weight

6.7.3. Water storage

- It is recommended that on-site water storage is provided. It is possible that a municipal water main could break that would leave the plant without a supply of water. Also, it may be necessary to treat the water with a antibacterial agent or chemical in the future.

- On site water storage of approximately 3 hours production requirements is recommended. This needs to be confirmed with the local Fire Department.

- It is estimated that the cost of tanks and installation to hold the equivalent of one day's storage would be $50,000.

6.7.4. Electricity

- The electrical supply must be adequate to meet the anticipated peak load.

- The electrical supply authorities need to make sufficient electricity available at an acceptable connection rate and competitive consumption price.

- High voltage, 3 phase power should be supplied to a transformer (800 KVA capacity) at site. The transformer will feed directly to the main switchboard located in the plant room and from there reticulated throughout the plant departments.

6.7.5. Heating, ventilation, air conditioning

- Dependant upon site location and local climatic conditions, air conditioning and heating may be required in the process areas (slaughter, fabrication).

- The food process areas will have positive pressure.

- Ventilation will be achieved by fresh air intakes with exhaust extraction in the roof.

6.7.6. Compressed air

- An air compressor of 1.2 cfm/head will be required to reticulate clean, dry air at 100 psi.

6.7.7. Refrigeration

- Refrigeration capacity of the following will be required (air temperatures):

- Cutting or fabrication room at 45-50°F
  The colder the temperature in this room the better for the meat. But, the workers must stay comfortable as well because they are in that room all day. Therefore, a compromise is used as long as the fabrication and packaging time is under one hour.
- Hold carcass coolers at 42-50°F
  The first cooler bay ("hot box") after slaughter is set at a higher temperature to prevent the carcass from chilling down too quickly resulting in "cold shortening" of the muscles. Sequential cooler after the first are set at cooler temperatures so that the overall meat temperature is around 40° F before fabrication.
- Box coolers to operate at 32°F
- Box freezers capability -22°F
- Box cold store to operate at -4°F
- Environmental load out (ELO) to operate at 32-38°F
- Edible offal rooms to operate at 45-50°F

6.7.8. CO_2 cooling

- Combo bin packed meat product will require CO_2 cooling. CO_2 snow usage is estimated at 28.7lb/head. An indicative cost of CO_2 is taken at $0.007/lb.

6.7.9. Effluent treatment

Effluent is a combination of the wastewater (equal to the water usage) used in the plant and waste materials flowing into the drains in the slaughter, refrigerated coolers and processing rooms. The amount of suspended and nonsuspended solids in the wastewater stream needs to be quantified so that a municipality or the company itself will know how to remove it or treat it to a concentration where it is safe for the environment.

Biological Oxygen Demand (BOD) is a measurement of the quantity of biological degradable organic matter in a wastewater stream in terms of the amount of oxygen required by microorganisms to oxidize it to carbon dioxide and water. The BOD load will range from 1,000 to 1,600 mg/liter or ppm in a plant such as the one being planned. The goal is be under 1,000 mg/liter. At 1,000 mg/liter, the daily BOD load for the plant at full capacity would be approximately 400 pounds pounds. BOD concentrations above 2,000 mg/liter are extremely high and mean that the plant is exhibiting no control over what goes into the drainage system.

Besides BOD, total suspended solids (TSS), fat concentration, and total nitrogen can be measured by a municipality or regulatory agency to gauge either treatment requirements or treatment efficacy. If a packing plant is utilizing a

municipality's water treatment facility, the municipality usually tests the effluent stream and charges the plant based on BOD load and possibly TSS.

It has become necessary to make several assumptions in terms of effluent treatment.

- Sanitary waste can be directed to on site septic tank systems or if available, to local municipal disposal system.

- Storm water drainage to soak pits or local municipal disposal system.

- All plant effluent water to on-site screening (2mmm screen to remove solids). A variety of options are available for effluent treatment and disposal following screening, i.e.:

  - Anaerobic, aerobic effluent pond treatment systems prior to off site disposal either to local authority disposal system of spray irrigation. Weather conditions may preclude pond treatment system.

  - Dissolved air flotation (DAF) system, which can be combined with chemical treatment prior to disposal into local system, water way or by spray irrigation.

  - Blood into an effluent stream is unacceptable for a modern processing plant. It needs to be streamed into a coagulator with the solids put with the rendering raw material.

  - Likewise to put water from the paunch dumping into effluent is unacceptable.

- In the final analysis, site location and conditions, local authority effluent treatment discharge criteria will dictate the type of effluent treatment system. Further site evaluation will be required to confirm the final effluent treatment system. Effluent has to be designed into the plant as part of the process to achieve cost effective operation.

6.7.10. Natural gas

Natural gas requirements are as such:

- Slaughter/chill/fabrication plant 2.7 million BTUs/hour
- Further processing 682,400 BTUs/hour

6.8. Projected Overhead Costs

6.8.1. Manning introduction

- Average pay rate of $13.00 per hour taken (includes benefits), which reflects current U.S. industry pay rates ($10 / hr, source – Cattle Buyers Weekly).

- All labor on-costs (added to base salary) taken as 30% to reflect holiday pay, insurance, sick leave and State charges to give a labor charge-out rate of $13/hour.

- Management wages taken at $50,300 (source Meat and Poultry, 16th Annual Salary, 2001) clerical administration at $35,000.

- No shift work is being worked for this stage, although provision has been made in the layout to allow for shift work.

- Plant cleaning assumed to be on contract basis with special contract team.

- Working year taken as 250 days.

6.8.2. 2 crews kill floor and 1 crew fabrication

	Per Week
• Plant Manager/Accountant $50,300 per year	1,935.00
• Supervisors 2 supervisors @ $40,000 per year	1,540.00
• Quality assurance, clerical, livestock coordinator, sales/marketing (hides, offal, & some meat) 3 full time equivalents @ $35,000 per year	2,100.00
• Plant operators 40 hours per week @ $13 per hour for 36 beef operators, 29 hog and lamb operators	17,355.00
• Maintenance 1 operator or out-sourced @ $45,000 per year	$865.00
Total Staff Cost Per Week	$23,795.00

Utilities

• Hot/warm water 215,000 US gallons per week 737,388,000 BTUs per week. Cost US$0.43/100,000 BTUs	3,171.00
• Water 215,000 US gallons per week (Luann)	500.00
• Sewerage Output 215,000 US gallons per week (McGregor)	540.00
• Electricity (includes refrigeration)	2,170.00
Total Utilities	6,381.00

Variable Expenses

• Cleaning/cleaning materials	1,125.00
• Inspection	1,000.00
• Supplies	7,890.00
Total Variable Expenses	10,015.00
Corporate overhead expense (insurance, property taxes, services, office expense, co-op expense)	1,593.00
TOTAL OPERATIONAL COST PER WEEK	41,784.00

- Cost Per Head

Cost per head will be covered in detail in Section 10.2.

6.9. Projected Slaughter/Fabrication Facility and Equipment Costs

The following are indicative capital budget estimates based on preliminary drawings and site unseen. All costs are expressed in US dollars. Where products or services are accessed from New Zealand the current USD/NZD exchange rate has been used.

1.	Site works	120,000
2.	Stockyards	190,000
3.	Slaughter, offal	840,000
4.	Coolers	1,000,000
5.	Fabrication	620,000
6.	Non food area	550,000
7.	Welfare	250,000
8.	Box cooler, box freezer, cold store, palletise	780,000
9.	Plant room	180,000
10.	Carton store	100,000
11.	Effluent P.C.	750,000
12.	Welfare non food	90,000
13	Design fees	740,250
14.	Contingency (Provisions for building, equipment, and installation costs which are higher than budgeted costs)	630,000
15.	Land purchase ((Assume 75 acres needed (with lagoon) @ $700 / acre))	52,500
16.	Potable water supply at site (See Section 6.7.3,)	$50,000
17.	Anti-microbial treatment Assume two steam vacuum units @ $10,000	$20,000
18.	Data capture (all hardware and software)	$75,000
19.	Individual live animal scale	$3,500
	Total property, plant and equipment (PPE) =	**7,041,250**

Cost exclusions

The following cost exclusions apply to this project and are usually included as part of the construction phase and start-up start up overhead:

- EPA and local permits
  (Permits and engineering firm application, $20,000)
- Training
  (Assume $40,000 in training costs)
- Assume all services are available at site including gas, water, electricity, etc.
- Vehicles/fork hoists
  (Assume these are leased)
- Power supply mains, transformer
  (Cost depends on site and local incentives)
- Sub-contractor bonds, insurance, etc.
  (Not determined)

Total Property, Plant & Equipment plus miscellaneous costs = $7,101,250

Section 7. Further Processing

7.1. Further Processing Options

Several options exist to add value to the meat products beyond the selling of fresh whole-muscle vacuum packaged products and trim.

7.1.1. Grinding

Beef, pork and lamb trim and some undervalued whole muscle cuts can be ground to manufacture fresh or frozen ground beef, pork and lamb. The ground products can be further processing in a forming machine to produce different sizes of ground meat patties. The grinding operation can also be a prerequisite to different types of sausage products.

7.1.2. Sausage manufacture

Ground beef, pork and lamb products can be mixed with different ingredients and formed into various shapes and products for the manufacture of many different types of sausage products. Some of these sausage products are pre-cooked and some are sold fresh.

7.1.3. Tumbling, pumping or curing

Many of the beef and pork whole-muscle products can be blended with seasoning and/or curing solutions by mechanically tumbling in a pre-formulated solution or be injected with a pre-formulated solution. Pork hams, bellies, and picnics are cured using these procedures. Beef roasts and prime rib and leg of lamb can be marinated and can be prepared using these procedures.

7.1.4. Pressing and forming

Some whole muscle rough or thin meats such as beef flap meat, cap & wedge meat, and rough ground meat products can be pressed and formed into simulated whole muscle products such as sandwich steak items and sliced roasts.

7.1.5. Batch cooking/smoking

Batch cooking or smoking is necessary for the manufacture of cooked/smoked hams, bacon, picnics, and some sausage items. It is also necessary for pre-cooked roasts, shredded beef and prime rib and pre-cooked leg of lamb. Jerky and dried meat products are also cooked or smoked.

7.1.6. Case-ready packaging

Many retail operations today are merchandising meat that has already been portion cut, weighed, priced, and packaged ready for display. Ground beef and pork case-ready items have been popular for some time and whole-muscle products are growing in popularity. To accomplish case-ready packaging, there must be adequate space for portion cutting, trimming, and weighing meat prior to packaging. Case-ready packaging can be accomplished with the use of several different types of equipment. Roll-stock or chamber machines are usually

situated at the end of cutting/trimming tables and are equipped with different types of overwrapping film. Many of these machines can actually CO2 gas flush the package to remove all oxygen from the package. Case-ready packaging can range from a very simple labor-intensive process to a very sophisticated automated process.

7.1.7. Total operational procedures

(a) Grinding over one shift to service ground beef and sausage meat lines.
(b) Case ready operates over one shift.
(c) Injecting/tumbling operates over one shift.
(d) Cooking operates over two shifts (the only two shift operation planned for the plant initially).

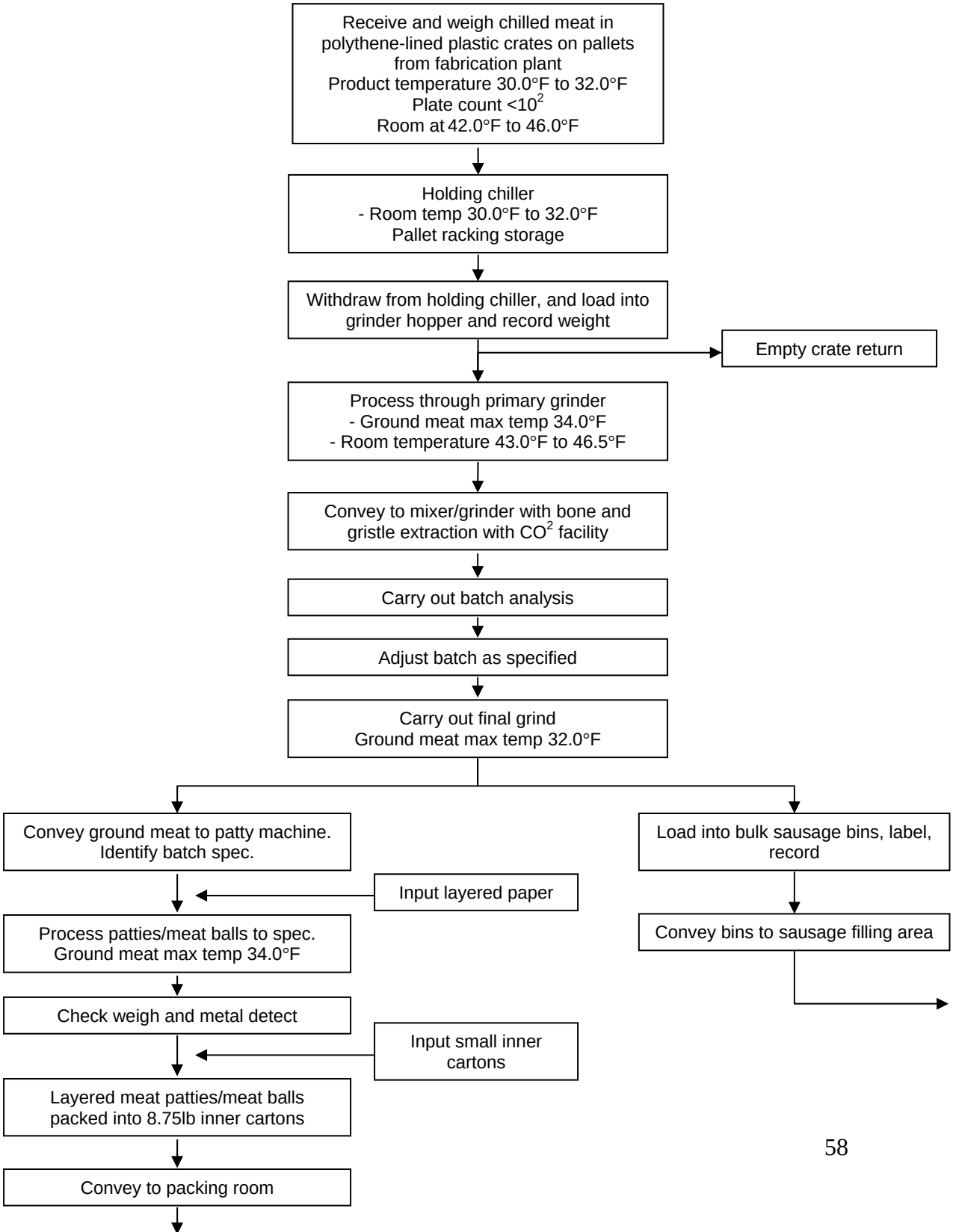
7.2. Meat Available For Further Processing

	Beef lbs/head		**Pork lbs/head**		**Lamb lbs/head**			
Grind and/or sausage	224.75		6.5		29.42			
Cooking	135.63		56.3		10.00			
Case ready	129.00		19.8		12.39			
Required Processing Capacity Per Day	**Lbs Per Day**	**Lbs Per Week**	**Lbs Per Day**	**Lbs Per Week**	**Lbs Per Day**	**Lbs Per Week**	**Total Per Day**	
							Lbs Per Day	**Lbs Per Week**
Grind and/or sausage	12,586	62,930	442	2,210	883	4,413	13,911	69,553
Cooking	7,595	37,976	-	-	300	1,500	7,895	39,476
Injecting	-	-	3,828	19,142	-	-	3,828	19,142
Case ready	7,224	36,120	1,346	6,732	372	1,858	8,942	44,710
Total	**27,405**	**137,026**	**5,616**	**28,084**	**1,555**	**7,771**	**34,576**	**172,881**

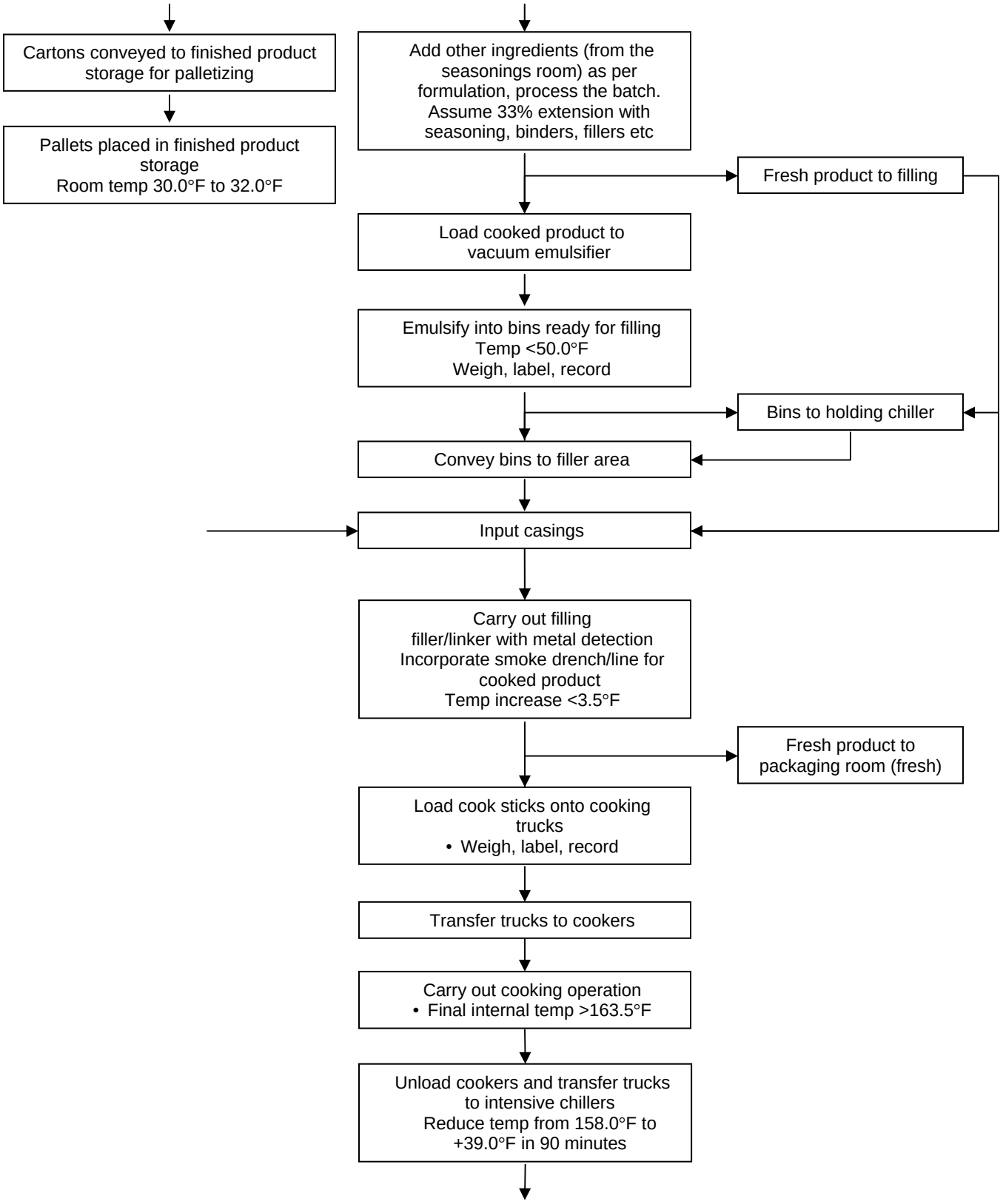
7.3 Grinding For Patties / Sausage

Grinding will be done in two stages with a capacity for 14,000 + pounds in 7 hours.

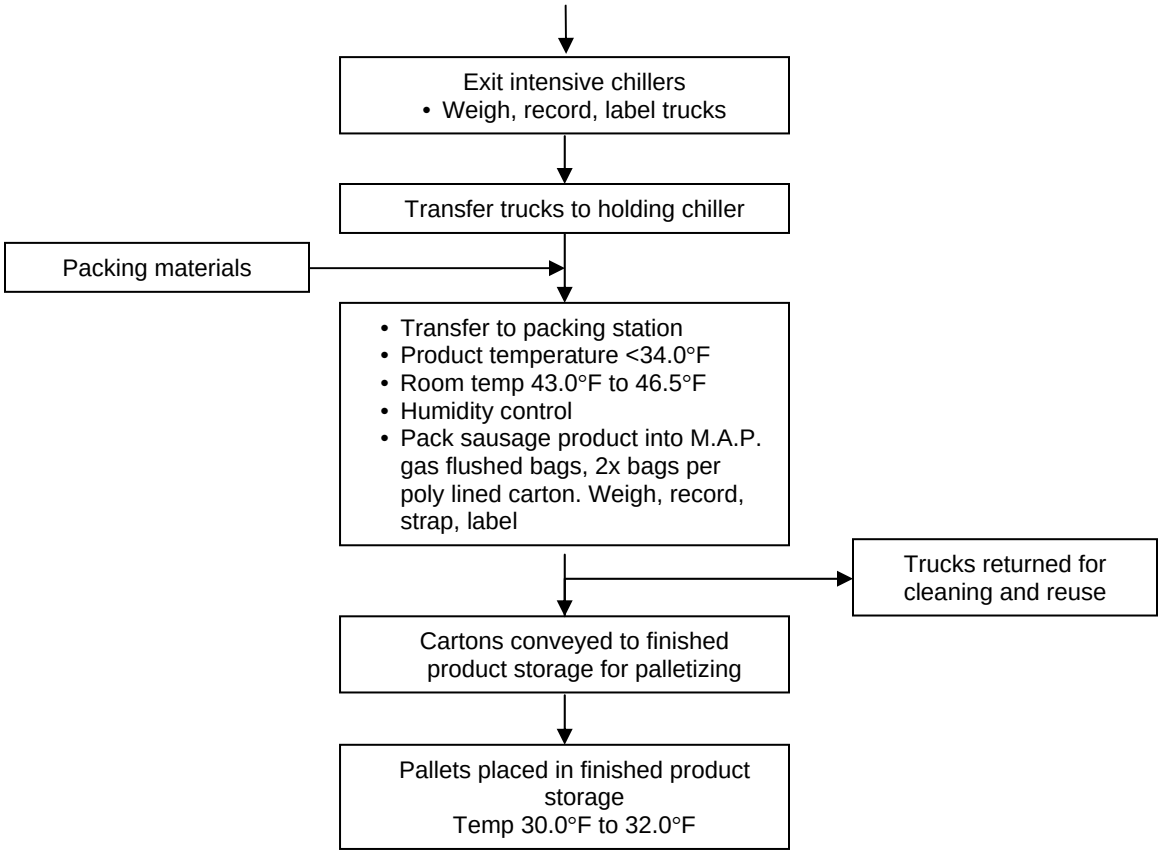
7.3.1. Flow Chart – Ground Meat for Patties, Sausages



Flow Chart – Ground Meat for Patties, Sausages (cont'd)



Flow Chart – Ground Meat for Patties, Sausages (cont'd)



7.3.2. Labor

Total people in ground beef.

Grinding, patties, fresh and cooked sausage:

Fresh area	8.0 persons
Cooked area	2.5 persons
Total	10.5 persons

8 hours paid per day @ $13.00 per hour	$104/day
x 10.5 people	$1,092/day
15,954 lbs produced per day, ∴ labor cost	$0.0685/lb

Note: night shift cooking man shared with muscle cuts.

7.3.3. Packaging Costs

	Per Day
Patties	212.18
Fresh sausages	113.16
Cooked sausages	417.68
Total	$743.72

= $0.0466 per lb.

Includes brine, casings and packaging.

7.3.4. Equipment requirements:

Grinder (30 kW)	$30,000
Mixer/grinder	55,000
Batch fat analysis	45,000
Patty machine	50,000
Metal detector	12,000
Vacuum emulsifier (55 kW)	40,000
Filler linker	35,000
Floor scales and checkweigh scales	5,000
Conveyors	4,500
Sausage/patty mix transfer bins x 8	2,600
Sausage emulsion transfer bins x 4	1,300
	$280,000

7.4. Injection/Marination/Cooking – Ham, Bacon, Beef and Lamb Whole Muscles

Operates over one shift except for cooking which operates over two shifts.

The process is designed to be able to produce marinated, pumped, primals that can be marketed in a chilled uncooked or chilled cooked state. Also produce bacon and hams.

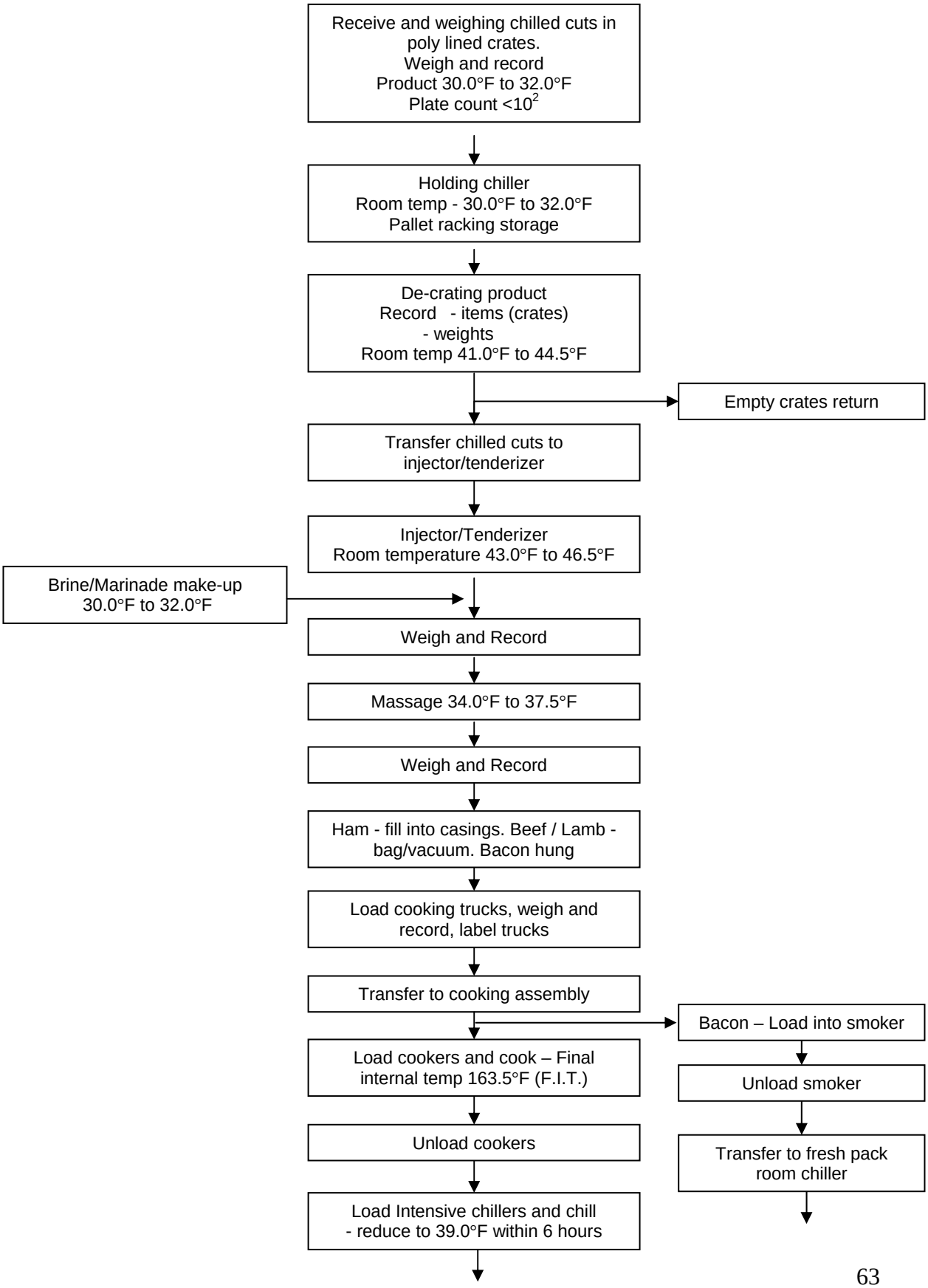
Expected daily production:

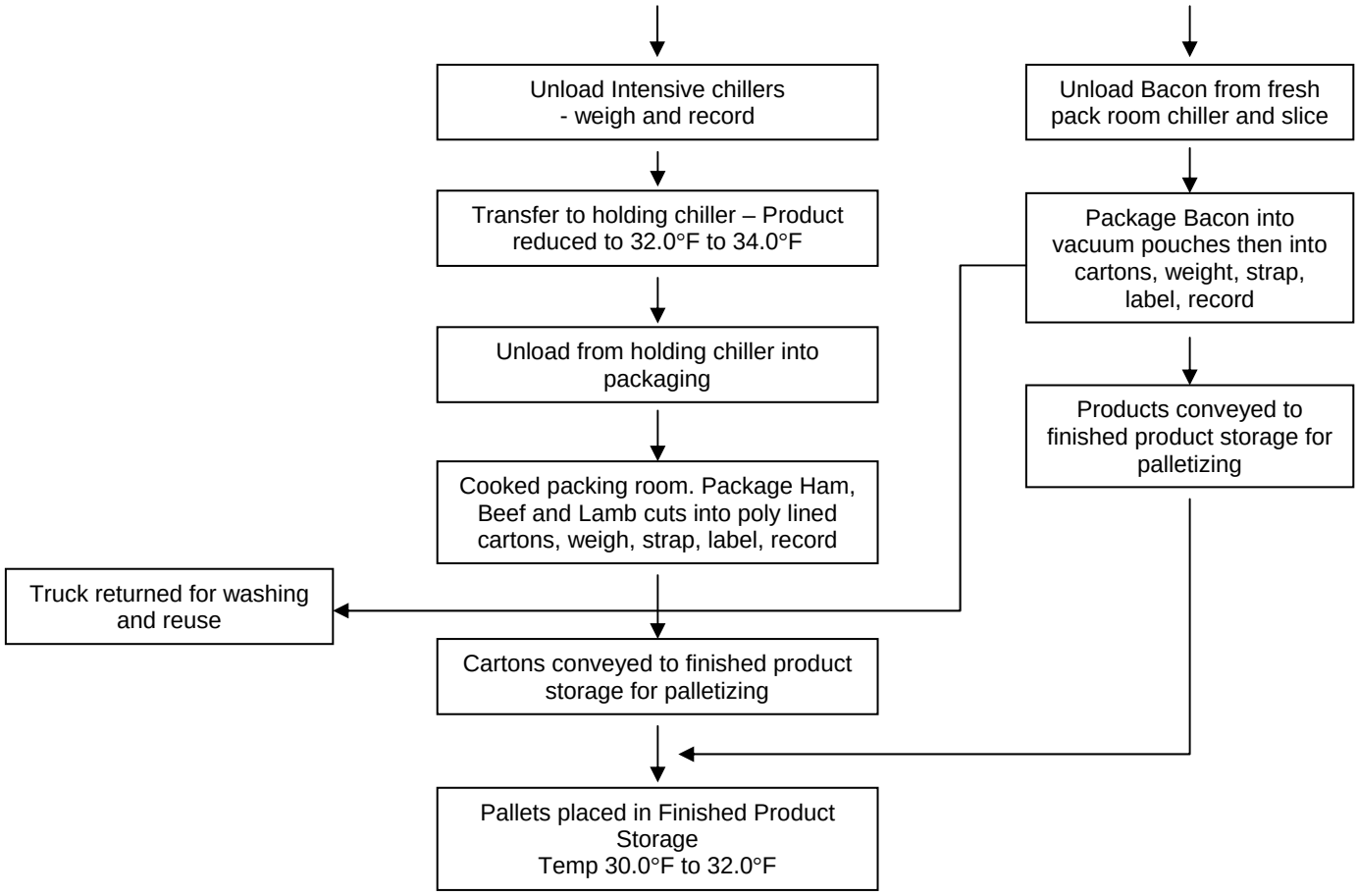
Pumping gain	15 to 35%
Bagging loss	8%
Cooking loss	11%

@ 100% chilled uncooked
@ 100% chilled cooked.

Assumption is all product is cooked.

7.4.1. Flow chart – Injection/Marination/Cooking





7.4.2. Labor

Injecting/brine, ham, picnics, bacon, beef/lamb cooked:

Fresh area	10.0 persons
Cooked area	5.5 persons
Total	15.5 persons

8 hours paid per day @ $13.00 per hour	$104/day
x 15.5 people	$1,612/day
14,062 lbs produced per day, ∴ labor cost	$0.1146/lb

Note: night shift cooking man shared with grinding.

7.4.3. **Packaging Costs**

	Per Day
Ham	310.16
Picnics	115.45
Bacon	95.94

Beef/lamb cooked	962.64
Total	$1,484.17

= $0.1055 per lb.

7.4.4. Equipment

Injection/Brine Process – Ham, Bacon, Beef/Lamb Cuts

Injector/tenderiser	$55,000	
Massager @ $45,000 x 2	90,000	
Floor scales	5,000	
Brine making equipment	6,000	
Bagger	1,500	
Stainless wheeled bins	4,000	
Conveyors	2,500	
		$164,000

Cooking

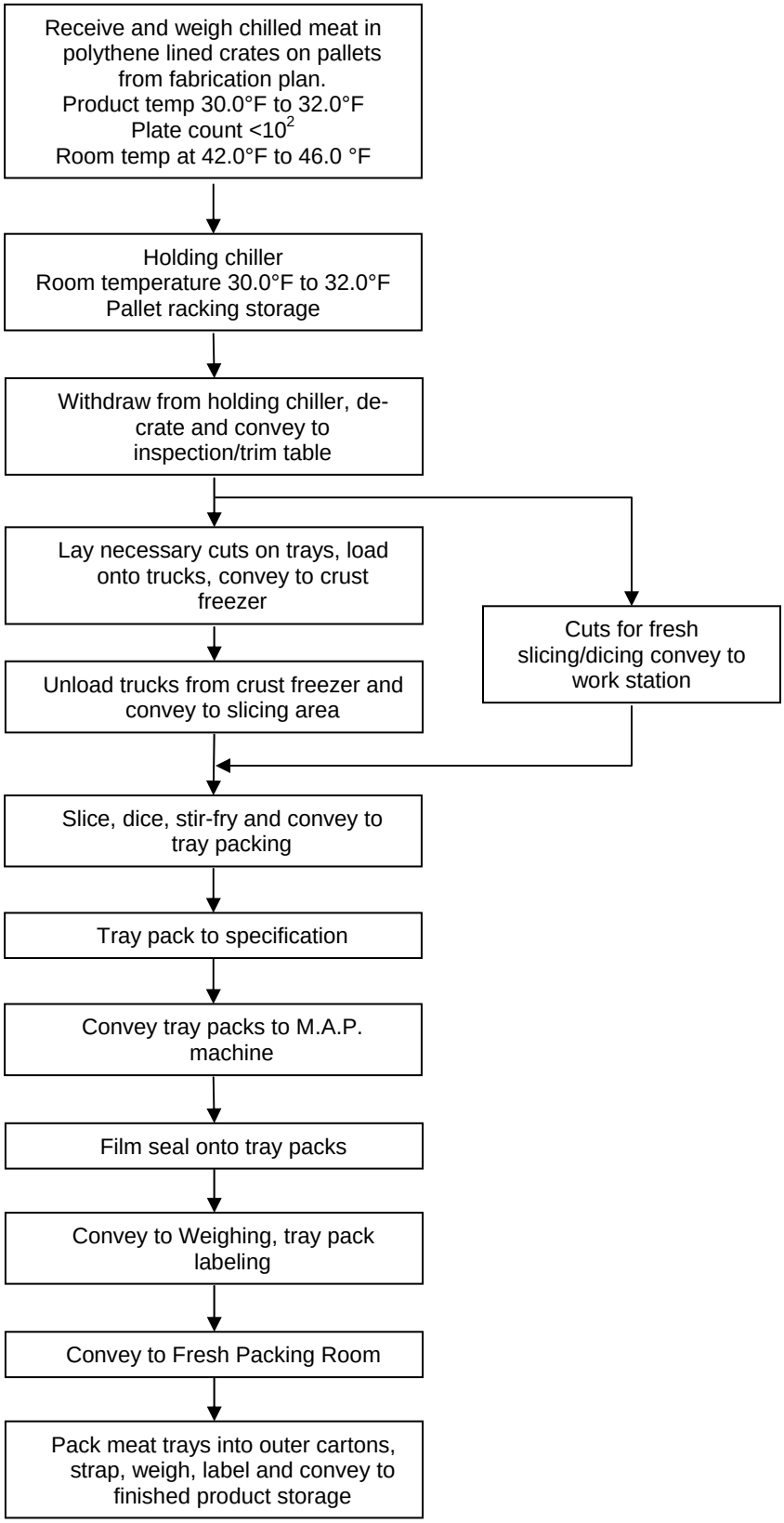
Cookers – 4 x 4 trucks @ $50,000 each	$200,000	
Chillers (to reduce temperature of cooked product)	50,000	
Cooking trucks and trays	40,000	
		$290,000

Packing

Vacuum packing (heat seal)	$45,000	
Carton strapper x 2	4,600	
In-line scales and label printer x 2	5,000	
Miscellaneous (conveyors, tables, etc.)	8,000	
Bacon slicer/stacker	18,000	
		$80,600

7.5. Case-ready

7.5.1. Flowchart – Case-ready



7.5.2. Labor

Total people = 12

8 hours paid per day @ $13.00 per hour	$104/day
x 12 people = total labor cost	$1,248/day
8,674 lbs produced per day, ∴ labor cost	$0.1439/lb

7.5.3. Packaging Costs
Includes trays, film, gas and cartons. $1,781 $0.2054/ lb

7.5.3. Equipment required:

Slicer (bone in and boneless product)	$25,000
Dicer/stir fry machine	12,000
Tray packaging, including gas flush	86,000
Intensive chiller (crust-forming)	50,000
Various (trim/packing tables, conveyors, trays, bins)	10,000
Checkweigh scales x 2	3,000
Bacon slicer (for thin meat slices)	12,000
	$198,000

7.6. Storage Space

Dry storage 60°F ± 5°F temperature.
Basis 65 days' storage on 40 x 48" pallets.

• Boxes 3,332 @ 36/pallet	94 pallets
• Seasoning 5,500 lbs @ 50 lbs/bag 20 bags/pallet + 20% for lines	6 pallets
• Brine 2,000 lbs @ 25 lbs/bag 25 bags/pallet	4 pallets
• Marshalling space	15 pallets

Allow for 119 pallets

Lifting equipment needed:
- Fork hoist (1)
- Pallet truck (1)

7.7. Plant Utilities

Plant utilities for further processing include water, electricity, compressed air, ventilation and effluent treatment.

11,200 US gallons per day.

Electricity consumption is estimated 3,400 kWs/day

Natural gas – 682,400 BTUs/hour

7.8. Plant Manning

	Grinding, patties, fresh and cooked sausage	8	2.5
•	Injecting/brine, ham, picnics beef/lamb cooked	10	5.5
•	Case ready	12	-
	Total operators	30 non cooking	8 cooking

•	Production manager – laboratory, QA yield @ $45,000/year	1
•	Administration support @ $35,000/year	1
•	Sales & marketing	1
•	Order make-up finished goods @ $13/hour = $26,000	1
	Total	42

7.9. Utilities and General and Administrative Overhead Expense

The production manager, administration support and order make up person, insurance costs, office expense, outside services, and repairs and maintenance all fall under general and administrative overhead expense. Some of this expense is nested in the overall plant costs and some can be tied directly to the further processing plant. It is estimated that this consolidated expense is equal to $0.005 /lb of further processed product. Utilities are estimated to be $0.005 / pound. **The combined expense = $0.01 / pound.**

7.10. Consolidated Production Costs

Process	Estimated lbs/day	$/lb Processed*
Grinding/sausage	16,664	**0.13**
Curing/cooking	14,062	**0.23**
Case-ready	8,674	**0.36**

***** Includes all overhead expense except debt service

7.11. Capital Costs

	$
Building	1,170,000
Equipment	1,013,000
Site works	100,000
Design fees	220,000
Contingency	240,000
	$2,743,000

Section 8. Training and Project Engineering Considerations

8.1. Training Requirements

ProAnd International highly encourages their company's involvement in the very critical step in successful implementation of the business, which is training. All training, to be effective, would be hands on, on-site training.

The key training objectives and areas are seen as follows:

Plant Management

- Establish critical administration control procedures, systems.
- Train key local management personnel (who should be identified during the early stages).
- Industrial contract design, staff selection, induction.
- Data capture technology – operational ramifications.

Slaughter

- Identify and train process staff in critical dressing tasks, i.e. stock washing, weasand sealing, legging, bunging, hide removal and evisceration.
- Train in all aspects of good dressing hygiene, i.e. opening hide spear cuts, washing, sterilization of knives and equipment.
- Meat hygiene, product quality training.

Fabrication

- Training to encompass sound, hygienic fabrication techniques and cut removal for a modern quarter fabrication system beef and cutting/boning for hogs/lambs.
- Yield control and monitoring.
- Product quality and hygiene.
- Vacuum packing techniques.
- Data capture – optimizing use and advantages.

Further Processing

- Further processing strategies and techniques
- Proper curing methods
- Recipe design and use
- Proper cooking methods
- Proper packaging methods
- Yield control and monitoring

By-Products

- Training to cover all areas of edible offal processing, rendering and hide processing.
- Key objectives are product quality and maximum yield recovery.

Food Safety Programs

- Assistance is necessary to development and implement quality systems, regulatory requirements and risk management programs. These programs include:
  - Risk management programs
  - HACCP (Hazard Analysis Critical Control Point) programs
  - Industry Standards Manual implementation and compliance
  - SSOP (Sanitation Standard Operating Procedure) programs.

8.2. Engineering

On the assumption that Upper Mississippi Family Meats is going to proceed with the project, ProAnd recommends that the capital cost budget for the project is confirmed in detail.

- Site visit for proposed facility to investigate availability of all services, land levels, roading and effluent options, plus discussions with local authorities.
- Preparation of detailed layout drawings for the total plant and associated services.
- Preparation of drawings and specifications so competitive bids can be obtained for the tradesmen and services.
  - Building, civil and roading design
  - Building, civil and roading construction cost
  - All mechanical process equipment
  - Refrigeration and ventilation cost
  - Stainless steel and hygiene ware
  - Mechanical services and generation of hot water
  - Electrical and controls
  - Effluent waste and treatment
  - Software program and systems.

All capital costs confirmed for the project, plus a list of all sub-contractors.

Completion of this stage will provide competitive bids for all aspects of the tasks and allow movement to the construction phase of the project. ProAnd International understands that the client may have relationships with local providers and engineers and this can be accommodated.

8.3. Construction Phase

If and when a construction phase begins, ProAnd's role during this stage could be as project management with full representation on site during the installation of process equipment and commissioning. Or, it is common to use a local project management that will be in communication with ProAnd.

There are two essential components, which cannot be over emphasized for a modern new meat processing plant to be successful. These are as follows:

- Innovative, lateral thinking to sound process plant design allowing optimum productivities and product hygiene. The building itself purely serves as a hygienic envelope with the process layout of critical importance in providing the basis for a cost effective, hygienic operation.

- Modern, competent, plant management skills are essential to the success of any new plant development. Management personnel (administration to supervisory staff) must have the skills or be trained in skills of modern meat processing plant management. With the current increasing emphasis on food safety, mistakes are punished severely with litigation and loss of business.

Section 9. Plant Site Considerations

9.1. Plant Site Selection Criteria

The following section details the typical site location criteria that should be taken into account with any new plant site selection.

- The site should be located within reasonable access to the type of livestock to be processed. While access to a site that welcomes this type of industry is probably of more importance, it should not be forgotten that meat is cheaper to transport in cartons rather than on the hoof, by a factor of approximately 2:1.

- The proposed site must be easily accessible to trucks bringing in live cattle, hogs and lambs and loading out finished product.

- The location of the site relative to the final market place is a factor and should be weighed against the location of the raw material.

- The major criteria however in site selection is finding land suitably zoned for operating a food processing plant. There should be minimal impact on the local community visually, ecologically and environmentally. An all around buffer zone is desirable including landscaping.

- Soil types subject to large expansion and contraction or water logging should be avoided. The site should lend itself to construction of sound and separate drainage systems for process wastewater, storm water and sanitary waste. A suitably qualified engineer should be engaged to prepare a report on the proposed land's suitability as a food-processing site.

- The availability of land area sufficient for the envisaged operation with space for future expansion is another issue worthy of consideration. Some meat plants have adjacent land for livestock grazing and holding prior to slaughter to ensure continuity of supply.

- The availability of a clean, fresh water supply that is potable or can be made potable easily (a requirement of USDA licensed premises).

- The effluent system ultimately used will be a huge issue. Whether the plant effluent utilizes the local authority systems or the plant carries out some primary treatment on site, gaining acceptance of the relevant local authorities will consume much time.

- In some cases, local authorities have put incentives in place to attract businesses to their area. The availability of incentives, rebates and/or support needs to be actively canvassed.

- The availability of suitably skilled labor for processing, maintenance support and management of the plant is critical. The arrival of a meat processing plant in a community that alters the social balance may not necessarily be welcomed. This issue requires careful management.

- Consideration must be given to what the supply of energy is (electricity, gas, or oil) and if it is already at the boundary of the site.

- The prevailing wind direction and the absence of wind born emissions of gas/condensate/smoke/dust from existing industries on the boundary can place the new plant at risk. Equally the plant must control emissions both within the site (non food to food) and to the boundary, which may be urban.

- The suitability of the land for the proposed operation should include consideration of the water table and natural drainage. The water table activity could have an immediate bearing on the decision for a basement below ground or at ground level.

- Modern meat processing plants must have systems in place for the disposal of used packaging material and any other waste that is produced, other than effluent.

- Road transport connection to the site for both livestock received and dispatch of finished products should be paved or sealed to minimize dust and to enhance appearance.

- An all round buffer zone of 0.3 miles (500 meters) minimum from residential, light industry or commercial premises is desirable.

- A minimum downwind buffer distance of 0.6 miles (1,000 meters) from the nearest residence is desirable if on-site rendering is intended (assuming effective and reliable odor control is installed).

- Areas where there are noxious industries or processes that are likely to lead to the contamination of the meat product must be avoided.

9.2. Utility Considerations

The following table is a summary of the utility needs for the plant designed for this project.

Utility	Usage – fresh meats	Usage – further processing	Total Plant
Water	43,600 gal / day	11,200 gal / day	54,800 gal / day
Waste water	43,600 gal / day	11,200 gal / day	54,800 gal / day
Electricity, daily usage	14,000 kWs/day	3,400 kWs/day	17,400 kWs/day
Electricity, peak load	800 kVA	200 kVA	
Effluent	1,300 mg/liter BOD, 400 lbs BOD / d, 100 ppm of suspended solids		1,300 mg/liter BOD, 400 lbs BOD / day, 100 ppm of suspended solids
Natural Gas	2.7 million BTUs/hr	682,400 BTUs/hr	3.4 million BTUs/hr

Section 10. Business Feasibility

10.1. Summary Of Investment Needs Of The Project

Fresh meats				
PPE [a]	7,041,250		Animal units / beef animal	1
Operating capital [b]	1,056,188		Animal units/ hog	3.38
Total capital needs	8,097,438		Animal units / lamb	4.82
Processed Meats			Total beef animal units	14,000
PPE [a]	2,743,000		Total pork animal units	5,185
Operating capital [b]	411,450		Total lamb animal units	1,556
Total capital needs	3,154,450		Total animal units	20,741
Combined PPE	9,784,250			
Combined Op. Cap.	1,467,638		**Total capital needs per animal unit**	**271**
Total capital needs	**11,251,888**			
% debt	50%		**Total investment per steer/heifer**	**271**
Total capital needs			**Total investment per hog**	**80**
to be invested	**5,625,944**		**Total investment per lamb**	**56**

Assumption

a	PPE = property, plant & equipment
b	Operating capital estimated @ 15% of PPE
c	Loan amount for 50% of PPE and operating capital needs @7.25% for 10 years
d	15% margin was assigned but can be any quantity desired

The above table summarizes the capital needs of this project that are detailed in this manuscript. This table also summarizes the total investment requirements and estimates what these investment requirements would be on an individual species basis. According to this table, it will require $271 / beef animal, $80 / hog and $56 per lamb of plant capacity in order to capitalize fifty percent of the property, plant and equipment and operating capital for the plant.

10.2. Income / Expense Projections

The following table represents a compilation of potential volume generated from the proposed plant, expected expenses generated from data in this report, and expected revenue. It is anticipated that the plant will be structured to deliver a modest income over expenses. Income generated from production margins could be used by the owners as:

a). operating capital kept in the plant to cover unexpected problems or to improve technology;
b). operating capital to purchase livestock to keep the plant operating at optimum levels;
c). marketing funds to assist owners in selling their meat products;
d). distributed earnings returned to the owners according to shares owned;
e). combination of the above.

Table 10.2.1. Income and expense statement from fresh boxed meat operations

			Beef		Pork		Lambs		Total	
			Capacity		Capacity		Capacity		Capacity	
Item	Assumption		**100%**	**80%**	**100%**	**80%**	**100%**	**80%**	**100%**	**80%**
Total operational Costs / yr =	**2,089,200**									
PPE	**7,041,250**	**a**								
Operating capital	**1,056,188**	**b**								
Total capital needs	**8,097,438**									
Annual principal	**404,872**	**c**								
Annual interest	**178,254**									
Annual harvest numbers			14,000	11,200	17,500	14,000	7,500	6,000		
% of processing time			67.50	67.50	25.00	25.00	7.50	7.50		
Calculated production costs, $/hd			100.73	125.91	29.85	37.31	20.89	26.12		
Debt Service, $/hd										
Princ.			19.52	24.40	5.78	7.23	4.05	5.06		
Interest			8.59	10.74	2.55	3.18	1.78	2.23		
Total			28.12	35.14	8.33	10.41	5.83	7.29		
Total Expense, $ / hd			**128.84**	**161.06**	**38.18**	**47.72**	**26.72**	**33.40**		
Total Expense, $			1,803,820	1,803,820	668,082	668,082	200,424	200,424	2,672,326	2,672,326
Plant revenue										
% margin		**d**	15.00	15.00	15.00	15.00	15.00	15.00		
Total revenue, $/hd			**148.17**	**185.21**	**43.90**	**54.88**	**30.73**	**38.41**		
Total revenue, $			2,074,393	2,074,393	768,294	768,294	230,488	230,488	3,073,175	3,073,175
Net Income, $			**270,573**	**270,573**	**100,212**	**100,212**	**30,064**	**30,064**	**400,849**	**400,849**
Net income/ hd			**19.33**	**24.16**	**5.73**	**7.16**	**4.01**	**5.01**		

Assumption

a PPE = property, plant & equipment
b Operating capital estimated @ 15% of PPE

c Loan amount for 50% of PPE and operating capital needs @7.25% for 10 years
d 15% margin was assigned but can be any quantity desired

The above table shows the expected expense per species of slaughtering, boning, and packaging fresh meat both at 100% plant capacity and at 80% capacity. When the plant is running at capacity the table shows costs of $128.84 /hd, $38.18 /hd and $26.72 /hd for cattle, hogs, and lambs, respectively.

Eighty percent capacity was chosen because it is usually not expected to reduce direct and indirect plant costs unless the plant capacity falls below 75 to 80 percent. Capacities lower than this will require new estimates of overhead costs. There is a $32.22 /hd, $9.54 /hd, and $6.68 /hd increase in costs when plant capacity is reduced by 20% for cattle, hogs, and lambs, respectively.

A 15% margin over expenses was chosen as plant revenue. Therefore, at plant capacity, the custom slaughter/boning/packaging fees are$148.17 /hd, $43.90 /hd, and $30.73 /hd, for cattle, hogs, and lambs, respectively. At lower plant capacities, these charges would have to be higher.

It would be expected that these charges represent investor owned livestock processed in the plant. It would be expected that non-investor owned livestock would be processed at a higher margin.

It would also be expected that revenue from the selling of hides, offal and byproducts would be returned to the owners of the livestock as a “drop credit”. It would be expected that Upper Mississippi Family Meats retain a small margin for selling this material. Drop credit values are discussed in Section 6.5.1.

Table 10.2.2. Table of income and expense from further processing operations

item		Assumption	Grinding/ sausage		Marination/ cooking		Case-ready		Total	
			Capacity		Capacity		Capacity		Capacity	
Plant capacity			**100%**	**80%**	**100%**	**80%**	**100%**	**80%**	**100%**	**80%**
PPE	**2,743,000**	**a**								
Operating Capital	**411,450**	**b**								
Total capital needs	**3,154,450**									
Annual principal	**157,723**	**c**								
Annual interest	**69,441**									
Pounds per year			3,988,500	3,190,800	3,515,500	2,812,400	2,168,500	1,734,800	9,672,500	7,738,000
Annual labor			273,000	273,000	403,000	403,000	312,000	312,000	988,000	988,000
Packaging			185,864	148,691	370,885	296,708	445,410	356,328	1,002,159	801,727
Utilities + Gen. Overhead			82,471	82,471	72,691	72,691	44,838	44,838	200,000	200,000
Total costs			541,335	504,162	846,576	772,399	802,248	713,166	2,190,159	1,989,727
Total costs / lb			0.14	0.16	0.24	0.27	0.37	0.41		
Debt Service, $/hd										
Princ.			0.04	0.05	0.04	0.06	0.07	0.09		
Interest			0.02	0.02	0.02	0.02	0.03	0.04		
Total			0.06	0.07	0.06	0.08	0.10	0.13		
Total Expense, $ / lb			**0.19**	**0.23**	**0.31**	**0.36**	**0.47**	**0.54**		
Total Expense, $			768,499	731,326	1,073,740	999,563	1,029,412	940,330	2,871,651	2,671,219
Plant revenue										
% margin		**d**	15.00	15.00	15.00	15.00	15.00	15.00		
Total revenue, $/lb			**0.22**	**0.26**	**0.35**	**0.41**	**0.55**	**0.62**		
Total revenue, $			883,774	841,025	1,234,801	1,149,498	1,183,824	1,081,379	3,302,399	3,071,902
Net Income, $			**115,275**	**109,699**	**161,061**	**149,934**	**154,412**	**141,049**	**430,748**	**400,683**
Net income/ lb			**0.03**	**0.03**	**0.05**	**0.05**	**0.07**	**0.08**		

Assumption

a PPE =property, plant & equipment

b Operating capital estimated @ 15% of PPE

c Loan amount for 50% of PPE and operating capital needs @7.25% for 10 years

d 15% margin was assigned but can be any quantity desired

The above table shows the expected expense according to individual process for further processing of beef, pork, and lambs at 100% plant capacity and at 80% capacity. When the plant is running at capacity the table shows costs of $0.19 /lb, $0.31 /lb and $0.74 /lb for the grinding/ sausage operations, marination / cooking operations, and case-ready packaging operations, respectively.

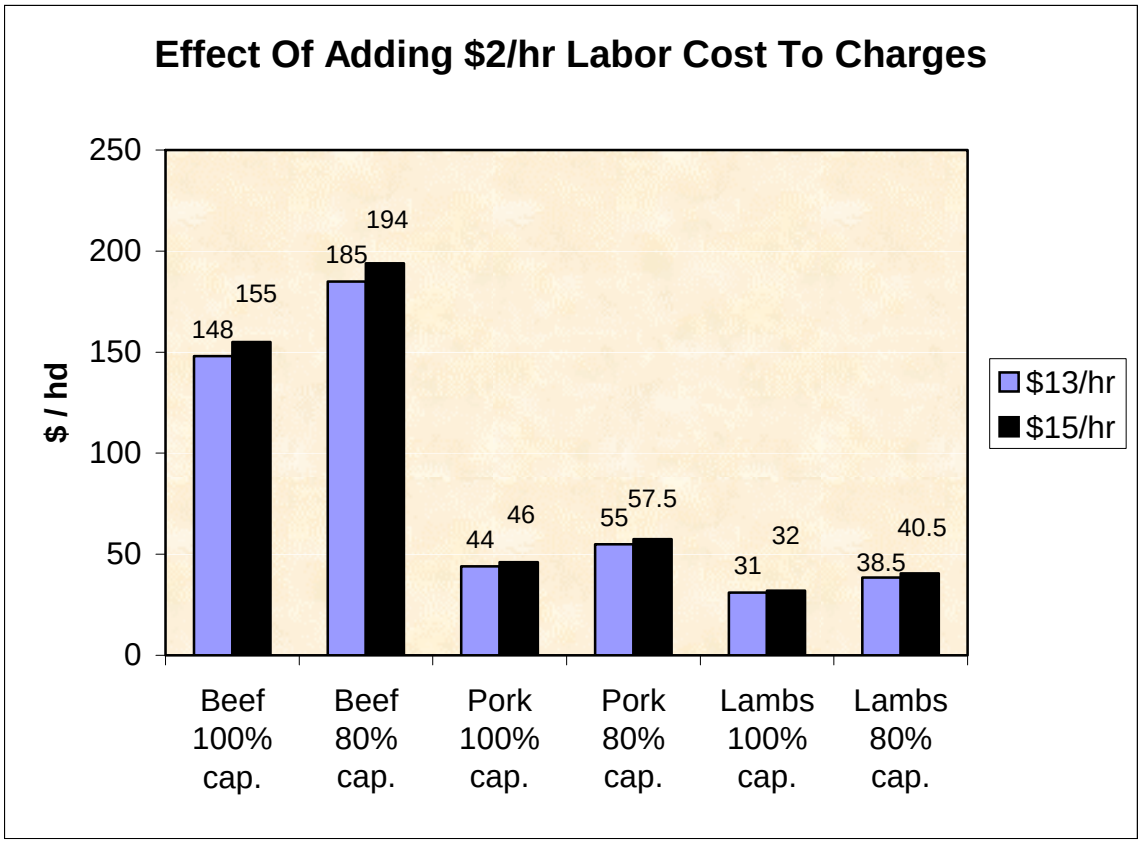
Eighty percent capacity was chosen because it is usually not expected to reduce direct and indirect plant costs unless the plant capacity falls below 75 to 80 percent. Capacities lower than this will require new estimates of overhead costs.

There is a $0.04 /lb to $0.07 /lb increase in costs when plant capacity is reduced by 20% for all the different processing operations.

A 15% margin over expenses was chosen as plant revenue. Therefore, at plant capacity, the custom further processing fees are $0.22 /lb, $0.35 /lb, and $0.55 /lb, for grinding / sausage operations, marination / cooking operations, and case-ready packaging operations, respectively. At lower plant capacities, these charges would have to be higher.

10.3. Sensitivity Based On Higher Labor Cost

A unique aspect of Upper Mississippi Family Meats is a respect for the average worker at the plant and a strong desire for employees to stay with the company. The income and expense statement presented in Section 10.1 and 10.2 used a labor cost of $13 per hour (including benefits). The following graph depicts the expenses and processing charges that would have to accounted for if the labor rate was raised from $13 / hr to $15 / hr.



According to this figure, adding an additional $2 / hr to the hourly salary of production workers increased the fresh meat processing charges $7 to $9 / hd, $2 to $3 / hd, and $1.50 to $2 / hd for beef, pork, and lambs, respectively. For the

further processing side of the plant, adding $2 / hr to process workers pay rates added on average $0.02 / lb to all processes.

10.4. Competitive Costs Of Processing

Four packing / processing plants will be reviewed as to their toll charges to slaughter, fabricate, and further process beef, pork, and lamb products.

Lorentz Meats, Cannon Falls, MN

Lorentz Meats has the capacity to slaughter 100 pigs and 80 cattle per week. Currently, 75 percent of that capacity is used leaving approximately 40 pigs and 30 beef cattle per week in custom packing/processing relationship. The fees are all encompassed in a fee of $0.40 per pound of hot carcass weight to slaughter and bone the animal, wrap the subprimals and freeze. A fee of approximately $0.10 per pound will be assessed to vacuum package the subprimals. There are no drop credits.

Curing, smoking of hams and bacon will cost $0.65 / pound and $0.25 / pound for slicing and packaging bacon. Sausage manufacture will cost $1.00 per pound.

O'Neill Packing Company, Omaha, NE.

O'Neill Packing Company has the capacity to slaughter and fabricate up to 1,800 head of cattle per week. They have provided services to small companies desiring to process only 10 to 20 head. Their charges would be an amount equivalent to the drop value to slaughter the animals and $0.15 per pound of cold carcass weight to fabricate into vacuum packages and boxed beef. The drop credit is currently worth approximately $65 per head. These rates would be for customers that would need a small number of animals processed. Lower rates could be negotiated if a consistent number of animals were brought to the plant each week.

Sioux-Preme Packing Co., Sioux Center, IA

Sioux-Preme Packing company's slaughter plant is in Sioux Center, IA and their fabrication plant is located in Sioux City, IA. They have the capacity to process 14,000 hogs per week. They are primarily a custom and program processor of fresh pork. Their customer or program list includes: Berkshire Pork, Nieman Ranch Pork, Organic Valley, Beeler Natural Pork. Their custom charges vary according to volume, process and packaging requirements of the customer. The base fees range from $18 to $22 per head for mostly bone-in cuts. Boneless cutting styles and special packaging requirements are additions to the base fee. Averaged across customers, fees are $35 per head processed.

Beeler Natural Pork/ Brunsville Quality Meats, Brunsville, IA

Brunsville Quality Meats is the production arm of Beeler Natural Pork but the plant also custom processes for other pork marketing companies. According to Time Beeler, President, the custom fees for further processed pork are:

Cured & Smoked Bacon – sliced and packaged into 1 lb packages = $0.85 /lb
- bulk = $0.80 /lb.

Cured and Smoked Ham - boneless whole hams = $0.70 /lb; half hams = $0.75
- bone in whole hams = $0.65 /lb; half hams = $0.70 /lb

Sausage - 16, 1 oz links retail package = $0.80
- 4, 5:1 links retail package = $0.75 /b
- chubs = $0.50

Cured and Smoked Picnic – whole = $0.50 /lb
- half = $0.55 /lb

10.5. Overview Of Business Feasibility

Beef - O'Neill Packing Company's charges to slaughter/fabricate/vacuum package beef would be $105 for a 700 pound carcass. The charges listed in Section 10.2 for beef would be $148 per head plus the value of a drop credit. As shown in Section 6.5.1 the drop credit ranges from $40 to $80. Therefore, the drop credit would have to be valued at $43 per head to equal the custom charges of O'Neill Packing Company. If the plant is running at 80% capacity, drop credit revenue would have to be at the top of the value range ($80/hd) in order to stay in line.

Pork - Sioux-Preme Packing Company's average custom charges are $35 per head; however, these charges are greater for producing mostly boneless cuts. The pork processing charges in Section 10.2 are listed at $43 per head. Drop credits (Section 6.5.1.) could drop this cost to $38 or $40 / hd and would result in similar costs to Sioux-Preme. If the plant were running at 80% capacity and below, the processing costs of UMFM would not be competitive.

Lamb - Lorentz Meats charges $26 to slaughter/fabricate a 65 pound dressed lamb; whereas, the charge listed in Section 10.2 is $30.73 per head. However, there could be a drop credit for lamb ranging from $5 to $14 / hd (Section 6.5.1), which will more than make up the difference. If the plant were running at 80% of capacity, the drop credits would have to be at the top of the value range ($13/hd) in order to stay in line.

Further Processing - The further processing charges represented in Section 10.2 are much lower that those reported by the above companies. Even at 80% of the further processing plant's capacity, the estimated costs and charges of processing are lower than those reported by other companies. This price differential would leave opportunities for processing margin management. Nevertheless, it is highly recommended that further processing remain an integral part of a plan to build a packing plant.

10.6. Business Core Competencies and Suggested Steps Going Forward

10.5.1. Core competencies

Based on the financial information provided in this manuscript and comparisons to the custom processing charges of other companies, the overall plan for Upper Mississippi Family Meats to build a specialty multi-species plant is feasible provided the following core competencies are met:

a). Money can be raised by producers and producer groups to account for at least 50% of plant and equipment costs and working capital needs.
b). Adequate numbers of livestock can be enrolled in an agreement with the plant to assure a high percentage of daily processing capacity.
c). Skilled management and labor can be hired and maintained.
d). Individual producers and marketing groups can sustain their personal operations in order to deliver livestock to the plant.
e). The skillfully marketing of hides, byproducts, offal and specific meat products by plant personnel to collectively bring more revenue from these products than what individual producers and marketing groups could accomplish themselves.
f). Tremendous organization, communication, and cooperation developed between users of the plant and the plant's management.
g). Skillful workmanship and production to customer's specifications of all products manufactured and sold from the plant.
h). Skillful combination of supply change management and plant operations.
i). Producers conscience about the delivered animal's health, overall condition, cleanliness, and quality.

10.5.2. Decision tree

The following decision tree could be used to assist in the sequence and content of making decisions by the steering committee or board of directors:

a). The first major question is, can sufficient capital (at least 50% of the property, plant and equipment costs plus 50% of the working capital needs) be raised by the individual producers, marketing groups, and other investors?

b). **If no**, the committee could:
  i). Evaluate creating a cooperative entity to coordinate custom processing and the marketing of non-needed meat items for the individual producers and marketing groups interested in this study.

ii). Judge the feasibility of a lower cost, single species facility.

c). **If yes**, begin the business-planning phase.
Business planning will fine-tune all developmental costs, design the business, design the equity raising strategy, and prepare UMFM for establishing a legal business.

d). Keep the marketing groups and individual producers interested in the project informed and engaged in the project. Mailings or a centralized meetings could accomplish this.

e). Narrow the site selection and begin working with potential local communities and their government agencies. State and city economic development personnel can assist in this process.

Section 11. Appendixes

Appendix A. Survey Instrument

Survey of Potential Users
Proposed Upper Mississippi Family Meats Processing Facility

Date: _____

Contact person _____

Address _____

Phone (day) _____ (evening) _____

Fax Email

☐ Individual Producer ☐ Producer Group _____ (number of producers in group)
How is group legally organized (coop, LLC, supply agreement, etc?

_____

1. Number of Animals For Processing

	2001	2002	2003	2004	2005	2006
Cattle						
Hogs						
Sheep (lamb)						
Goats						
Other _____						
Other _____						
Other _____						

2. Please describe any special production standards used in your operation:
(for example: organic, natural, range-fed, etc.)
_____
_____

3. Please describe any special processing requirements or certification you want:
(for example: organic, humane, etc.)
_____
_____

4. Extent you want meat processed:

	Fresh	Frozen
whole carcass		
vacuum packaged & boxed subprimals		
case-ready (portioned, individual cuts, & tray packaged)		
ground into patties		
cooked product _____ (describe)		
other _____ (describe)		
other _____ (describe)		
other _____ (describe)		

5. Where are your animals currently processed?
(name and location of plant(s))

_____
_____

6. How many are processed per week? _____

7. What are your current custom processing costs?

Kill	$
Boning & fabrication	$
Portion cutting	$
Further processing	$

8. Would you be interested in attending an informational meeting with other farmers interested in creating a meat processing facility in northeast Iowa built and operated on the values and principles described in the cover sheet?

☐ yes ☐ no

9. Additional Comments:

_____
_____

Appendix B. Map Of Survey Area

Appendix C. Background On The Study Authors

Appendix C.1. Food & Livestock Planning, Inc.

Kansas City Office
609 NE 95th St.
Kansas City, MO 64115
816-420-3042 phone
816-420-3055 fax

North Dakota Office
PO Box 522
Mandan, ND 58554
701-663-1116 phone
701-667-1356 fax

Food Livestock & Planning, Inc. (FLPI) develops systems that assist predominately livestock producers and their organizations in participating in the food industry beyond delivering livestock to a terminal market. The company provides technical assistance to existing food companies as well.

Research - FLPI provides research experience in marketing, feasibility analysis, and data development and its analysis. FLPI can determine market viability for various products. FLPI staff has been published in scientific journals and popular press.

Business and Market Planning - Completed or current business plans have involved projects with beef, pork, lamb, bison, and elk meat and dairy in 15 states.

Production and Price Modeling - FLPI has developed special pork and beef pricing formulas and contracts and have published articles on pricing livestock. Experience includes studying and testing a flow-through pricing mechanism that prices livestock based on processed cutout meat value, drop value and plant processing costs. Meat price models have been written for Conservation Beef, Cloverdale Growers Alliance, Dakota Beef Cooperative, Dakota Lamb Growers Cooperative, and Minnesota Certified Pork. An elk farming production model has been written for the states of South and North Dakota. Case-ready pricing models have been developed for Iowa Lamb Corporation.

Meat Packing and Processing - FLPI staff has extensive meat packing experience including executive management experience with meat packing and processing companies. FLPI is a partner with ProAnd Ltd with several U.S. projects. ProAnd Ltd. is a New Zealand company focusing on hygienic and technological processing and fabrication of livestock. Packing and processing plant models can be developed and various research projects involving the processing industry can be studied and applied to various situations. FLPI has assisted in the development of a state meat inspection program for North Dakota and have authored HACCP programs for several small companies.

Staff and Contract Associates

Keith DeHaan, Ph.D. - As owner and President of FLPI since 1998, Keith has extensive experience in all areas listed above. Keith earned a Ph.D. in Nutrition from the University of Nebraska, a M.S. in Reproductive Physiology and a B.S. in Animal Science from South Dakota State University. Past successes include:

Vice President, Technical Operations, Beef America Packing Company - Managed research and development, food safety/quality and performed new business development. COO of Beef America Specialty Foods Division, which involved specialty cutting, packaging, and further processing of beef and pork products.

Manager of Beef Production Systems, Farmland Industries – Managed a production business unit that tied together all production processes from birth to carcass. Wrote models for optimum cow/calf to processing systems. Worked on swine production projects.

Founder, officer, and investor in Ranchers' Gourmet, a specialized meat retail business located in Kansas City.

Raised on a family cattle feeding and ranching business in South Dakota.

Contract Associates
Marketing - Trudi Freeman, Overland Park, KS
Packing Plant design and consulting - ProAnd International Ltd., Fielding, New Zealand.
Legal - Steven Noack, Moorhead, MN
Plant siting and planning of agricultural facilities – DeHaan, Grabs, and Assoc. Mandan, ND,

Appendix C.2. ProAnd International Ltd.

New Zealand Office
56-62 Stafford St.
Feilding 5600
New Zealand
+64 6 323 8633

Australia Office
Suite 3, 10 Wharf Rd.
Gladesville, Sydney NSW
2111, Australia
+61 2 9879 5500

ProAnd International Limited is an independent international market leader in the design and operation of ultra hygienic and efficient meat and by-products systems and plants, and completely conversant with USDA, EU, and Halal regulations.

The Company is fully devoted to the meat processing industry offering a totally integrated range of services to assist clients from pre-design stages through to commissioning and operation of plants. In addition the Company provides

continuous improvement programs, cost reduction studies, product management and market advice.

ProAnd International Limited has a proven performance record in New Zealand, Australia, Europe, U.S.A., Middle East and South East Asia. The Company is proud of its reputation for integrity, quality and the high standard of individual service provided to clients. USA clients include Washington Beef, Mid-Ag, Northern Plains Premium Beef, Superior Farms, Ferry Brothers.

The Company is privately owned with offices in New Zealand and Australia.

Personnel

All personnel working for the Company have long and extensive experience in all aspects of the meat industry. In-house skills range from plant management through strategic planning, benchmarking, design/development engineering, production management, production/process development to marketing.

Client Base

ProAnd's New Zealand client base includes the majority of the major and minor meat companies. ProAnd has been responsible for the upgrade of many existing plants. In addition the Company has been responsible for many of the new smaller plants**.**

ProAnd has a significant client base in Australia, USA, and in many other countries of the world. The Company actively pursues an export policy.

Website

The background of the professional principals and employees of ProAnd International, a listing of their successfully completed projects around the world, and a description of the services that they perform are listed on their website: www.proand.co.nz

Appendix D. Plant Design