THE ECONOMIC FEASIBILITY OF A SMALL MULTI-SPECIES MEAT PROCESSING PLANT IN THE STATE OF OKLAHOMA

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CHAPTER I

INTRODUCTION

In the past few decades the number of small multi-species meat processing plants in Oklahoma has decreased from 225 in 1983 to 157 in 2000 (Holcomb, and Ward, 2003). These authors found these plants have closed for various reasons such as family members not continuing in family business, increased cost due to new/changing USDA regulations, labor shortage, and the need to update facilities. Because of this decrease in number, clients of the Robert M. Kerr Food & Agricultural Products Center (FAPC) at Oklahoma State University, including members of the Oklahoma Food Cooperative, have indicated that it is difficult to find a processor to harvest their animals and the wait time to get into a plant can be several months (Willoughby, April 2011). This problem, combined with the increased demand for organic/natural meats (Food Marketing Institute, 2011, http://www.fmi.org/) and USDA's "Know Your Farmer, Know Your Food" program (www.usda.gov/knowyourfarmer) has many interested parties examining the feasibility of opening their own plants.

The opening and operation of a meat processing plant are impacted by many variables, and the impacts of changes in variables are not easily understood by people who lack meat industry experience (Coleman, 2008). The cost of building a plant to meet USDA or State regulations that will withstand the rigors of daily cleaning is relatively

high, and one goal of this research is to explain the components and considerations that impact facility cost. Through the documentation of facility requirements and the development of a spreadsheet model, this thesis will allow the prospective plant owner to develop the conditions necessary to cash flow his/her new company and to achieve profitability.

Problem statement

Livestock producers and entrepreneurs may be interested in owning or operating their own meat processing plant for many reasons, mostly related to capturing marketing margins and/or maintaining control of their animals from the farm to the consumer's plate (Willoughby, April 2011). However, most do not understand the factors that impact plant operations and ownership. The ownership decision must be founded in sound financial analysis, not simply disappointment over current market wait times for custom slaughter. Potential plant owners need to know some detail of the potential animal slaughter needs in a given area. For example, one question could be: Is the proposed facility site located in a rural area with enough potential customers that raise animals for slaughter? In other words, do enough local patrons still demand locker beef or whole hog processing for their freezers, and will this demand make use of a majority of the proposed facility's capacity?

Plant owners must consider the impacts of balancing a variety of potential business activities under one roof. These may include custom packing for multiple species (e.g. beef cattle, hogs, sheep, goats, bison, etc.), handling of wild game (e.g. deer and wild hogs), and possibly even maintaining a retail shop in the plant for customers in

the community. Other factors also impact ownership decisions, and this thesis project is expected to help potential plant owners make informed decisions.

Objectives of this Study

General Objective

1. To provide guidelines for building and operating a small multi-species meat processing plant.

Specific Objectives

1. Provide a basic equipment list needed for a generic meat processing plant.
2. Provide an estimated cost of building a facility that will meet current USDA-FSIS requirements and recommended humane handling specifications.
3. Provide a financial template that can be used for a large or a small scale plant design and will estimate profitability, cash flow, and returns on investment under various operating conditions.

CHAPTER II

LITERATURE REVIEW

There is an opinion among Oklahoma Food Cooperative members and producers of locally grown livestock that there is a shortage of small meat processing plants in Oklahoma (Willoughby, April 2011). The long wait time to get an animal harvested and processed may average up to 3 months (Ralphs May 2011, Country Home Meats April 2011). At certain times of the year, the wait may be up to 6 months. This fact alone has caused interested parties to look at the feasibility of launching a multi-species meat processing plant. At this time there is little guidance in this area. A publication by Iowa State University (2009) is a good reference for plant design and addresses food safety and product flow. While the guide provided a detailed overview of facility design options, the publication did not discuss the economic impacts of operational decisions. The authors focused solely on plant construction issues.

The USDA has acknowledged the loss of small meat processors, even while promoting its "Know Your Farmer, Know You Food" campaign and placing greater demands on the existing small plants (Kershner, 2010). USDA's Food Safety Inspection Service (FSIS) has published guidance documents

(http://www.fsis.usda.gov/News_&_Events/NR_083010_01/index.asp) for small mea

plants and mobile meat plants to encourage more small-scale local processing, but the documents do not give any financial advice to help with a decision of this magnitude.

There is little to be found on the economics of a small meat plant, possibly because these plants are mostly owned by single entrepreneur or family-owned and do not publicly report their financial information. Producers opening or proposing to open a facility typically have little information regarding the actual cash needed to construct the plant and serve as working capital to fund operations until profitability can be attained. Livestock producers with no experience in meat processing do not realize the risks that come with this kind of decision. Examples of risks includes variations in equipment costs (used and new), shortage of skilled labor, high utility bills including waste removal, and the ever increasing time demands and expense associated with USDA or state oversight and inspection.

DeHaan (2006) includes some financial information for a relatively small beef packing plant. However, this case study was very specific to one situation in Montana with the focus on beef slaughter and was very specific to size and scale. Because the DeHann feasibility study has only been published as a case study, it did not allow for modification of the case facility or provide enough detailed information for a producer or entrepreneur to generate an individualized model. The DeHaan study would be difficult to use as a decision making tool for a multi-species meat plant in Oklahoma. The DeHann study focused on purchasing cull cows and retailing the products made from the cull cows and bulls, while a small multi-species meat plant would likely have a greater emphasis on custom packing.

There have been several private business plans and feasibility studies generated in recent years, and some plans were funded by producers through the USDA's Value Added Producer Grants program, and are not available for public access. Additionally, the re-creation of these plans and studies would require hiring the consultants who generated the original plans. Before funding for a complete business plan, a cash prediction income tool for potential plant owners would be beneficial. This tool would not to replace a complete business plan or a detailed feasibility study, but would to be a guide to help make initial planning decisions.

CHAPTER III

Facility Design

The design of the facility may be the most important decision made when building a meat processing plant (Iowa State University, 2009). A key decision is whether to be state inspected, federally inspected or custom exempt. A USDA inspected plant will have the most stringent requirements, although a state-inspected plant generally follows the requirements of federal regulations (http://www.fsis.usda.gov/factsheets/inspection_&_grading/index.asp). Building a plant that will meet all requirements for federal inspection may be more expensive in the beginning but it will position the plant for future growth. A federally inspected plant has a potential for sales growth that a state inspected plant does not, due to current restrictions on state-inspected facilities for meat marketing across state lines.

In Oklahoma the USDA or the Food Safety Division of the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF) are the regulatory authorities for meat processing plants. The USDA or the ODAFF will inspect the plant daily for sanitation and good manufacturing practices if the brand of inspection is required. The USDA or ODAFF oversee inspection of custom slaughter and processing, and processing of wholesale meats. If retail sales are a consideration, the plant may face regulation by the FDA and/or Oklahoma State Department of Health. With the signing into law of the Food Safety Modernization Act in January 2011, the FDA will have more authority as the law

is developed and implemented (http://www.fda.gov/food/foodsafety/fsma/default.htm).

The USDA has published a document that is a guide for Small and Very Small plants: "*Applying for Federal Grant of Inspection for Meat and Poultry Plants"* (http://www.fsis.usda.gov/PDF/Guidelines_for_Obtaining_Federal_Grant_of_Inspection.pdf). This guide identifies and discusses seven steps to complete for obtaining a federal grant of inspection:

1. File an Application for Inspection
2. Facilities Must Meet Regulatory Performance Standards
3. Obtain Approved Labels and/or Brands
4. Obtain Approved Water Source Letter
5. Obtain Approved Sewage System Letter
6. Provide a Written Standard Operating Procedure for Sanitation
7. Provide a Written Hazard Analysis and HACCP Plan

Because of some very high profile events that have been taped by Humane Society of United States, more focus has been placed on humane handling than in the past (http://www.huffingtonpost.com/wayne-pacelle/action-needed-to-better-e_b_488424.html). The new scrutiny that is placed on animal handling will have a great impact on how the unloading area and animal holding pens of new plants are designed.

The design of the stunning box to handle the various sizes and species of animals must also be well thought out. In a small meat processing plant, typically all animals are rendered unconscious in the same chute, from100 pound lambs to 2,500 pound bulls. It is reasonable to understand the difficulty in designing a facility that will function well for all animals between those two extremes. Even if a facility will only slaughter custom exempt animals they must follow the same guidelines as an inspected facility for humane handling.

The following information was obtained from FSIS Directive 6900.2 Revision 1, which has taken information from the Humane Methods of Slaughter Act of 1978 and federal requirements from 9 CFR 313 and compiled them in one document for ease of use. The Humane Methods of Slaughter Act of 1978 (Section 1901, 1902 and 1906, Attachment 1) requires that the handling and slaughtering be accomplished by humane methods. The USDA has some clearly defined parameters for humane handling and slaughter of livestock in FSIS Directive 6900.2:

- Humane methods are methods that prevent needless suffering of animals.
- Once a vehicle carrying livestock is on an official establishment's premises it is part of the official establishment, and is then subject to 9 CFR 313.2.

Provisions in 9 CFR 313.2 state that:

> *(a) Driving of livestock from the unloading ramps to the holding pens and from the holding pens to the stunning area shall be done with a minimum of excitement and discomfort to the animals. Livestock shall not be forced to move faster than a normal walking speed.*
> *(b) Electric prods, canvas slappers, or other implements employed to drive animals shall be used as little as possible in order to minimize excitement and injury. Any use of such implements which, in the opinion of the inspector, is excessive, is prohibited. Electrical prods attached to AC house current shall be reduced by a transformer to the lowest effective voltage not to exceed 50 volts AC.*
> (*c) Pipes, sharp or pointed objects, and other items which, in the opinion of the inspector, would cause injury or unnecessary pain to the animal shall not be used to drive livestock.*
> (*d) Disabled livestock and other animals unable to move.* (Also refer to FSIS Directive 6900.1, Humane Handling of Disabled Livestock).
> *(1) Disabled animals and other animals unable to move shall be separated from normal ambulatory animals and placed in the covered pen provided for in section 313.1(c).*
> *(2) The dragging of disabled animals and other animals unable to move, while conscious, is prohibited. Stunned animals may, however, be dragged.*
> *(3) Disabled animals and other animals unable to move may be moved, while conscious, on equipment suitable for such purposes; e.g., stone boats.*

(e) Animals shall have access to water in all holding pens and, if held longer than 24 hours, access to feed. There shall be sufficient room in the holding pen for animals held overnight to lie down.
(f) Stunning methods approved in section313.30 shall be effectively applied to animals prior to their being shackled, hoisted, thrown, cast or cut.

Facilities are subject to 9 CFR 313.1 as it relates to the conditions of pens:

(a) Livestock pens, driveways and ramps shall be maintained in good repair. They shall be free from sharp or protruding objects which may, in the opinion of the inspector, cause injury or pain to the animals. Loose boards, splintered or broken planking and unnecessary openings where the head, feet, or legs of an animal may be injured shall be repaired.
(*b) Floors of livestock pens, ramps, and driveways shall be constructed and maintained so as to provide good footing for livestock. Slip resistant or waffled floor surfaces, cleated ramps and the use of sand, as appropriate, during winter months are examples of acceptable construction and maintenance.*
(*d) Livestock pens and driveways shall be so arranged that sharp corners and direction reversal of driven animals are minimized.*

Animals must also be rendered unconscious instantly and remain so before being slaughtered. There are four methods of acceptable to render a animal unconscious:

- Chemical-Carbon Dioxide
- Mechanical- Captive Bolt
- Mechanical – Gunshot
- Electrical-stunning or slaughtering with electric current

Besides designing a facility for humane handling one must address the more common questions of design for a typical meat processing plant:

- Will the plant process fresh meat only?
- Will there be a cooked or smoked meat section of the plant?

- Will smoked or cooked meat products be considered ready to eat?

Answering these questions will be very important not only for inspection, but also for facility design to get optimum product flow through the facility (Nelson, 2011).

Plant size and location are also important considerations for a potential plant owner. Location and size of the facility will determine the type of waste water system to be used. If the facility is built where waste water can be handled by public systems, the cost may be much less than building and maintaining a waste water treatment system. Land cost for a plant can vary greatly and will depend heavily on the community in or near where the plant is built.

Careful thought and planning must go into designing the livestock unloading, holding and handling area. Pens must be designed so that there are no sharp corners and in a way that livestock can be handled easily and with low stress. Several companies have designed cattle working systems with sweep gates that help drive animals into a lane that could lead to the knock box. These systems would need some modification for handling hogs and sheep, but will be a good starting point for establishing a facility cost. A 35 head capacity unit for cattle will be used for simulation purposes. It is understood that money could possibly be saved by building your own system. However, for this exercise a pre-constructed 35 head capacity unit will be used.

The next step is to develop a total cost estimate for building a plant. The costs below are for building a new plant:

- **Land:** Land values are highly variable, but for simulation purpose the model will use land prices on the South side of Stillwater, OK: $15,000/acre (Frontier realty, 2011)

- **Building:** A red iron steel building shell may cost $31.00/square foot (Schneberger, 2008). This model will assume a 5,000 square foot building, for a total shell building cost of $155,000.

- **Refrigeration**: Refrigeration systems and the refrigeration requirements of the plant can vary, impacting the total cost. For purposes of a baseline simulation in this model, a quoted cost of $84,857 for a "general" 5,000 square foot multi-species plant will be used (Minus Forty Sales 2011).

- **Interior construction of the plant:** A value of $95,286 is used (Cold Storage, 2011). This includes the insulated walls and doors that will make up the refrigerated sections of the plant.

- **Holding pens and Livestock unloading area:** A pre-constructed unit for 35 head (cattle) is assumed, costing $21,202.00 (www.priefert.com, May2011).

In addition to the construction of the facilities, costs for equipping the facility are an important consideration. Equipment costs can vary greatly, depending on the status of the equipment (new or used), the vendor, and even the current prices of stainless steel. Table 1 provides a proposed equipment price list for the simulation facility, recently quoted prices for equipment, and the sources for the quotes.

Table 1: Equipment List for a Small Meat Packing Plant.

Item	Cost	Source
Knocking box	$3,890.00	Koch Quote March 2011
Hoist	$2,995.00	Koch Quote March 2011
Split Saw	$5,861.00	Koch Quote March 2011
Skinning cradles	$1,075.00	Koch Quote March 2011
Evisceration cart	$5,485.00	Koch Quote March 2011
Carcass Scales	$2,499.00	Mid-Western Quote May 2011
Trolleys	$12.70 each	Koch Quote March 2011
Carcass dropper	$1,585.00	Koch Quote March 2011
Stainless steel landing table	$1,580.00	Koch Quote March 2011
Boning table	$1,465.00	Koch Quote March 2011
Packaging Table	$1,285.00	Koch Quote March 2011
Band saw	$8,115.00	Koch Quote March 2011
Mixer Grinder	$11,519.00	Mid-Western Quote May 2011
Stuffer	$9,999.00	Mid-Western Quote May 2011
Slicer	$3,180.00	Mid-Western Quote May 2011
Patty machine	$6,681.00	Mid-Western Quote May 2011
Vacuum packaging machine	$12,467.00	Mid-Western Quote May 2011
Brine injector hand held	$2,299.90	Mid-Western Quote May 2011
Automatic brine injector	$47,900.00	Reiser Quote May 2011
Table top scales	$599.00	Mid-Western Quote May 2011
Tenderizer	$1,836.00	Mid-Western Quote May 2011
Smoke house	$48,882.00	Mid-Western Quote May 2011
Fresh meat case	$2,500.00	Ebay buy it now option May 2011
Cash Register	$99.99	Best buy 2011
Desk	**$**569.00	**S**taples May 2011
Chair	$189.00	Staples May 2011
Computer	**$**1,199.00	Best Buy 2011
Printer/copier/fax	$449.00	Best Buy 2011

CHAPTER IV

Operational Costs

Operational costs differentiate the profitability of similarly-sized/capacity plants. These costs are composed of fixed costs, variable expenses and payroll and salaries. Examples of these are:

Fixed costs: Utilities (electric, gas, water), inedible removal, phone and internet, maintenance cost, equipment rental, advertising and insurance.

Variable expenses: Packaging supplies, cleaning supplies, cost of goods sold, office supplies, and miscellaneous expenses.

Salaries and Payroll expenses: Actual salary or hourly wage paid, FICA and Social Security taxes, worker's compensation insurance, unemployment insurance, and health insurance.

Actual expenses to be used in the simulation include the following:

Table 2: Assumed Fixed Expenses (Monthly Basis) for a Small Meat Packing Plant.

Expense	Cost Monthly	Source
Electric	$4,500.00	Small Oklahoma processor
Gas	$1,370.00	Small Oklahoma processor
Sewer	$1,379.00	Small Oklahoma processor
Microbiological Testing	$140.00	Small Oklahoma processor
Inedible expense	$1,105.00	Personal conversation with Valley Proteins
Phone and Internet	$150.00	Small Oklahoma processor
Maintenance	3%	Holcomb and Kenkel Template
Equipment Rental	$200.00	Southwest Saw
Insurance	3%	Holcomb and Kenkel template

Table 3: Assumed Variable Expenses for a Small Meat Packing Plant.

Expense	Cost	Source
Beef Packaging	$52.00 per animal	Koch packaging
Pork Packaging	$16.00 per animal	Koch packaging
Lamb , Goat, Deer Packaging	$6.50 Per animal	Koch packaging

Table 4: Assumed Payroll and Salaries Expenses for a Small Meat Packing Plant.

Position	Wage	Source
Manager	$48,210.00	http://www.bls.gov/oes/current/naics4_311600.htm
Butcher	$27,380.00	http://www.bls.gov/oes/current/naics4_311600.htm
packaging	$24.120.00	http://www.bls.gov/oes/current/naics4_311600.htm

Explanations for some of the expenses in Table 2 are necessary for clarification. Microbiological testing costs are the costs a small plant is at this time paying currently. Inedible expenses are derived from 3 service charges a week at $85.00 a trip. Equipment rental will include grinding plates, knife blades for the grinder and saw blades. Variable costs per animal assume a basic cut order of 2 cuts per package and includes vacuum bag cost and the cost of boxes. This cost can vary greatly depending on the kind of storage device used for finished product in the freezer.

Expected income streams include custom processing and potential retail sales:

- Beef : $50.00 slaughter fee and a processing fee of $0.65/lb (hot carcass weight basis), based on 700 lb carcass;
- Pork: $40.00 slaughter fee, processing fee $0.65/lb and $0.60 /lb for smoking and curing (hot carcass weight basis). The figures used in this template are based on 210 lb carcass and 86 lbs of cured meat.
- Deer, lamb, or goat: $100.00/head for processing
- Retail meat sales may be a possible income stream but the amount of profit from this income stream can vary greatly by location. This current plant simulation does not include retail meat sales.

Impacts of Management on Operating Costs

Opening a new business can be a risk, and projected numbers cannot adequately depict the value of management. Some of the management and operational skills sets needed to keep operational costs low, are:

- Welder - Many tasks during startup and operation of a meat processing plant require welding, from building pens to hanging rails for carcasses. If an owner or manager possesses this skill set there is a potential for significant savings in both startup and routine maintenance during operation.
- Accountant - A plant owner or manager who has a basic understanding of accounting and can appropriately use one of the common accounting software products has the potential to save money on monthly accountant fees.
- Electrician- A basic knowledge of how to wire outlets and hook up equipment can save money by avoiding expensive electrician service fees each time a new piece of equipment is installed.
- Plumber - The ability to unclog a drain, clean a grease trap, maintain a septic system, or make repairs to cracked water pipes can help keep costs down.
- Equipment repairman - The ability to repair and perform maintenance on equipment can save the business from expensive service agreements or costly out-of-plant repairs. This also helps in the purchase of used equipment. Some plants may have a workshop that houses used machines purchased at auctions or from other businesses, used for parts or as backup equipment. Having the ability to repair or rebuild equipment can help reduce short-term maintenance costs and longer-term capital replacement costs.

- Quality Manager - By attending workshops on quality a manager can improve the operations of the company (Young, 2011). Examples of these workshops are HACCP courses, quality control workshops, and lean manufacturing courses.
- Sanitation - A successful business manager is sometimes one who handles even the less glorifying tasks to keep the enterprise's costs down.
- Salesman - For a business to be successful it helps if an owner or manager has some skills in sales and marketing, to promote both the plant and the products.
- Butcher - The skill set that may have caused an owner or manager to work in a meat processing plant can at times be the least used, but a good manager is always ready and able to help his production workers in the event of high business volume.
- Business manager - Basic management skills are needed to manage a business, and some of the skills that are helpful in a meat processing plant can be scheduling, inventory management, supervisory skills, and time management.

To successfully operate and manage a business of this type will require many skill sets. Owners who can fulfill some of these tasks can reduce costs in these areas. Other ways to manage costs are to hire employees who can fulfill some of these tasks as well as their meat processing duties.

CHAPTER V

Results

A Microsoft® Excel® spreadsheet has been developed as a template for determining the feasibility of a multi-species meat processing plant. There are places in the spreadsheet for inputting the various costs associated with building costs, operational expenses, personnel expenses, and other inputs. This spreadsheet includes individual sheets labeled *Inputs, Market Projections, Loan Amortization, Personnel Expenses, Expense Projection, Operation Summary, Depreciation,* and *Return on Investment*. The spreadsheet model develops profit/loss and cash flow projections over a 10 year period. Appropriate tables in this chapter will show the first 5 years as examples, but the full 10 year tables are available in the appendix.

Table 5 is a partial list of assumptions from the *Inputs* page and has cells to input the percent of the facility financed and the interest rates, monthly expenses, and information on expected income streams. Additional expense entries are made on the *Personnel* page (salaries and wages) and the *Depreciation* page where the costs of building, land, and equipment are listed.

Table 5: Basic Financing and Operating Expenses for a Multi-Species processing plant

INPUT CAPITAL STRUCTURE AND EXPENSE INFORMATION	
Percent Financed	80.00%
Long Term Interest Rate	6.25%
Loan Term	10
Total Plant Property & Equip	$558,818
Loan Amount	$447,054
Tax Information	
Property Tax as % of Prop and Plant	0.00%
Income Tax Rate	28.00%
Payroll Information	
% of Payroll Tax to Salaries	8.00%
% of Employee INS Tax to Salaries	21.00%
Benefits as % of Salaries	29.00%
Wage Inflation	0.00%
Utilities	
Electricity/month	$4,500
Misc Exp	$2,824
Gas/month	$1,370
Telephone/month	$150
Total Utilities	$8,844
Other	
Expense Inflation Rate	1.00%
Maintenance as % of Plant & Equip	3.00%
Insurance as % of Plant & Equip	3.00%
Discount rate for NPV calculation	10.00%

Table 6 shows the projected income stream can change with business growth. The example in this model reflects a growth of 1% per year. For purposes of this example, the variable costs of packing are subject to a 1% inflation rate but the price for services do not change.

Table 7 is the loan amortization table. This table shows how principle on the loan decreases over time and the amount of interest paid per year. As you change the loan amount it will also show how this is affected and will reflect on other reports.

Table 8 shows personnel expenses, with the salaries obtained from the Bureau of Labor Statistics (www.bls.gov). These figures represent national average costs for experienced labor for these jobs. Some plants could operate with an owner/manager who may not take a salary until the business becomes profitable. It also may be possible to find untrained labor to do these jobs. But for the simulation, trained labor will be used and full salaries will be paid. This table will allow salaries to be entered for the various positions in the plant with or without overtime.

Table 9 is an example of the expense projections using the numbers and assumptions stated in previous tables. These numbers could be quite different depending on how the plant is built. If the plant were built with used equipment instead of new the maintenance expense would be expected to go up.

Table 10 shows the estimated profits/losses and annual cash flows for years 1-5. These numbers that have been inputted elsewhere in the spreadsheet are used to generate these projections. The number of head slaughtered can be adjusted to determine the plant's breakeven level of processing. Salaries could also change these numbers along with the loan amount financed and the actual cost of the business.

Table 11 is return on investment, showing predicted returns to the venture in a variety of formats. Collectively, the net present value (NPV), internal rate of return (IRR), return on assets (ROA), and return on beginning equity (ROE) provide an overall picture of the economic feasibility of the plant under different operating assumptions.

Table 6:Market projection

Sales Projections

		Year 1	Year 2	Year 3	Year 4	Year 5
Beef	animal	735	742	750	757	765
pork	animal	315	318	321	325	328
lamb , Goat and Deer	animal	300	300	300	300	300
		1,350	**1,361**	**1,371**	**1,382**	**1,393**

Gross Sales Projection

	Year 1	Year 2	Year 3	Year 4	Year 5
Beef					
Total Volume	735	742	750	757	765
Price/Unit	$505.00	$505.00	$505.00	$505.00	$505.00
Gross Sales	$371,175.00	$374,886.75	$378,635.62	$382,421.97	$386,246.19
pork					
Total Volume	315	318	321	325	328
Price/Unit	$228.100	$228.100	$228.100	$228.100	$228.100
Gross Sales	$71,852	$72,570	$73,296	$74,029	$74,769
lamb , Goat and Deer					
Total Volume	300	300	300	300	300
Price/Unit	$100.00	$100.00	$100.00	$100.00	$100.00
Gross Sales	$30,000.00	$30,000.00	$30,000.00	$30,000.00	$30,000.00
TOTAL GROSS SALES	$473,027	$477,457	$481,931	$486,451	$491,015
Production Expense					
Beef	$38,220	$38,602	$38,988	$39,378	$39,772
pork	$5,040	$5,090	$5,141	$5,193	$5,245
lamb , Goat and Deer	$1,950	$1,950	$1,950	$1,950	$1,950
TOTAL VARIABLE EXP.	$45,210	$45,643	$46,080	$46,521	$46,967

Table 7: Loan amortization

Total Investment	$558,817.99				
Long Term Interest Rate	6%				
Percent Financed	80%				
Loan Amount	$447,054.39				
Loan Term	10				
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Beginning Balance	$447,054.39	$413,533.46	$377,917.46	$340,075.47	$299,868.35
Interest Rate	6%	6%	6%	6%	6%
Interest	$27,940.90	$25,845.84	$23,619.84	$21,254.72	$18,741.77
Annual Payment	$61,461.84	$61,461.84	$61,461.84	$61,461.84	$61,461.84
Principal	$33,520.94	$35,615.99	$37,841.99	$40,207.12	$42,720.06
Ending Balance	$413,533.46	$377,917.46	$340,075.47	$299,868.35	$257,148.28
Total Interest Expense	$27,940.90	$25,845.84	$23,619.84	$21,254.72	$18,741.77

Table 8: Personnel expenses

Occupation	Salary	Benefits	Overtime%	Overtime	Total
Owner /Manager	$48,210	$13,981	0%	$-	$62,191
Butcher	$27,380	$7,940	0%	$-	$35,320
Kill floor employee	$24,120	$6,995	0%	$-	$31,115
Packaging	$24,120	$6,995	0%	$-	$31,115
Total Personnel Costs	$123,830	$35,911		$0	$159,741

Table 9:Expense projections

Labor	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Salaries		$123,830.00	$123,830.00	$123,830.00	$123,830.00	$123,830.00
Benefits		$35,910.70	$35,910.70	$35,910.70	$35,910.70	$35,910.70
Overtime		$0.00	$0.00	$0.00	$0.00	$0.00
Total Labor	**$0.00**	**$159,740.70**	**$159,740.70**	**$159,740.70**	**$159,740.70**	**$159,740.70**
Production Expenses		$41,090.00	$41,481.40	$41,876.71	$42,275.98	$42,679.24
Utilities		$106,128.00	$107,189.28	$108,261.17	$109,343.78	$110,437.22
Total Variable	**$0.00**	**$306,958.70**	**$308,411.38**	**$309,878.59**	**$311,360.47**	**$312,857.16**
Fixed						
Maintenance		$4,500.00	$4,545.00	$4,590.45	$4,636.35	$4,682.72
Insurance		$4,200.00	$4,242.00	$4,284.42	$4,327.26	$4,370.54
Property Tax		$800.00	$808.00	$816.08	$824.24	$832.48
Depreciation		$34,003.86	$53,126.11	$40,003.00	$30,629.35	$23,955.31
Interest		$27,940.90	$25,845.84	$23,619.84	$21,254.72	$18,741.77
Total Fixed	**$0.00**	**$71,444.76**	**$88,566.95**	**$73,313.79**	**$61,671.93**	**$52,582.82**
Other						
Supplies		$6,600.00	$6,666.00	$6,732.66	$6,799.99	$6,867.99
Miscellaneous*		$10,560.00	$10,665.60	$10,772.26	$10,879.98	$10,988.78
Total Other	**$0.00**	**$17,160.00**	**$17,331.60**	**$17,504.92**	**$17,679.97**	**$17,856.76**
Total Expenses	**$0.00**	**$395,563.46**	**$414,309.93**	**$400,697.29**	**$390,712.36**	**$383,296.75**

Table 10: Operation summary

Gross Sales

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Beef	$0	$335,825	$339,183	$342,575	$346,001	$349,461
pork	$0	$65,009	$65,659	$66,315	$66,978	$67,648
lamb , Goat and Deer	$0	$30,000	$30,000	$30,000	$30,000	$30,000
retail	$0	$0	$0	$0	$0	$0
Total	**$0**	**$430,834**	**$434,842**	**$438,890**	**$442,979**	**$447,109**

Expenses

Variable	$0	$306,959	$308,411	$309,879	$311,360	$312,857
Fixed	$0	$71,445	$88,567	$73,314	$61,672	$52,583
Other	$0	$17,160	$17,332	$17,505	$17,680	$17,857
Total Expenses	**$0**	**$395,563**	**$414,310**	**$400,697**	**$390,712**	**$383,297**
Before Tax Profit	$0	$35,270	$20,532	$38,193	$52,267	$63,812
Tax	$0	$9,876	$5,749	$10,694	$14,635	$17,867
After Tax Profit	**$0**	**$25,394**	**$14,783**	**$27,499**	**$37,632**	**$45,945**

Estimate of Cash Flows

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
After Tax Profits	$0	$25,394	$14,783	$27,499	$37,632	$45,945
Depreciation	$0	$34,004	$53,126	$40,003	$30,629	$23,955
Principle	$0	$33,521	$35,616	$37,842	$40,207	$42,720
Cash Flow	**$0**	**$25,877**	**$32,293**	**$29,660**	**$28,054**	**$27,180**

Table 11: Return on Investment for a Small Multi-Species Plant (discount rate for NPV = 10%)

Total PV of Income	$2,741,300
Total PV of Expenses	$2,665,452
Net Present Value	$75,848
Internal Rate of Return	13.02%
PV Benefit/PV Cost Ratio	1.03
Return on Assets	
(after tax income/total PPE investment)	
Average ROA	7.62%
Return on (Beginning) Equity	
(after tax income/non-borrowed PPE investment)	
Average ROE	38.11%

Table 12- 14 are sensitivity analyses with different scenarios. Table 12 shows the impact of facilities and equipment costs on internal rate of return and net present value. Table 13 shows the impact of lowering the amount financed on NPV and cash flow in the first year, depicting the wide range in cash position resulting from debt load. Table 14 shows the sensitivity of the plant's profitability to changes in the number of hogs and cattle processed per year.

Table 12: Sensitivity Analysis: Impacts of Changes in Plant, Property, & Equipment Costs on Small Meat Plant IRR and NPV (10% discount rate).

PP&E Costs (% base)	IRR	NPV
-20%	19.08%	$192,747
-15%	17.35%	$163,522
-10%	15.78%	$134,298
-5%	14.34%	$105,073
Baseline	13.02%	$75,848
+5%	11.79%	$46,623
+10%	10.64%	$17,398
+15%	9.58%	($11,826)
+20%	8.58%	($41,051)

Table 13: Sensitivity Analysis: Impacts of Borrowing Level on Small Meat Plant IRR, NPV (10% discount rate), and Year 1 Cash Flow.

Borrowed Capital (%)	IRR	NPV	Yr 1 Cash Flow
50%	13.21%	$80,955	$45,992
55%	13.18%	$80,104	$42,639
60%	13.14%	$79,253	$39,287
65%	13.11%	$78,402	$35,935
70%	13.08%	$77,550	$32,582
75%	13.05%	$76,699	$29,230
Baseline = 80%	13.02%	$75,848	$25,877

Table 14: Sensitivity Analysis: Impacts of Annual Cattle/Hog Slaughter (70% cattle, 30% hogs) on Small Meat Plant IRR, NPV (10% discount rate), and 10-Year Average Annual Profits.

Cattle/Hogs Combined Annual Slaughter (hd)	IRR	NPV	Avg. Annual Profit
850	2.61%	($167,247)	-$1,166
875	5.44%	($106,473)	$6,369
900	8.10%	($45,700)	$13,772
925	10.61%	$15,074	$20,942
950	13.02%	$75,848	$28,112
975	15.33%	$136,622	$35,281
1,000	17.56%	$197,396	$42,451

Chapter VI

Conclusions

The goals of this thesis were to provide guidelines and financial considerations for building and operating a small multi-species meat processing plant.

The specific goals were:

1. Provide a basic equipment list needed for a generic processing plant.
    - This goal was met by the equipment list provided in Table 1
2. Provide an estimated cost of building a facility that will meet current USDA-FSIS requirements and recommended humane handling specifications.
    - This Goal was met by the following:
        - Providing costs of a shell building.
        - Providing costs of facility infrastructure.
        - Providing costs of livestock handling equipment.
        - Providing regulations and recommendations associated with humane handling.
        - Providing information regarding USDA-FSIS guidelines for startup of new plant.

3. Provide a financial template that can be used for a large or small scale plant design and will estimate profitability, cash flow, and returns on investment various operating conditions.
    - A template has been developed that will allow the user to input initial building costs, equipment cost, monthly expenses, salaries, and expected income streams.
    - The template will produce financial predictions out to 10 years.
    - The template will produce estimated annual cash flow numbers based on number of animals harvested per year.
    - The template shows various measures of return on investment to help its users determine the overall viability of a venture.

In summary the specific objectives of the study have been met. Further research is necessary to explore other avenues of revenue besides custom slaughter. Other items that could add profit to the business with further study are:

- Wholesale meat sales - Providing meat for local hotels and restaurants as well as small grocery stores is another way profits could be increased. Niche items like jerky or snack sticks could also be marketed.
- Retail meat sales - A fresh retail meat counter in or attached to the plant is another avenue that was not investigated. While there may be health inspection implications involved, this option has been profitable for many small plants.
- Mobile slaughter - The recent interest in mobile slaughter could be a completely separate topic for study, especially if a mobile slaughter facility is

to be complemented by a stationary further processing and/or retail sales facility.

The ever-changing nature of food safety requirements and possible regulatory changes represent the possibility for related studies in the near future. Regardless of the challenges faced by small meat processors, it seems that there is a continued demand for their services is present. It is hoped that this study will serve as a useful tool for those wishing to build or expand their small multi-species processing ventures, whether in Oklahoma or other states.

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APPPENDICES

This sheet calculates depreciation. You enter descriptions and values for buildings, equipment and other property.

Depreciation

Buildings	39 year Straight Line
Special Purpose Buildings	10 year Straight Line
Equipment and Heavy Rolling S	7 Yr MACRS with half year convention
Light Trucks and Vehicles	5 Yr MACRS with half year convention

Buildings

Description	Value	Salvage
Shell metal building	$155,000	$75,000
Refrigeration system as part of building	$84,857	
Cooler construction & doors	$95,286	
Livestock holding area (pens)	$21,202	
#5		
Total Buildings	$356,345	$75,000

Special Purpose Buildings

Description	Value
#1	
#2	
#3	
#4	
#5	
Total Special Purpose Building	$0

Equipment and Heavy Rolling Stock

Description	Value
equipment	$187,473
#2	
#3	
#4	
#5	
Total Equip and Heavy Rolling Stock	$187,473

Light Trucks and Vehicles

Description	Value
#1	
#2	
#3	
#4	
#5	
Total Light Trucks and Vehicles	$0

Total Plant Property and Equipment	$543,818
Land	$15,000
Total Land, Plant Property and Equipment	$558,818

Annual Total Depreciation

Year	1	2	3	4	5	6	7	8	9	10
Buildings	$7,214	$7,214	$7,214	$7,214	$7,214	$7,214	$7,214	$7,214	$7,214	$7,214
Special Purpose Buildings	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Equipment and Heavy Rolling Sto	$26,790	$45,912	$32,789	$23,415	$16,741	$16,723	$16,741	$8,361		
Light Truck and Vehicles	$0	$0	$0	$0	$0	$0				
Total Depreciation	$34,004	$53,126	$40,003	$30,629	$23,955	$23,937	$23,955	$15,575	$7,214	$7,214

Buildings	39 year Straight Line
Special Purpose Buildings	10 year with percentage from table

VITA
Kyle Flynn

Candidate for the Degree of

Master of Science

Experience:

Meat Plant Manager, Robert M. Kerr Food and Agriculture Products Center, Oklahoma State University. April 2006-current. Manage and operate the USDA inspected meat processing plant at FAPC. Assist and help Departement of Agriculture Sciences and Natural Resources departments with research and extension projects in the meats area. Train students, FAPC staff and industry clients in meat processing and processes that go along with meat processing. Work with industry on developing new products and assist entrepreneurs in bringing their product to the market place.

Plant Manager, Country Cut Meats, Stillwater Oklahoma: Managed the day-to-day operation of the family business; this included working in all areas of business such as managing payroll, the business accounting, hiring of employees, writing the HACCP plan scheduling all of the animal harvests, managing customer complaints, and maintaining excellent business practices. I was also an officer of the corporation.

Quality Control Supervisor, IBP Amarillo: June 1996 – October 1997. Duties included supervising a crew of 20 quality control inspectors and being the HACCP coordinator for the plant.

Quality Control Manager, IBP West Point, NE: November 1994- June 1996.

Duties were to be the quality control inspector and the HACCP coordinator.

Quality Control Inspector, IBP, Dakota City NE and Finney County KS: September 1992 – November 1994. Duties were Quality control inspector in slaughter and processing.

Education:

Currently pursuing a masters degree in Food Science

B.S. Degree in Agriculture (May, 1992) Major Animal Science Oklahoma State University.

Name: Kyle Flynn Date of Degree: July 2011*

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: ECNOMIC FEASABILITY OF A SMALL MULTISPECIES PROCESSING PLANT IN THE STATE OF OKLAHOMA

Pages in Study 37 Candidate for the Degree of Master of Science

Major Field: Food Science

Scope and Method of Study: In this study I investigated the economic feasabiltiy of a multispecies processing plant in Oklahoma. The number of small processing plants has decreased, but producers have said that more are needed. The point of this paper is to see if that is feasible

Findings and Conclusions: The finding of this research is that under the right conditions that building and operating a multispecies processing plant is feasible.

ADVISER'S APPROVAL: Rodney Holcomb