PU XING COMPANY LIMITED

FEASIBILITY STUDY

FOR

ESTABLISHING

MEAT PROCESSING I.E LIVESTOCK (COW AND GOAT) OMASUM AND MALE GENITAL ORGANS AND HORNS

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remains stagnant at a high level. Picture bellow is the Dry Salted Omasum

The rising demand for meat in developing countries is mainly a consequence of the fast progression of urbanization and the tendency among city dwellers to spend more on food than the lower income earning rural population.

Given this fact, it is interesting that urban diets are, on average, still lower in calories than diets in rural areas. This can be explained by the eating habits urban consumers adopt. If it is affordable to them, urban dwellers will spend more on the higher cost but lower calorie protein foods of animal origin, such as meat, milk, eggs and fish rather than on staple foods of plant origin.

In general, however, as soon as consumers" incomes allow, there is a general trend towards incorporating more animal protein, in particular meat, in the daily diet. Man"s propensity for meat consumption has biological roots. In ancient times meat was clearly preferred; consequently time and physical efforts were invested to obtain it, basically through hunting.

This attitude contributed decisively to physical and mental development of humankind. Despite the growing preference in some circles for meatless diets, the majority of us will continue eating meat.

It is generally accepted that balanced diets of meat and plant food are most effective for human nutrition. Quantitatively and qualitatively, meat and other animal foods are better sources of protein than plant foods (except soy bean products).

The only possible alternatives are making better use of the meat resources available and reducing waste of edible livestock parts to a minimum. This is where meat processing plays a prominent role. It fully utilizes meat resources, including nearly all edible livestock parts for human food consumption.

Meat processing, also known as further processing of meat, is the manufacture of meat products from muscle meat, animal fat and certain non-meat additives. Additives are used to enhance product flavour and appearance.

They can also be used to increase product volume. For specific meat preparations, animal by-products such as internal organs, skin or blood, are also well suited for meat processing. Meat processing can create different types of product composition that maximizes the use of edible livestock parts and are tasty, attractive and nourishing.

The advantage of meat processing is the integration of certain animal tissues (muscle trimmings, bone scraps, skin parts or certain internal organs which are usually not sold in fresh meat marketing) into the food chain as valuable protein-rich ingredients. Animal blood, for instance, is unfortunately often wasted in developing countries largely due to the absence of hygienic collection and processing methods and also because of socio-cultural restrictions that do not allow consumption of products made of blood. While half of the blood volume of a slaughtered animal remains in the carcass tissues and is eaten with the meat and internal organs, the other half recovered from bleeding represents 5-8 percent of the protein yield of a slaughter animal.

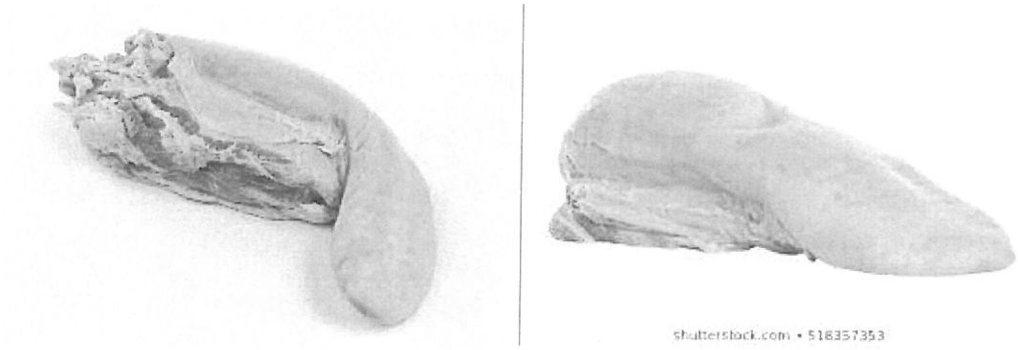
But they offer diversity to the meat food sector, providing the combined effect of nutritious food and food with excellent taste. Processing technology Meat processing technologies were developed particularly in Europe and Asia.

The European technologies obviously were more successful, as they were disseminated and adopted to a considerable extent in other regions of the world – by way of their main creations of burger patties, frankfurter-type sausages and cooked ham. The traditional Asian products, many of them of the fermented type, are still popular in their countries of origin.

But Western-style products have gained the upper hand and achieved a higher market share than those traditional products. In Asia and Africa, there are a number of countries where meat is very popular but the majority of consumers reject processed meat products.

This is not because they dislike them but because of socio-cultural reasons that prohibit the consumption of certain livestock species, either pork or beef depending on the region. Because processed products are mostly composed of finely comminuted meat, which makes identifying the animal species rather difficult, or are frequently produced from mixes of meat from different animals, consumers stay away from those products to avoiding eating the wrong thing.

But when the demand for meat increases and a regular and cost-effective supply can only be achieved by fully using all edible livestock parts, consumers will need to adjust to processed meat products, at least to those where the animal source can be identified.



Processing technologies for meat products will not deliver satisfactory results if there is no adequate meat hygiene in place.

In the interest of food safety and consumer protection, increasingly stringent hygiene measures are required at national and international trade levels. Key issues in this respect are Good Hygienic Practices (GHP) and Hazard Analysis and Critical Control Point Schemes (HACCP), which are discussed in detail in the manual.

Extensive knowledge on hazards that microorganisms cause is indispensable in modern meat processing. Thus, along with technological aspects of meat processing, the manual includes reference to related aspects of meat processing hygiene, including causes for meat product spoilage and food borne illnesses as well as cleaning and sanitation in meat processing.

For the purpose of consumer protection and the quality control of meat products, simple test methods are provided that can be carried out at the small enterprise level without sophisticated laboratory set-ups.

However, some of these procedures have to be understood as screening methods only and cannot supplement specific laboratory control, which may be officially required. As the authors, we have endeavored to incorporate in this publication a series of practical topics, which are important in meat processing but which are usually not sufficiently referred to or not found at all in meat processing handbooks.

This includes the handling and maintenance of equipment and tools, workers" appliances, workers" safety in using equipment and tools, meat processing under

In this context, meat can be defined as "the muscle tissue of slaughter animals". The other important tissue used for further processing is fat.

Other edible parts of the slaughtered animal and often used in further processing are the internal organs1 (tongue, heart, liver, kidneys, lungs, diaphragm, esophagus, intestines) and other slaughter byproducts (blood, soft tissues from feet, head). A special group of internal organs are the intestines. Apart from being used as food in many regions in particular in the developing world, they can be processed in a specific way to make them suitable as sausage casings (see chapter on Casings, page 249). Some of them are eaten with the sausage; others are only used as container for the sausage mix and peeled off before consumption.

The skin of some animal species is also used for processed meat products. This is the case with pork skin and poultry skin, in some cases also with calf skin (from calf heads and legs).

Meat is the most valuable livestock product and for many people serves as their first-choice source of animal protein. Meat is either consumed as a component of kitchen-style food preparations or as processed meat products.

Processed meat products, although in some regions still in their infancy, are globally gaining ground in popularity and consumption volume. Meat processing has always been part of FAO"s livestock programmers, not only because of the possibility of fabricating nutrient-rich products for human food, but also owing to the fact that meat processing can be a tool for fully utilizing edible carcass parts and for supplying shelf-stable meat products to areas where no cold chain exists.

Moreover, small-scale meat processing can also be a source of income for rural populations. In the mid-eighties to early nineties of the last century, FAO published two books on meat processing (Animal Production and Health Series No. 52 and 91) in order to familiarize food processors in developing countries with meat processing technologies.

However, due to the time elapsed since then they no longer fully reflect current techniques and processing procedures used in the meat sector. FAO initiated two major projects in this sector.

The increasing demand for protein coupled with calls for better use of natural resources have renewed interest on the recovery of value from products and secondary food production streams, providing an opportunity for the meat processing industry to fully explore the potential of these rich materials.

5.1 FUTURE TRENDS AND CONCLUSIONS

Meat processing by-products have been widely used both as a protein-rich food ingredient and a nutraceutical agent.

Despite the amount of published research and the promising results that have been obtained in this field, many aspects of meat processing by-product use still need to be investigated.

Technological advances have made it possible to extract different protein fractions from meat, poultry, and fish processing by-products. Moreover, enzymatic, chemical, and fermentative hydrolysis in vitro has been implemented to simulate the breakdown of these proteins in digestion.

However, in order to evaluate the real effect these protein hydro lysates from meat processing by-products might have on living organisms, it is necessary to validate the findings by means of in vivo studies, both in laboratory animals as well as human subjects.

Bioactive properties of protein hydro lysates from meat processing by-products that have been investigated include their antioxidant, antimicrobial, and ACE-inhibitory and antihypertensive activities. As for the functional properties of these protein hydro lysates, their solubility has been investigated thoroughly since all the other functional properties depend on it.

However, it might be of great interest to explore the relationship between the distribution of peptide molecular weight in the protein hydro lysates from meat processing by-products and their bioactive and functional properties.

The body of research reviewed in this chapter seems to suggest that a specific range of molecular weights might guarantee both bioactive and functional properties of protein hydro lysates from meat processing by-products.

been reported to modify the muscle structure and protein profile (Hopkins, 2014).

These processes decrease the overlapping of actin and myosin, cause physical damage to the sarcomere and connective tissues or improve proteolysis rates through the activation of calpains by calcium ions released after membrane disruption.

5.3 ELECTRICAL STIMULATION OF CARCASSES

Electrical stimulation of carcasses has no detectable influence on the degradation of desmin and troponin T (Ho et al., 1997), but could slightly accelerate the degradation of the cytoskeletal proteins titin and nebulin in postmortem muscle (Ho et al., 1996).

Pulsed Electric Field There has been recent interest in meat tenderization applications of PEF. PEF causes the electroporation of muscle cell membranes, which potentially facilitates the meat ageing process by releasing the calcium ions from sarcoplasmic reticulum, which triggers the calcium-activated proteases and/or speeds up pre-rigor glycolysis, and also by releasing the cathepsins from the lysosomes (Warner et al., 2017).

Compared to untreated muscles, PEF-treated cold- and hot-boned beef Longissimus lumborum muscles had increased degradation of troponin T and desmin (Suwandy et al., 2015a, b).

5.4 EXOGENOUS ENZYME TECHNOLOGY

Exogenous proteases have been applied in meat tenderization for many years (Payne, 2009; Sullivan and Calkins, 2010). Most plant-based proteases canhydrolyze myofibrillar proteins efficiently (Bekhit et al., 2014; Kim and Taub, 1991). For the stromal proteins, under heating conditions, both papain and ficin were found to be effective in

hydrolyzing elastin and collagen whilst bromelain degraded only collagen (more actively than papain and ficin) (El-Gharbawi and Whitaker, 1963; Miyada and Tappel, 1956; Payne, 2009).

5.6 HIGH PRESSURE PROCESSING

HPP is one of the technologies applied in the meat industry to improve shelf life, safety, and quality characteristics (texture and color) of foods (Bajovic et al., 2012). HPP subjects the meat to high pressure, usually ranging from 100 MPa to 800 MPa, via a surrounding liquid and is sometimes accompanied by heat treatment at 60 °C (Hopkins, 2014; Troy et al., 2016). HPP causes the destruction of microorganism, leads to protein denaturation and inactivation of endogenous enzymes (Sikes and Warner, 2016; Torres and Velazquez, 2005).

HPP alters protein secondary, tertiary and quaternary structures in the muscles by disrupting their conformations and molecular interactions (Campus, 2010; Sikes and Warner, 2016; Strasburg et al., 2008).

For example, at pressures above 100 MPa protein tertiary structure unfolds and protein aggregation occurs (Cheftel and Culioli, 1997). However, covalent bonds are mostly unaffected.

High pressure has been reported to denature myofibrillar proteins (Anderson and Parrish, 1989), cause depolymerization of actin (Ikkai and Ooi, 1966), and release cathepsins into the cytoplasm by degrading muscle membranes (Homma et al., 1994; Jung et al., 2000).

For example, at pressures between 100 MPa and 300 MPa, myosin and actin were denatured (Angsupanich and Ledward, 1998; Sikes et al., 2010). The effect of high pressure on muscle structure depends on the applied pressure, processing temperature and time, and the muscle type (pre- or post-rigor) (Cheftel and Culioli, 1997).

For instance, increases in intermyofibrillar spaces and myofibril shrinkage were observed in Atlantic salmon meat with increasing applied pressure (from 400 to 900 MPa) and time (Gudbjornsdottir et al., 2010).

The tenderness of pre-rigor meat can be improved by HPP (Sikes and Warner, 2016). Accelerated glycolysis of pre-rigor meat may occur when high pressure is applied, resulting in shear force reduction of myofibrillar-based food (Elgasim and Kennick, 1982; Hopkins, 2014; Kennick et al., 1980).

The effect of high pressure on the texture of post-rigor meat depends on the processing temperature (Sikes and Warner, 2016). In most studies, high reducing the enzyme activity in the meat, retarding oxidation of the fat, and preventing spoilage by microorganisms.

These aims have been achieved through drying, curing with salts, or smoking meat. Sausage manufacturing, for which meat is ground to varying degrees, is another form of processing, in principle for the same purpose. Either one or a combination of these procedures in various regions of the world has preserved goats' meat. (*See* MEAT | Preservation.)

In modern times, meat is processed not only as a means of preserving, but also for producing consumer-acceptable products compatible with modern lifestyles and philosophy of a health-related quality of life. In order to achieve this the processor has to define clearly the image and commercial appeal of the envisaged product.

The decision-making process of the consumer needs to be defined in terms of real and perceived value, the convenience the product offers, and its palatability Goat meat, regardless of breed, can be used to manufacture processed products of acceptable sensory quality, particularly when a spicy formulation is used.

The low appeal of goat meat to some consumers may be due to its lack of tenderness, particularly in meat from older animals. Tenderness should not be a problem for comminuted meat products (e.g., patties) or products that undergo slow cooking or pressure cooking/retorting (e.g., curries and stews). Although goat meat has a less desirable flavor, aroma, tenderness, and juiciness than beef or pork to western taste panelists, a panel found up to 40% substitution of beef by Angora goat meat to be quite acceptable in frankfurters.

The goat frankfurters had good physical attributes, being firm, resilient, and springy under forefinger pressure with a firm „bite" – a desirable textural attribute in quality emulsified sausages. Such frankfurters would maintain their form and shape during peeling, indexing, and packaging operations. (*See* MEAT| Sausages and Comminuted Products.)

Vienna sausages manufactured from meat of mature does (six teeth) had detectable different palatability characteristics compared with Vienna"s manufactured from beef. The goat Vienna"s also recorded higher shear force values ($P < 0.0002$). Differences in both physical and textural attributes could be

5.8 EMERGING TECHNOLOGIES OF MEAT PROCESSING

Application of emerging meat-processing technologies for the replacement of conventional energy-intensive meat processes could provide potential to reduce energy consumption, production costs, and improve the sustainability of the meat sector without the infrastructural changes of meat production chains.

The chapter briefly reviews four emerging technologies of food processing. High-pressure processing (HPP) is applied for the packaged high-value products to assure their safety and stability, which leads to the extension of shelf life. It has certain limitations due to the batch-based process of treatment.

Further design of HPP equipment should target the advances toward improved efficiency of energy consumption and pressure recovery. The development of shockwave (SW) or dynamic HPP aims specifically meat tenderization.

Short range of specific application challenges the extensive analysis and comparison of the technology.

However, the technology is indicated to be more environmentally friendly and cost efficient if applied at small scale and aimed at substitution of long-aging processing. Ohmic heating (OH) is an emerging technology for industrial meat processing via direct electric heating.

Previous experiments and available studies indicated its potential as a cost-efficient technology for meat products treatment in a more rapid rate. Further technology development and penetration on the market is expected soon. Pulsed electric field (PEF) is another processing method applying direct electric energy for the processing.

It has various applications for meat processing, however more studies are needed to identify the optimal processing conditions.

Salting/curing ¾ Utilization of spices/non-meat additives ¾ Stuffing/filling into casings or other containers ¾ Fermentation and drying ¾ Heat treatment (see separate chapter page 87) ¾ Smoking

6.2 EQUIPMENT USED IN MEAT PROCESSING

In modern meat processing, most of the processing steps can be mechanized. In fact, modern meat processing would not be possible without the utilization of specialized equipment. Such equipment is available for small-scale, medium-sized or large-scale operations. The major items of meat processing equipment needed to fabricate the most commonly known meat products are listed and briefly described hereunder.

A meat grinder is a machine used to force meat or meat trimmings by means of a feeding worm (auger) under pressure through a horizontally mounted cylinder (barrel). At the end of the barrel there is a cutting system consisting of star-shaped knives rotating with the feeding worm and stationary perforated discs (grinding plates). The perforations of the grinding plates normally range from 1 to 13mm. The meat is compressed by the rotating feeding auger, pushed through the cutting system and extrudes through the holes in the grinding plates after being cut by the revolving star knives. Simple equipment has only one star knife and grinder plate, but normally a series of plates and rotary knives is used. The degree of mincing is determined by the size of the holes in the last grinding plate. If frozen meat and meat rich in connective tissue is to be minced to small particles, it should be minced first through a coarse disc followed by a second operation to the desired size. Two different types of cutting systems are available, the "Enterprise System" and the "Unger System": ¾

The "Enterprise System" (Fig. 19) is mainly used in smaller meat grinders with orifice diameters up to 98 mm and consists of one star knife, sharpened only on the side facing the disc, and one grinder plate. Hole diameters can vary from 13 to 5 mm. ¾ set of curved knives rotating vertically on a horizontal axle at high speeds of up to 5,000 rpm. Many types and sizes exist with bowl volumes ranging from 10 to 2000 litres. The most useful size for small- to medium-size processing is 20 to 60 litres. In bigger models bowl and knife speed can be regulated by changing gears. Bowl cutters are equipped with a strong cover. This lid protects against accidents and its design plays a crucial role in the efficiency of the chopping process by routing the mixture flow. Number, shape, arrangement, and speed of knives are the main factors determining the performance of the cutter (see page 304). Bowl cutters should be equipped with a thermometer displaying the temperature of the meat mixture in the bowl during chopping.

Modern large scale bowl cutters may have devices to operate under a vacuum (Fig. 30), which helps to improve colour and texture of the meat products by keeping oxygen out of the meat mixes and avoid air pockets. Cutter knives should be adjusted to a distance of 1-2 mm from the bowl (Fig. 27) for optimal cutting (check the manufacturers recommendations for each model). Most of the large and high-speed bowl cutters are equipped with mechanical discharger devices for emptying the cutter. The process of chopping in a bowl cutter is used for producing fine comminuted products such as frankfurters, bologna, liver sausage etc., and enables processors to offer a much wider range of products.

Filling machine ("sausage stuffer") These machines are used for filling all types of meat batter in containers such as casings, glass jars, cans etc. The most common type of filling machine in small and medium size operations is the piston type. A piston is moved inside a cylinder forcing the meat material through the filling nozzle (funnel, stuffing horn) into the containers. Piston stuffers are either attached to the filling table manual) or designed as floor models; hydraulic). In small-scale operations manual stuffers are usually sufficient, sometimes even simple hand-held funnels are used to push meat mixes into casings.

Modern filling machines for larger operations are designed as continuous vacuum stuffers. During the filling process a substantial part of the enclosed air is removed from the product, which helps to improve colour and texture of the

the generator to the smoking chamber (Fig. 38(1), 41) via a smoke pipe (2). The burned sawdust is collected at the bottom (5).

Vacuum packaging machine

For vacuum packaging the meat product has to be placed into a vacuum bag (multi-layer synthetic bag, see page 270). Air is removed from the bag by means of the vacuum packaging machine (Fig. 50) and the bag then sealed (see page 273). Special vacuum packaging machines can operate with so called gas-flushing, where a mixture of gas is injected after evacuating the air. Such protective gas atmospheres inside the product package inhibit bacterial growth and stabilize the meat colour. The gas mixtures usually contain CO2 and N2

7. PRODUCED PRODUCT

The Company is expected to Processing i.e. livestock (cow and goat) Omasum and male genital organs and horns per annum.

8. PRODUCTION CAPACITY

The Company is initially expected to produce 114 tons of Meat Processing i.e. livestock (cow and goat) Omasum and male genital organs and horns per annum.

9. TYPE AND SOURCE OF RAW MATERIALS

The raw materials will be 7200 slaughtered livestock"s (Cow and Goat) Omasum and male genital organs and horns.

10. DEMAND, SUPPLY AND TARGET MARKETS

The market is growing due to increasing in demand in Asia especially in China and here in Tanzania as Raw Materials for production of animal

iii. Motor vehicle running Expenseus$20,000 Petrol/diesel and lubricant requirement for the project's motor vehicles, this cost element will amount to US$20,000 annually.

iv. Insurance: US$5,800 each vehicle will be covered by third party insurance of US$ 5,800 annually

v. Marketing cost US $2815 a portion of US$39,216 is to be used for instance, Public Relations' contributions, charity donations, etc.

vi. Depreciation cost US $162,966 for the day to day depreciation of fixed asset of the project US $162,966 will be required annually for depreciation cost.

vii. Pension contribution US $ 31,000 the company has set a side US $ 31,000 as pension contribution (vii) Communication cost US$ 5,500 and Administration cost US$ 5200.

13.ASPECTS OF PROJECT SUSTAINABILITY

The project sponsors having studied market conditions and the infrastructure in Tanzania are convinced that the project will be able to operate undisturbed. The growing demand for quality products locally and in neighboring countries gives them assurance of a steady market. The peace and tranquility that exist in Tanzania is another aspect of assured business sustainability.

14.MONITERING AND EVALUATION

The monitoring and evaluation tools will be applied in running this project as well, the project sponsors are determined to cooperate fully with the government and other stakeholders for smooth business running.

15.FINANCIAL ANALYSIS

Considerations and Assumptions:

The corporate tax charged is 30% of the profits. Capital investment allowance is 50%. The capital assets are exempted from custom duty and Value Added Tax. The straight line method to depreciate the project's capital items has been applied. It is assumed that the major raw material will be procured from Slaughtering Centers and the product will be processed at the factory. Revenues have been conservatively estimated based on

17.PROJECTED PROFIT AND LOSS STATEMENT

The Income and Expenditure Statement shows the projected income for the 5 years' period. The position depicted is that the project earns profit throughout its life. Accumulated after tax profits grow from. US $ 419,499 in first year to US $ 456,299 in the 5 year

PU XING COMPANY LIMITED PROJECTED INCOME & EXPENDITURE STATEMENT

	US $ 1	US$ 2	S$ 3	US$ 4	US$ 5
Sales Revenue	1,630,800	1,640,800	1,649,805	1,655,901	1,700,000
Cost of Sales	510,000	512,000	518,000	520,000	525,000
Gross Profit Operating Expenses:	1,120,800	1,128,800	1,131,805	1,135,901	1,175,000
Administrative Expenses	5,200	5,205	6,000	6,200	6,800
Motor vehicle running expenses	20,000	20,000	20,000	20,000	20,000
Salaries and Wages	320,000	320,000	320,000	320,000	320,000
Donation	1,200	1,200	1,200	1,200	1,200
Depreciation	75,000	75,000	75,000	75,000	75,000
Marketing Costs	2,815	2,815	2,815	2,815	2,815
Utility costs	32,000	32,000	32,000	32,000	32,000
Insurance	5,800	5,800	5,800	5,800	5,800
Communication	5,500	5,500	5,500	5,500	5,500
Pension Contribution	48,000	48,000	48,000	48,000	48,000
Loan Interest (3%)	6,000	6,000	6,000	6,000	6,000
Total Expenses	521,515	521,515	521,515	521,515	521,515
Profit before tax	599,285	607,274	609,475	613,364	651,857
Tax (30%)	179,785	182,182.20	182,842	184,009	195,557
Profit After Tax	419,499	425,091	426,632	429,354	456,299

19.PROJECTED BALANCE SHEET

The projected Balance Sheet of the projected is shown in the financial statements under same heading. Net worth of the project increases from US$ 1,261,548 in the first year of operation to US $ 1,297,691 in the 5th year.

	1	2	3	4	5
Fixed Assets					
Long-term Assets	750,000	675,000	600,000	525,000	450,000
Depreciation	75,000	75,000	75,000	75,000	75,000
Total Long-term Assets	675,000	600,000	525,000	450,000	375,000
Current Assets					
Cash	1,320,818	2,646,017	3,974,467	5,307,455	6,685,521
Accounts Receivable	5,700	5,750	6,000	6,250	6,300
Total Current Assets	1,326,518	2,651,767	3,980,467	5,313,705	6,691,821
Total Assets	2,001,518	3,251,767	4,505,467	5,763,705	7,066,821
Current Liabilities					
Accounts Payable	5,000	5,200	5,200	5,300	5,500
Other Current Liabilities	0	0	0	0	0
Subtotal Current Liabilities	5,000	5,200	5,200	5,300	5,500
Long-term Liabilities					
Long-term Liabilities	200,000	200,000	200,000	200,000	200,000
Total Liabilities	205,000	205,200	205,200	205,300	205,500
Net Assets	1,796,518	3,046,567	4,300,267	5,558,405	6,861,321
Capital and Reserves					
Owners Contribution	800,000	800,000	800,000	800,000	800,000
Retained Earnings	461,548	467,140	468,310	470,889	497,691
Total Capital	1,261,548	1,267,140	1,268,310	1,270,889	1,297,691