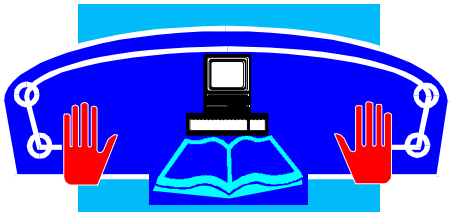

Draft Report On Tannery Study
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Author: Rmc Resource Mgmt Consultants
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June 17, 1986

Mr. Syd Kirwan
Head Renewable Resources
Department of Economic Development & Tourism
Government of the Northwest Territories

Dear Syd:

Enclosed is the draft of the report of the tannery study. The report stresses strategies for the establishment of a tannery more than detailed implementation plans. I felt that an Investigation of the correct positioning of the tannery in terms of size, throughput, and type of product would benefit a prospective tannery more than very detailed implementation plans, which depend so much on the persons actually Involved.

In the course of the work I have gathered information on such things as possible plant layout, list of suppiers and other material which could be added as appendices. Since this is a draft, I have not included them. Your direction would be appreciated.

I am looking forward to your reaction to this draft and would like to express my pleasure in the chance to work on this project. As I mentioned when I was in Yellowknife, I will be out of the country in July.

Sincerely yours,
RMC Resources Management Consultants
(N. W. T.) Ltd.

Maarten Ingen-Housz
Associate

MIH/alr
encl.

TABLE OF CONTENTS

1. INTRODUCTION

The reason For the investigation of the possibilities for a community-based small scale tannery or tanneries lies in the need to make a more complete use of the available resources (in this case hides and skins), to create employment, and to give more control to the owners of the resource.

Currently, the NWT exports raw furs to southern auctions and imports tanned leather and furs as an input into the craft industry. There is a certain amount of traditional Native tanning going on but not enough to keep the local craft industry supplied. Many hides and skins are left in the bush or disposed of in garbage dumps.

The draft renewable resouces policy emphasizes the need for the NWT to become more self sufficient in food and fiber. This inward look of supplying the NWT market with NWT products before looking at southern export markets is reflected in this report. The study examines the possibilities to set up one or more community based tanneries in the NWT with a first objective to supply the local markets using local hides and skins. As a secondary objective, and this will play only if the local market is well supplied, it can be considered to use the tannery to supply southern markets either directly or via a finishing tannery in a southern location.

Throughout this report we make the distinction between fur dressing and leather tanning. The former is the conservation of a hide or skin with the hair and the latter is the conservation of the hide or skin without any hair, to be used as leather. Fur dressing especially is a very much market driven industry. Fashions change constantly and with them the type of furs that are required by the industry. This uncertainty will be especially true if a NWT tannery is to supply southern markets. Flexibility should be built into the tannery design and management to allow the tannery to react to changes in demand.

This report will look at two different sizes for a tannery. First we will examine a very small tannery with a throughput of 5 hides a week (or 225 a year) and secondly we will look at a medium small tannery with a throughput of some 25 hides a week. For each size tannery we will discuss, what the appropriate technologies are, whether that size of operation can be economically viable, what kind of jobs will be created, where the hides come from, and where to sell the finished product.

2. THE TANNING PROCESS ANO SOME OF ITS IMPLICATIONS

2.1 Very Small Tannery

2.1.1 Native Tanning with a Low Level of Mechanization

Throughout the NWT there are people who still tan moose and caribou hides in the Native way using moose brain and smoke. The product is highly valued by the people in the craft industry because it is water resistant and easy to sew.

AS with all tanning methods, there is no one traditional method but rather a number of variations on a general procedure. For the purpose of this report it is not necessary to go into the minor differences between Native tanning methods: the analysis here concerns an economic assessment of tanning, not a how-to manual. (For some 'how-to" books on Native tanning, see the bibliography.) Most variations of the Native tanning process consist of the following steps:

1. Skin the animal and dehair the hide with a knife.
2. Flesh the hide.
3. Shave the hide to an even thickness.
4. Soak the hide to clean.
5. Wring the hide and dry it moderately.
6. Hang the hide over the smoke.
1. Soak the hide in brainwater or other softening agent.
8. Scrape hide dry to soften and stretch; repeat soaking.
9. Smoke the hide.

Step 1 - Skinning and Dehairing

There are several methods to prepare the hide for dehairing and fleshing, ranging from stretching the hide inside a large wooden frame to simply draping it over a low upright pole. The objective here is to give the person who dehairs easy access to the hide.

Dehai ring is accomplished by shaving the hide with a sharp knife or scraper against the hairs. This operation requires very sharp tools and a steady hand to prevent the knife or scraper from biting into the hide and gashing it.

Step 2 - Fleshing

Fleshing is the removal of the flesh, veins, and membranes exposing those parts of the hide that will be tanned. Traditionally the fleshing is done with bone scrapers, but nowadays people often use special knifes or other metal Implements. This job is the hardest of the whole tanning process and requires at least two hours of hard physical labour.

Step 3 - Shaving

Shaving is similar to fleshing in that it removes parts of hide. In this step the objective is 'not to remove those parts of the hide that will not be tanned, but to produce a hide with an even thickness so that the tanning will be even.

Step 4 - Soaking

Soaking the hide in fresh water removes any blood residue from the hide and prepares the hide for the first stage of the actual tanning. If the hide is especially dirty or bloody, it may be necessary to replace the water several times. Agitating the hide in the soaktub will speed up the process.

Step 5 - Wringing

The traditional methods recommend that two sticks are laced through holes on two sides of the hide. These sticks give a good grip on the hide and allow the tanner to wring out the hide quite thoroughly. The hide is commonly dried further by laying it over a beam. However, the hide is not fully dry before it is used in the next step.

Step 6 - Smoking

Most variants of the traditional tanning method smoke the hide twice. The first time for anywhere between two to eight hours. The type of wood used and the length of the exposure to the smoke are responsible for the colour of the finished product. Punk spruce

gives a cool smoke and result in a light coloured leather and only a low level of smoke smell in the hide. Other decayed woods are used and even wood shavings, as long as it is possible to keep a smoldering smoking fire without flames.

Step 7 - Soaking and Softening

Moosebrain, in various stages of decay, is used to soften the hide. This can be done by directly applying the brain on the hide or by soaking the hide in water with moosebrain. Sometimes the brain is kept in a bag and left in warm water to make a kind of moosebrain tea in which the hide is then soaked. Agitation of the hide in the water speeds up the, process and results in better softening. Commercial softening agents such as 'Fleecy" or "Downey" are sometimes used instead of moosebrain.

Step 8 - Scrape and Dry

This step is often repeated more than once. The hide is taken from the tub and wrung dry. Then the hide is further dried, softened, and stretched by scraping it from one end to the other with a blunt scraper, forcing the liquid out of the hide and smoothing wrinkles, etc. Repetition of this step creates a smooth and soft end product.

Step 9 - Smoking

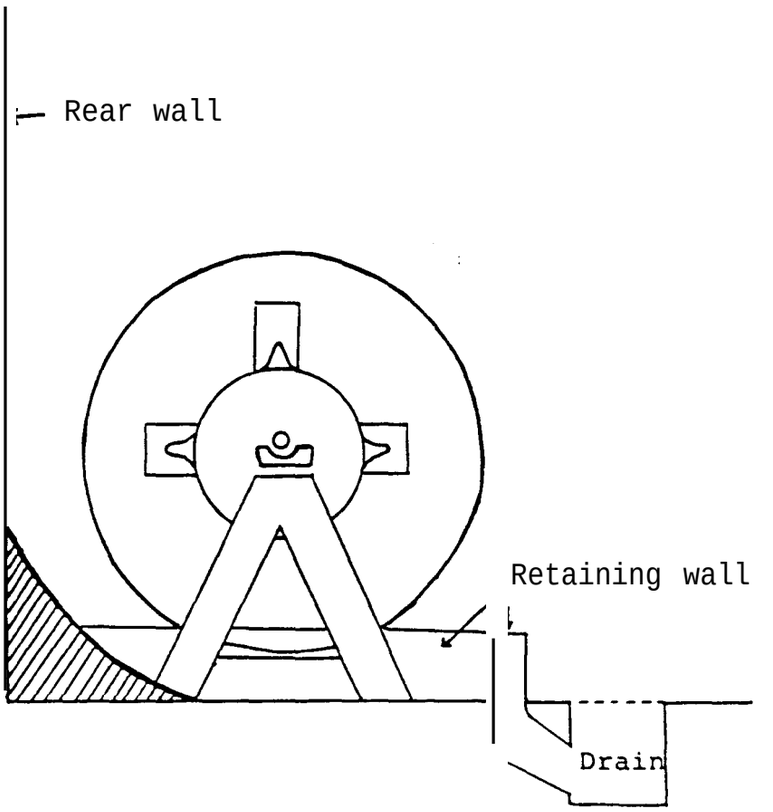
The final smoking is critical for the final appearance of the leather, and may take another day. The hide is often sewn into a sleeve to optimize the contact with the smoke.

All of the stages of the Native tanning process are done by hand and do not need any other implement than a sharp knife. The introduction of a low level of technology can ease the work involved, especially the fleshing, the cleaning, and the stretching and softening steps of the process. In the rest of this section we will explore the type of technology that can be used to make the Native tanning process into a semi-mechanized operation.

The simplest fleshing machine consists of a round knife that is spun around by an electric motor. The hide is moved over the knife by the operator piece by piece until a clean fleshing job is accomplished. This knife can also be used to obtain a uniform thickness of the hide. Thus, steps 2 and 3 can be easily mechanized.

Soaking of the hide (step 4) can be sped up and made easier with the introduction of a drum. The agitation of the hide by the motion of the drum makes any handling of the hide unnecessary.

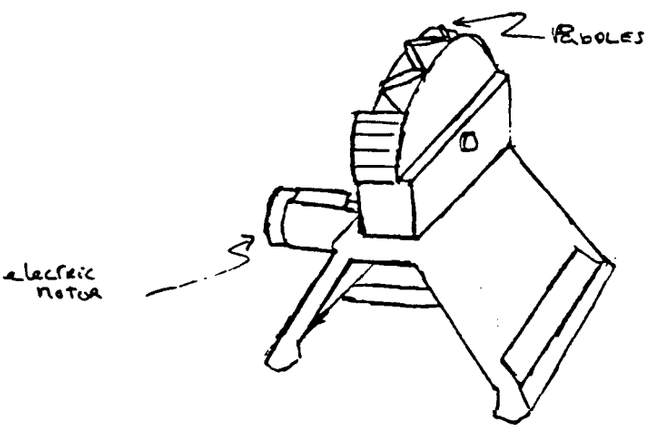
Figure 1: Tanning Drum - side view



Source: FAO (1981)

Stretching can be mechanized by the introduction of a simple stretching machine that consists of a number of small wooden paddles on a motor driven wheel. The hide is moved over the machine by the operator in such a way that the paddles hit the hide and recreate a motion similar to the hand scraping in the non-mechanized Native tanning method. Thus step 8 is mechanized. More sophisticated stretching or toggling machines are on the market.

Figure 2: Simple Stretching Machine



Other parts of the process can be mechanized. For example, the wringing of the hides to get the water out of them. The original method asks for two sticks that are woven into the edge of the hide so that two people can wring the hide. A centrifuge would do the same job but with less elbow grease. However, the wringing is not as major an undertaking as the fleshing on the stretching/softening and be mechanizing this step is not deemed necessary under this scenario.

2.1.2 Equipment Schedule

1-	Skinning knife (also used for dehairing	
1-	Circular knife fleshing machine	$ 900
1-	Orum (including motor and chains)	2,000
2-	Wringing sticks	
1-	Drying rack	
1-	Stretching machine	2,000
1-	Smoke tan pit	

Notes: Commercial drums designed for the tanning process are normally way too large for the very small scale tannery discussed here. Large drums need a larger number of hides before they reach capacity. Special smaller drums are available (often described as test drums) and prudent purchasing should allow a tanner to purchase these for around $2,000. The drums are relatively simple machines and can be built locally.

The stretching machine discussed here is hard to find on the market because higher volume and more automated machines are available. Prudent shopping may unearth a stretching machine but more likely they should be made locally.

The small scale of the tannery allows the one drum to be used for both step 4, soaking and cleaning, and step 7, soaking and softening. It is assumed here that one batch of hides is processed per production cycle. The batch is determined by the site of the drum.

2.1.3 Building Requirements

Minimal. A small workshop will do. The only requirements is the availability of water (does not need to be running water) to fill the drum and electricity to drive the fleshing knife, the stretching machine, and the drum.

2.1.4 Environmental Concerns

Minimal. All waste from the hide is biodegradable and can be disposed of on the local dump. The waste water will contain dirt, blood and a softening agent (brain or a commercial product) and could be disposed of in the local water supply without treatment. Worker safety required good ventilation of the workplace.

2.1.5 Capacity

The tannery as described above would work on a batch system, processing a drumload full of hides per cycle. Depending on the size of the drum, a minimum of five hides per cycle would be processed, giving a capacity of about 5 hides a week. With proper planning of wood and water supplies there is no reason why the process cannot be kept up year round. With a 48 week production year the throughput would run 240. If the tanning is only active from May through October, the throughput would be 130.

2.1.6 Employment and Training

The process above would need two people to help the hide through all the stages. One of these two people would be the trained tanner, the other a helper or trainee. Tanning is an art as much as a skill and the tanner will make the difference between a top quality product and garbage.

There are several places in the NWT where there are women with a good working knowledge of Native smoke tanning methods. Snowdrift and Rae Edzo are two places with skilled people. Mrs. Jane Dragon has for the past few years run a tanning workshop in the Fort Smith area.

The introduction of machinery into the process creates the need for additional training. Especially the circular knife is a machine that requires substantial effort before one is proficient on it. It is estimated that a person can be a good flesher/shaver using a circular knife in no less than 8 months. This timeframe assumes supervision and access to surplus hide that can be ruined without endangering the financial position of the tannery.

The tanner would be expected to take care of the business side of the enterprise, flesh the hides, and supervise all tasks. The trainee would be responsible for most of the physical handling of the hides and helping the hide through the process at times helped by the tanner or casual help. Further casual help mey be required in the collection of punk wood.

2.2 Medium Small Tannery - Leather

2.2.1 Technology

This tannery is set up to investigate a more structured tannery, using small scale tanning technology adapted from non--native rather than native traditions. The discussion is more formal for two reasons: 1) the scale is larger and the organization of the tannery will need to be more structured, and 2) there is no indigenous pool of skills and traditions to draw from resulting in the need for a more explicit and business-oriented approach. The basic process goes through 6 stages:

1. hide selection and storage
2. soaking
3. liming, fleshing and dehairing
4. deliming, bating, and pickling
5. tanning
6. softening, oiling and drying
7. measuring, sorting and storage

Step 1 - Hide Selection and Storage

Hide selection is important if there is a surplus of hides to choose from. The objective of the selection process is to obtain those hides with the maximum value. Damage can be due to poor skinning which may result in an asymmetrical hide or a hide with deep knife marks, vein and blood stains, which may spoil the appearance of the hide or the flesh side, scratches and holes, due to old wounds or insect damage, or rot in the hide.

If selection is not possible due to the small size of the supply of hides, the skinner should try to upgrade the hides that are offered to him by educating the hunter about what devalues the hide. More about hunter education in Chapter 5.

If the hides have not been cured by drying or pickling by the hunter and if the raw hide cannot be processed immediately the tanner will have to dry or pickle the hides himself before storing the hides.

Storage requires protection of the hides against rodents or other vermin by keeping the stored hides off the ground on pallets or shelving.

Step 2 - Soaking

The hides are soaked to wash off dirt and blood and to soften the hides if they *were* stored in a dried state. Soaking will make the hides swell. In the soaking operation the hides are put in a wet drum and agitated. If necessary, disinfectants can be added to the water to counter bacterial damage to the hide.

Step 3 - Liming, Fleshing and Dehairing

Liming, the immersion of the hide in a mixture of water and lime, destroys or softens the outer layer of the hide to facilitate the dehairing process. It also destroys those parts of the hide such as nerves and sweat glands, that are not converted into leather. Liming also makes the fleshing operation easier.

Fleshing as described in Section 2 is the removal of all the flesh from the hide. A circular knife is assumed here. Dehairing is the removal of all the hair with the help of a scraper. Both fleshing and dehairing can be done without the immersion of the hides in a lime solution. As a matter of fact the Native tanning methods omit liming. However, the liming process makes the dehairing and fleshing easier and allows for a higher throughput.

Dehairing after the liming process is reduced to scraping the loosened hair from the hide using the back of a fleshing knife or any other blunt scraper.

Step 4 - Deliming, Bating and Pickling

The manipulation of the hide in this step is done to prepare the unhaired hide for the tanning process. This preparation has both a chemical and physical component.

Deliming is the washing of the hide to remove the liming solution and bring the hide at one desired pH, which is 7 or 8 for the bating process.

Bating is a further step in the purification of the hide. It is the enzymatic removal of unwanted parts of the hide such as epidermis, hair and so called "scud" on the hide and in the hair follicles and pores.

Pickling is the treatment of the hide with salt and acid to bring the hide to the desired pH for tanning, which depends on the tanning process used.

All three parts of this step take place in drums (one drum for each substep), placed close to each other to facilitate the movement of hides through the process. This step underlines the need for an experienced tanner. Each of the parts of the tanning process depend on the prior ones in that successful preservation of the hide will only come about if all variables (such as the pH) are expertly manipulated.

Step 5 - Tanning

Tanning is the conversion of a hide Into leather. There are many different methods of tanning and all yield different results. The basic aim of the tanning process is to preserve the hide so that it can be used to make leather goods. Smoke tanning, as discussed in the previous section, results in a very pliable, water-resistant, and easy to sew leather. Chrome tanning, which is the most widely used commercial tanning method, yields a leather that is very resistant to bacterial decay and that stands up to high temperatures. However, without further processing it is not easy to work with, and the process is highly polluting since the chrome salts do not break down easily.

The choice of tanning method is dependent on the quality of leather demanded, the inputs that are available, the pollution control systems that are in place, and the skills of the tanner. Smoke tanning has been discussed in the previous section and could be adopted to a larger volume tannery by divising a way in which the smoking could take place while the hides are in a drum. Chrome tanning, on the other end of the technological spectrum, has to be rejected for a northern tannery on the basis of environmental concerns.

The discussion in this section will assume the choice of aluminium sulphate as the major tanning agent. This choice is based on the fact that aluminium sulphate does not constitute as large a health hazard as, for example, chrome salts, is relatively easily neutralizcd-in-the effluent, and can be purchased from Alberta suppliers.

One drawback of alum salt tanning is that it results in a leather that is likely to be more stiff and hard. This drawback can be overcome by paying extra attention to the softening process that follows the tanning stage.

Alum salt tanning uses a wet drum placed close by the drums for the deliming, bating, and pickling part of the cycle.

Step 6 - Softening, Oiling and Drying

The tanned hides can be piled on top of each other and allowed to drain. This removes most of the excess tanning liquids from the hides. The leather is further dried by applying a stroking Pressure from one end of the piece of leather to the other. This motion which can be done with the stretching machine discussed in the previous section. More sophisticated machinery is available.

The result of this softening and drying process is a soft and pliable hide that can be finished by the application of some oil, such as neat's foot or castor oil. The product at this stage is semi-finished leather to be sold to the leather product manufacturers or to another tanner for further finishing for specificspecialty markets.

Step 7 - Measuring, Sorting, and Scraping

This step is not part of the tanning process, but like step 1, the hide selection and storage, is a very important part of the tannery as a business. Leather is preserved animal hide and is therefore not a uniform product. Separating the finished pieces of leather by grade and measuring the individual pieces will enable the tannery operator to Price his product more precisely and to target seParate markets with special needs.

Storage of the finished product should ensure that the quality of the product does not diminish in value due to exposure to weather, especially bright sunlight. Some effort should be made to protect the leather from pilfering or vandalism.

2.2.2 **Equipment Schedule**

1-	Soaking drum	$2,000
1-	Liming drum	2,000
1-	Circular fleshing knife	900
1-	Circular knife sharpening machine	5,000
1-	Scraper	
1-	Deliming drum	
(1-	Pickling drum)	
(	) optional	
(1-	Bating drum)	
1-	Tanning drum	
1-	Extractor (dryer)	9,000
1-	Stretching machine	3,000
1-	Effluent settling tank	

2.2.3 **Building Requirements**

A well insulated building with 3 phase power, proper ventilation, good water supply and drainage is required. It is possible to change an existing building to a leather tanning operation with minimal adaptation. Effluent disposal may create the need to **build** a settling tank.

2.2.4 Capacity

As with the very **small** tannery discussed above, this tannery would work on a lot basis. A lot is the **amount of hides needed to fill a drum and is thus dependent on the drum size.** In **the earlier stages it is recommended to use small drums of 4-5 feet diameter.** This diameter drum can **accommodate up to** 5 moose or caribou hides.

The **fleshing/dehairing** stage is the bottleneck in the operation since it is the most labour intensive step. An experienced flesher should be able to flesh 5 moose hides in a day using a circular fleshing knife. If properly timed it is therefore possible to fill one drum per day -- giving the operation a weekly capacity of 25 hides in which hides fleshed on Friday will start their wet cycle on the next Monday or left to soak (without agitation) over the weekend.

Since the whole process is a single winterized building, the process can be maintained year round. If we assume a 48 week work year, the total yearly throughput would be 1200 hides.

Throughput can be increased by adding a second circular fleshing machine or upgrading the circular knife to a drum type fleshing machine.

2.2.5 Environmental Concerns

Waste water needs to be processed before it can be let out of the tannery into the environment. There are two major effluent streams: the lime contaminated water from the liming and deliming step and the alum salt contaminated water from the tanning step. The lime contaminated water is not much of a problem since lime is not a harmful (be it smelly) chemical. Indeed lime is commonly applied to neutralize acidic soils and the water with the lime and fleshing waste makes a good fertilizer and can be disposed of with beneficial effect on soil.

The water contaminated with aluminum salts and other tanning agents should be recycled as much as possible and neutralized before it is disposed of outside the tannery. Charcoal filtration will go a long way to take out the salts; separating the salts from the water by boiling is another method but is unlikely to be used in the NWT due to the high energy costs.

In the summer the salt.contaminated water can run into a lagoon or open pit and oxydized by the action of the sun. A complete system would see two or three settling tanks set up before the water reaches the lagoon. Most solid contaminants settle in these tanks and can be removed and buried in a landfill site. The leftover water is discharged in the lagoon to be oxydized by the sun. This system has drawbacks in that it can be a smelly affair and, of course, the open pit lagoon would be frozen solid in the winter. If a special winter lagoon was crated that would be filled over the winter with effluent to be oxydized during the summer, one may get around the fact that the oxydization process doesn't work in the winter.

2.2.6 Employment and Training

The process described above would need the follow crew:

1- master tanner/tannery operator

1- experienced flesher

1- tanner-trainee

1- helper

The master tanner would be responsible for the running of the tannery in both a business and a technical sense. He is the one who makes the ultimate buying decisions, controls chemical levels in each of the process steps, schedules the work, and markets the product. The multiplicity of tasks will require a fair level of delegation of responsibilities to other members of the staff e.g., the tanner-trainee.

Well trained all round tanners are few and far between and it takes at least four years of apprenticeship to reach a level of proficiency. Tanning is an art as well as a skill and requires a good sense of observation, more than a basic knowledge of chemistry, and a lot of practical knowledge of mechanics. All aspects of the tanning process require a high level of skills; fleshing for example, make take 8 months of training, stretching one month, and shaving - 6 months.

2.3 Medium Small Tannery - Furs

2.3.1 Technology

Fur dressing is a slightly more difficult process than leather tanning because besides conserving the hide, the process has to keep the hair not only intact but also firmly bedded in the hide. Our investigation of the demand (see Section 4) indicates that commercially dressed fur is overwhelmingly preferred over home tanned furs. The tannery discussed in this section is therefore set up to come up with a product that equals the output of southern tanneries. Several stages of the fur dressing operation are similar to leather tanning process and no further explanation of these steps will be given. The basic process goes through 10 steps:

1. Hide selection and Storage

2. Soaking

3. Washing

4. Fleshing and Shaving

5. Pickling

6. Dressing (tanning)

7. Softening, Washing and Drying (includes stretching)

8. Drumming and Caging

9. Sanding and Ironing

10. Sorting and Storage

Step 1 and 2 are similar to the steps in the leather tanning process (see Section 3.1). Step 3, washing, has the objective to clean out the dirt and possibly blood from the fur, and to degrease the hair. To accomplish this, a detergent is added to the water in the drum.

Step 4, fleshing and shaving, is as described in the leather tanning process. As with leather tanning, the pickling (step 5) is to prepare the Fur for the actual tanning. The pH of the hide is of critical Importance for the success of the tanning operation.

Step 6, Dressing, is similar to the tanning step in the leather operation. It should be noted here that although the tanning method here is based on aluminum salts, it is not true that there is one standard tanning liquid that can be used for all leather and furs. It is specifically in this stage that the craft of the tanner comes into play. Each lot of skins, hides or furs will need Individual attention and the tanning solution will have to be adjusted for each type of hide or fur. In general, it is recommended to keep leather tanning and fur dressing separate and not share machines or equipment between them with the exception of the fleshing knifes. Different types of fur can be processed in the same line of equipment but efficency and conservation of inputs require that large runs of each type of fur are processed to minimize the number of times the tanner needs to change tanning solutions, the acidity of the picling solution, etc.

Step 7, softening, washing and drying is very much the same as in the leather tanning process except that the fur will be improved if it is force dried with hot (30-32^{o}C) air blown over it by a fan.

Step 8, drumming and caging, finishes the process for the fur. Special grade sawdust is mixed in with the furs in a drum and spun around. This process removes any impurities from the fur and makes it fluffy and soft. Caging is the removal of the sawdust.

Step 9, ironing and sanding, can be seen as optional. Ironing gives a lustre to the fur and sanding gives a soft finish to the leather side. Step 10, storage, is much the same as in leather tanning.

2.3.2 Equipment Schedule

1-	Fleshing machine	$, 900
6-	Drums	@ 2,000
1-	Stretching machine	3,500
1-	Sawdust drum and cage	5,000
1-	Ironing machine	9,000
1-	Sanding machine	8,500
1-	Forced air furnace and ducts	2,500
1-	30" extractor (dryer)	9,000

2.3.3 Building Requirements @ 4 >

As with leather tanning

2.3.4 Capacity

As with the leather tanning process, the bottleneck is the process in the fleshing stage. Table 2.1 shows estimates for the numbver of furs by type that can be processed on one circular fleshing knife in one day. A second factor in the capacity of the tannery is the need to process the furs in drumloads. Table 2.1 also indicates how many drumloads an experienced flesher can hope to fill in a day's work.

Table 2.1 Estimates of Daily production of an Experienced Flesher using a Circular Fleshing Machine

	Number	Drumloads
8ear	5	N.A.
Beaver	20	2/3
Buffalo	2	1
Coyote	20	3/4
Fox	30	3/4
Rabbit	75	3/4
Muskrat	75	3/4
Seal	20	1
Wolf	15	2/3
Wolverine	20	N.A.

Source: N. Guilbeault

Since the fur dressing process omits the liming and deliming step, it remains possible to process 5 drumloads per week. The actual number of furs will depend on the type of fur processed, which is dependent on the demand for furs (see Section 4). Total yearly throughput will be 240 drumloads in 48 weeks.

5 x 2
x 4
4

2.3.5 Environmental Concerns

see leather tanning

2.3.6 Employment and Training

see leather tanning

3. SUPPLY AND DEMAND OF HIDES ANO FURS

3.1 Very Small Tannery

3.1.1 Demand

The *very* small tannery with a throughput of 5 hides a week or 225 hides per year is modelled on the Native tanning methods that are used in the Northwest Territories. Leather produced in this fashion will be the same as the leather now produced by hand methods. Native leather tanning is limited mainly to moosehides with some tanning of caribou hides. This observation itself already gives an Indication of the demand for Native tanned leather. Contact with most art and craft stores in the NWT and a number of persons and companies involved in the purchase, manufacture, wholesale, and resale of leather goods lead to the conclusion that demand for leather for the handicraft indistry in the NWT is roughly equivalent with the demand for tanned moosehides (with a poorly developed demand for tanned caribou hide as a distant second) and that the demand for tanned moosehides is overwhelmingly a demand for smoke tanned leather.

Table 3.1 and 3.2 show the demand for smoke tanned moosehide and caribou hide in the NWT. The figures are the results of a survey of craft stores and cooperatives in the N.W.T. The figures presented in Table 3.1 and 3.2 are conservative estimate of the demand because it only takes into account the demand of local NWT stores contacted by RMC and does not include tanned moose or caribou hides that could be marketed through larger companies such as the Hudson's Bay Company, the Arctic Trading Company and Northern Impressions.

Table 3.1
Demand of Smoke Tanned Moosehides
By Region 1985

	1	2	3	4	5	6	Total
1985	175	13	18	20	0	0	226

Table 3.2
Demand of Smoke Tanned Carriboo Hide
By Region 1985

	1	2	3	4	5	6	Total
1985	197	10	0	40	0	0	197?

Demand is subdivided by region to give a first indication of where the tannery should be located. The subdivision of the NWT is the same of the one used in the Diand publication 'Fur Trade Posts of the NWT, 1870-1970' by Peter Usher. The regions are:

1. Great Slave Lake
2. MacKenize River
3. MacKenzie Delta
4. Western Arctic
5. Eastern Arctic
6. Keewatin

The total number of smoke tanned moosehides demanded is very close to the total capacity of the very small tannery as outlined in Section 2 giving the tannery an initial market of at least the full capacity of operation. Not all suppliers will be pushed out of the way by a new tannery in the NWT; some hides will be supplied by individual women in the NWT and B.C. On the other hand a recent ban on the interprovincial trade in smoke tanned hides introduced by Alberta helps the new tannery in finding an outlet for its total production.

The market for smoke tanned moosehides is not limited to the numbers presented in Table 4.1 Several people in the arts and craft industry in the NWT indicated a certain level of frustrated demand. This unfulfilled demand allows for a guarded optimism that the output of a very small tannery can be marketed in the NWT even in the absence of any market development efforts.

S0 far, the discussion has centred on tanned moosehides, and ignored cariboo hide. Total demand for cariboo hide is not well developed and there are a lot of quality difficulties with carribo leather due to insect and parasite damage. Inclusion of the cariboo hides as part of the 240 hide total output would ensure the marketability of the total output of the tannery, even though it would lower the gross and net revenue of the operation. (See section 4 for a discussion of the economics of tanning in the NWT.)

3.1.2 Supply

Moose is hunted by General Hunting License (GHL) holders and to some extent by resident hunters. Figures based on GHL holder information is not very reliable; however, there seems to be a clear downward trend in the total moose harvest from around 1800 in the mid sixties to 600--1000 in the early eighties. These numbers may show substantially under-reporting of the kill, but even at these conservative levels it is clear that the annual moose harvest is more than sufficient to supPly all the hides (i.e., 225) that the very small tannery can process.

Figure 4.1 shows the location of moose kills between 1981/82 and 1983/84. Even casual inspection of the map shows the area around the Great Slave Lake as the dominant moose hunting area with the MacKenzie Delta and the MacKenzie mountains as two other important areas.

3.1.3 Location

It is established that sufficient numbers of moose are harvested each year, and that the area around the Great Slave is the dominant hunding grounds. It is also established that the Ft. Smith region (region 1 in Table 4.1) has the highest apparent demand (mainly centered in Yellowknife and Rae Edzo). The conclusion regarding the location seems straight forward If we consider further that most regular inputs are supplied locally (power, punk wood, moose brain).

* Rae Edzo seems likes the most likely place to locate the very small tannery because:

  - located close to major centres of demand,
  - located in the area of most moose kills,
  - large and active pool of talent among the native population.

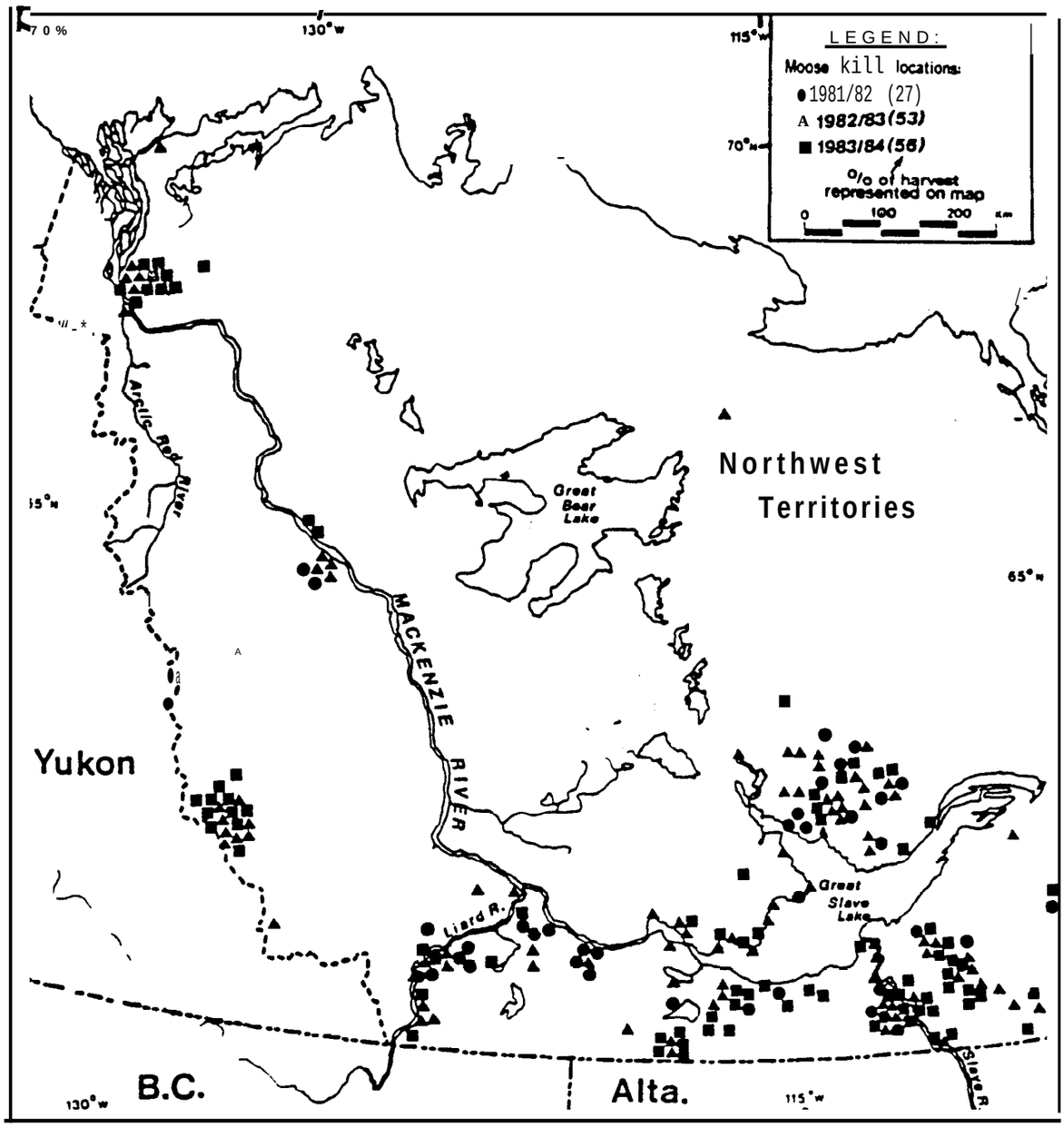


Figure 4.1 Distribution of moose kil 1s by resident hunters, 1981-1984.

Source: Tres e de r and G r a f 10 95

3.2 Medium Small Tannery

3.2.1 Demand for Leather

Demand for tanned moose and cariboo hide through small craft stores was approximately 400 hides in 1985 (see tables 3.1 and 3.2). This demand is far below the potential output of a medium small leather tannery (output = 1200 hides]. Active market development and the inclusion of large organization such as Arctic Trading, Northern Impressions, and the Bay will not increase the total number of hides demanded over 700-800 hides. This lack of demand for tanned leather is what makes a Medium Small Leather Tannery 'a marginal undertaking. This demand analysis does not even take into account the very clear preference of NWT consumers for smoke tanned leather, which decreases the livelihood of success for the leather tannery.

3.2.2 Demand for Furs

Arts and Craft shops contacted by RMC voiced an overwhelming preference for commercially tanned furs. Commercial furs are more durable than home tanned pelts, and have a higher consumer appeal. Table 3.3 shows the estimates of the demand for furs in the NWT based on RMC contacts with local arts and craft organizations. Not all respondents were able to give a breakdown of the total number of furs demanded. As with Table 3.1 and 3.2 the demand has been broken out by region.

Table 3.3
Demand for Furs in the NWT
by Region 1985

Type	Region 1	2	3	4	5	6	Total
Beaver	305		50				355
Coyote	100		50	50	3	50	253
Fox	230			75	20	50	365
Muskox	60						60
Rabbit	870		750	7			1620
Seal				500			500
Wolverine	5		50	25		50	130
Wolf	285			75			360
Other	625		100	100	0	50	862
Total	24B0		1000	825	23	200	4505

Source: RMC Survey

Figures presented in Table 3.3 should be used with care as an indication of demand only and not as an absolute measurement.

As with the figures presented in Tables 3.1 and 3.2 larger companies such as Hudson's Bany Company, Arctic Trading and Northern Impressions have not been included to prevent double counting furs traveling through the wholesale channels.

But one conclusion can be drawn from these indications of demand from the NWT and that is that the demand for furs by small art and craft shops is not enough to use the total capacity of the medium small tannery. Figures in Table 3.3 can be converted to lot sizes" using the numbers presented in Table 2.1. A lot is the number of furs need to fill one drum to an efficient capacity and is the size of each batch of furs processed. The demand figures of Table 3.3 convert to approximately 100 lot sizes or less than half the capacity of the tannery.

To increase the volume of furs that can be processed by the tannery it is necessary to get access to the larger markets. Northern Impressions of Yellowknife, the Arctic Trading Co. of Churchill Manitoba and the Hudson's Bay Company are three major users of fur and fur products. Each one of these companies handles enough furs to keep the tannery working at full capacity or close to it.

3.2.3 Supply

The NWT is a major supplier of raw furs to the world markets. Even casual inspection of fur harvest statistics (e.g., Resources Initiatives 1985) show the potential abundance of fur supplies in the region. Tables 3.4 through 3.8 show harvest estimates by region. The figures in the table can be related to the size of the fur dressing plant discussed here by expressing some of the harvest numbers to lot sizes of our tannery. The Inuvik muskrat harvest alone equals over 1400 lots (or batches of pelts enough to fill a drum) as compared with a total capacity of 240 lots for the size of tannery discussed here.

This casual indication that there are more than enough pelts being produced in the NWT to keep a medium small fur dressing plant more than busy, begs the question whether a NWT tannery will be able to get access to this supply. Most furs are now harvested and sent as raw pelts to southern auctions. This flow of fur goes via the established fur trading channels such as the Hudson's Bay Co. or via the NWT Wildlife Officials on behalf of individual hunters and trappers.

Table 3.4

Inuvik fur harvest (no. of pelts)

Species	1980-81	1981-82	1982-83	1983-84
Bears:				
Polar	25	8	3	17
Other	12	16	14	17
Beaver	415	458	255	295
Caribou	--	--	--	--
Coyote	--	--	--	--
Fisher	19	--	--	--
Fox				
Blue	2	4	1	2
cross	316	572	367	515
Red	478	917	584	862
Silver	77	78	61	92
White	2,551	2,338	321	1,626
Lynx	242	3,929	584	441
Marten	10,485	8,705	7,350	7,055
Mink	1,876	1,137	1,675	1,207
Muskrat	87,854	105,864	11S,798	119,161
Muskox	11	--	--	--
Otter	2	3	1	11
Rabbit	--	--	.-	--
Squirrel	728	368	52	--
Weasel	191	159	54	237
wolf	57	36	33	234
Wolverine	5	1	4	39
Total Value:	$1,161,288	$1,045,878.80	S966,310.46	$1,121,319.27

Table 3.5

Fort Smith fur harvest (no. of pelts)

Species	1980-81	1981-82	1982-83	1983-84
Bears				
Polar	--	--	--	--
Other	7s	52	21	44
Beaver	4,612	1,857	2,459	2,297
Caribou	--	--	--	.-
Coyote	16	.52	29	15
Fisher	107	64	55	51
Fox				
Blue	3	--	7	--
cross	346	296	247	121
Red	844	521	504	268
Silver	64	45	39	14
White	332	16	374	32
Lynx	2,963	2,051	1,616	858
Marten	18,318	17,283	10,153	6,517
Mink	2,968	1,933	1,093	1,242
Muskrat	37,601	27,619	15,311	27,983
Muskox	--	--	--	--
Otter	94	52	39	74
Rabbit	--	--	--	--
Squirrel	20,524	6,863	2,360	12,218
Weasel	1,497	1,183	303	865
wolf	94	121	248	292
Wolverine	35	54	91	59
Total Value:	%1,705,706.01	$1,511,488.08	1,103,5S5.SS	$853,611.89

Table 3.6

Kitikmeot fur harvest (# of pelts)

Species	1980-81	1981-82	1982-83	1983-s4
Polar bear	96	50	2s	60
Fox				
Blue	96	32	28	39
cross	113	140	79	204
Red	383	283	304	S38
Silver	19	4s	8	40
Whi te	22,882	8,642	3,495	8,773
Marten	--	4	2	1
Muskox	2	--	--	- -
Otter	--	1	2	--
Rabbi t	--	--	--	3
Squirrel	--	10	64	12
Weasel	14	7	--	1
wolf	142	1s7	95	170
Wolverine	15	26	38	37
Total Value:	%770,343.45	S351 ,257.82	$145,822.52	$319,398.10

Table 3.7

Keewatin fur harvest (no. of pelts)

Species	1980-81	1981-82	1982-83	1983-84
Polar bears	78	96	98	100
Fox				
Blue	10	7	21	3
cross	7	7	19	3
Red	64	3s	70	24
Silver	6	2	7	1
White	6,274	1,426	7,666	1,943
Muskox	--	1	--	--
Weasel	14	--	--	1
Wolf	142	71	107	129
Wolverine	15	6	3	6
Total Value:	$233,S72.50	$133,825.02	%280,467.39	%190,364.50

Table 3.8

Baffin fur harvest (no. of pelts)

Species	1980-81	1981-82	1982-83	1983-84
Bear				
Polar	134	144	70	12s
Other	1	--	--	--
Fox				
Blue	18	13	2	20
Cross	23	40	12	17
Red	119	69	25	118
Silver	4	3	--	3
White	5,276	2,809	796	3,097
Weasel	1	--	--	--
Wolf	62	58	40	64
Wolverine	2	1	1	--
Total Value:	%268,143.00	$218,480.00	$77,924.00	%154,943.00

Source for Table 3.4 - 3.8: Resource Initiatives(1985)

Fur buyers who frequent the auctions are a very sophisticated small group with strong established ties reacting to the very fickle requirements of the international fashion industry. Once bought the fashion manufacturers usually have their furs custom tanned to the specification of that specific time.

The link between the fur auctions and the international fashion world and the dominance of the Hudsons Bay Co. in this trade suggest that this market is not an appropriate one for a small NWT based fur dressing plant. Stronger yet it can be debated that the fur auctions are a system that the NWT hunter and trapper should shy away from as much as possible. Prices for each type of fur vary widely by grade, colour, cleanliness, and freshness, leaving the hunter with very little information about the real value of his product. In general there, is a real lack of information available to the hunters and trappers about when to market furs. Insufficient 'information leads to lower returns to the producer. The existence of so-called treaty sales, sale of lots of fur that were not sold at a regular auction or arrived too late for the auction, often further depresses the returns to individual trappers.

The distance between the trapper and the fur auction may open a door for a NWT based fur tannery. By virtue of its location in the NWT, the tannery will be able to establish a good working relationship with many hunters and trappers and their organization. Better lines of communication, the opening up of an alternative marketing channel, and at least equal returns, will go a long way to convince Individual hunters and trappers to divert part of their harvest to a NWT base tannery.

3.2.4 Location

The total harvest of pelts in the Inuvik region is estimated at $1.1 million dollars in 1983/84 (Resource Initiatives 1985), while the Ft. Smith region's harvest was estimated at $850,000 and the Kitikmeot harvest at $320,000. Thus, if the tannery were to be located close to the major supply of furs to minimize freight for furs, a location in the Inuvik region would be selected. However, all other criteria, and as location of demand, minization of input costs such as chemicals and utilities, point into the direction of locating the tannery in the Ft. Smith region.

Fur dressing Is very input intensive. A industry rule of thumb is that 1 kg of tanned leather will need 5 kg of chemical" inputs. In terms of bulk it is thus more efficient to have the furs travel to the tannery than have the tanning chemicals travel to where the furs are. The majority of the input is salt which is easily transported, but many of the other chemicals, such as chromium salts that are added to the aluminium salt to stabilize the tan, are often in the form of an emulsion and very sensitive to temperature and temperature changes. Winter transport of these chemicals increases the chances that the chemicals become inactive.

Hay River has the infrastructure for a tannery. Good road ace="to Alberta will allow for a least cost location (for the" NWT) when it comes to inputs such as chemicals and sawdust. Hay River's established industrial base will make it possible 'to find existing warehouse or factory space that can be adpated *to* the 'needs of a tannery. Pine Point has a pretty well the same advantages as Hay River as a location for a tannery.

4. THE ECONOMICS OF SMALL SCALE TANNERIES

4.1 Very Small Tannery

The very small tannery discussed in Section 2 is basically an adaptation of existing native tanning methods. Simple machinery is introduced to take some of the drudgery and hard physical labour out of the process.

Aspirations for this tannery are limited to the supply of the local (NWT) market, which absorbed at least 226 smoke tanned moose hides and 197 smoke tanned cariboo hides in 1985. This tannery will only process moose and cariboo hide and produce smoke tanned leather; no other products or types of hides will be considered in the initial phases of the tannery because mmose and cariboo hides, especially moose hides will find a ready market in the NWT arts and crafts industry.

Moose is the prime hide to be processed because it is in high demand and fetches high prices. The price for a smoke tanned moose hide in the NWT ranges from $250 to $375 while tanned moose hides sell between $50 and $60. If we assume a conservative average price for tanned moose hides of $300 and $50 for a untanned hide, we arrive at a $250 spread that can be absorbed by the tannery as a tanning fee.

The figures for cariboo are a lot lower, reflecting both the more abudant supply of cariboo hides and the less developed demand. Average price for smoke tanned cariboo hide was around $50 in the Ft. Smith region in 1985 as for untanned hides, $15. Leaving only $4 per hide for the tanning process.

Transportation costs do not play a major role here since the practice now is that the hunter will offer the raw hide for sale at one of the major centres such as Yellowknife, Rae Edzo, or Hay River, thus absorbing the cost of transporting the hide from the outlying communities to the centres. More critical is that the tanner establishes a relationship with the hunters so that they know where to bring the hide and is what state or form. Many moose hides are left in the bush or end up in land fill sites because hunters do not know the hides can have value. Positioning the tannery close to the major sources of demand in Yellowknife, Rae Edzo, and the craft shops along the Liard highway minimizes the transportation cost from the tannery to the customer.

Table 4.1

VERY SMALL TANNERY
WEEKLY THROUGHPUT OF 5 HIDES

	48 WEEKS CAPACITY fULL	26 WEEKS CAPACITY FULL	48 WEEKS CAPACITY	0.87
EQUIPMENT	$7,000,00	$7,000.00	$7,000.00	
BUILDING	$0.00	$0.00	$0.00	
VARIABLE COSTS:				
KNIVES	$200.00	$120.00	$174.00	
CHEMICALS	$240.00	$130.00	$240.00	
RENT	$6,000.00	$6,000.00	$6,000.00	
UTILITIES	$3,0s0.00	$1,8s0.00	$3,050.00	
COST OF HIDES	$12,000.00	$6,500.00	$10,440.00	
COST Of STOCK	$1,200.00	$6s0.00	$1,044.00	
INTEREST COST	$2,580.00	$2,300.00	$2,244.60	
EQUIPMENT MAINTENANCE	$350.00	$350.00	$350.00	
WATER	$144*OO	$70.00	$125.28	
LABOUR TRAINEE	$16,640.00	$8,320.00	$16,640.00	
LABOUR TANNER	$31,200.00	$18,000.00	$31,200.00	
LABOUR FLESHER	$0.00	$0.00	$0.00	
LABOUR HELPER	s ,280.00	$640.00	$1,280.00	
FIXED COSTS:			$3.00	
BUILDING DEPRECIATION	$0.00	$0.00	$0.00	
EQUIPMENT DEPRECIATION	$462.00	$462.00	$462.00	
TOTAL COSTS	$75,346.00	$45,400,00	$73,252.08	
REVENUE	$84,000.00	$4s,500.00	$73,080.00	
PROFIT (LOSS)	$8,654.00	$100.00	($172.88)	

Table 4.1 shows estimates of cost of production and revenues for the very small tannery. Under various assumptions regarding number of weeks in operation per year and level of utilization of. the capacity. Further assumptions used in the calculation of the figures presented here are compiled in Appendix A.

The assumption of full capacity for 48 weeks means a total production of 240 tanned moose hides, slightly above the identified demand for moose hides by small craft stores in the NWT but definitely not outside the realm of possibilities of some market development is done. All assumptions are chosen so that the economic picture presented in Table 4.1 is as realistic as can be. However, the very nature of this approach makes it more of a depiction of the situation when everything goes well than the reflection of the actual budget of an operating tannery. Small changes in the assumption quickly whittle away the $8,500 profit that the enterprise shows. For example, what if full capcity during the whole year cannot be maintained? The third column in Table 4.1 shows that the tannery breaks even if the capacity utilization drops to just below 90%. Spoilage of hides also would make a quick dent into the operation's profitability. A 10% spoilage of tanned hides because of mismanagement or inexperience would eat away most of the profits. Any additional labour cost would be critical for the tannery since labour is the largest cost factor.

Column 2 of Table 4.1 shows the results of a partial operation of the tannery. In the 26 weeks of operation this tannery would process 130 moose hides. Labour costs go down, and labour is the main cost in the tannery discussed here, but not proportional to the reduction i>' working weeks. The tanner has been deemed to be on the job for four weeks outside the 26 weeks production season to prepare the tannery for the new season, to market the production after the close of the production season, and to take care of all necessary paperwork. However, the tannery still shows a positive, be it small, return.

Table 4.2 shows a slight variation in the setup of the tannery and investigates a higher production is an economical alternative. To make the larger throughput possible, one extreme drum has been added so that there are two separate soaking drums. Two drums will allows one drum to be used exclusively for the initial soaking and washing and one for the soaking of the semi-tanned hide at the end of the process. An extractor has been added to the equipment to mechanize the wringing of the hide after the soaking stage. The casual help is used year round in this scenario.

Table 4.2

VERY SHALL TANNERY
WEEKLY THROUGHPUT OF 10HIDES

	48 WEEKS CAPACITY FULL	26 WEEKS CAPACITY FULL	48 WEEKS CAPACITY	0.96
EQUIPMENT	$13,500.00	$13,500.00	$13,500.00	
BUILDING	$0.00	$0.00	$0.00	
VARIABLE COSTS:				
KNIVES	$400.00	S240.00	$384.00	
CHEMICALS	$480.00	$260.00	$480.00	
RENT	$6,000.00	$6,000.00	$6,000.00	
UTILITIES	$3,170.00	$1,940.00	$3,170.00	
COST OF HIDES	$12,250.00	$12,200.00	$11,760.00	
COST OF STOCK	$1,22s.00	$1,220.00	$1,176.00	
INTEREST COST	$3,120.00	$2,600.00	$2,995.20	
EQUIPMENT MAINTENANCE	S675.00	$675.00	$675,00	
WATER	$288.00	$156.00	S276.48	
LABOUR TRAINEE	$16,640.00	$8,320.00	$16,640.00	
LABOUR TANNER	S31,200.00	$18,000.00	$31,200.00	
LABOUR FLESHER	$0.00	$0.00	$0.00	
LABOUR HELPER	$16,640.00	$8,320.00	$16,640.00	
FIXED COSTS:				
BUILDING DEPRECIATION	$0.00	$0.00	$0.00	
EQUIPMENT DEPRECIATION	$891.00	$891.00	$891.00	
TOTAL COSTS	$92,979.00	$60,822.00	$92,287.68	
REVENUE	$96,000.00	$85,000.00	$92,160.00	
PROFIT (LOSS)	33,021.00	$24,178.00	($127.68)	

The tannery still shows a positive return with the higher throughput, but the profit has more than halved. This drop in profitability is due mainly to the lack of demand for smoked moose hide. The 240 hides that the tannery produced on full capacity before the expansion filled the current demand for moose hide, leaving the extra production capacity for the production of smoke tanned cariboo hides. This market is less well developed and the tanning margin on cariboo is substantially lower than on moose ($40 vs. $300).

It is clear from the figures presented here that the profitability of the tannery is optimized by concentrating on moose hides and minimizing labour costs. Indeed the tannery shows a healthy profit in the scenario of a 26 week production season, 260 hides (240 moose and 20 cariboo), as shown in column 2 of Table 4.2, the breakeven capacity of this expanded very small tannery is now over 95% reflecting the lower tanning margin of cariboo as compared to moose hide.

Expansion of the tannery necessitates the inclusion of cariboo hides if the tannery is to operate year round. The lower tanning margin for cariboo lessen the profitability of the operation but does increase employment.

4.2 Medium Small Tannery

4.2.1 Leather Tanning

The medium small tannery discussed in Section 2 is a small scale version of a commercial tannery as found in Canada. Machinery have taken over all hard physical labour and modern tanning agents are used to preserve the hides. The major adjustments made for the northern location is the substitution of an aluminium salt based tanning solution for the more common chrome salt tanning solution. This substitution makes the tanning process less polluting.

At full capacity, the medium small tannery will produce 1200 hides per year, far in excess of the current demand for leather in the NWT. Even if the consumer acceptance of commercially tanned moose and cariboo hides was equal to the acceptance of smoke tanned hides (and this is not the case) the NWT based tannery would be working at less than halfcapacity if it would supply all of the local demand.

Table 4.3

MEDIUM SMALL TANNERY WEEKLY THROUGHPUT	100 SEALS 48 WEEKS CAPACITY FULL	200 SEALS 48 WEEKS CAPACITY FULL
EQUIPMENT	$31,300,00	$47,700.00
BUILDING	$135,000.00	$180,000.00
VARIABLE COSTS:		
KNIVES	$0.00	$0.00
CHEMICALS	$13,200.00	$26,400.00
RENT	$0.00	$0.00
UTILITIES	$10,000.00	$12,000.00
COST OF HIDES	$72,000.00	$144,000.00
COST OF STOCK	$7,200,00	$14,400.00
INTEREST COST	$21,480,00	$25,000.00
INSURANCE	$2,494.50	$3,415,50
EQUIPMENT MAINTENANCE	$1,565.00	$2,385.00
WATER	$360.00	$720.00
LABOUR TRAINEE	$16,640.00	$16,640.00
LABOUR TANNER	$31,200.00	$31,200.00
LABOUR FLESHER	$20,800.00	$41,600.00
LABOUR HELPER	$16,640.00	$49,920.00
FIXED COSTS:		
BUILDING DEPRECIATION	$4,455.00	$5,940.00
EQUIPMENT DEPRECIATION	$2,065.80	$3,148.20
TOTAL COSTS	$220,100.30	$376,768.70
REVENUE	$192,000.00	$384,000.00
PROFIT (LOSS)	($28,100.30)	$7,231.30

It is clear that the NWT based medium small leather tannery needs a major market development effort before it can hope to sell its production. This market development effort would have to be directed towards southern markets because the NWT consumers prefer smoke tanned hides. Contacts with southern based tanneries indicate that the smallest size leather tannery would process about 1,000 sides a day (mainly beef) and employ 95 people. An operation like this would have a price tag of 10 million dollars and is clearly in another league that the medium small tannery discussed in this report.

The conclusion can be drawn that a NWT based leather tannery cannot compete with southern tanneries. Perhaps a possibility for this size tannery is to create a niche in the specialty leather market. Table 4.3 presents the estimated cost of production and revenues from a medium small tannery set up to process seals into seal leather. this specialty market is currently being investigated by the Nunasi corporation using an Ontario based tannery. Assumption underlying the figures presented in Table 4.3 are compiled in Appendix A. Table 4.3 shows that apart from being a very capital intensive operation, the seal leather tannery as outlined in this report is not profitable. The inclusion of freight costs from the communities on the Arctic Ocean and Hudson Bay would further deteriorate the economics of this undertaking.

Column 2 of Table 4.3 shows the economic picture for a leather tannery with twice the throughput (i.e., 200 seals/week).

Adding a second tannery line of 6 drums, an extra fleshing machine, and a second stretching machine does change the economic picture. A second tanning line has repercussions on the size of the building and utilities, and especially on the labour requirements. One extra flesher and two extra helpers are needed. As is seen in column 2 of the Table 4.3 the tannery set up like this shows a very modest profit. Inclusion of freight costs of the pelts to the tannery would more than wipe out this positive return.

Considering the fact that the seal leather market is not yet developed and considering the economic of a medium small tannery are negative or very marginal, it seems warranted to consider a medium small leather tannery in the NWT as uneconomical.

4.2.2 Fur Dressing

All fur demanded in the NWT is of commercially tanned quality and the fur dressing plant discussed in this report is set up to be a small scale version of commercial tanneries in Canada. A NWT based fur dressing plant will have to equal the quality of southern tanneries to be able to market its production. This is especially critical if the larger NWT consumers of fur are to be catered to.

Price considerations are an equally important factor and the analysis of tannery discussed here will use current tanning rates. Tanning rates for fur are most often quoted on a custom work basis. Especially the small fur dressing plants operate as custom tanneries, and do not take ownership of the pelts. This organizational set-up has been adhered to in our analysis.

Table 4.4 shows the estimates of the cost of production and revenues for the medium small fur dressing plant. Assumptions underlying these figures have been gathered in Appendix A. The figures presented in table 4.4 underline the higher capital costs due to the higher level of mechanization. Higher machinery cost also increase the interest costs. Revenue figures are very hard to assess in a custom fur tannery because of the large number of different furs that can be processed. The figure used in table 4.4 is an average of tanning fees adjusted for size for 12 types of furs likely to be processed in the tannery (see Appendix A for details). The actual mix of furs processed will depend heavily on the market and the skill of the tanner. If the tannery can concentrate on furs that command a higher than average tanning fee (such as wolf or bear) than the tannery will do better than depicted in table 4.4. If beaver or coyote become the mainstay of the tannery the economic performance will deteriorate because tannery fee for these pelts (adjusted for size) is less than the averaged used here.

Reduction of labour costs by operating the tannery for only 26 weeks out of the year, results in a loss for the operation (see column 2 of table 4.4). The need for expensive equipment to produce the necessary quality of furs does not allow for part time operation. Column 3 of table 4.4 shows the percentage capacity that the tannery needs to maintain to break even. If utilization of the plant drops below 80%, the profit is reduced to zero.

Transportation costs can be ingnored in this analysis because the revenue is based on custom tanning fees. In this organizational set-up the owner of the Fur is responsible for getting the Furs to the plant and back again. Since custom tanning is the normal way of doing business in the industry, a NWT based tannery may have a slight edge over southern tanneries because the customers have to absorb less transportation costs.

Table 4.4

MEDIUM SMALL FUR DRESSING PLANT
MEEKLY THROUGHPUT OF 5 LOTS OF FURS

	48 WEEKS CAPACITY FULL	26 WEEKS CAPACITY FULL	48 WEEKS CAPACITY 0.8
EQUIPMENT	$47,900.00	$47,700.00	$47,900.00
BUILDING	$150,000.00	$1s0,000.00	$150,000.00
VARIABLE COSTS:			
KNIVES	$0.00	$0.00	$0.00
CHEMICALS	$13,200.00	$7,150.00	$13,200,00
RENT	$0.00	$0.00	$0.00
UTILITIES	$12,000.00	$7,000.00	$12,000.00
COST OF HIDES	%0.00	$0.00	$0.00
COST Of STOCK	$1,100.00	$595.83	$880.00
INTEREST COST	$34,020.00	$34,020.00	$27,216.00
INSURANCE	$2,968.50	$2,968.50	$2,968.50
EQUIPMENT MAINTENANCE	$2,395.00	$2,385.00	S1,916.00
WATER	$360.00	$195.00	$288.00
LABOUR TRAINEE	$16,640.00	$8,320,00	$16,640.00
LABOUR TANNER	$31,200.00	$18,000.00	$31,200.00
LABOUR FLESHER	$20,800.00	$10,400.00	$20,800.00
LABOUR HELPER	$8,320.00	$4,160.00	$8,320.00
FIXED COSTS:			
BUILDING DEPRECIATION	$4,950.00	$4,950.00	$4,950.00
EQUIPMENT DEPRECIATION	$3,161.40	$3,148.20	$3,161.40
TOTAL COSTS	$151,114.90	$103,292.53	$143,539.90
REVENUE	$180,000.00	$97,500.00	$144,000.00
PROFIT [LOSS)	$2B,8B5.10	($5,792,53)	$460.10

5. IMPLEMENTATION

The economic analysis of different possible scenarios for a northern tannery, presented in section 4, allows us to ignore the medium small leather tannery in respect to the implementation phase. The figures do not add up for this operation. Implementation of a very small leather tannery and of a medium small fur dressing plant will be discussed below in terms of procurement of supply, marketing, training needs, and possible start-up scenario.

5.1 Procurement of Hides

The very small leather tannery discussed in this report will use essentially Native tanning methods and concentrate as much as possible on moose hides. This tannery will need 240 hides to operate year round. The medium small fur dressing plant will need 240 lots of furs.

There are two barriers that may stand in the way of procuring enough hides and furs: 1) price, and 2) quality. The price of $50 for a raw moosehide is used in this report because that is the price that is currently being paid in the NWT. Some people contacted in the course of this study commented on the Fact that even at that price (Alberta prices are lower), hunters often perceive it not worthwhile to put in the extra effort to carefully skin the hide and bring it out of the bush. One of the underlying reasons here is that there is no established reliable market for raw moosehides in the NWT. A new tannery will thus have to establish itself as a reliable market For moosehides; creating a sense of trust in the hunter that he will be able to sell the product of the extra effort.

Uncertainty about the real price of furs because of the poor information from the fur auctions to the hunters and trappers may work in favour of the chances of a small NWT tannery to procure enough furs. Please refer to section 3.2.3 for a further discussion of this topic.

The financial reward to the hunter may be increased if the tannery would be organized to use mainly local products, which would mean the use of bones to make neat's foot oil for softening the hide or the use of moose brain. Especially collecting bones, which are carried out of the bush with the meat, may create an addedincentive to bring in the moosehides.

Quality is definitely a consideration for the tannery. Inexpertly skinned hides will result in lesser quality leather. Deep knife marks or petrification are both factors that reduce the value of the raw hide or fur and thus the incentive of the hunter to supply hides to the tannery. The answer here lies in communication and training. Careful skinning techniques can be taught, for example by the tanner, and the training should find fertile ground if the tanner can convey an understanding of why certain techniques will result in a better hide and thus higher returns. Preservation of hides, for example, by simply salting them soon after the kill, and then folding them up into a relatively small parcel is an acceptable method and easier and quicker than stretching the hide on a frame to dry.

Procurement of moose hides should not be a problem if the tannery can establish itself as a reliable outlet of raw hides for the numbers, and if the tannery succedes to spread information of what a quality hide is.

Procurement of furs will not be an easy as that of moose hides but prudent cultivation of contacts with hunters and trappers will allow the tannery to carve out a niche as a small alternative market outlet for NWT hunters and trappers.

5.2 Marketing

The target market for the very small leather tannery is the craft industry in the NWT. This industry is almost without exception adamant that it needs smoke tanned hides and a major portion of the marketing effort is, therefore, already done by the use of Native tanning techniques.

Craft shops in the NWT are currently being supplied by both local women and imported from Alberta and B.C. In our contacts with craft stores, some people mentioned quality concerns about their current suppliers, especially about the colour of the tan which shows regional differences. Other concerns were raised about the timeliness of the supply of moosehides.

AnNWT-based tannery would be well advised to concentrate its marketing efforts on the displacement of out of territory hides and on the expansion of the market for hides. Discouraging local women to supply the craft stores would be counterproductive because it would destroy the pool of skills that the tannery needs, and possible create unnecessary animosity towards the tannery which may reflect on the possibility of the tannery to procure hides.

Since most craft stores expressed interest in buying hides from a NWT based tannery, we don't expect any great difficulties as long as the tannery can build a good working relationship with the craft stores based on a good product, reliability of supply, and competitive prices. The tannery would benefit if it could bring the craft stores to order their requirements well in advance of the time when they need it.

Most craft stores need only a small number of hides per year (most require less than 10 hides a year). There will be no need for a special transportation network. Existing transportation facilities like bus, truck, or scheduled airplanes are sufficient to bring the production of a very small tannery to its customers.

Marketing of the output of the fur dressing plant is not so much the marketing of the product but of the service. Small fur dressing plants operate on a custom work basis and the plant discussed in this report follows this set up. A custom tannery does not take possession of the pelt, but rather charges the owner of the pelt a fee for tanning it.

As NWT -based fur dressing plant is thus in direct competition with established southern plants for the loyalty of customers. In our contacts with craft stores, we found a positive attitude towards the idea of using a NWT-based tannery because several craft stores expressed a feeling of lack of control about the pelts sent out to be tanned. The quality of the tanning is not always satisfactory but many craft stores feel that they have little or no recourse by the time their pelts come back. Competitive prices, good service, and open lines of communication should allow a NWT based tannery to win the loyalty of these customers.

The demand generated by craft stores in the NWT is not enough to operate the plant with sufficient capacity to make its operation profitable. Part of the business will have to come from the larger users of furs such as the Hudson's Bay company and the Arctic Traing Co. Quality and consistency of supply are the critical factors here or are ''''the ability to follow the market when it comes to the type of fur demanded.

Custom tanning for southern sport hunters may be another market for the NWT based tannery. This market is not large but will likely be a good supplement to the demand from craft stores in the earlier stages of the development of the tannery.

5.3 Training Needs

SectIon 2 outlined the amounts of time needed to train people on the machinery proposed for the tannery. From the implementation point of view, the need to train people reflects on when a tannery can be started up. The possible scenarios include: 1) hiring an experienced tanner to run the operation and train local people, and 2) send interested local people to apprentice in an existing tannery. The first scenario would allow for a quick start up of the tannery because all that is needed is to buy a limited amount of equipment and hire the tanner. The second scenario would put the opening of the tannery at east one but possibly two years in the future.

Both Mr. Norm Guilbeault, a traveling tanner, and Mr. Schluessel of Edmonton Tannery and Buckskin Leather Co. Ltd , as well as Mr. Cano of Techno Tan of Montreal, all of whom were contacted in the course of this study, expressed interest in cooperating with a NWT based tannery and could be approached to provide the needed training. A small tannery in the NWT could be in a relatively strong position to obtain training, and expertise from existing tanneries because of their need for supplies of furs and hides. The establishment of firm links with selected smaller tanneries in the south may benefit the fur industry in the NWT by opening up an additional marketing channel.

5.4 Start-up Scenarios

This section presents two possible scenarios of setting up a tannery to conclude this investigation of the possibilities for a small scale tannery in the NWT. These start up scenrios are necessarily only poor approximations of the start--up procedures and costs of an actual tannery because so many variables are not yet fixed.

5.4.1 Very Small Leather Tannery

The start-up of the very small leather tannery is not very complex because it involves a process that is already well established in the NWT. Table 5.1 shows the proforma income statements for the first seven years of operation of ths tannery, and is a reflection of the following scenario. All figures are based on Table 4.1.

Prior to Start-up: One person, who is to become the tanner in the new tannery is sent down to a southern tannery to apprentice as a flesher. A wage subsidy of $5,000 is budgeted to supplement the income as an apprentice. First are contacts made to purchase equipment.

Year 1: Equipment is bought and small workshop is rented. Trainee is hired and production is started. First year's production is at half capacity to reflect start-up difficulties. 80% of the hides are successfully tanned and marketed.

Year 2: Continuing marketing efforts and training in the plant result in operation at over 80% capacity (200 hides) with a 90% success rate.

Year 3-7: Tannery is running smoothly and at full capacity.

Table 5.1

PRO FORMA INCOME STATEMENT
VERY SMALL LEATHER TANNERY

	PRIOR TO STARTUP	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7
RENT		$6,000.00	$6,000,00	$6,000.00	$6,000.00	$6,000.00	$6,000.00	$6,000.00
UTILITIES		$2,000.00	$3,050.00	$3,050,00	$3,050.00	$3,050.00	$3,050.00	$3,050.00
COST OF HIDES		$6,000.00	$10,000.00	$12,000.00	$12,000.00	$12,000.00	$12,000.00	$12,000.00
COST OF STOCK		$600,00	$1,000.00	$1,200.00	$1,200.00	$1,200.00	$1,200.00	$1,200.00
INTEREST		$2,590.00	$2,580,00	$2,580.00	$2,580000	$2,580.00	$2,580.00	$2,580,00
MAINTENANCE		$350.00	$350,00	$350.00	$350.00	$350s00	$350.00	$350,00
WATER		$50.00	$100.00	$144.00	$144.00	$144.00	$144.00	$144.00
LABOUR TRAINEE		$16,640s00	$16,640.00	$16,640.00	$16,640.00	$16,640,00	$16,640.00	$16,640,00
LABOUR TANNER	$5,000.00	$31,200.00	$31,200.00	$31,200.00	$31,200.00	$31,200.00	$31,200.00	$31,200,00
LABOUR HELPER		$0.00	$1,280.00	$1,280.00	$1,280.00	$1,280.00	$1,280000	$1,280,00
REVENUE		$33,600.00	$63,000.00	$84,000.00	$84,000.00	$84,000.00	$84,000.00	$84,000.00
PROFIT (LOSS)	($S,000.00)	($31,820.001	($9,200.00)	$9,S56,00	$9,556.00	$9,S56.00	$9,556.00	$9,556.00
CUMULATIVE	($5,000.00)	($36,820,00)	($46,020.00)	($26,464.00)	($26,908.00)	($1 7,352,00)	($7,796.00)	$1,760.00

As can be seem from Table 5.1, even modest start-up difficulties as outlined above create a Financial stress on the fledgling tannery, and it takes three years before the operation is in the black and seven years before the start up costs have been paid off. All calculations assume commercial money, no wage subsidies, or grants, and are, thus, conservative estimates.

By year 3, the first year that the tannery shows an operating profit (depreciation costs have been kept out of the analysis here), the total investment has been $46,000. This investment created two full time and one part time job.

5.4.2 Medium Small Fur Tannery

Starting up a fur dressing plant in the NWT is a more complex undertaking. Not only is there no existing skill base, but there is also not as ready and easily accessible a market as is the case with smoke tanned moose leather. The scenario behind the pro forma statements presented in table 5.2 reflects the anticipated difficulties. All figures are based on table 4.4.

Prior to Start-up: One person, who is to become the tanner, is sent south to apprentice in a tannery. A wage subsidy of $5,000/ year For 3 years is budgeted to supplement the apprenticeship wages. $2,500 is set aside as a wage subsidy for a flesher apprentice for 6 months prior to the actual start-up. Purchasing and plant location decisions are made in the year before start-up.

Year 1: Fur dressing plant starts operation. A trainee is hired and the semi-skilled flesher is further trained. Wages of flesher reflect the fact that he/she is in training. Plant is operating on half capacity and the spoilage is at 20%.

Year 2: Plant is running at 75% capacity and spoilage is at 10%. All staff is hired and marketing efforts are ongoing.

Year 3: Plant is running smoothly (0% spoilage) and throughput is at 200 lots (83% capacity).

Year 4: Plant at full capacity.

Table 5.2

PRO FORMA [NICOME STATEMENT
MEDIUM SMALL FURURTANNERY

	PRIOR TO START UP	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEARS	YEAR?
CHEMICALS		$6,600.00	$9,62S.00	$11,000.00	$13,200.00	$13,200.00	$13,200.00	$13,200,00
COST Of STOCK		$s50.00	$802.08	$916.67	$1,100.00	S1,1OO.OO	$1,100.00	$1,100.00
UTILITIES		$8,000.00	$10,000000	$11,000.00	$12,000.00	$12,000.00	$12,000.00	$12,000.00
INSURANCE		$2,900.00	$2,900.00	$2,900.00	$2,900.00	$2,900.00	$2,900.00	$2,900.00
INTEREST		$34,000.00	$34,000.00	$34,000.00	$34,000.00	$34,000000	$34,000.00	$34,00000
MAINTENANCE		$1,200.00	$1,800.00	$2,000.00	$2,400.00	$2,400.00	$2,400.00	$2,400.00
WATER		$180.00	$270,00	$300.00	$360.00	$360.00	$360.00	$360.00
LABOUR TRAINEE		$16,640.00	$16,640,00	$16,640.00	$16,640000	$16,640.00	$16,640.00	$16,640.00
LABOUR FLESHER	$2,500.00	$15,600.00	$20,800.00	$20,800.00	$20,800.00	$20,800.00	$20,800.00	$20,800.00
LABOUR TANNER	$15,000.00	$31,200.00	$31,200.00	$31,200.00	$31,200.00	$31,200.00	$31,200.00	$31,200, '.:
LABOUR HELPER		$0.00	$8,320.00	$8,320.00	$8,320.00	$8,320.00	$8,320.00	$8,320.00
REVENUE		$67,S00.00	$121,S00.00	$150,000.00	$180,000.00	$180,000.00	$180,000000	$180,000.00
PROFIT (LOSSI		($17,500.001	($49,370.001	($14,857.08)	$10,923.33	$37,080.00	$37,080.00	$37,080,00
CUMULATIVE		($17,S00.00)	($66,870.001	($81,727. 09)	($70,803.751	($33,723.7S)	$3,356.25	$40,436.2S	$77,516.25

The figures in Table 5.2 show the higher costs of starting up a fur dressing plant as compared to the cost of the leather tannery. However, in this scenario the fur dressing plant starts to show a profit in year 3 (excluding depreciation) and has paid off the start up costs by year 5. Again, as with the very small leather tannery, wage subsidies, grants, or low interest loans would improve the economics of the operation.

By year 3, the first year in which the operation is in the black, the total investment is $82,000 and 3 full-time and 1 part-time job has been created.

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APPENDIX A

Assumption underlying Table 4.1. Estimated cost of production and revenue of a very small leather tannery.

1. Equipment as per equipment schedule in Section 2.

1-	Circular knife	$ 900
1-	Wet drum	2,000
1-	Stretching machine	3.500
	Miscellaneous tools	600
	total	$7,000

2. Variable costs:

replacement knifes for the fleshing machine are needed because knives dull quickly while working on moosehides. The assumption is that dull knives will be sent out to be professionally sharpened. A $5,000 sharpening machine is part of the circular fleshing knife assembly but is not included in our equipment schedule due to the relatively low useage of the knife.

A small workshop of around 500 square feet is assumed with a monthly rent of $500. Utility costs are estimated as $400/month in the winter and $150/month in summer.

Cost of hides	240 moosehides: $12,000
Cost of stock	10% of costs of hides to finance small stockpile to about one month of hides to secure continuity of operation.

Interest costs

Equipment loan of $7,000 is amortized over 5 years at 13%, compounded semi-annually: monthly payment $160.

Operating line of credit of $5,000 at 13%: monthly interest payment $55. Operating line of credit figures are adjusted for scenario where the tannery only operates part time or at less than full capacity.

chemicals @ $45/batch for softening agent.

Equipment maintenance at 5% of value of machinery.

Water use is estimated at 1500 litres per batch of hides @ $2 per cubic metre (including Sewer).

Labour rates

Tanner	$15/hour	- year round
Trainee	$ 8/hour	- year round
Helper	$ 8/hour	- 4 weeks

3. Fixed costs:

NO building depreciation: workshop is rented

Equipment depreciation is a straightline depreciation of 6.6% annually which equals a depreciation period of 15 years.

4. All figures have been adjusted to reflect the Scenarios of 26 weeks production at full capacity, 48 weeks at 82% capacity (breakeven point) and for the same three scenarios at 10 hides a week throughput. Labour costs of the tanner in the 26 week scenario is set at 30 weeks to reflect start up and wind down time.

Assumption underlying table 4.2.

1. Equipment Schedule

as for assumption table 4.1, plus

1-	Wet drum	$2,000
1-	Extractor (rebuilt)	4,500

2. Variable costs

as for assumption table 4.1 but utility costs increased to reflect extra machinery operations. Labour cost have been increased to reflect two full time helpers.

Assumptions underlying table 4.3

- Machinery as per equipment schedule

6 -	Wet drums	@	$2,000 ea.
2-	Circular knives	@	900 ea.
1-	Circular knife sharpener		5,000
1-	Stretching machine		3,500
1-	Extractor (dryer)		9,000

Building 3000 square feet @ $45 includes effluent settling tanks (3) of 3-5 m3

Cost of hides

Sealskins bought @ $1.50 Sq. foot 20 seals make one lot or one lot equal 200 square foot. Full capacity is 48000 square feet of seal skin

Interest cost:

Building costs of $135,000 amortized over 25 years @ 11%: monthly payment: $1325

Equipment costs of $31,000 amortized over 10 years @ 13%: monthly payment: $465

Insurance costs are calculated at $1.50 Per $100 Or

$$\frac{166.000 \times 1.50}{100} = 2500$$

Equipment maintenance @ 5% of equipment value

Water useage of 1500 litres per lot @ $2 per m^3 (including sewer).

Labour costs

Tanner	@ $15.00/hour
Flesher	10.00/hour
Trainee	8.00/hour
Helper	8.00/hour

Depreciation is straightline: 15 years for equipment and 30 years for building.

Assumptions for Table 4.4

Building
As for medium small leather tannery includes heating system capable of keeping drying room at required temperature includes anti-pollution system @ 10% of building costs.

Equipment Schedule

1-	Fleshing machine		$ 900
6-	Drums	@	2,000
1-	Stretching machine		3,500
1-	Sawdust drum and cage		5,000
1-	Ironing machine		9,000
1-	Sanding machine		8,500
1-	30" extractor		9,000

Chemicals

* Soaking	10	grams of salt/litre
* Washing	3	grams of soap/litre
* Pickling	6	grams of salt/litre
	10	grams of formic acid/litre
* Tanning	65	grams of salt/litre
	20	grams of alum salt/litre
	2	grams of Bicarb/litre
	10	grams of chrome salt/litre
* Oiling	2	mg oil/batch
	40	grams of ammonia/gram
* Cleaning	50	grams of saw dust/batch

Estimate chemical costs per batch or lot $55.00

Chemical prices

Salt	$9.00/7 kg
Soda Ash	.65/kg
Bicarbonate	.89/kg
Hydrogen Peroxyde	1.43/kg
Aqua Ammonia	.90/kg
Alum Sulphate	.76/kg*
Formaldehyde	1.15/kg
Formic Acid	2.20/kg
Perchlorethylene	1.55/kg
Saw Oust	.07/bag

Note: Aluminium chloride can be bought as a tanning agent under the name of Luthan F for $2.50/kg.

Interest costs

Building mortgage as with leather tannery: payment $1470

Equipment costs of $47,900 amortized over 10 years @ 13%: monthly payment: $715

Working capital of $5,000 @ 13%: monthly payment: $650

Insurance: as with leather tannery

Cost of chemical stock estimated at one month's supply.

Labour requirements

Tanner	$15.00/hour	year round
Trainer	8.00/hour	year round
Flesher	10.00/hour	year round
Casual help	8.00/hour	half time

Revenue

Custom tanning rates 1986

Revenue is calculated by taking the average of the whole sale and retail tanning fee for each fur (and thus implying that half of the business will be in the wholesale and half in the retail trade) and calcualting the daily production in that fur expressed in dollars gross revenue.

The revenue per day has been averaged over 12 types of fur likely to be processed in a NWT tannery.

	WHOLESALE	RETAIL	DAILY OUTPUT	AVERAGE REVENUE
BEAR	80	140	8	BBO
BEAVER	30	40	20	700
BUFFALO	260	340	2	600
COYOTE	30	40	20	700
FOX	30	37	30	1005
LYNX	35	45	15	600
HARTEN	13	18	40	620
HUSKRAT	5	8	75	488
RABBIT	5	8	80	520
SEAL	45	60	20	1050
WOLF	60	85	15	10B8
WOLVERINE	40	45	20	8S0
AVERAGE	53	72	29	758