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SOURDOUGH SODBUSTERS FINAL REPORT

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Sourdough Sodbusters is presently operating with the assistance of the Canada/Yukon Economic Development Agreement Program (EDA), an experimental sod project 25 miles north of Whitehorse on the Klondike Highway. From this operation we serve the City of Whitehorse, as well as the entire Yukon. This sod project is a first for Yukon.

The project employs 4 full time, seasonal, people and contributes approximately \$70,000 annually to the Yukon economy. The project has been partly funded by an EDA grant for a portion of the capital expenditures. The reason for requesting funding from EDA was that this was considered an experimental project. Sod growing did not have a track record in Yukon and therefore could not be funded by the traditional funding institutions. The grant received from EDA was \$83,500. The total capital expenditures for start up were \$148,000.

We would like to acknowledge the assistance and good will of the Yukon Agriculture Branch, in particular Mr. Dick Filteau, Agriculture Advisor, and Mr. Paul Dribnenki, Director of Agriculture. Without their advice, the project, in all likelihood, would have failed.

Mr. Filteau set out the test plots which were planted in August 1985; selected the best known seed mixtures from Alberta, British Columbia, Ontario, and Alaska; recommended the proper type and quantity of fertilizer as well as the quantity of irrigation. Having monitored the season's growth, Mr. Filteau then made the final choice of the two following selections:

1. CANADA NO. 1 FORAGE MIXTURE (CUSTOM)

- 30% Creeping Red Fescue
- 40% Kentucky Blue Grass (Park)
- 20% Blue Grass (Regent)
- 10% Blue Grass (Baron)

2. CANADA NO. 2 FORAGE MIXTURE (CUSTOM)

- 25% Creeping Red Fescue
- 25% Kentucky Blue (Park)
- 25% Blue Grass (Regent)
- 25% Nugget Blue (Alaska)

All varieties using a minimum 25% Creeping Red Fescue and 50% Kentucky Blue Grass variety were a success. The other 25% could be left to personal preference, provided it did not include more than a 10% mixture of Rye grasses. Using a mixture in excess of 10% of Rye grasses, for some reason, resulted in extensive winter kill.

a sufficient volume of water through the system to deactivate automatic drains. After the necessary volume is in the line, the diesel pump is shut off, and the electric pump turned on. O&M maintenance costs of an electrical pump lessens the problems involved with irrigation. The cost of operating this irrigation system is approximately \$25.00 per acre per month. The amount of irrigated water required is 6 inches per growing season. This seems like a lot, but since we are in a semi arid region, it is a necessary amount required to grow a successful sod crop. Irrigation is required through the months of June, July, and August.

The project was not without set backs. The winter of 1985/86 was extremely mild causing extensive glaciation which covered the entire sod field. On the advice of the Agriculture Branch, more money was required to dig drainage ditches to allow the water to drain and not sit stagnant on the field. The crop was saved and the project was a success.

As this winter is similar to the last, we have taken further precautions by extending the drainage ditches. We have been forced to absorb an additional cost of \$20,000 for winter drainage that was not considered in the original budget proposal.

Last August, our crop was ready for market. A sample of the crop can be seen at the new Justice Building in Whitehorse. We supplied the landscaper with a quality, Yukon grown product at southern prices. In our opinion, this is a first for Yukon.

There is still much work to be done in marketing. There presently exists a belief that sod is too expensive for the average person, but the fact is that the average sized lot in Whitehorse is 1,500 square feet, and at our retail price, the cost of sodding an average lot would only be \$300.00. Somehow, we still need to get this message across to the general public. We are not yet definite on the size of the market in Yukon but we feel it is adequate to support our project. In our opinion the project has been a total success. Besides creating self employment, in keeping with our established lifestyle, we started the project with three things in mind. They were:

1. to create a new Yukon industry;
2. to supply a product at a reasonable price; and
3. to create permanent, seasonal jobs.

Appended, you will find further information, some of which we gathered through our own experience, and some which we collected from various reports written by other sod growers across Canada. We hope this information will be of assistance to anyone interested in growing grass in Yukon.

Submitted by:

SOURDOUGH SODBUSTERS

A handwritten signature in black ink, appearing to read "Allen C. Falle", with a long horizontal flourish extending to the right.

Allen C. Falle

THIS REPORT COMPILED BY SOURDOUGH SODBUSTERS.

THE CONTENTS HEREAFTER ARE COMPILED FROM EXISTING REPORTS AS WELL
AS OUR OWN INFORMATION.

CONTENTS OF REPORT ARE AS FOLLOWS:

SOIL PREPERATION	SOURCES OF FINANCING
SEEDING	SITE SELECTION
IRRIGATION	SEED AND SEEDING
FERTILIZER	KENTUCKY BLUEGRASS
SOIL TESTING	OTHER GRASSES
GENERAL MAINTANCE	GRASS SEED
HARVESTING	WEED CONTROL
FARM BUILDING	OFFICE
SALES METHOD	ADVERTISING
GRASS CLIPPINGS	THE MARKET'S

THE MARKETS

The two major markets for sod are home owners and landscape contractors. Sales direct to homeowners, often called retail sales, usually have the advantage of immediate payment. Sod may be sold from the farm or, for a fee, is delivered to the home. This sales method usually appeals to people purchasing small amounts for lawn repairs. Peak sales to homeowners are usually during July and August, the holiday months.

Sales to landscape contractors are usually in large volume whereby wholesale prices are offered. This sod may go to residential lots, apartment complexes, business lots, parks, schools, and industrial sites. Sales to landscapers usually require deliveries to fewer locations, are less affected by weather, and are more steady throughout the growing season than to homeowners. However, payment is usually not immediate and losses can be high if the customer goes out of business.

IDENTIFYING THE MARKETS:

There are several ways to determine potential sod markets. Because sod sales are closely tied to construction trends, statistics on construction starts and growth trends can be used to predict markets. It has been estimated that there is a two year time lag between construction starts and landscaping sales. Old homes are a potential market for lawn renovations. Municipalities record the number of these homes also. The Federal Business Development Bank (FBDB) holds a series of seminars in Whitehorse throughout the year. One seminar helps businessmen identify what and where their markets are.

SOURCES OF FINANCING

Assistance for financing a new business or expanding an existing business may be available from conventional loan sources such as banks. In Yukon the Economical Development One Stop Shop has several services to help with setting up a business and seeking financing. A free booklet discusses methods of financing and how to approach lenders. Individual counselling is available through the EDA department.

In Yukon, loans are available from the EDA, Federal Business Development Bank, and the Canada Agriculture Development Corporation (CADC).

Yukon Agriculture Branch has a Farm Economist in Whitehorse. The Economist can help with establishing budgets and cash flow projections. The Economist can also advise on arranging for financing and completing loan applications.

SITE SELECTION

When selecting the site for a sod farm, consider the proximity to markets, soil type, climate, water, and land cost.

SOIL:

The site chosen must have suitable soil as this is an important component of sod productivity. Amending soil problems to suit sod growth is expensive and often impractical. The land should be level but with enough slope to allow good water drainage. Excessive depressions make seeding, mowing, and harvesting difficult. Depressions hold snow in the spring and so increase the potential for disease as well as delaying spring maintenance. The site should be fairly clean of weeds, particularly perennial grassy weeds.

Stoniness can be a problem in sod production. Stones, down to very small sizes, damage mower and harvester blades. Rockpickers can be used to clean up some fields, but in very stoney areas, rocks come to the surface at each cultivation and rock picking is a continuous procedure.

Soils are classified according to their texture, based on the sand, silt, and clay content. A soil classified as a moderately-well drained loam is usually considered ideal for sod production; it is about 40% sand, 40% silt, and 20% clay. Sandy soils have the advantage of drying quickly. After a heavy rain, there is little delay in harvesting. However, because sands do not hold much water, they require more irrigation than a clay soil. Soils high in clay are slow to thaw and dry out in the spring. Harvesting can be impossible for several days after heavy rain. Uniformity of texture throughout a field is another important consideration because management practices, such as fertilizing and irrigation, vary according to the soil type.

A final consideration is that the sod soil texture is similar to the soil where it will be installed. Sod roots best when laid on compatible soils and there are no problems with poor water movement between soil layers. This may be an unimportant consideration when the market covers a large area, but could be a selling advantage for local growers.

CLIMATE:

Climate has much less effect on sod production than most other types of agriculture. Knowing about the climate of an area is not a major factor in site selection.

Only a small irrigation system may be needed for back-up purposes in high rainfall areas whereas in low rainfall areas, like Yukon, irrigation is a necessity.

Times of spring and fall frosts have little effect on sod production but the usual date of snowfall and soil temperature records give an idea of the length of the selling season. Except in newly seeded fields, hail is usually not a problem.

WATER:

All sod growers consider some sort of irrigation a necessity for producing sod. As a general estimate, turf requires about 3.5cm of moisture/week for good growth. That is about 65cm of water from May 1 to October 15.

When selecting a site, consider the availability of water and its quality. Rivers, lakes, and natural running streams, with an adequate flow throughout the growing season, are a good source for irrigation water. The quality of the water from natural streams is usually suitable for irrigation. Sloughs can also be a source for water although water quality and storage capacity can be limiting factors. Dugouts generally have limited capacity available to supply a project greater than a few acres in size.

SEED AND SEEDING

GRASS TYPES:

Hundreds of species of grass grow throughout the world but only a few species are used for sod production. In Yukon and most of Canada, sod is grown primarily with Kentucky Bluegrass. Generally a mix of 75-90% Kentucky Bluegrass, including two or more cultivars, 10-25% Creeping Red Fescue or Chewings Fescue is used.

There are several important reasons for using a mix of seed:

1. Each cultivar has different characteristics, each contributing to the overall appearance of the sod. For example, one maybe green late in autumn, and some may perform better than others during dry weather.
2. Resistance to disease varies among grasses. Turf sown with a seed mix is unlikely to be completely damaged by disease.
3. Lawns usually have sunny and shaded areas, the grasses that perform better in each area will dominate there.
4. A fast germinating grass, such as a fescue, is desirable to keep the soil from eroding and to compete with weed growth.

KENTUCKY BLUEGRASS

Kentucky Bluegrass (*Poa pratensis*) is the standard manicured lawn grass in Canada. Characteristics such as colour, growth habit, disease resistance, and growth requirements vary among cultivars, but there are some general characteristics of the species:

- medium texture (refers to blade width)
- dense growth, good sod forming roots
- green to dark green colour
- long-lived perennial
- average germination 14 days
- good drought tolerance, but goes dormant under heat and moisture stress
- good low temperature hardiness
- best under full sun or light shade
- tolerance to wear medium-good
- prefers moist, well-drained, fertile, medium textured soil, pH 6.0-7.0
- preferred cutting height is 2.5-5.0cm
- nitrogen requirements range from .2kg-.6kg nitrogen/100m²/growing month
- for optimum growth requires about 3.4cm moisture/week

Lawn seed mixes originally used "common" Kentucky Bluegrass, an unimproved grass. Through turfgrass research programs, more than 100 improved Kentucky Bluegrass cultivars (from cultivated varieties) have been developed. Thirty-two cultivars are licensed for use in Canada. A sod seed mix should include at least 2 of these improved cultivars. The choice of cultivars should be based on research results.

Out of the 10 varieties of sod seed mixes, tested by Sourdough Sodbusters, the sod seed mix consisting of 30% Creeping Red Fescue, 40% Kentucky Bluegrass (Park), 20% Bluegrass (Regent), 10% Bluegrass (Baron) has proven to be the mixture which will tolerate and exist in a northern climate.

The second choice of sod seed mix was:

- 25% Creeping Red Fescue
- 25% Kentucky Bluegrass (Park)
- 25% Bluegrass (Regent)
- 25% Nugget Blue (Alaska)

CHARACTERISTICS OF SOME KENTUCKY BLUEGRASS CULTIVARS

Banff- A dwarf poa high tolerance to close clipping, broad leaf, dark green colour which persists late in autumn.

Baron-Low growing, forming a very dense turf, somewhat darker green than Merion, gives early groundcover, good fall cover.

Dormie-Erect growing, deep green, highly resistant to *Typhula* spp. and *Microbotryum nivale* snow moulds, almost immune to powdery mildew, fairly coarse-textured, very dormancy and early spring green-up.

Eclipse-very low growing, dark green, good density, medium texture, improved shade tolerance.

Majestic-Moderately low growing, dark green, blades 3-4mm wide.

Mystic-postrate growth habit, light to medium green resistant to powdery mildew, good autumn colour, fine texture, little thatching.

THE FESCUES

There are over 100 species of grasses called fescues. Creeping Red Fescue (*Festuca rubra*) and Chewings Fescue (*F. rubra* var. *commutata*) are species commonly used in sod seed mixes. The main characteristic that makes them desirable in the seed mix is rapid germination, giving fast establishment. Some other general characteristics are:

- tolerate dry conditions, low water use
- low fertility requirements, .1-.2kg nitrogen/100m²/growing month
- pH of 5.5-6.5 preferred but will tolerate acid soils
- medium to dark green
- fine textured
- good shade tolerance, prefers full sun
- medium wear tolerance
- performs best when mown at 2.5-6.5cm
- Creeping Red Fescue has a creeping, sod-forming growth habit. Chewing Fescue is a non-creeping bunch-type plant.

-long-lived perennial

The Creeping Red Fescue cultivars licensed in Canada and recommended for Alberta are 'Dawson', 'Fortress', 'Penlawn', and 'Boreal'. The Chewings Fescue Cultivars are 'Agram' and 'Highlight'.

OTHER GRASSES

Kentucky Bluegrass is the standard lawn grass in Canada. However several other grasses are used in special situations such as unirrigated, low maintenance, or frequently flooded lawns. Because many of these grasses do not have sod forming roots and do not produce a fine quality turf, they have not been used in sod. Some examples are Crested Wheatgrass, Russian Wild Ryegrass, Red Top, and Rough Stalk Bluegrass.

Formerly clover was a common constituent of lawn seed mixes and is still found in some. Although it has some advantages, such as its ability to fix nitrogen, clover's broad leaves and white flowers make it unacceptable in fine quality sod.

Perennial Ryegrass is used in some seed mixes because it germinates and grows quickly. It is not completely hardy in Yukon and it dies out after first years growth. Since the sod field can be prepared and seeded for optimum growth the advantages of Perennial Ryegrass are not needed. Creeping Bentgrass is often used on golf and lawn bowling greens because it can tolerate being mown to 5mm. Bentgrass requires very frequent mowing, high fertility, and careful disease control and is therefore not practical for home lawns or large turf areas.

Grasses are divided into two groups, warm season and cool season, depending on the optimum temperature for their growth. The warm season grasses, Bermuda, St. Augustine, and Zoysia for example, are not hardy in Canada.

There has been little research on alternative grasses for sod. Most sod growers have only one sod quality. There may be potential for developing "playground" quality turf or bentgrass grown on a sand base for sports fields and greens. Minimum maintenance grasses may become important if water supplies are reduced and become expensive. Turf-type tall fescues are being grown for sod in parts of the U.S. for drought-resistant turf.

GRASS SEED

In Canada, all types of seed are sold in various grades. The grades have standards based on maximum number of noxious weeds and percent of germination. When buying specific cultivars, Canada Certified #1 is recommended. Canada #1 seed has the same quality limits as Certified #1, however, seed in the former grade cannot be sold by cultivar name. Seed mixes can be graded Canada #1 or lower.

Seed prices vary, like other commodities, depending on the success of the year and supplies available. Crop forecasts can be used to help decide the best time of year to buy seed. This sort of information may be reported in trade magazines. Most importantly, buy the seed early enough to be sure the desired cultivars are available.

To store grass seed successfully, it must be kept cool and dry. Constant temperature just above freezing is ideal. Average room temperature is too warm. In Yukon, humidity is not usually a problem. However, seed should be kept off of floors, particularly earth or concrete floors, to prevent moisture uptake and to allow air circulation. Most grass seed should store well for 2-3 years. Germination will drop 1-2%. After 3 years there is usually a large drop in germination rate.

SOIL PREPERATION

Many differant implements can be used to prepare the seed bed. It is most important to finish with a fine, firm, and level seed bed. Because the grass seed is small, the soil must be fine, not cloddy. The bed needs to be level, without ruts, for easy mowing and harvesting.

The implement most likely to be used is a disc. A plough may be neccassary if the soil has never been broken. But generally, ploughing buries the desirable topsoil and leaves the surface too rough for grass seeding. Cultivators also disrupt the soil surfaces too much. Rotovators will give an ideal seed bed.

Depending on the soil type and the amount of crop residue to be buried, a field may have to be disced two or more times. The seed bed should be prepared with as few operations as possible. Each time it is tilled the soil becomes more dried out. The soil may be diced 7.5 to 10cm deep. The deeper the soil is tilled, the fluffier it becomes and the harder it is to make a firm seed bed. Discing will likely need to be followed by harrowing to level out any ridges or furrows. The harrow may be pulled across a field in two or more directions. A roller is often used to pack the soil after harrowing to firm the seed bed, and again after seeding to ensure good seed-to-soil contact for good germination. Sometimes the seeder alone packs the soil adequetely.

A soil test may indicate that the soil requires some sort of amendment. If organic matter is added it should be applied at the beginning of the soil preparation procedure. It must be evenly incorporated throughout the soil. Water movement and consequently plant growth is impaired if this material is layered in the soil. Amendments to adjust soil pH are not necessary, they are best incorporated a year prior to seeding because they will require some time to react with and improve the soil. Fertilizer is generally applied just prior to seeding. This can be broadcast over the seed bed and incorporated with the last discing. This will distribute fertilizer throughout the top 7.5cm of the soil.

If a sod field is to be reseeded, after a sod crop has been harvested, several tillage operations may be necessary to incorporate all the roots.

Kentucky Bluegrass can regrow from underground stems called rhizomes. Rather than re-seeding, some sod growers let their fields reestablish from rhizomes, left in the field after harvesting. The advantages are immediate regrowth and no cost for soil preparation and seeding. However, the speed of reestablishment may be slowed with each following crop. The proportion of each grass in the mix gradually change. As well, improved cultivars cannot be added when they become available.

SEEDING:

Seeding rates vary greatly from 40kg/ha to 170kg/ha. The average seeding rate is about 75-80kg/ha. The rate affects how quickly the sod establishes. Low seeding rates are only successful if irrigation is used. As a Bluegrass plant grows, it sends up side shoots (tillers) from the underground stems, or rhizomes. Turf seeded at 45kg/ha will eventually be as dense as turf seeded at 90kg/ha, but the area seeded at the higher rate will have the densest covering first. Very high rates of seeding are not only expensive but seedling growth may be adversely affected by the crowded seed bed.

In most parts of Yukon the best time to seed is early June. The soil has warmed up to the 15 degree C needed for the fast germination, it has dried out enough to allow soil preparation before seeding, and there is usually good rainfall. July is a poor time for seeding. It is often hot and dry, making it difficult to keep a new seed bed moist enough for good germination. Mid to late August is another recommended time for seeding because of cooler temperatures and more rainfall. A new seeding requires at least 6 weeks of growth before it goes into winter dormancy. This allows the plant to "harden off" to survive cold temperatures. Grasses seeded too late in the season will be growing lushly when cold weather comes and often have severe winterkill or snow mould. Forage grasses are sometimes seeded in late autumn. The seed lays dormant through the winter and germinates in the spring. The germination rate is often poor and

is not recommended for turfgrass.

Timing of seeding is particularly critical if no irrigation is available. Once the grass seed germinates there must be adequate rainfall to keep the seeding alive. With irrigation and careful attention to water, seeding can be successful through most of the growing season.

The "Brillon" seeder packs the soil, drops the seed in a furrow, and repacks the soil. Grass seed should be planted .6cm-1.3cm deep. If planted too deep, some seed will die before it can emerge. The depth of seeding is determined by how well the seed bed is prepared. The packers on the seeder may be sufficient and the bed need not be packed prior to seeding. Some growers use the empty seeder as a packer, prior to seeding. For even coverage, the seed may be divided in half and seeded in two directions.

Rough turf areas and pastures can be broadcast seeded and harrowed in, or drilled in with a grain drill. Neither method is satisfactory for sod seeding. Higher seed rates are needed and the distinct drill rows take a long time to fill into a dense turf. The cost of seed and irrigation demands a well seeded bed.

IRRIGATION

Most sod growers have access to some irrigation. Many have complete systems and irrigate regularly, while others have small systems and use it only at seeding and during especially dry weather.

IRRIGATION SYSTEMS:

The most common method of irrigating sod in Yukon is with a wheel roll lateral system which consists of a lateral line with steel wheels. The line is drained after each set. Wheel roll systems can be used on areas smaller than a quarter section, but the per acre cost rises. Irregularly shaped fields require additional labour to operate a wheel roll system since sections have to be added and dropped.

The hand move irrigation system is relatively inexpensive. It is best suited to small acreages and irregularly shaped fields. Laterals are commonly spaced 18m along a mainline with 12m between sprinklers along the laterals. Light water applications require frequent moves.

A license to divert water is required for all projects greater than one acre in size. The license is granted by The Yukon Territorial Water Board following submission of appropriate plans, specifications, reports and other data on the project.

FERTILIZER

All plants require 16 elements to grow. Three used in the largest amounts, carbon, hydrogen, and oxygen, are supplied by air and water. The remaining 13 are taken from the soil. Of the 13, seven are considered micro or minor nutrients. They are important for plant growth but are only needed in small amounts. The soil usually has adequate amounts of these nutrients and so-called micronutrient fertilizers are rarely needed.

The nutrients needed in the largest amounts are nitrogen, phosphorus, and potassium. The soil's supply of these nutrients is usually quickly exhausted. This is particularly so with turf because nutrients are continually being taken from the soil. When the sod is harvested the nutrients are not returned, as happens when the remains of an annual crop are tilled under.

Nitrogen is needed for lush green leaf growth. It is used in large amounts by established turf. Phosphorus, from phosphate, is needed for healthy root growth as well as flower and fruit set. It is particularly important for new sod. Potassium, from potash, gives plants disease resistance and helps form strong stems. Sulphur is important for dark green colouring in turf. It has recently been shown that sulphur is often deficient in turf. Sod growers should consider including sulphur in their fertilizer program.

FERTILIZER TYPES:

Fertilizers can be divided into two main groups according to the rate at which nitrogen is released. The "Quick Release" fertilizers include inorganic, or "chemical" fertilizers, and urea. These are the common agricultural fertilizers.

The "Slow Release" fertilizers release nitrogen gradually by differences in ability to dissolve in water or through gradual breakdown by microorganisms.

Quick Release fertilizers are generally less expensive per unit of nitrogen than slow release types. Plants respond to fertilizing in as little as 2-4 days. Because these are water soluble, they can be applied as a soil drench or foliar spray. Temperature has little effect on the availability of nitrogen.

Since slow release fertilizers release nitrogen gradually, fewer applications are needed to maintain uniform growth than with fast release types. There is less nitrogen loss through leaching and volatilization (loss to the air) with slow release fertilizers. These fertilizers rarely burn the turf. Although slow release fertilizers are commonly used in the turf industry they are rarely used by sod growers, primarily because of cost. Where fertilizer is difficult or time consuming to apply, slow release fertilizers are economical. However, this is not the case on

level, open sod fields.

FERTILIZER SPREADERS

There are two types of granular fertilizer spreaders: a dribble type and spinner type. For field use, the spinners are most common. They are generally pulled behind a tractor. They can be calibrated fairly accurately. A skilled operator is needed to get even coverage throughout a field. However, because there is some overlap in the spreading pattern, a missed strip is not necessarily obvious. Most spreaders available cover a 12-15m wide strip at each pass.

SOIL TESTING

A soil test is the only accurate way to determine nutrient levels in a soil. Nutrient deficiencies or surpluses are costly, can delay the time to harvest, and may reduce sod quality. Soil tests also evaluate three other soil characteristics that affect sod quality and saleability: pH, salt levels, and texture.

There is one private soil test laboratory in Yukon. Soil analysis methods vary among the laboratories so it is important to use the same lab from year to year to get consistent results. Fees vary from approximately \$15.00-\$30.00 per sample. Do-it-yourself soil testing kits are available. For accurate and consistent results, only the relatively expensive kits should be considered. If planning to buy a kit, seek advice from someone who is knowledgeable about soil testing.

Soil test labs usually provide a report form, soil sample containers, and instructions for sampling. Ideally, a field should be tested just before each crop is seeded, and at least once every year until the sod is harvested. Soils should not be sampled when they are frozen or waterlogged. For this reason, many farmers sample in late autumn, usually in October just before the soil freezes, so the test results are available in time to make fertility plans for spring seeding or maintenance through the year. Samples taken in autumn, after the soil has cooled down, give an accurate report of what the soil condition will be the following spring.

Soil testing is a very important management tool. It can have a significant effect on production costs and it is not difficult or expensive.

GENERAL MAINTENANCE

MOWING:

Once the sod has been seeded and has grown to about 8cm tall, mowing becomes a regular part of maintenance until the sod is harvested.

For a fine cut turf, there are two main types of mowers, rotary and reel.

Reel mowers are most commonly used by sod growers. The scissor-like cutting action gives a clean cut. Reel mowers will cut very low, down to 6mm for golf and bowling greens, and may increase the time it takes for the sod to become harvestable. Ideally, no more than 1/3 of the grass blade should be removed at one time. If grass is left to grow long and is then cut back to 7cm, the plants will have become coarse at the base and sensitive to the sun. For very long grass, raise the height of the mower and, with each following mowing, gradually bring the height back down to 7cm.

Through most of the growing season turf requires mowing every 6-8 days. When growing conditions are best, mowing may be needed as often as every 3-4 days. During hot dry weather and when cool autumn temperatures set in, mowing only every 2-3 weeks may be necessary. Heat stress can be reduced by raising the cutting height by .5-1.5cm during hot weather.

In cases where sod may need to be held over for one season or more, mowing becomes expensive. Some growers reduce mowing frequently. Some let the grass grow very long and use the cuttings for silage, and still others grow it on to harvest for hay. Several months (2-4) of intensive management are needed to bring this grass back to saleable sod quality.

A sharp, clean cut by a mower gives a nice appearance to the turf. A poor cut leaves the blade ends ragged. These grass plants may be more susceptible to entry by disease organisms than well cut grass. Mower blades are dulled by coarse weeds, stones, and excessive dust on fields where grass cover is sparse.

SWEEPING

Generally grass clippings do not need to be picked up after mowing on sod fields. Clipping removal is recommended on most other turf areas because the accumulation of clippings, called thatch, can cause problems with water and fertilizer penetration. Unless sod is kept in the field for more than two years thatch is rarely a problem. Clipping removal is an added cost because of the labour and equipment required. As well, some of the nitrogen is removed with the clippings.

However, if the grass has grown long, large clumps of clippings left on the grass can be harmful and should be picked up. Some growers sweep the turf just before it is harvested, to improve the appearance. Some growers have experimented with regularly picking up some clippings and using them for animal feed.

If the sod field is near a lot of trees, a shelterbelt for instance, a sweeper would be useful for picking up leaves. Before snowfall, leaves should be taken off the turf. Leaves become wet and pack down, making an ideal site for snow mould

and disease organisms to grow.

HARVESTING

The length of time from seeding to harvest depends on the time of year the sod was seeded and how intensively it was grown. The usual time from seed to harvest is approximately 18 months.

Sod is ready for harvesting when the roots are strong enough to hold the turf together during harvesting and when being handled. The sod must also be in good condition, that is be weed-free, dense, and have a uniform colour. Harvestability can be tested by cutting sample strips. Because of variability in soil type some parts of a field may be ready before others.

Properly rooted sod must be thicker to prevent it from falling apart. Kentucky Bluegrass can be harvested with only .6-1.3cu of soil. Thickly cut sod has an advantage of being more tolerate to dry conditions at the time of laying but it takes longer to root, is heavier to transport and handle, and removes valuable soil from the field.

Sod can be harvested from early spring, as soon as fields are dry enough to work on, until late autumn, when the soil freezes. Heavy rain may interupt harvesting. Sod that is very wet is difficult to cut and is heavy to transport.

SOD HARVESTERS

The two basic types of harvesters are walk-behind models and riding models. The walk-behind type has the main advantage of lower cost as compared to the riding type. This harvester can cut about 2 acres of sod/day in 12, 16, or 18" widths. Sod can be rolled or left flat on the ground. The sod must then be lifted by hand and stacked on pallets. Walk-behind harvesters are often used by sod growers with small acreages and by those just starting in the buisness.

Riding types, either self-propelled, tractor pulled, or tractor mounted harvesters can cut from about 1,500-2,500sq. yd./hour. These are manufacturer's estimates, under ideal conditions. Actual cutting rates will depend on many factors, such as soil type, soil moisture, and skill of operators.

Forklifts are used to lift the loaded pallets from the field onto trucks for delivery. When the sod is delivered, a forklift must be available for unloading. Many growers use forklifts that mount on the back of their

truck. At least one model has a pallet retriever.

TRUCKS

Unless all sod sales are directly from the farm a truck, or trucks, will be required to transport the sod. The size and number of trucks needed depends on the amount of sod to be shipped and the distances it will be transported.

WEED CONTROL:

Weed control begins before the sod field is seeded. A season of summer fallow is often necessary. Repeated cultivation is used to prevent annual weeds from re-seeding and may control perennial weeds such as dandelion and thistle. Because there are no herbicides that can selectively kill grassy weeds in turf, it is important to kill perennial grasses, such as quackgrass, before seeding. Annual weeds will germinate and grow as the newly seeded turf begins to grow. Generally, these annual weeds disappear once regular mowing begins and no chemical weed control is necessary. The most common weed problems in turf are perennial plants such as dandelion, thistle, clover, and quackgrass.

WEED CONTROL TERMINOLOGY

1. ANNUAL WEEDS complete their life cycle in one year. They grow from seed, flower, produce seeds, and die. e. g. chickweed, pigweed, stinkweed, groundsel, purslane.
2. PERENNIAL WEEDS grow for many years. They may set seed every year but they also multiply by the spreading growth of a large root system. e. g. dandelion, thistle, plantation, clover.
3. GRASSY WEEDS are undesirable grasses in the turf. Kentucky Bluegrass is considered a weed if it grows in bentgrass green. Because grasses have similar physiological make up, herbicides that kill grassy weeds also kill desirable grasses. e. g. quackgrass, wild oats.
4. BROADLEAF WEEDS usually have broader leaves than grasses. Their physiology also differs from grasses and so can be controlled chemically without harming the turf.

DISEASE CONTROL

Snow moulds have caused some serious damage in our sod fields. These fungus diseases develop under the snow. Typically a fuzzy, "mouldy" looking growth appears as snow melts in spring and large patches of grass can be killed. Often the grass regrows during the summer but it delays harvesting and lowers the sod quality.

Management practices such as excessive nitrogen and failure to allow the turf to harden off in autumn will predispose the grass to attack by snow mould.

FARM BUILDINGS

Many types of building construction are suitable for storage and workshops. Plans for several buildings can be used and are readily available. Plans can be found from the Farm Building Plan Service of the Engineering Field Services Branch.

OFFICE

The office may be just a room in the house or it may be a separate building with several employees. Because the only contact with customers may be by telephone, good telephone service is essential. For some, an electronic answering machine or answering service is the only practical solution. Typically, sod customers have many questions other than just price. They often seek information on installing their sod and many ask general garden questions. It is important that office staff are courteous and knowledgeable.

SALES METHODS:

Sod is sold to two main markets-landscape contractors and homeowners. Sod sold to landscapers is either delivered or picked up at the field.

ADVERTISING

The sod industry in Yukon is not competitive, but advertising is becoming increasingly important, to let people know it is available and not expensive.

GRASS CLIPPINGS

Sod growers have experimented with several methods of using turfgrass for animal feed. Studies have found Kentucky Bluegrass clippings to have from 20-30% or more crude protein, making it an excellent feed. Clippings have been fed in pelleted and loose forms. Growers have also experimented with leaving the grass to grow for several weeks and using the cuttings for silage. When an area of sod will not be sold for some time, growers have let it grow and harvested hay. The last two methods reduce mowing costs, but some time must be allowed to bring the sod back to marketable quality.

Although little research has been done in this area, some feel that there is a lot of potential for clipping use as a by-product from large turfed areas, like sod fields and parks.