Recommendations for Small Grain Production in Newfoundland (Report # 2)

INTRODUCTION

Grain production has been an important part of Newfoundland agriculture long before confederation. In 1891 it was reported that 12,900 bushels (188 Tonnes) of oats were produced in Newfoundland, primarily as feed for draft horses. Since confederation however, grain production has fallen to a mere 300 bushels (4 Tonne) in 1981 due mainly to increased mechanization and cheap grain sources from western Canada (Data from the Report of the Task Force on Agrifoods, 1991). Grain production has re-emerged in 1993 through a jointly funded Federal-Provincial Alternative Feeds Program designed to alleviate Newfoundland's dependence on cheap western grains. In 1995 the Canadian feed freight assistance program was terminated which resulted in increased feed prices of up to 75%. Grain production is again taking its' place in Newfoundland agriculture with over 350 Tonne of barley and wheat and 1,140 Tonne of corn silage produced in 1998.

Small grains have been evaluated to determine its' suitability for production in Newfoundland since 1993. The data has been collected from on-farm demonstration and research plots in cooperation with many farmers and the Agriculture and Agri-Food Canada's Atlantic Cool Climate Crop Research Station. Based on this collection of data some general recommendations or guidelines have been generated for farmers interested in growing small grains. They include 1) Growing Degree Days (GDD's) for Small Grains, 2) Seedbed Preparation, 3) Weed Control, 4) Seeding Date and Rate, 5) Maturity and Harvest Date, 6) Wet and Dry Storage, 7) Feed Management and 8) Equipment Specific to Growing Grain.

GROWING DEGREE DAYS (GDD'S) FOR SMALL GRAINS

GDD's are calculated using normal maximum and minimum temperatures from May 1st to Oct 31st. The accumulated GDD provides a reference for the relationship between temperature and crop development. It is calculated from daily maximum and minimum air temperatures and a base temperature, which for small grains is $5^{o}C$:

$$GDD = \frac{Tmax + Tmin}{2} - 5^{o}C$$

The minimum GGD's (base $5^{o}C$) required for cereal grains, such as spring barley, to reach physiological maturity and 14% moisture content is about 1200. With the exception of Cormack and some upland areas of South Branch, all of the 13 sites shown in figure 1 satisfy these GDD requirements (Figure 1). Barley however has successfully matured at all these sites including both Cormack and South Branch. The grain project findings suggests that physiological maturity can be achieved in barley at these sites but attaining 14% moisture content is risky. One alternative to dry grain is harvesting at higher moisture contents. High moisture grain (HMG) is considered highly nutritious as a livestock feed and normally has a moisture content ranging from 20 to 30%.

Early maturing grains such as barley and winter wheat can be harvested as dry grain, in most locations, during late August and early September. Later maturing species of small grains such as oats and spring wheat require an additional 10 to 14 days to mature. In areas such as Cormack, barley and winter wheat have the most potential to reach physiological maturity as high moisture grains. Cereal grain can also be harvested late July and Early August during the boot or early dough stage as grain silage.

Figure 1. Map of Newfoundland With Climatic Data Sites For 1997

Table 1. Grain Varieties Studied Under the Newfoundland Grain Project

SEEDBED PREPARATION

Soil sample analysis should be used to determine soil pH and fertilizer requirements for small grains. Minimum tillage is required for weed free vegetable land however the recommended practice is to prepare the soil in the fall to accommodate early spring seeding. For fields with perennial forage stands round-up application prior to plowing is recommended. As a general fertilizer treatment 51lbs/acre of N,P

and K should be used for spring grains and 54lbs/acre of N and 108lbs/acre of P and K for winter wheat at seeding and 32lbs/acre of N in the following spring.

For best production, soils should have a minimum of medium fertility and a pH value of 6.5. Soils with pH values of less than 5.5 are considered border line for barley and wheat and grain and straw yields will decrease significantly below this pH. There is a linear relationship between Chapais barley grain yields and soil pH (Figure 2).

Figure 2. Soil pH effect on Chapais barley grain yield (data from 1993-97)

WEED CONTROL

Round-up herbicide prior to ploughing or discing is necessary if couch grass or any other perennial grasses are present in the field. Annual broadleaf weeds can be controlled by heavy discing prior to seeding or with herbicide spray (as recommended in The Guide to Weed Control), 2-4 weeks after seeding when the weeds are in the 3 to 6 leaf stage.

SEEDING DATE AND RATE

Seedbed preparations should be done in the fall prior to seeding or as soon as the field is able to be worked in the spring. For the South West Coast and the Avalon Peninsula the normal seeding date is Early to Late May. For Humber and Exploits Valley's and Central Regions the normal seeding date is late May to early June. Seeding grain later than the normal seeding dates within each region will result in decreased grain yields. Frost will not harm the viability of the seeded grains although it will delay emergence. The main emphasis on spring grain production in Newfoundland is to get the crop in the soil as early as possible. Seeding date and Chapais barley grain yields are linearly related (Figure 3). The optimum winter wheat seeding date has been determined as Mid September for the Humber Valley and the South West Coast. This is likely true for the remainder of the island as well. The recommended seeding rates for barley and oats is 120lbs/ac and for spring and winter wheat 135 lbs/acre. If spring barley, oats or wheat are sown as a nurse crop for forages then 100lbs/ac is recommended.

Figure 3. Seeding date vs Chapais barley grain yield (data from 1993-97)

GRAIN MATURITY AND HARVEST DATE

Among the wheat, barley and oat varieties tested in Newfoundland the earliest crop to reach grain kernel maturity is winter wheat followed by spring barley, spring wheat, oats and naked oats. In the South West Coast and the Avalon Peninsula, winter wheat, spring barley, spring wheat, oats and naked oats will reach maturity. In the Humber Valley winter wheat has matured successfully in 2 consecutively years of testing (1994 and 1995), spring barley has matured in 3 consecutively years of testing (1993, 1994 and 1995), spring wheat has matured in 1995 at The Pynn's Brook Resource Centre and oats and naked oats have not yet been evaluated. In the Exploits Valley Region spring barley, spring wheat and winter wheat will reach maturity.

For dry grain combine harvesting should be done on clear sunny days, beginning at mid morning and through to the evening when moisture content in the grain is lowest. Grain moisture content can drop substantially from early morning to late afternoon. Combine harvest should normally be done in early to late September for the South West Coast and the Avalon Peninsula and early to late September in the Humber and Exploits Valley's. Too much fertilizer on a grain crop may inhibit early maturity of grain and moisture content at harvest may be high as a result. High moisture grain can normally be harvested a week to 10 days before dry grain. If the grain is to be harvested as silage than look for the flag leaf and early emergence of the grain head to signal time to harvest.

WET AND DRY STORAGE

For storing dry grain an aeration bin is required to remove field heat from the grain. This will cool the grain for safe storage. As temperatures begin to drop you will need to blow cool air through the grain to prevent moisture accumulation in the mass. Grain harvested at 20% moisture content can be dried using the aeration bin as long as the air going into the bin is above 10^{o}C. High moisture grain can be stored whole in a horizontal bunker silo or an upright air tight silo. Grain stored in a horizontal bunker silo is best when cracked before going into storage. This can increase fermentation and lessen the work at feed out. It is

imperative that the plastic covering the mass is sealed air tight and that the surface area exposed during feed out is small to limiting exposure and spoilage. Inoculants are available to promote fermentation and limit spoilage when exposed at feed out. The optimum moisture content for storing grain this way is 30% moisture. Similarly grain silage can be treated like regular forage silage and stored as both silage or haylage.

FEEDING MANAGEMENT

Grain produced for livestock must be rolled prior to feeding (with the exception of sheep and goats) in order to expose the starch content. This allows enzyme and bacteria in the stomach to act upon the nutritional content of the grain and thus enhancing digestion. An analysis should be done on the grain to determine TDN, Crude Protein, Net Energy, Calcium, Phosphorus, Magnesium and Potassium content. The grain can then be formulated into three feeding techniques:

Ration for Cattle

1. To formulate a balanced ration of locally produced grain oats, wheat, barley and soybean plus a mineral and protein supplement to a desired nutrient level. The amount of a formulated ration fed to a particular group of animals is based on a forage feeding program.

Example 1.1.

Example 1.2.

2. Depending upon the nutrient quality of the grain such as barley, you can Top Dress it to silage at the rate of 3lbs per cow and reduce the amount of commercial mix allocated to each cow. This technique can reduce overall feed costs while maintaining optimum production performance in dairy, beef and sheep.

3. For feeding heifers mix locally produced oats, barley plus commercial protein supplement ration at various proportions with the aim of satisfying nutrient requirements and reduce the unit cost of the feed.

Example 3.1.

Example 3.2.

Equipment specific to Growing Grain

- Grain Drill
- Combine
- Portable Auger (necessary for Steel Bin Type)
- Storage Bin with Dryer
    1. Horizontal Bin Type
    2. Steel Bin Type
- Roller Mill