Sod-Seeding into Existing Forage Stands

Manitoba has nearly 4 million acres (1.6 million hectares) of unimproved pasture and hayland. However, productivity from much of this area is limited due to a number of factors. These include soil moisture, nutrient availability, and the inherent genetic inability of the particular plant species to produce sufficient biomass.

Production on these areas may be improved by introducing additional plant species into the established stand. Adding a legume such as alfalfa, birdsfoot trefoil or cicer milkvetch can increase the yield and nutritional quality of the forage and add nitrogen to the soil. Once legumes are established, the existing grasses will thicken and improve in vigour as a result of the nitrogen fixation.

There are three basic techniques to improving forage production in this manner. The traditional approach has been to terminate the existing stand using a non-selective herbicide such as glyphosate, followed by tillage to create a firm, smooth, weed-free seedbed. The prepared area is then reseeded with the desired species. This method requires time – generally two years – although an annual crop such as oats or barley may be produced during the first year. The operation may require a number of tillage passes which results in high fuel consumption. In addition, the practice is generally not suitable for steep inclines, erodable soils, or stony ground.

A second alternative is to broadcast seed upon the ground directly into the existing stand, followed by disturbance to encourage germination. This disturbance may take the form of natural processes such as frost heaving to disturb the soil, or by using an aeration machine, drag or harrow to disturb the seedbed mechanically.

The third strategy is to use a zero-till drill or sod seeder to place the seed directly into the soil, commonly referred to as sod-seeding. This method is the main focus of this fact sheet.

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Manitoba

Sod-seeding

Seeding alfalfa directly into existing grassland is not a new method of pasture renovation – it has been around since the late 1920s. But, the practice has not been widely adopted in the past because of the somewhat limited success rate. However, recent developments in commercially available equipment and non-selective herbicide technology have greatly improved the success of this technique.

Regardless of the method chosen, the success of any renovation project hinges upon adequate planning, appropriate equipment resources, timely action and cooperative weather conditions.

Planning starts with setting an objective. The objective may be any one of the following, or a combination of these objectives.

- Introduction of more productive forage species
- Overall increase of forage quantity and quality
- Soil conservation in fragile topography
- Soil improvement
- Reduced energy inputs
- Enhancement of habitat cover

Once the purpose of the renovation has been identified, select an appropriate strategy to achieve the desired result. For example, changing an entire existing forage species compliment will require the total removal of the existing species. On the other hand, introducing a legume into a grass pasture may be accomplished through suppression of the grass, and placement of the seed into the existing sward using either a broadcast or sod seeding method.

Select the Appropriate Species

Since the purpose of sod-seeding is to improve the quality and yield of forage, a legume is recommended. Alfalfa is the easiest to establish, and can be used for both hay and pasture. The seedlings are vigorous, the plant grows rapidly, and the crop is adaptable to a large range of soils and moisture conditions except where moisture is excessive.

Birdsfoot trefoil is slow to grow and establish, but reseeds itself upon establishment. It is non-bloating, moisture tolerant and withstands heavy grazing. Cicer milkvetch is a non-bloating, creeping rooted, widely adaptable legume. It is slower to establish than alfalfa, but once established, is extremely hardy.

Sod-seeding tame grasses into an existing stand is not recommended. Tame grasses are difficult to establish when there are other grasses already present.

Determine Soil Fertility Needs

In the year of seeding, take soil samples to determine the fertilizer needed to meet the plants' requirements. Phosphorus fertilizers may be applied with the seed at rates up to 25 pounds/acre (25 kilograms/hectare) of actual P_2O_5. Additional rates of phosphorus and all other nutrients should be applied broadcast before or immediately after seeding. Avoid nitrogen fertilizers since they are more likely to cause seed sterility and will encourage more grass growth, providing more competition to the seeded legumes.

Managing Competition

Sod-seeding demonstrates clear advantages compared to conventional establishment practices if existing growth is initially suppressed. Eliminating competition from existing vegetation enhances the soil moisture levels available to seedlings. Competition can be suppressed by overgrazing in the previous season, close mowing, chemical application, or some combination of these management techniques.

Intentional Overgrazing

In the season prior to planting, intentional overgrazing can help reduce competition but it requires close attention to avoid elimination of desirable species. The duration of the grazing period and stocking rates must be closely monitored. Overgrazing lowers available nitrogen, which promotes legume growth while limiting grass growth.

Mowing

Mowing can be as beneficial as overgrazing, however the harvested vegetation should be removed, or the long-term benefits of mowing will be reduced due to improved moisture availability because of the mulch layer and nutrient cycling. Mowing favours grass over weeds, and is ideally carried out once weeds reach a height of six to eight inches (150 to 200 millimetres), but before mature seed is produced.

Chemical Application

Establishment and production of sod-seeded alfalfa can be greatly improved by suppressing the existing sod with herbicide before seeding. The most favourable results will be obtained through chemical suppression of existing vegetation prior to, or soon after seeding. This eliminates competition for moisture at the critical seedling development stage. Chemical suppression of existing vegetation is necessary in dry or drought conditions, but has also proven very beneficial even if adequate moisture is available. Glyphosate, as an overall spray at 1.0 to 1.5 litres/acre, is most effective when applied as grasses reach six to eight-inches (15 to 20-centimetres) tall. Most zero-till drills work successfully when existing vegetation is suppressed prior to seeding.

Studies conducted by the University of Manitoba's Plant Science Department have shown that sod suppression with a non-selective herbicide combined with fertilizer use can improve seedling emergence and survival and dry matter production of sod-seeded alfalfa. The results of this research are presented later in this fact sheet.

Seeding

Sod-seeding drills will provide good soil penetration, soil-seed contact and coverage on most soils without previous tillage or seedbed preparation. Early spring planting is the best approach to take advantage of existing moisture. Otherwise, wait until moisture conditions are adequate to ensure germination. Seeding can be done while snow or frost is on the ground. Dormant seeding in the fall (usually after November 1) has also been successful providing the soil temperature is below 2°C and soil moisture is low enough to prevent germination until the following spring.

Seed Placement and Seeding Rates

Proper seed placement is critical when seeding forage crops. In general, seeding depths vary between 0.25 inches and 1.50 inches (6 to 37 millimetres), depending on seed type, soil type and moisture availability. Good seed-soil contact is critical to germination. Some packing is beneficial when seeding into light and/or dry soil conditions.

Alfalfa should be seeded at 7 to 10 pounds/acre (7.8 to 11.2 kilograms/hectare), Birdsfoot trefoil at 2 pounds/acre (2.2 kilograms/hectare) and cicer milkvetch at 14 pounds/acre (15.7 kilograms/hectare).

Stand Management

For successful pasture renovation, management of the seedling stand is critical. Close grazing of new seedlings must be avoided. A general caution is to avoid grazing too early and overgrazing. On established stands, legumes should be rotationally grazed for up to six days, followed by a 24 to 30 day rest period, to allow for replenishment of the root reserves.

Soil fertility levels should be maintained as indicated by periodic soil tests and fertilizer recommendations. Allow the legume plants to replenish root reserves by not grazing or harvesting for six weeks prior to the killing frost. Improve winter survival by leaving at least three to four inches (7.6 to 10 centimetres) of residual matter to catch snow and act as an insulation barrier.

Tips for Successful Sod-Seeding

- Minimize competition from surrounding vegetation.
- Provide adequate soil fertility.
- Seed early to take advantage of existing soil moisture, or wait until desirable moisture conditions exist.
- Accurate seed placement is critical to success.
- Check seed depths and calibrate equipment accordingly.
- Pack soil when seeding in anything other than ideal moisture conditions.

Sod Seeding Study

Studies conducted by the University of Manitoba's Plant Science Department have shown that sod suppression and fertilizer use can improve seedling emergence and survival and dry matter production of sod-seeded alfalfa. The studies were conducted on two sites, near Gladstone and Portage la Prairie.

On the sites used for this study, applying 26.7 or 35.6 pounds/acre (30 or 40 kilograms/hectare) of phosphorous (P2O5) with the seed improved plant emergence and vigour and increased dry matter production significantly over non-fertilized planting. However, applying 35.6 pounds/acre (40 kilograms/hectare) of phosphorous did not increase emergence or dry matter production significantly over 26.7 pounds/acre (30 kilograms/hectare).

Table One: Dry Matter Production at Gladstone Site in lb/ac (kg/ha)

TREATMENT	1991		1992	
	Not Sprayed	Sprayed	Not Sprayed	Sprayed
26.7 lb/ac (30 kg/ha) P_2O_5	691 (776)	3856 (4330)	299 (336)	5198 (5836)
35.6 lb/ac (40 kg/ha) P_2O_5	614 (690)	4244 (4765)	272 (306)	4556 (5115)
No Treatment	161 (181)	2358 (2648)	231 (260)	4587 (5150)

The dramatic differences in production between the sprayed and non-sprayed areas was due primarily to soil moisture factors. Suppressing the existing sod allowed the alfalfa to take full advantage of the available moisture.

Table Two: Dry Matter Production at Portage la Prairie in lb/ac (kg/ha)

TREATMENT	1991		1992	
	Not Sprayed	Sprayed	Not Sprayed	Sprayed
26.7 lb/ac (30 kg/ha) P_2O_5	2283 (2563)	5128 (5758)	2445 (2745)	6886 (7732)
35.6 lb/ac (40 kg/ha) P_2O_5	2326 (2612)	5205 (5844)	2920 (3278)	7482 (8400)
No Treatment	2737 (3073)	4262 (4785)	2406 (2701)	5858 (6577)

Athough alfalfa establishment on the non-sprayed sites was satisfactory, suppressing the sod more than doubled production.

Table Three: Dry Matter Production in Year Following Establishment in lb/ac (kg/ha)

TREATMENT	GLADSTONE		PORTAGE	
	Not Sprayed	Sprayed	Not Sprayed	Sprayed
26.7 lb/ac (30 kg/ha) P_2O_5	1842 (2068)	1975 (2218)	7020 (7881)	7785 (8741)
35.6 lb/ac (40 kg/ha) P_2O_5	907 (1018)	2095 (2352)	6400 (7186)	6271 (7041)
No Treatment	558 (627)	1534 (1722)	5817 (6531)	7180 (8061)

The effects of sod suppression and fertilizer in the year following establishment are evident but far less dramatic.

In summary, the study determined the following:

- The number of alfalfa plants to emerge and survive can be significantly increased by removing the competition of existing vegetation through non-selective chemical burn-off before seeding. Dry matter production of alfalfa on burned-off sod can be increased several times over non-treated land.
- Sod-suppressed sites may exhibit increased dry matter production during the year following establishment, as well as in the establishment year.
- Soil moisture has a great bearing on the success of sod-seeded alfalfa. The drier the site, the more important it is to remove the competition of the existing grasses. Direct seeding helps to conserve whatever moisture there is.
- Soil fertility also has a direct bearing on the rate of success of forage establishment. Test your forage fields for nutrient availability, in addition to annual cropland. Fertilize as required.

Additional References

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For more information on introducing additional species into existing forage stands, contact your local Manitoba Agriculture, Food and Rural Initiatives office or visit us online at manitoba.ca/agriculture/production

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