



# **Business Planning and Economics of Forage Establishment and Cost of Production in Nova Scotia**

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## **Introduction**

Forages are a key component of any ruminant production unit, regardless of whether they are producing dairy, beef, or sheep. Nova Scotia is well adapted to the production of forage crops. Abundant rainfall that is often well distributed throughout the growing season, coupled with moderate temperatures, provide excellent growing conditions for forage production. While the majority of forage crops grown in the province are for on-farm use, Nova Scotia has the ability to attain high forage yields and the potential to satisfy current and emerging markets.

## **The Nova Scotia Industry**

Nova Scotia currently has 175,000 acres of forage crops, occupying 65% of the total cropland. The estimated feed value of forages used in Nova Scotia exceeds 50 million dollars annually, making forages the highest valued crop in the province. According to the 2006 Census of Agriculture, 197 Nova Scotia farms reported producing corn for silage, while 541 farms produced alfalfa products and 1,728 farms produced all other tame hay and fodder crops.

Nationally, Nova Scotia's share of forage crop production is small. However, Nova Scotia takes a leadership role within the Maritimes in forage production. While the majority of forage crops grown are re-invested in on-farm production, additional markets are developing. Export markets do exist, but are limited due to high transportation costs.

## **Objectives**

This report is intended to provide general information to producers regarding the establishment, production, and harvesting of forage. The report reflects the management practices of producers in Nova Scotia and the current economic conditions that can influence the establishment and production costs. The costs in this document represent average scenarios for producers who produce hay and silage; expenses will vary depending on the producer and their management decisions.

## **Methods and Procedures**

The information presented in this report was gathered through economic reports and tools from other forage producing regions in Canada and the United States, online and printed resources, and discussions with Nova Scotia producers, specialists and agribusinesses.

## Overview of Forage Establishment and Production

*With forage production, returns are a function of costs and revenue, which is a function of yield, price, and quality.*

In the establishment year of forage, or the seeding year, it is unlikely that the producer will see a positive return on the crop. This is because the seeding year yield is not sufficient to cover the establishment costs. The balance of the establishment costs must be carried over to the production years. The producer will re-establish, or re-seed, the forage crop every 4-6 years.

The longevity of the forage stand is heavily dependent on the producer's selection of the right forage species and variety and matching these to the soil type on the farm. Ongoing management and weather conditions also play a significant role in the year to year survival and forage yield. Appropriate harvest and fertility management can significantly enhance the long term viability of a forage stand.

In order to maximize forage yield and quality, many producers find that they need to harvest their crop as silage or haylage. The decision to harvest dry hay may limit stored forage quality and the opportunity to take a second cut. This is because the weather in late spring and early summer is often not suitable for drying hay. For example, most dairy and many beef operations harvest their forage as silage or haylage to take advantage of the improved forage quality and reduced production costs.

In many cases, smaller ruminant production units could minimize their production costs by purchasing their forage requirements. This is because of the availability of excess forage on many farms and the high capital costs associated with owning the machinery to harvest the forage.

## **Advantages and Disadvantages of Silage Compared to Hay**

The most significant advantage of harvesting forage as silage is that the forage crop can be harvested at the appropriate growth stage of the plant to maximize both forage yield and quality, with less concern for weather conditions compared to hay. As well, when forage is harvested as silage, field losses associated with hay production are minimized, resulting in higher nutritional quality. As silage, the quality of feed is more consistent, simplifying the producer's livestock feeding program.

The major disadvantage of harvesting forage as silage is that there is limited market opportunities due to the higher cost of transportation associated with a higher moisture product. Most silage that is sold is sold locally.



## **Forage Plant Species**

Most tame forage crops consist of a mixture of plant species that match the soil type on the farm. The most commonly grown forage legume species in Nova Scotia are:

- Alfalfa
- Red Clover
- White Clover

The most commonly grown forage grass species in Nova Scotia are:

- Timothy
- Meadow & Tall Fescues
- Bromegrass
- Orchardgrass

## Costs and Returns of Forage Production

For this report, the cost of production has been calculated for two forage production systems: forage as hay and forage as silage. The hay is harvested as large round bales and the silage is chopped and stored in a silo. The costs associated with both of these production systems have been calculated. Revenues on these forages have been calculated using three price scenarios in order to represent price fluctuations. Returns are then calculated over these price ranges. Those producers harvesting large round bales have the option to bale their hay with higher moisture content and wrap it in plastic to produce haylage or silage. They can use the hay production costs as an estimate to the production costs of haylage (or silage) with the addition of the cost of wrapping the bales.



## **Establishment, Cost of Production & Operational Assumptions**

- Legal, office, and general maintenance costs are not included
- The cost of land is excluded from the analysis
- The land is productive farmland
- For hay production, the land has a barn structure in place suitable for storing hay bales
- For silage production, the land has a silo in place suitable for storing silage
- The producer has already purchased necessary equipment or elects to have custom work done – assume same costs
- All costs of production include labour and fixed costs, such as equipment depreciation
- Conventional tillage methods are used to establish the forage crop
- The moisture content of the hay bales is 18% (or less)
- Re-seeding is done every five years
- Any losses in the establishment year (or re-seeding years) are spread over the four production years
- For the establishment year, the stand is harvested once, with a yield of 0.9 tonnes/acre
- For the production years, the stand is harvested twice, with a total yield of 3.1 tonnes/acre

## Establishment Year (or Re-seeding Years)

**Table 1: Establishment year costs per acre – Hay**

<b>Seeding Years - Hay</b>			
<b>Price per Tonne</b>	<b>\$70</b>	<b>\$120</b>	<b>\$150</b>
<b>Income</b>			
Yield Tonnes/Acre	0.9	0.9	0.9
Revenue	\$63	\$108	\$135
<b>Total Revenue</b>	<b>\$63</b>	<b>\$108</b>	<b>\$135</b>
<b>Reseeding Costs per acre</b>			
Pre-Tillage Herbicide	\$17	\$17	\$17
Lime	\$115	\$115	\$115
Tillage	\$85	\$85	\$85
Fertilizer	\$74	\$74	\$74
Rock Picking	\$22	\$22	\$22
Seed Costs	\$47	\$47	\$47
Seeding Costs	\$16	\$16	\$16
Herbicide or Clipping	\$23	\$23	\$23
<b>Harvesting Costs per acre</b>			
Mowing	\$15	\$15	\$15
Tedding	\$5	\$5	\$5
Double Windrowing	\$20	\$20	\$20
Baling	\$33	\$33	\$33
Hauling & Unloading into Storage	\$20	\$20	\$20
<b>Total Cost</b>	<b>\$492</b>	<b>\$492</b>	<b>\$492</b>
<b>Returns = Total Revenue - Total Cost</b>	<b>-\$429</b>	<b>-\$384</b>	<b>-\$357</b>



**Table 2: Establishment year costs per acre – Silage**

<b>Seeding Years - Silage</b>				
<b>Price per Tonne Income</b>		<b>\$70</b>	<b>\$120</b>	<b>\$150</b>
Yield Tonnes/Acre		0.9	0.9	0.9
Revenue		\$63	\$108	\$135
<b>Total Revenue</b>		<b>\$63</b>	<b>\$108</b>	<b>\$135</b>
<b>Reseeding Costs per acre</b>				
Pre-Tillage Herbicide		\$17	\$17	\$17
Lime		\$115	\$115	\$115
Tillage		\$85	\$85	\$85
Fertilizer		\$74	\$74	\$74
Rock Picking		\$22	\$22	\$22
Seed Costs		\$47	\$47	\$47
Seeding Costs		\$16	\$16	\$16
Herbicide or Clipping		\$23	\$23	\$23
<b>Harvesting Costs per acre</b>				
Mowing		\$15	\$15	\$15
Double Windrowing		\$20	\$20	\$20
Forage Harvester		\$24	\$24	\$24
Hauling, Blowing or Packing		\$15	\$15	\$15
<b>Total Cost</b>		<b>\$473</b>	<b>\$473</b>	<b>\$473</b>
<b>Returns = Total Revenue - Total Cost</b>		<b>-\$410</b>	<b>-\$365</b>	<b>-\$338</b>

# Production Years

**Table 3: Production year costs per acre – Hay**

Production Years - Hay				
Price per Tonne		\$70	\$120	\$150
Income				
Yield Tonnes/Acre		3.1	3.1	3.1
Revenue		\$217	\$372	\$465
<b>Total Revenue</b>		<b>\$217</b>	<b>\$372</b>	<b>\$465</b>
<b>Fertilizer 1</b>		\$71	\$71	\$71
<b>Harvest 1</b>				
Mowing		\$15	\$15	\$15
Tedding		\$10	\$10	\$10
Raking		\$14	\$14	\$14
Baling		\$33	\$33	\$33
Hauling & Unloading into Storage		\$20	\$20	\$20
<b>Fertilizer 2</b>		\$26	\$26	\$26
<b>Harvest 2</b>				
Mowing		\$15	\$15	\$15
Tedding		\$5	\$5	\$5
Raking		\$20	\$20	\$20
Baling		\$33	\$33	\$33
Hauling & Unloading into Storage		\$20	\$20	\$20
<b>Seeding Year Costs</b>		\$107	\$96	\$89
<b>Total Cost</b>		<b>\$282</b>	<b>\$282</b>	<b>\$282</b>
<b>Returns = Total Revenue - Total Cost</b>		<b>-\$65</b>	<b>\$90</b>	<b>\$183</b>

**Table 4: Production year costs per acre – Silage**

<b>Production Years - Silage</b>				
<b>Price per Tonne</b>		<b>\$70</b>	<b>\$120</b>	<b>\$150</b>
<b>Income</b>				
Yield Tonnes/Acre		3.1	3.1	3.1
Revenue		\$217	\$372	\$465
<b>Total Revenue</b>		<b>\$217</b>	<b>\$372</b>	<b>\$465</b>
<b>Fertilizer 1</b>		\$26	\$26	\$26
<b>Harvest 1</b>				
Mowing		\$15	\$15	\$15
Double Windrowing		\$20	\$20	\$20
Forage Harvester		\$24	\$24	\$24
Blowing or Packing		\$15	\$15	\$15
<b>Fertilizer 2</b>		\$26	\$26	\$26
<b>Harvest 2</b>				
Mowing		\$15	\$15	\$15
Double Windrowing		\$20	\$20	\$20
Forage Harvester		\$24	\$24	\$24
Hauling, Blowing or Packing		\$15	\$15	\$15
<b>Seeding Year Costs</b>		\$102	\$91	\$85
<b>Total Cost</b>		<b>\$302</b>	<b>\$291</b>	<b>\$285</b>
<b>Returns = Total Revenue - Total Cost</b>		<b>-\$85</b>	<b>\$81</b>	<b>\$180</b>

## Conclusion

From the tables above, it has been shown that the price received for harvested forage greatly impacts the return on the crop. The establishment year will not see a return on the crop. Thus, the negative return on the establishment year forage crop needs to be spread over the four production years. A producer can use these estimates, coupled with current prices for forage, to determine whether it is economically feasible to produce their own forage. For years when the price is significantly low, or for smaller farms, it could be more cost effective for the producer to purchase their forage needs for the year.

## **Resources for Forage Production**

There are a number of useful resources available to individuals wishing to produce forage in Nova Scotia, many of which are available by contacting one of the following:

Nova Scotia Department of Agriculture, Business Development and Economics  
<http://www.gov.ns.ca/agri/bde/>

AgraPoint  
<http://www.agrapoint.ca>

Ontario Ministry of Agriculture, Food, and Rural Affairs  
<http://www.omafr.gov.on.ca/>

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## Appendix 1: Cost of Production Explanation – Establishment Year, Hay and Silage

Establishment Costs	
<p><b>Reseeding Costs per acre - Hay and Silage</b></p> <p>Pre-Tillage Herbicide</p> <p>Lime</p> <p>Tillage:</p> <p>    Plowing</p> <p>    Discing</p> <p>    Harrowing</p> <p>    Land Leveling</p> <p>Fertilizer</p> <p>Rock Picking</p> <p>Seed Costs</p> <p>Seeding Costs</p> <p>Herbicide or Clipping</p> <p><b>Production Costs per acre - Hay</b></p> <p>Mowing</p> <p>Tedding</p> <p>Double Windrowing</p> <p>Baling</p> <p>Hauling &amp; Unloading into Storage</p> <p><b>Production Costs per acre - Silage</b></p> <p>Mowing</p> <p>Double Windrowing</p> <p>Forage Harvester</p> <p>Hauling, Blowing or Packing</p>	<p>Herbicide and application costs</p> <p>3 tonnes/acre @ \$29/tonne, plus spreading &amp; trucking costs</p> <p>Plowing, discing, harrowing, and land leveling costs</p> <p>    5 Furrow, 2.5 acre/hour</p> <p>    14 foot disc harrow, 8.0 acre/hour</p> <p>    14 foot S-tyne, 8.0 acre/hour</p> <p>    14 foot land leveler, 8.0 acre/hour</p> <p>250 lbs/acre of 12-24-24 @ \$565/tonne plus spreading costs</p> <p>Manual labour costs</p> <p>Alfalfa: timothy, 65:35</p> <p>Brillion seeder</p> <p>Embutox 625 plus spraying costs</p> <p>6.0 acre/hour @ \$90/hour</p> <p>10 acre/hour @ \$50/hour, one pass</p> <p>Raking into double windrow, 2.5 acre/hour @ \$50/hour</p> <p>3.0 acre/hour @ \$100/hour</p> <p>5.0 acre/hour @ \$100/hour</p> <p>6.0 acre/hour @ \$90/hour</p> <p>Raking into double windrow, 2.5 acre/hour @ 50/hour</p> <p>5.0 acre/hour @ \$120/hour</p> <p>4.0 acre/hour @ \$60/hour</p>

## Appendix 2: Cost of Production Explanation – Production Year, Hay

Production Costs per acre - Hay	
<b>Fertilizer 1</b>	300 lbs/acre of 17-17-17 @ \$517/tonne
<b>Harvest 1</b>	
Mowing	6.0 acre/hour @ \$90/hour
Tedding	10 acre/hour @ \$50/hour, two passes
Raking	3.5 acre/hour @ \$50/hour
Baling	3.0 acre/hour @ \$100/hour
Hauling & Unloading into Storage	5.0 acre/hour @ \$100/hour
<b>Fertilizer 2</b>	150 lbs/acre of 34-0-0 @ \$438/tonne
<b>Harvest 2</b>	
Mowing	6.0 acre/hour @ \$90/hour
Tedding	10.0 acre/hour @ \$50/hour, one pass
Raking	Raking into double windrow, 2.5 acre/hour @ \$50/hour
Baling	3.0 acre/hour @ \$100/hour
Hauling & Unloading into Storage	5.0 acre/hour @ \$100/hour
<b>Seeding Year Costs</b>	Residual seeding year costs, spread over four production years

### Appendix 3: Cost of Production Explanation – Production Year, Silage

Production Costs per acre - Silage	
<b>Fertilizer 1</b> <b>Harvest 1</b> Mowing Double Windrowing Forage Harvester Blowing or Packing  <b>Fertilizer 2</b> <b>Harvest 2</b> Mowing Double Windrowing Forage Harvester Hauling, Blowing or Packing  <b>Seeding Year Costs</b>	150 lbs/acre of 34-0-0 @ \$438/tonne   6.0 acre/hour @ \$90/hour Raking into double windrow, 2.5 acre/hour @ \$50/hour 5.0 acre/hour @ \$120/hour 4.0 acre/hour @ \$60/hour  150 lbs/acre of 34-0-0 @ \$438/tonne   6.0 acre/hour @ \$90/hour Raking into double windrow, 2.5 acre/hour @ \$50/hour 5.0 acre/hour @ \$120/hour 4.0 acre/hour @ \$60/hour  Residual seeding year costs, spread over four production years