

# Can Irrigation Support a 10,000 Head Feedlot in Saskatchewan?

## Introduction

In the last several years, there has been considerable interest in establishing feedlots as a community venture. Cattlemen are looking to keep a larger share of livestock profits by moving up the value chain. The BSE crisis has slowed the development of many of these ventures, but as this crisis appearing to be coming to an end, interest will certainly resume.

Feedlot location is one of the first questions to arise when establishing a feedlot. While there are many factors that go into a decision of location, this article is going to focus on the amount of irrigated acres needed to maintain a feedlot. Most of the prairies' beef cattle finishing has located and relocated to Irrigation Districts in the South Saskatchewan River basin in Alberta. This river basin has a lot more water to be developed in Saskatchewan. Two advantages to locating a feedlot in an irrigated region are consistent supply of silage and consistent supply of drinking water for animals.

Another question is the size of the feedlot. This example will be based on a 10,000 head capacity facility. For a 5,000 head operation, simply halve the feed and acreage numbers. For 20,000 head, double the numbers. An average feedlot will turn over its stock about 1.5 to 2 times in a calendar year with maximum one time occupancy between 75-90%. A 10,000 head feedlot will actually feed 15,000 to 20,000 cattle or more over the course of a calendar year. I will assume a turnover rate of 1.6.

Feed requirements depend on whether the feedlot strictly finishes animals or if it also backgrounds a portion of the calves. Most feedlots in Saskatchewan background some calves. If the feedlot accepts calves for backgrounding, they require a period of slower growth to develop skeletal structure (i.e. muscle and bone) before finishing. A typical growth rate for backgrounding would be 2.0 to 2.2 lbs of gain per day with the calf eating about 2.45% of their body weight on a dry matter basis. A typical as-fed backgrounding ration would be about 60% barley silage, 21% barley grain, 15% greenfeed, and 4% supplement. The finishing animal will eat about 2.2% of their body weight on a dry matter basis on an as fed ration consisting of 80% barley grain, 15% barley silage, and 5% supplement and gain 3-4 lbs/day. Remember also, that movement between these two rations must be gradual and some larger framed exotic breeds may be sufficiently mature at a lower weight to be able to sustain the 3-4 lb daily gains of finishing. Table 1 shows an example of 9 step-up rations.

Table 1. Examples of beef feeding rations on a step up program.\*

Ration	Barley Silage (%)	Barley Grain (%)	Green Feed (%)	32% Supplement (%)	Canola Meal (%)
1	52	28	15	3.5	1.5
2	57	23	15	3.5	1.5
3	51	30.5	15	3.5	0
4	52	35	10	3.5	0
5	53	38.5	5	3.5	0
6	54.5	42	0	3.5	0
7	44	52	0	4.0	0
8	30.5	65.2	0	4.0	0
9	14	81	0	5.0	0

\* All rations are in as-fed basis. Greenfeed was added to reduce the moisture content of the ration.

Barley grain and barley silage are the most common feedstock used in western Canadian feedlots. Feed barley production is generally unprofitable on irrigated land. Barley grain can be trucked from wherever it is cheapest. However, silage can only be profitably hauled 10 miles at the most (preferably less than 5), so it must be produced close to the feedlot. We will use barley silage in the following example.

## Irrigated Silage Production for a 10,000 Head Feedlot

**How much silage and irrigated land is required?** The assumptions and calculations for this example are listed in Table 2. I'll assume that we purchase 550 lbs medium frame calves and will sell them finished at a finished weight of 1300 lbs. We'll background them until they reach a weight of 850 lbs.

**Table 2. Calculation of silage use by a 10,000 head feedlot.**

	<i>Backgrounding Period</i>	<i>Finishing Period</i>
Weight Gain (lbs)	300 (850-550)	450 (1300-850)
Daily Weight gain (lbs/day)	2.1	3.5
Days on feed	128 (300 / 2.1)	143 (450 / 3.5)
Intake (% of body weight )	2.45%	2.2%
Midpoint in weight range (lbs)	700	1075
Intake (lbs) per day DM	17 (700 x 2.45%)	24 (1075 x 2.2%)
% Silage in Ration	60% (36% DM basis)	15% (6% DM basis)
Daily silage intake (lbs/day)	19 (17 x 36% / 33% moisture)	4.3 (24 x 6% / 33% moisture)
Total silage over period (tons)	1.3 (19 x 128 days / 2000 lbs/ton)	0.3 (4.3x143 days / 2000 lbs/ton)
Total Silage required per head		1.6 (1.3 + 0.3)
Tons Silage for 16,000 head		25,600 (1.6 x 16000)

Through the backgrounding and finishing phases, a steer will eat 1.6 tons of wet silage. A 10,000 head feedlot would need 26,000 tons of silage (and also 32,000 tons of barley grain). Assuming barley silage yields of 13 tons/acre under sprinkler irrigation, the operation will require **2000 acres of irrigation (15 quarter section pivots)** of silage.

If the same feedlot purchased all the animals at 850 lbs to feed them to finish, it would require 24,000 tons of grain and 4,400 tons of barley silage. It would take only 340 acres (3 pivots) of silage to supply this feedlot. However, a feedlot that is only finishing cattle should be able to increase their turnover rate to 2.0. That would increase their silage requirement to 5,500 tons and 30,000 tons of grain, which would require **425 acres (just over 3 pivots)** to grow the silage.

Barley is commonly grown for silage because it produces consistent yields and is easy to grow on a range of soils, even the poor ones. Thirteen tons/acre for barley silage is a conservative yield: some producers have achieved yields of 15 tons/acre with intensive management. Corn typically yields more silage than barley. Sixteen tons per acre can be expected and up to 24 tons per acre can be realized in a good corn year. Yield and choice of variety is dependant on Corn Heat Units, so consult Saver's Corn Heat Unit Map for your location. The warmest areas of the province are around a line from Estuary to Elbow to Estevan. Corn silage also has more energy per ton (TDN in the 70% range) compared with barley silage. Use of corn silage in the ration reduces the amount of grain required compared with barley.

## Manure Management for a 10,000 Head Feedlot

**Is the irrigated acreage enough to effectively utilize of the manure?** The standard assumption for manure production for feedlot cattle in Saskatchewan is 57 lbs of manure per day per animal (manure plus bedding). If the 10,000 head feedlot is kept 100% full all year round, that works out to 104,000 tons of manure. Let's look at the breakdown: if the steer eats 20 lbs DM (75% digestible) per day, that leaves 5 lb of dry manure. Adding in bedding and moisture would result in an output of less than the 57 lbs per day. However, in the absence of existing records, SAFRR will base the land requirement on 57 lbs per day for ILO approval.

Manure application rates should be calculated based on a manure analysis and soil test nutrient recommendations. A ton of manure has an average nutrient value of 12.6 lbs total N, 3.8 lbs total P and 12.4 lbs total K, but these values vary widely depending on season, operation, and ration. Meeting the crop nitrogen requirement with solid manure can result in an over application of phosphorus. Nutrients in manure are not balanced for crop production in one year, although this can be overcome with rotation. Corn and barley are intensive nitrogen users, and alfalfa uses proportionately more phosphorus.

Assume the manure is applied at 25 ton per ac every third year on dryland fields in the dark brown soil zone and incorporated within 24 hours. Approximately 4,200 acres each year or 12,700 acres total would be required to spread the manure. Even if the feedlot is doing a lot of backgrounding, **the feedlot will not have enough irrigated acres to utilize of the manure for even one year**, but will need to gain access to additional acres. This should not be a problem, since the benefits of manure for building soil organic matter and nutrient supply are well known. A common agreement is to trade manure for straw. A 10,000 head feedlot needs 5,000 tons of straw for bedding.

Table 3. A selection of Irrigation district acreages.

### Water for a 10,000 Head Feedlot

A feedlot steer drinks about 10 gallons of water per day and a 10,000 head feedlot at 75% occupancy would require about 27 million gallons of drinking water per year. At 100% occupancy (an over-estimation) it works out to 36.5 million gallons. An irrigator is allocated 12 inches of water per acre or 36.6 million gallons for a quarter section. So, a 10,000 head feedlot would use as much water as a pivot applies to a quarter section. Choosing a location with access to water is critical, both for a sufficient quantity and quality of water.

<i>Irrigation District</i>	<i>Acres</i>
Northminster	1557
Herbert	1732
Macrorie	2065
Rocky Lake	2075
Baildon	2940
Hillcrest	3246
Luck Lake	8913
Riverhurst	8255
SSRID	34077

### Conclusion

This article is meant to highlight the opportunities for locating a feedlot near irrigation. Based on the two feedlot examples above, 425 to 2000 acres of irrigation would be required to provide silage to a 10,000 head feedlot. Table 3 lists some of the larger irrigation districts in Saskatchewan. For a more complete list, contact one of SAFRR's Irrigation Agrologists. There may be locations where there are enough private irrigators in close enough proximity to each other, or near a smaller irrigation district where a feedlot may be feasible. Also new irrigation districts could be constructed around a feedlot proposal. Any ILO approvals must be obtained through the official channels and approval of will be based on the plan of individual proposal.

Thanks to Dr. John McKinnon of Animal Sciences, U of S; Bill Kowalenko of SAFRR; and Marsha Cannon for contributing to this report.

<sup>1</sup> SAFRR Workbook and Application Form - For the Approval of plans under the Intensive Livestock Provisions of *The Agriculture Operations Act*.