



Virtual Beef

ISSN 2291-188X

VOLUME NO. 15 ISSUE NO. 45 MAY 2015

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Create custom maps and find agricultural information for Ontario using GIS.

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Direct general questions and suggestions to: Tom Hamilton, Editor at tom.hamilton@ontario.ca or call 705-647-2087.
For inquiries regarding content of a specific article contact the author.

The Importance of Optimal Nutrition Throughout Gestation

Brian Pogue, Beef Cattle Program Lead, OMAFRA, Guelph

The most fundamental equation taught at University was $P = G + E$; Phenotype = Genetics + Environment. Phenotype is what is observed, which could be weaning weight, muscling, feet and legs, etc. What we observe is a combination of genetics and environment where $E = \text{feed and management}$. So even having the best genetics does not guarantee superior performance - the genes do not get a chance to express their superiority unless the cattle are fed and managed properly.

The past 2 winters have continuously had much colder temperatures than what is referred to as “normal”. With colder temperatures, cows need additional nutrients for maintenance. Proper nutrition is also critical to the development of the fetus and can have long lasting impact throughout the lifetime of the calf.

With respect to calf development, many only think of nutrition and management from birth onwards. However, research would indicate that nutrition and management are important in a calf’s life from conception. This can be referred to as “fetal programming” or “developmental programming”. The concept of developmental programming is that a stimulus or insult at a critical period in fetal development has long term effects on the offspring. The insult can be such things as restricted nutrients, over nutrition and hypothermia. Maternal nutrition during pregnancy has been shown to program the growth and development of the fetus, both during pregnancy and later into adult life. Maternal diet also affects the mammary gland and colostrum yield.

It is well known that 75% of fetal growth occurs in the last 3 months of gestation, and consequently some beef farmers pay attention to the feeding of their cows in the last trimester. It is important to have beef cows in good shape at calving so the calf will be born easily with vigour, the cow will have good colostrum and she will breed back quickly. Corah (1975) reported that pregnant cows fed 70% of their calculated energy requirements during the last 90 days produced calves with increased mortality and morbidity. It appears that restricting nutrients during pregnancy can increase the susceptibility of cattle to respiratory disease later in life.

Inadequate nutrition during early gestation may appear to be unimportant because of the limited nutrient requirements of the fetus for growth and development during the first half of gestation. However, there is growing evidence that nutrition in early gestation is critical. This is the time of early fetal development, maximal placental growth, and differentiation. The first heartbeat occurs at about day 21, followed by development of other vital organs; testicles start development at day 45 and ovary development in heifers starts at day 80. Muscle development has a lower priority to organ development and is very vulnerable to nutrient deficiency, as the number of muscle fibres form during the 2nd to 8th month of gestation. Zhu (2006) found a reduction in muscle fibres as a result of nutrient restriction from early to mid-gestation. Du (2010) found that both muscle fibre number and the sites for marbling are influenced during fetal development. Greenwood (2004) showed that steers from cows nutritionally restricted during gestation had reduced carcass weights compared to those from cows fed adequately. Underwood (2010) reported increased tenderness in steers from dams grazed on improved pastures compared to steers whose dams grazed on native pasture during mid-gestation.

Other studies have shown the impact of proper nutrition for a fetus on a number of factors important in beef production such as weaning weight, ADG and heifers’ pregnancy rate.

Table 1. Effect of maternal nutrition on steer progeny performance*

	IP ¹	NR ²
Weaning Weight	564	534
ADG	3.65	3.28
Carcass Weight	768	726
Marbling Score	455	420

*Underwood et al (2010)

¹IP = dams grazed improved pasture from day 120 to 180 of gestation

²NR = native range

Stalker (2006) found protein supplementation increased weaning weight and the percentage of calves weaned. Certainly, with the current price of feeder calves, the increase in weaning weights would easily justify the cost of supplement.

Martin (2007) also reported a 28% increase in the number of heifers calving within the first 21 days for heifers whose dams received supplement. Wu (2006) stated that maternal diet during pregnancy can influence neonatal mortalities, intestinal and respiratory dysfunction, slow postnatal growth, differing muscle fibre diameters, and reduced meat quality.

Table 2 Effect of maternal protein supplementation on heifer progeny performance*

	SUP ¹	NS ²
205 day weight, lb	467	456
Age at puberty, days	339	334
Pregnant %	93	80

*Martin et al (2007)

¹SUP = dams were supplemented 3 times a week with 1 lb/day of 42% CP cube while grazing dormant Sandhills range during the last third of gestation.

²NS = dams did not receive protein supplement

Conclusion

Proper management of cow nutrition during gestation can improve progeny performance and health. Time should be spent with your nutritionist to ensure your cows are receiving optimal nutrition throughout the year.

References

Corah 1975 Influence of prepartum nutrition on the reproductive performance of beef females and the performance of their progen. J Anim Sci 41:819

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Underwood 2010 Nutrition during mid to late gestation affects growth, adipose tissue deposition and tenderness in cross-bred beef steers Meat Sci 86:588

Stalker et al 2006 Effects of pre and postpartum nutrition on reproduction in spring calving cows and calf performance J Anim Sci 84:2582

Wu et al 2006 Intrauterine growth retardation: implications for the animal sciences. J Anim Sci 84: 2316

Zhu 2006 Maternal nutrient restriction affects properties of skeletal muscle in offspring. J Physiol 575:241

----- VB -----
Brian Pogue, Beef Cattle Program Lead
Ontario Ministry of Agriculture, Food and Rural Affairs
brian.pogue@ontario.ca
----- VB -----

Weed Control on Pasture

Jack Kyle, Grazier Specialist, OMAFRA, Guelph

Weeds are a challenge in any cropping situation and can be a major problem in pastures. There are a number of different approaches to weed control on pastures and often a combination of practices is the most effective.

Identify the Problems

Identify the weeds that are your major problems, then the strategy that is the most effective in managing those species. In pasture fields we can find annual weeds such as lambs quarters and pigweed; biennial weeds such as Nodding, Bull and Scotch thistles, wild carrot and blueweed; and perennials such as Canada thistle, and buttercup. To complicate this further some of these weeds spread by seed, others by root systems, and some by both seeds and roots. A good source for weed identification is Ontario Weeds – Weed Gallery at:

<http://www.omafra.gov.on.ca/english/crops/facts/ontweeds/weedgal.htm>

Maintain a Healthy Sward

A strong healthy sward of desirable forage species is the first step to minimize the weed pressure in a pasture. A grazing strategy that allows for optimum animal density and sufficient rest and recovery time for the grass is critical. If the animal density on a paddock is low, the livestock will leave the less palatable species and over-graze the desirable species. This over-grazing will result in the exposure of soil and provide the opportunity for weeds to germinate and grow. With the correct animal density, the animals will consume (or tramp) all the available forage including the weeds. It is also critical that the desirable forage species have sufficient rest and recovery time between grazing's. This time will depend on the time of year and moisture conditions. Most pasture managers find that 3-4 weeks is sufficient rest time in the early part of the season (May). After mid-June, and later it takes 40 days or more to have optimum regrowth – provided there is adequate moisture. If we think of hay fields and the time between cuttings, these numbers match up quite well. The only difference between a hay field and a pasture field is the harvesting equipment!

Clipping

Clipping weedy species as they start to flower but before they set seed can be effective in managing some of the weed pressure. Clipping pastures to remove seed heads on desirable grass plants will stimulate new leaf growth. Clipping is an extra cost but will help to reduce the weed pressure, especially on taller weeds such as thistles and improves the appearance of the pasture. If there are only a few weeds (thistles in particular), using a spade to cut them off about 2-3 cm (1 inch) below the soil surface is an effective way to reduce the spread of these weeds.

Herbicide Options

Spraying is an effective weed control measure for the weeds that are there, but once you eliminate those weeds you need to manage the pasture in a way that will discourage them from returning. The phenoxy products (2,4-D, MCPA, dicamba) will control many of the weeds. For some of the very challenging perennials it may be necessary to use a product containing aminopyralid (that will also kill the legumes). Guidelines for spraying pastures are in the Guide to Weed Control, OMAFRA Publication 75 on pages 188-191 at this link

<http://www.omafra.gov.on.ca/english/crops/pub75/pub75ch10.pdf>. Timing is important, depending on the weed species that you want to focus on. Herbicide applications in June and September may be necessary for biennial and perennial weeds. Keep in mind that many of the herbicides will kill or at least reduce the legume stand in your pasture. When selecting a herbicide, note the grazing restrictions that are on the label.

Maintain a Healthy Pasture

The best weed control program is a thick pasture with a minimum of 40% legume content that is grazed for short periods with a long enough rest periods between grazing's to allow the plants to fully recover and regrow. This will promote good growth of the desirable legume and grass species and minimize the amount of selection that the livestock do in their grazing. This same system will help to insure that there is no bare ground for weeds to get established.

----- VB -----
Jack Kyle, Grazier Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
jack.kyle@ontario.ca
----- VB -----

Facilities for Beef Cattle

Barry Potter, Agriculture Development Advisor, OMAFRA, New Liskeard

The phone rings and the question is, “I want to build a new barn for my beef cows, are there any new designs? The Canada Plan Service plans date back 30 + years.” <http://www.cps.gov.on.ca/english/frameindex.htm>

The observation that beef barn design has not changed much is somewhat true. There are new fabric barns, and new flooring discussions, but the basic principles remain the same.

A better question to start with might be, “if I am starting a beef operation, what facilities do I need to look after my animals?” Sorting out the type of farm you want, and the production system you will employ, will determine what you need for facilities.

Beef Farmers of Ontario conducted an extensive study last year as they looked at what a start-up beef operation would require for land, machinery and facilities. Long discussions with farmers, advisory staff, and economists considered a wide range of options.

With a beef cow/calf operation, three critical care points are easily identifiable: calving, health treatments and weaning. In Ontario, our weather determines how elaborate our calving facility needs to be. Traditional calving during the winter months requires some type of barn to protect the newborn calves from the elements, and typically include a heat source of some kind. The BFO model looks at working with nature and the seasons, with calving on grass during the summer months. This eliminates the need for a heat source, and a specific calving barn.

Treating animals for health reasons requires an excellent handling system. Under the Beef Code of Practice it is critical to handle cattle safely and humanely. The BFO model builds in a facility for handling livestock in a safe manner.

At weaning time, calves experience stress as they are separated from their mothers. This stress can be reduced using the Fence line and Two-Step weaning methods as outlined in previous *Virtual Beef* articles.

The BFO model found that the optimum number of cows was around 250, and would need about 2500 acres of land. What did the BFO model indicate as an absolute requirement for facilities to look after these animals?

The first building is a simple open fronted pole shed, 30' X 100', or in that size range, that would serve primarily as storage for high quality hay. Wastage from dry hay stored outside without cover can be extensive. Storing some high quality dry hay under cover would retain quality, plus allow for hay that could be accessed in the middle of winter if it is stormy. The secondary purpose of this facility would be for sick pens and a weaning area as the hay is fed out. See Diagram 1 or follow this link for plans for such a building.

The second building would be a covered handling facility, approximately 30' X 30'. This would house the crowd tub, working chute and squeeze for restraining livestock for treatment purposes.

Where do the cows spend the winter if there is no barn for them? The BFO model uses windbreaks and bedded pack dry lots for housing the cows. Cows need shelter from wind, more than from rain or snow. By using tree lines and groves for cover, cows can get out of the wind. If they are out of the wind, cold can be managed by the animal's internal metabolism.

Using existing trees or planting trees for windbreaks is the cheapest option for keeping cows sheltered from the elements. By bale grazing and feeding out on pasture, manure can be spread as the cows eat, supplying soil with nutrients and organic matter. In the absence of trees, portable wind breaks could be used. Some examples are pictured.

For more traditional dry lots, both Western Canada and Northwest Quebec ranches use wooden windbreaks to block their wintering sites from the wind.

Things to consider in locating a dry lot include:

- raised area for bedded pack
- sufficient slope to direct runoff to proper location
- windbreak for shelter
- feeding area (preferably with paved surface)
- Adjacent alley ways (for sorting livestock into different areas, feed and manure handling equipment, etc.)
- Sufficient distance from surface water, wells, neighbours, etc.
- Proper site preparation so water from the roofs of adjacent buildings and overland flow of field runoff does not enter livestock yard area.

*from fact sheet 720/400. Managing Outdoor Confinement Areas and Livestock Yards

By Christoph Wand and Peter Doris

Table 1. Beef animal space requirements^{1,2}

Type of housing	Area per animal (square ft/hd)		
	Cows and Bred Heifers	Feeders (750 lbs)	Calves (500 lbs)
Earth lot without mound	600	500	400
Earth lot with bedded mound (bedded mound area)	300 (35)	250 (30)	150 (25)
Paved lot	80	50	40

¹ Beef Housing and Equipment Handbook, Midwest Plan Service. <https://www-mwps.sws.iastate.edu/catalog/livestock-operations/beef>

² Beef Cattle Housing and Feedlot Facilities. http://www.agriculture.gov.sk.ca/beef_cattle_housing

Dry bedded mounds inside the windbreaks allow the cows a place to stay dry as well as out of the wind. Keep the bedded mounds away from feeding and watering areas. Rectangular shaped mounds are easier to manage. Have good drainage around the mounds. A well-compacted soil base material is essential. The top should be rounded with a minimum height of 5 ft. (1.5 m) at the centre. Side slopes must be flat enough that cattle can easily walk to the top of the mound. Maximum side slopes of 1:4 are recommended.

Wood chips and straw can be used for bedding

- Wood chips or shavings: 12.5 lb. /1000 lb. animal weight (1.25 kg/100 kg), applied once a week. Do not use wood products for bedding if the wood has been treated with preservatives.
- Straw: 25 lb. /1000 lb. of animal weight (2.5 kg/100 kg), applied at least three times a week (preferably daily)

Machine sheds were identified as important under the BFO model to keep equipment out of the elements ... the cattle actually keep better outside than the tractor does.

The facilities discussed in this article suit extensive beef production using summer calving and employ minimalist facilities.

Reference material:

Windbreaks Provide Shelter for Cattle. Harold House. 2009

<http://www.omafr.gov.on.ca/english/livestock/beef/news/vbn1109a2.htm>

Managing Outdoor Confinement Areas and Livestock Yards. Wand and Doris. 2004

<http://www.omafr.gov.on.ca/english/engineer/facts/11-007.htm#2>

----- VB -----
Barry Potter, Agriculture Development Advisor
Ontario Ministry of Agriculture, Food and Rural Affairs
barry.potter@ontario.ca
----- VB -----

2015 Decision Guide for Marketing Calves, Backgrounders or Pastured Yearlings

Tom Hamilton, Beef Program Lead – Production Systems, OMAFRA, New Liskeard

Introduction

Cow-calf producers have several alternatives for marketing their animals. They can sell them as weaned calves, keep the weaned calves and background them over the winter for sale in spring, or retain them for another stage by pasturing the backgrounders and selling them the next fall. Determining which option is best on a particular farm is a complex issue. Among the variables that need to be considered are cash flow, availability of feed and pasture, and the anticipated profit or loss from each option. This article will deal projecting the financial gain or loss for each option, assuming that the additional feed and pasture needed is available at cost of production.

These projections were calculated by establishing a base budget for each option, and then re-running the budgets within a range of buying and selling prices. In previous articles, Marketing Weaned Calves vs. Backgrounders (<http://www.omafr.gov.on.ca/english/livestock/beef/news/vbn1112a1.htm>) and Is it Profitable to Pasture Yearlings? (<http://www.omafr.gov.on.ca/english/livestock/beef/news/vbn1112a4.htm>) Similar calculations were done using the price ranges relevant at the time. However, since the industry has entered into an era of unprecedented high prices, these calculations need to be updated.

Budgets

The tables 1, 2 and 3 contain the values used for evaluating each marketing option. The budgets include operating costs but do not include a charge for operator labour, risk or return on investment. The foundation budget for the cow herd (Table 1) was prepared using the OMAFRA Cow-calf budgeting tool¹.

Table 1. Cow-calf Budget*

Item	Value
Mature cow wt.	1400 lbs
Weaned calf wt.	500 lbs
Weaned calf price range	\$2.50 - \$3.50 /lb
Cull cow value, \$/lb	41% of calf price
Health and Vet	\$30 /hd
Breeding	\$30 /hd
Herd replacement rate	15% per yr
Marketing / Trucking	\$40 /hd
Yardage	\$0.40 /day
Winter feed cost	\$352 /cow
Hay COP	\$100 /tonne
Pasture cost	\$128 /cow /yr
Interest rate (operating)	3.0 %

*includes costs for replacement females retained within herd; does not include operator labour or interest on long term loans

The scenario assumes cows calving in late May on pasture, with calves weaned in late October. Heifers are retained within the herd to supply replacement females (15%/yr), and the cost of raising them and the associated loss of revenue from the heifer calves is accounted for in this budget. The \$margin from selling the calves at prices ranging from \$2.50 to \$3.50/lb was calculated and the results presented in graph form in Fig. 1.

Table 2. Backgrounding Budget

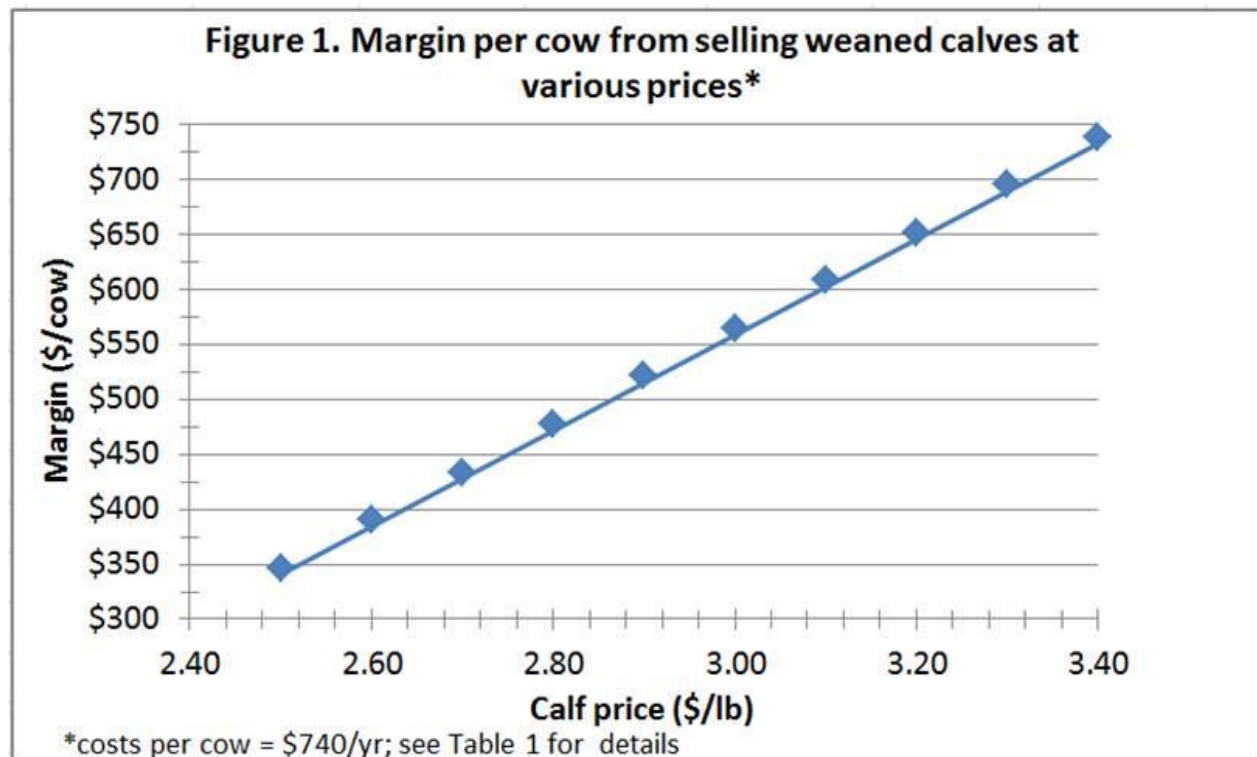
Item	Value
Weaned calf weight	500 lbs
Weaned calf price range	\$2.50 - \$3.50 /lb
Backgrounder weight	725 lbs
Stocker price range	\$1.80 - \$3.00 /lb
Health and Vet	\$20 /hd
Marketing / Trucking	\$40 /hd
Yardage	\$0.42 /day
Interest rate	3.0 %
Good quality hay	\$100 /tonne
Corn grain	\$200 /tonne
Beef supplement	\$440 /tonne
Salt /mineral	\$550 /tonne

The backgrounding budget was prepared using the OMAFRA Background budget tool¹. In this scenario, 500lb weaned calves are fed for 150 days to gain 1.5 lbs/day, with a spring sale weight of 725 lbs. The \$ margins which would result from the backgrounding program were calculated assuming the same weaned calf price range used in the Cow-calf budget and a spring sale price range of \$1.80 to \$3.00 /lb. The net margins for each price combination are plotted Figure 2.

Table 3. Yearling Pasture Budget

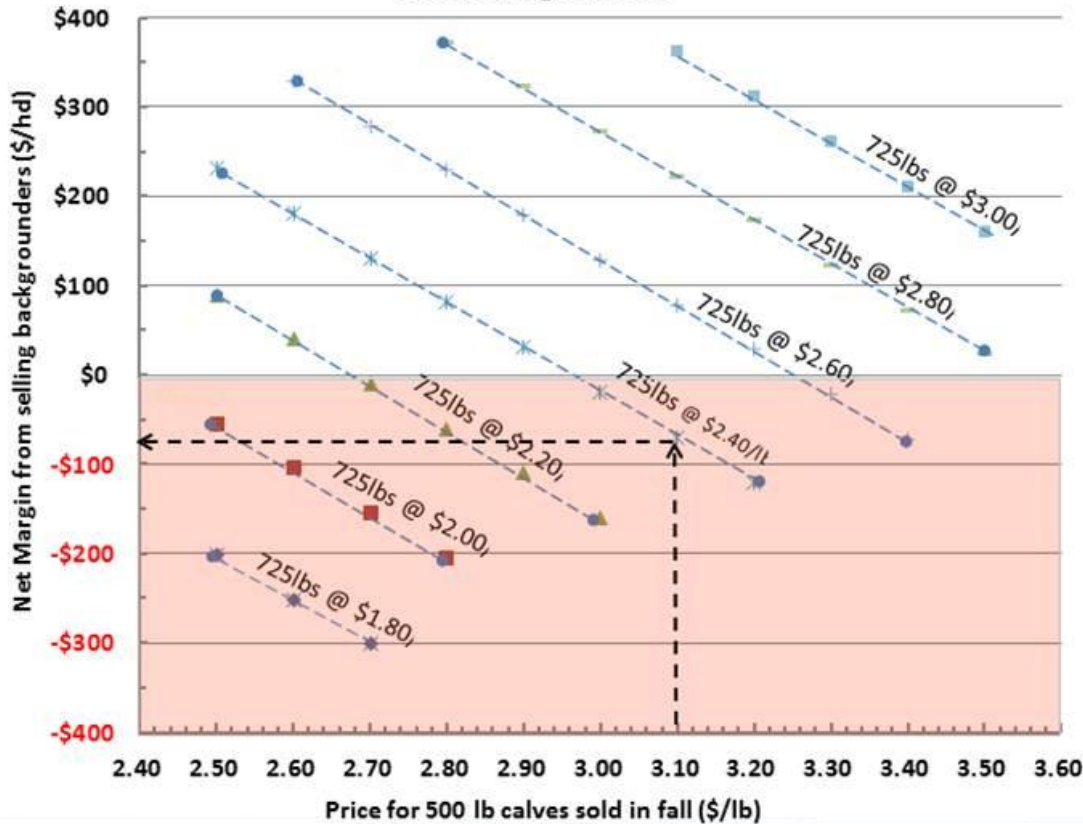
Item	Value
Days on pasture	165 days
ADG on pasture	2.0 lbs. day
On-pasture wt.	725 lbs
On-pasture price range	\$1.80 - \$3.00 /lb
Off-pasture wt.	965 lbs
Off-pasture price range	\$1.40 - \$2.00 /lb
Health and Vet	\$5.00 /hd
Marketing / Trucking	\$40 /hd
Implant	\$3.00 /hd
Fly tags	\$4.00 /hd
Salt, mineral	\$550/tonne
Interest rate	3.0 %
Stocking rate	1.0 ac/hd
Seeding	\$3.00 /ac
Fertilizer	\$25.00 /ac
Maintenance /repair	\$5.00 /ac
Cost per lb of gain	\$0.43 /lb

A similar methodology was used to project net margins from retaining the backgrounded cattle and pasturing them vs. selling them at the backgrounded stage, using a custom spreadsheet. Cattle were assumed to gain 2.0 lbs per day on pasture over a 120 day grazing season, and sold into a feedlot at 965 lbs (see Table 3). The backgrounder price range was the same as that in the preceding example, with an off-pasture price range of \$1.40 to \$2.00 /lb. The net margins resulting from these calculations were graphed in Figure 3.



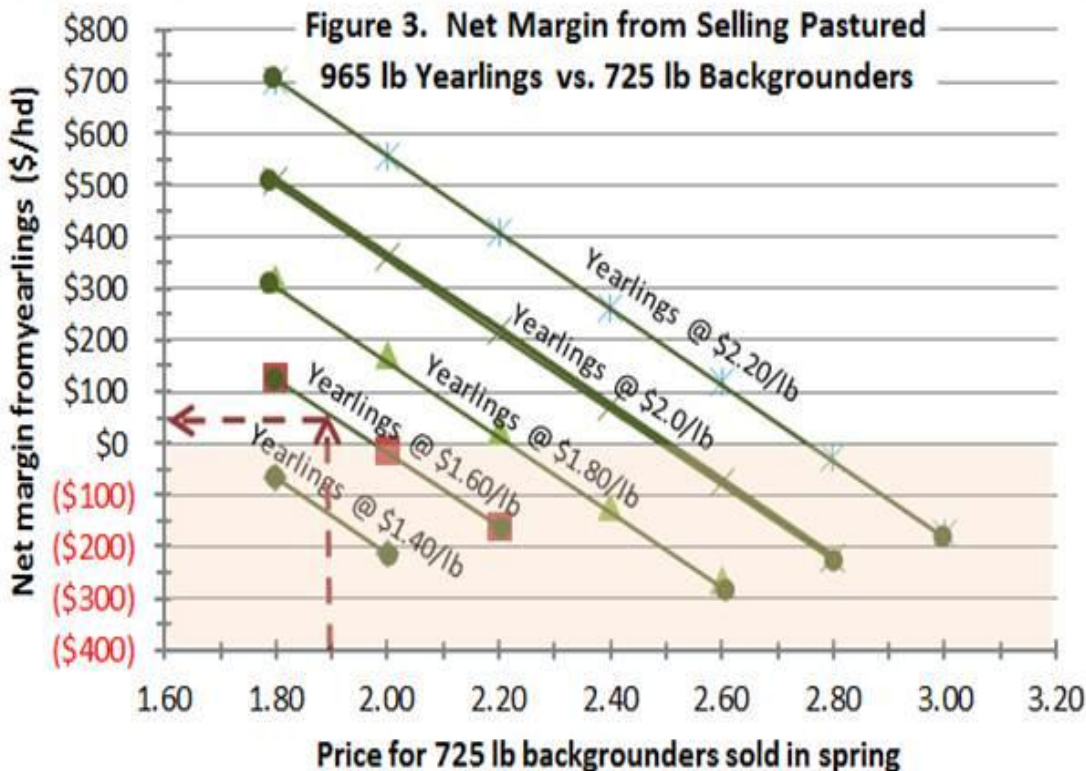
Graph comparing margin (\$/cow) and calf price (\$/lb) from selling weaned calves at various prices. X-axis represents calf price (\$/lb), starting at \$2.40/lb and increasing in \$0.20/lb increments to \$3.40/lb, and Y-axis represents the margin (\$/cow), starting at \$300/cow and increasing in \$50/cow increments to \$750/cow. A single line starting from the bottom left corner to the top right corner.

Figure 2. Net Margin from Selling 500 lb Weaned calves or 725 lb Backgrounders



Example of how to use Fig. 2. The anticipated price for 500 lb calves is \$3.10/lb. Draw a vertical line up from this point until it crosses the sloped line which corresponds to the projected price for 725 lb backgrounders (\$2.40/lb). Then from that point draw a horizontal line to the left hand side of the graph. Then read the value off of the axis (-\$75/hd).

Figure 3. Net Margin from Selling Pastured 965 lb Yearlings vs. 725 lb Backgrounders



Example of how to use Fig. 3. The anticipated price for 725 lb backgrounders is \$1.90/lb. Draw a vertical line up from this point until it crosses the sloped line which corresponds to the projected price for 965 yearlings (\$1.60/lb). Then from that point draw a horizontal line to the left hand side of the graph. Then read the net margin value from the axis (\$50/hd).

Discussion

Margins were very positive for the Cow-calf operation selling calves at weaning. This reflects the very high prices for beef cattle currently being paid in the marketplace, while the costs of keeping beef cows have remained relatively stable. Existing beef Cow-calf producers are experiencing an era of paralleled profitability.

The option of retaining calves over the winter presents both risk and opportunity to beef cow operators. Generally, heavier cattle sell for a lower price per pound than lighter cattle of the same quality. This is referred to as a negative price margin. For example, if 500 lb calves are selling for \$3.00 /lb and 800 lb stockers are selling for \$2.70 /lb, the price margin is $\$2.70 - \$3.00 = -\$0.30$. This is a negative price margin of 30 cents /lb. The profit potential of feeding cattle to heavier weights lies in the feeding margin – how much it costs to add an additional pound of weight to the animal.

The net margins for backgrounding are illustrated in Fig. 2. This graph can be used to project the profit potential of retaining calves vs. selling at weaning. Over the price ranges used, net margins from backgrounding are positive when the price margin is in the range of -60 to -80 cents per lb. The graph provides a quick method of evaluating whether or not retained ownership is an attractive proposition, and based on these producers can undertake more detailed calculations specific to their farm.

The next step in retained ownership is pasturing the backgrounded cattle. Figure 3 provides a visual representation of the relationships between backgrounder price, off-pasture yearling price and net margin. Over the range of prices used, pasturing would result in a profitable outcome as long as the price margin was -50 cents per lb or less.

In order to compare selling pastured yearlings vs. weaned calves, we need to add together the appropriate margins from Figs. 2 and 3. First, select the anticipated 500 lb calf price and off-pasture yearling price. Then choose any backgrounder price within the range offered in Fig. 2. Next, read the corresponding net margin values from Figs. 2 and 3 and add them together. The result will be the projected net margin for retaining calves through to the pastured yearling stage, compared with selling the weaned calves

Example:

Assume the following prices:

Calf = \$3.00 /lb Backgrounder = \$2.60 /lb Pastured yearling = \$2.20 /lb

Reading from the graphs ...

Margin from backgrounding relative to calf sales = \$150

Margin from pasturing relative to backgrounding = \$110

Margin from pasturing yearlings vs calf sales = \$260

These tools will assist beef Cow-calf producers in making decisions about retaining ownership of their calves to later stages. Each producer will balance the projected economic benefits against the additional labour and risk, as well as the alternative uses for farm resources.

<http://www.omafra.gov.on.ca/english/busdev/bear2000/Budgets/budgettools.htm#livestock>

----- VB -----
Tom Hamilton, Beef Program Lead-Production Systems
Ontario Ministry of Agriculture, Food and Rural Affairs
tom.hamilton@ontario.ca
----- VB -----

NEW! AgMaps Portal and Agricultural Information Atlas Application Help Tutorial Series

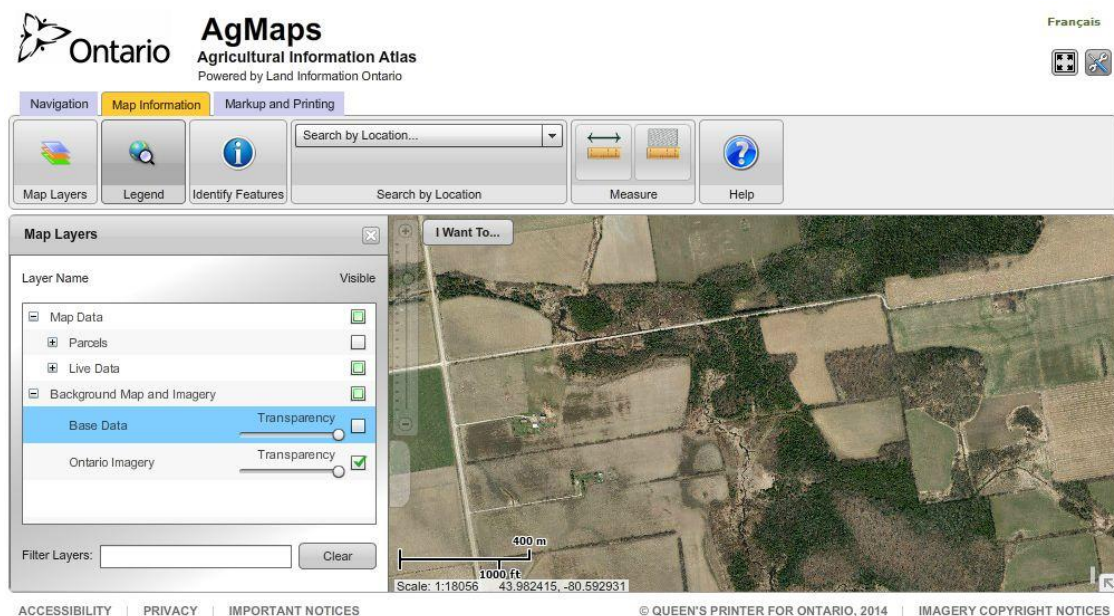
Just launched!

The Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has a new series of tutorials to help you use the Agricultural Information Atlas (AIA), an online application that allows you to create custom maps and find agricultural information for Ontario. You can find the AIA link on the AgMaps Geographic Information Portal at ontario.ca/agmaps, the ministry's single access point for geospatial data.

The AgMaps Portal and AIA Application Help Tutorial Series provides step-by-step instructions on how to use the AIA for your farm or business. The audio/visual series helps with a range of topics – from navigating the application and creating layers on your custom maps, to creating tile drainage maps and nutrient management strategy farm sketches.

Find the 13 tutorials on the [OMAFRA website](http://www.omafra.gov.on.ca/english/landuse/gis/agatlas-help.htm) (www.omafra.gov.on.ca/english/landuse/gis/agatlas-help.htm).

For more information, contact the Agricultural Information Contact Centre at 1-877-424-1300 or ag.info.omafra@ontario.ca.



Pasture Production Publication

The updated OMAFRA Pasture Production Publication provides information on improving pastures, including species selection, fertility, rejuvenation and renovation, weed control, grazing systems, fencing and watering. It also provides insight into animal pasture management, budgeting, and managing different types of livestock on pasture. It's available to download from the OMAFRA website or purchase a copy for \$10 at an OMAFRA Resource Centre or through ServiceOntario Publications.

Here are the links for this publication:

English: <http://www.omafra.gov.on.ca/english/crops/pub19/pub19toc.htm>

French: <http://www.omafra.gov.on.ca/french/crops/pub19/pub19toc.htm>