  

Virtual Beef

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Hemp, Tropical Corn and Other Alternative Annual Forages: Opportunities for Beef Cattle in Five Easy Lessons!

Christoph Wand, Beef Cattle & Sheep Nutritionist (with contributions from the OMAF and MRA Nutrition Team)

Improving Forage Options

Following the forage shortage and high prices seen in 2012, OMAF and MRA staff and University of Guelph researchers are investigating more forage opportunities for Ontario livestock producers. One direction within this area was the repurposing and characterization of a number of existing and novel crops for the purpose of stored forage. Of those investigated in 2013, each shows some potential for this purpose. **Lesson #1: If it can be cultivated (if it grows on a farm) there is a good chance cattle can make use of it!**

The annual crops investigated included hemp, which is currently grown for biomass and fibre, specialty biofuel and sweetener crops (high-sugar Millet and high-sugar Sorghum) and two specialty long-season tropical corn varieties developed by Dr. Fred Below at the University of Illinois. The tropical corn varieties tested included both a biofuel variety and a forage variety. Since corn originally evolved in the tropics, the name **"tropical corn"** needs explanation. The key here is that **Tropical Corn has not been bred for photoperiod** adaptation and is exceptionally long-seasoned. The millet, sorghum and corn varieties were grown at Canada's Outdoor Farm Show location (Woodstock) and the hemp on private plots near Kemptville. It should be noted that plots of the corn, sorghum and millet were also seeded near Elora but due to late seeding and lack of timely weed control these were abandoned. **Lesson #2: planting dates and weed control are key to success with annual forages. Agronomics matter!**

Figure 1 shows the trend in percent total digestible nutrient (TDN) in these various crops by date. As evident, the crops that will develop grain (e.g. sorghum, millet) have different TDN curves than those that would not, such as perennial grasses, which show a classic and degrading feed quality response to maturity. Neutral detergent fiber (NDF) data was not included in the graph but was as follows:

- **Hemp:** NDF ranged from 40 to 59% in three repeated samplings, but not in progression.
- **Sweet Millet:** NDF ranged from 55 to 65 in repeated samplings with a general upward trend as it matured
- **Sweet Sorghum:** NDF ranged from 46 to 60% in repeated samplings, but no real trend associated with maturity
- **Tropical Corn:** NDF ranged from 56 to 62% in three repeated samplings, and also not in any progression.

As a reference, the TDN and NDF of Ontario wheat straw is often seen at about 45 and 75% respectively Wheat straw was included in many beef rations in 2012 and 2013. **Lesson #3: Many existing and emerging crops have greater feed value then we give them credit for!**

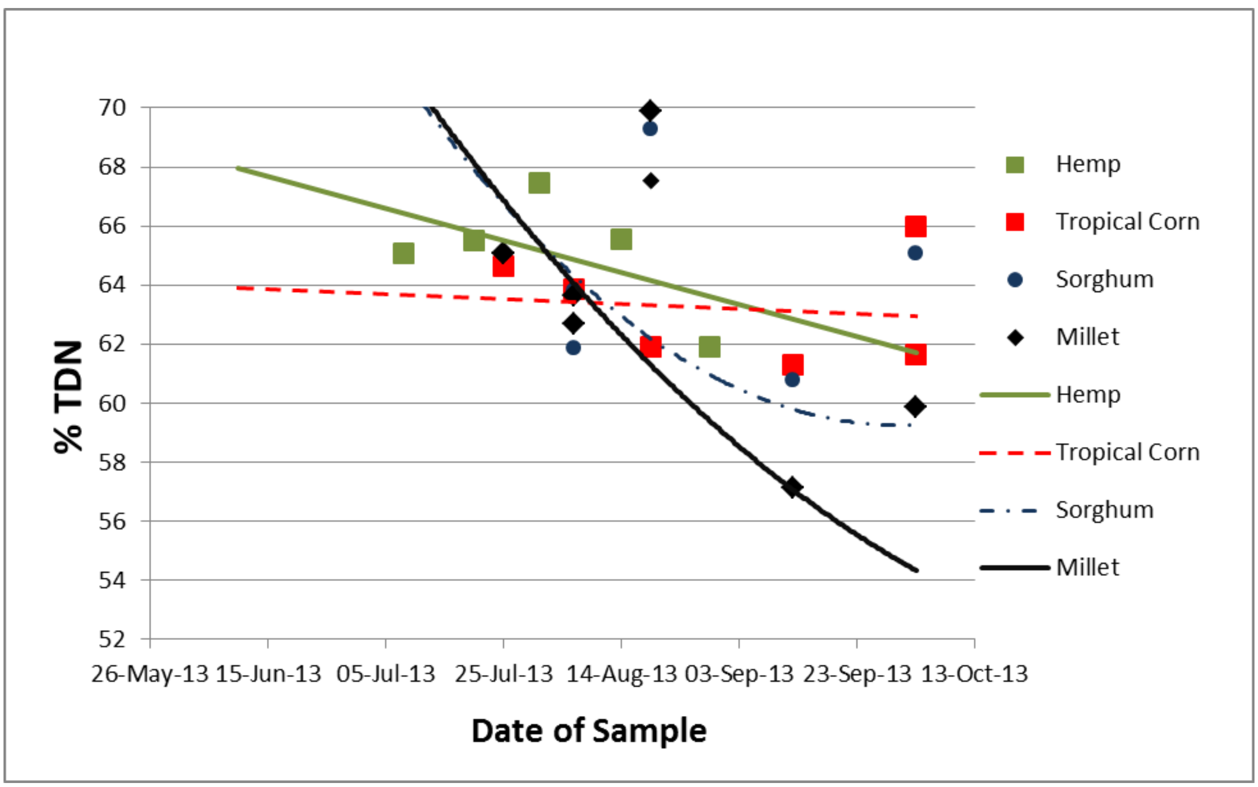

Figure 1. Total Digestible Nutrient (TDN) Content by Date

Figure 1 shows the trends in TDN content of the 4 forage types over the 2013 growing season year. These species are Hemp, Sweet Millet, Sweet Sorghum, and Tropical Corn. As a reference, the baseline for the graph is 52% , well above the 45% TDN which is typical of Ontario wheat straw when used in a ration. The lowest TDN observed which was Sweet Millet (57%), which is equal to many first cut hays in Ontario.

Potential Species for Ontario

The remainder of this article contains information on the species represented by this sampling and discussed thus far. In the future, palatability and intake checks may need to be performed to match up with the chemical analysis as seen in the 2013 plots. **Lesson #4: Other jurisdictions already have information on the forage potential of crops which we don't yet realize can be forages!**

Hemp

High quality hemp is cultivated throughout Canada. It is possible to cut hemp for silage to mix with corn silage[i], and by mixing hemp in with corn silage, cows had improved weight gains. Hemp is a common crop in the Netherlands as it is an alternative to straw and is low in dust and is very absorbent. One report in the popular press there suggested that dairy cows fed hemp give a little more milk and seem to be really healthy. When considering hemp, it is important to realize that all hemp growers need to obtain a licence from the government of Canada.

Sweet Pearl Millet

Sweet pearl millet is commonly used as a biofuel crop, and the residues produced are often used in livestock feed[ii]. In addition to sweet pearl millet, regular (RMR) and brown midrib (BMR) pearl millet varieties are also available. Although BMR shows improved quality through increased digestibility, BMR yield is lower which offsets value so that both BMR and RMR are approximately equal in overall feed value per unit area grown[iii]. Sweet millet differs from regular pearl millet in that the plant has longer and narrower leaves, profuse nodal tillering with asynchronous maturity, short thin spikes, and very small grains. Sweet millet has been found to have twice the amount of soluble sugar in comparison to regular pearl millet varieties[iv], and hence its name.

Millet has long been grown for forage and grain in areas of Africa, Asia, and the Southern US. However, in the 1990's the hybrid Pearl millet was developed for use in the sandy soils of Eastern Canada[v].

Sweet Sorghum

Sweet sorghum is a very efficient crop to grow in areas prone to droughts due to its water use efficiency and enlarged root system. Under drought stress, sorghum is able to maintain similar physiological activity to well watered sorghum, unlike drought stressed corn. Total biomass production in sorghum under drought stress is reduced by about 40% compared to an almost 50% reduction in drought stressed corn[vi]. A 2009 study [vii] compared sweet sorghum with both brown midrib (BMR) and grain type sorghum varieties. The study found that lignin content was lower in the sweet sorghum than both of the other varieties; and consequently, sweet sorghum was found to have higher digestibility than either BMR or grain varieties.

Figure 2. Sweet sorghum stalks

Figure 2 shows Ron Lackey (OMAF and MRA) with sweet sorghum grown at the Canada's Outdoor Farm Show site (October 2013). These stalks were being processed into mini-silos to determine potential on a pilot level.

Sweet sorghum silage has been shown to be a suitable substitute for corn silage when feeding growing calves. In another study[viii], Hereford and Angus calves were fed either sorghum silage, corn silage, or fescue hay. The feeds were determined to be comparable in terms of dry matter intake, crude protein, and gross energy. Sweet sorghum silage may also be a suitable substitute for alfalfa silage when feeding lactating cows. Research[ix] has demonstrated that although milk yield was lower for sweet sorghum fed dairy cows, dry matter intake, energy corrected milk yield, and feed efficiency were similar between the two feeds.

Tropical Corn

There is currently very little knowledge about growing tropical corn in the mid to northern USA and Southern Ontario. However, a trial in Wisconsin[x] at 45^{o}N latitude and found that tropical corn grown for silage at this location was earless and did not produce any grain. The earless corn silage was included at 50% of DM in the diet fed to Holsteins heifers

Figure 3. Tropical Corn, forage variety

Figure 4. Tropical Corn, biofuel variety

and did not appear to have any significant effect. Having less grain content than conventional or temperate corn hybrids, Tropical Corn may have applications in things like beef cow rations as it has the large yield of corn silage, but at much lower or zero grain content.

Figure 3 shows forage variety Tropical Corn grown in the Canada's Outdoor Farm Show plots. Note the immature ear in this photo taken October 4th, 2013. This variety was developed and provided courtesy of Dr. Fred Below of the University of Illinois.

When planted in **mid-summer** in the southern USA, tropical corn produces higher DM and grain yields than temperate hybrids planted at the same time. This is because temperate hybrids have been developed for spring plantings and are not as productive when planted later in the summer[xi,xii]. This indicates potential for Tropical Corn as a second crop grown later in the season.

Figure 4 shows a biofuel variety of Tropical Corn developed by Dr. Below. This photo also taken October 4th; note the immense size of the plant and lack of a cob.

Figure 5. Making mini-silos of alternative annual crops.

Figure 5 illustrates the making of mini-silos for testing the ensilability of annual Tropical Corn (2 varieties), Sweet Millet and Sweet Sorghum in 20 litre pails. This is done using a hydraulic ram as packing matters in all silos, especially little ones! Photos of their feed-out were posted to Twitter under [@CtophWand]() in December of 2013.

Increased Forage Options for Cattle Producers

While the focus of this article has been on selected annuals, there may be a number of feeds available that have been planted for industrial or forage purposes which can serve as feed in an Ontario beef system. Some of these have been piloted in Ontario as shown in Figures 2, 3, 4, and 5. They may be purposeful, opportunity, salvage, or emergency feeds but remain options outside of the regular crops should the need arise. **Lesson #5: the forage options are many and this article only scrapes the surface when it comes to options for feeding the versatile beef animal!**

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De-coding the Code – Chapter One "Animal Environment"

Nancy Noecker, Cow-Calf Specialist, OMAF Kemptville

For the Canadian Beef Industry the National Code of Practice is new. But for beef producers, dealing with the environment isn't! The first chapter of the new code looks at Animal Environment, followed by Feed and Water, Animal Health, Animal Husbandry, Transportation, and Euthanasia. This makes a logical progression for explaining the industry practices to the consuming public.

Some producers have been a little scared off by comments about the code such as "it's a 60 page book"! However, if you take a look at the code, the summary of the 6 chapters and producer requirements fits on 6 pages. The rest of the book is made up of an easy to read lay out (where the producer requirements are highlighted in yellow boxes), a glossary, a list of good industry contacts, and some recommended Best Management Practices.

So start at the beginning of the code and work through it one chapter at a time …

REQUIREMENTS

Cattle must have access to areas, either natural or man-made, that provide relief from weather that is likely to create a serious risk to their welfare.

Promptly assist individual cattle showing signs of not coping with adverse weather (see Sections 1.1.1 and 1.1.2 for lists of signs).

Cattle usually seem more comfortable outside but given the temperature challenges of the last few months, most producers will have been actively achieving this requirement. In many cases producers will have been moving portable windbreaks to shelter cattle or moving the cattle to shelter via bush lots, barns, or bale windbreaks. For more information see Virtual Beef article fall/2009 on Windbreaks at http://omafra.gov.on.ca/english/livestock/beef/news/vbn1109a2.htm

Providing bedding or more of it in extreme cold will also help cattle cope. It may be hard to imagine right now, but come those really hot days in summer producers may need to be active in providing more water-trough space, perhaps shades, and water sprinkling or misting in some situations.

The next thing a producer needs to do is…

REQUIREMENTS

Provide additional feed to meet animals' increased energy requirements when facing cold stress.

Figure 1. Cattle are usually more comfortable outside.

Figure 2. Cattle exposed to cold temperatures need feed of adequate quantity and quality.

Again, I suspect that many producers have changed the diet being offered over the last few months, from providing grains, silages or just better quality hay and perhaps more of it.

The facilities used to work, load, and house the cattle are the next requirements…

REQUIREMENTS

All beef operations must have access to equipment or facilities for the safe handling, restraint, treatment, segregation, loading, and unloading of cattle.

Design or manage indoor and outdoor cattle facilities to provide well-drained, comfortable resting areas.

Provide traction in handling areas to minimize cattle slips and falls.

All cattle in a group must have sufficient space to adopt normal resting postures at the same time.

Cattle kept in groups must be able to move freely around the pen and access feed and water.

Stocking density must be managed such that weight gain and duration of time spent lying is not adversely affected by crowding.

Maintain indoor air quality and ventilation at all times (ammonia levels < 25ppm).

Provide cattle housed indoors that do not have access to natural light with supplementary lighting to allow natural behaviour patterns and monitoring of the cattle.

This looks at having the proper equipment for the safety of cattle when working or moving them. The good side of this requirement is that by having the right equipment to move or work cattle safely, generally means that the producer is also safer. Dry comfortable resting areas, with no slip flooring may take a bit of adjustment on some set ups but will generate benefits in gain. The air quality and stocking densities will also pay dividends in cattle comfort and gain for the producer.

The last set of requirements in the animal environment section deals with calving cows and the facilities needed …

REQUIREMENTS

Provide an environment that is safe and clean for calving and that promotes calf survival.

Again this requirement is very much in the self-interest of the producer. If calves don't live there isn't anything to sell but rather bills to pay. It doesn't say you need a sterile hospital pen, but rather a safe and clean environment. If you are calving the cows on grass, on a nice sunny day in May you have more than exceeded the requirements. However, if it is minus 35°C and a howling wind then certainly shelter and bedding is required.

Overall, when you look at the requirements in this first chapter of the code, they seem pretty reasonable. They all work toward cattle being more comfortable, thus gaining better and creating better returns for the producer. They are not prescriptive on how you do it, but that you do achieve the desired outcome. Some accommodations will be short term while some changes may be a long term solution to meeting the code. Examples of this will be the very cold weather in Dec-Jan -Feb. In the short term this year it may have meant you put out extra or better hay. Or maybe you just rolled an extra bale out on the snow. You may also have provided more bedding or moved the herd to a bush lot.

Figure 3. Provide a clean, safe environment for calving

In the long term, however, you may be taking a look at the selection criteria you have for your replacement heifers and new herd sires. Are they the cattle that are best suited to your farm or area? How about the temperament of the cattle? Easy keeping, quiet cattle, which lay down lots of fat in the fall, go through the cold a lot better. Have you ever wondered what the R-value is for cows that have snow on their backs that isn't melting? How much insulation is between core body temperature, a layer of fat, a thick hide, a thick hair coat and the snow on top? The calving season may be another long term adjustment on your farm. If you are staying with winter calving to reap the benefits of large calves for the fall sales, you will need to consider extra facilities, windbreaks and lots of good quality feed and bedding. Moving to spring calving will require less facilities but will mean your marketing will need to change. All these decisions need to be decided through the lens of the whole farm economics.

Work through the code one chapter at a time. When you de-code it into manageable pieces it isn't nearly as daunting. Much of it you may already be doing or can easily achieve. The rest you can plan for how to implement. Then try to use those changes to improve your returns by lowering your cost of production or getting more for a welfare-managed branded product.

The beef industry itself will continue to change as the code gets implemented. Proactive producers will use this code to help market their beef to consumers, with an assurance of how much we care for our animals, and how we do it.

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The Greenhouse Effect and Crop Heat Unit Trends in Northern Ontario

Tom Hamilton, Beef Program Lead – Production Systems, OMAF and MRA

Climate and Change

While **weather** is based on short term measures of atmospheric conditions such as temperature, precipitation and cloud cover, **climate** refers to the long term averages for these factors. Since the weather is quite variable on a day to day basis, it can be difficult to detect long term trends without utilizing accurate, long term records. Scientists who study the long term patterns in climate (climatologists) have found that overall, the earth's climate has warmed since the early1900s, with some dips in the overall trend. The consensus of climatologists is that the average temperature of the earth (lower atmosphere) has risen by 1.4° F. in the last hundred years. While this may not seem like a lot, it can have a big impact on the length of the growing season and the heat available to stimulate plant growth.

Why is It Getting Warmer?

This warming trend is associated with a steady increase in the amount of carbon dioxide (CO_2) (and some other gases) in the atmosphere. When energy from the sun's rays strikes the earth's surface, some of the energy which is initially absorbed by the earth is emitted back into the atmosphere in a form which can be absorbed by these gases. Higher levels of these gases results in more of this energy being trapped instead of being lost into space, warming the atmosphere.. This is called the "Greenhouse Effect", and the gases are called Greenhouse Gases (GHG). And since the level of GHG is expected to keep rising, it is predicted that average temperatures will continue their upwards trend for at least the next 100 years.

Figure 1. CHU Data Collection Locations

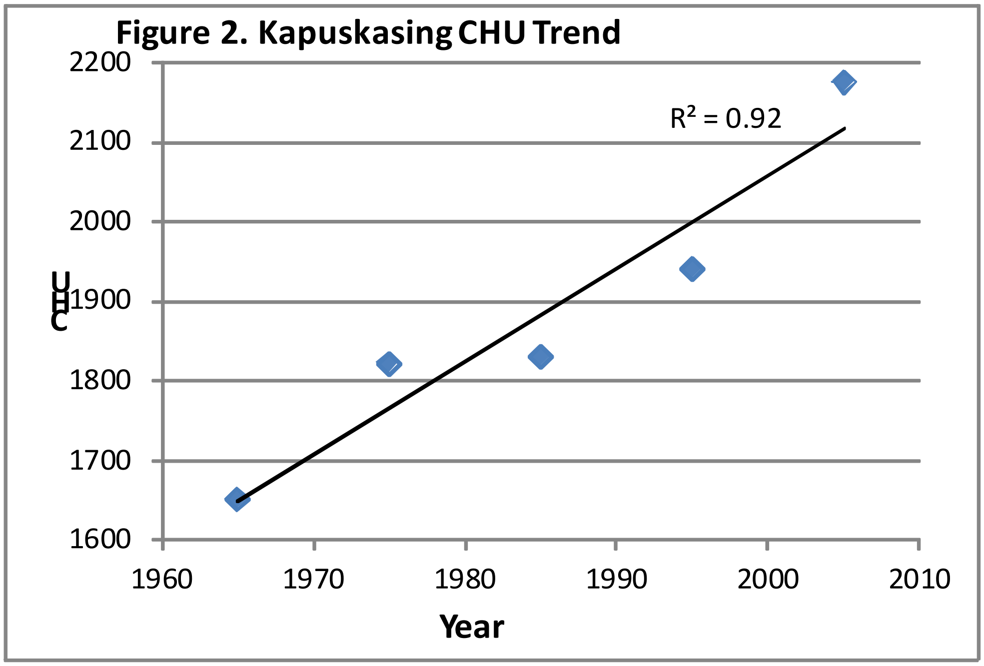
How Does Climate Change Affect the North?

In general, the magnitude of the temperature change associated with the Greenhouse Effect increases with distance from the equator. This has been evident in the dramatic decreases in the amount and duration of seasonal ice cover in the Arctic. Northern Ontario's agricultural regions, at about 46 to 49° latitude (N) lie in the temperate zone, a little over halfway between the equator and the north pole. At this latitude, the effects of climate warming would be expected to be significant. And since crop production in this region has traditionally been hampered by a short, cool growing season, even modest increases in heat could result in significant benefits.

In order to evaluate the impact of climate warming across Northern Ontario, Crop Heat Unit (CHU) data from 5 locations across the North were reviewed and graphed to determine trends over time (Figure 1). Crop Heat Units are a good measure of the growth and maturing potential of warm season crops such as corn and soybeans. The data for North Bay, Sault Ste. Marie and Kapuskasing covered the past 50 years, while data for Thunder Bay and Rainy River included only the past 16 years.

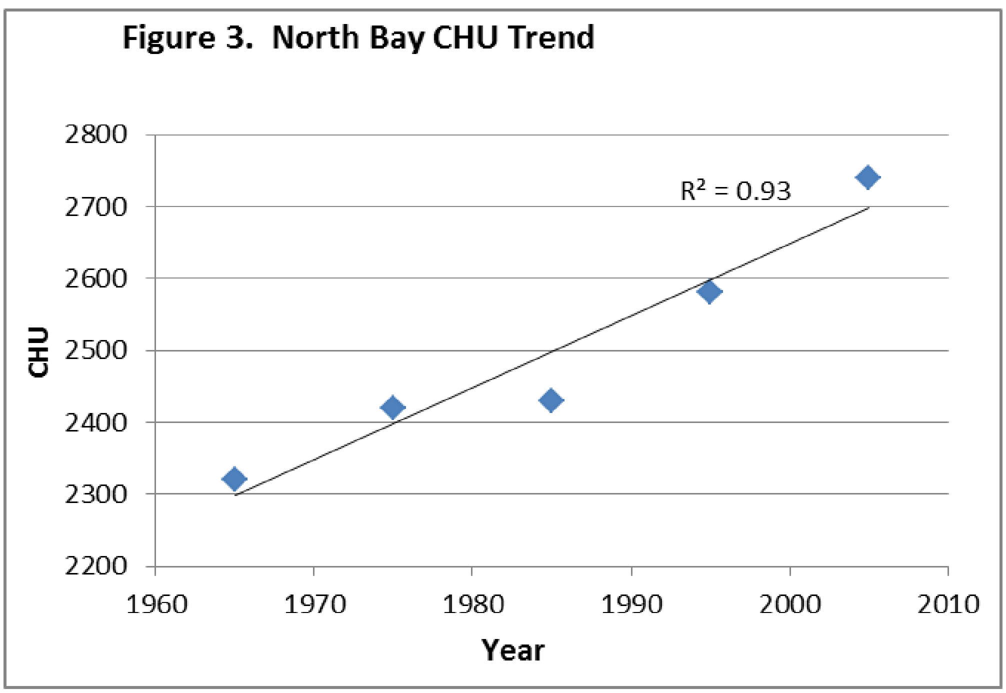
CHU Trends

Both Kapuskasing and North Bay displayed a consistent positive trend, with CHU increasing significantly over time. For Kapuskasing, the rate of increase was 117 CHUs per decade (Figure 2). From 1965 to 2005, seasonal CHUs increased from approximately 1650 to 2150.



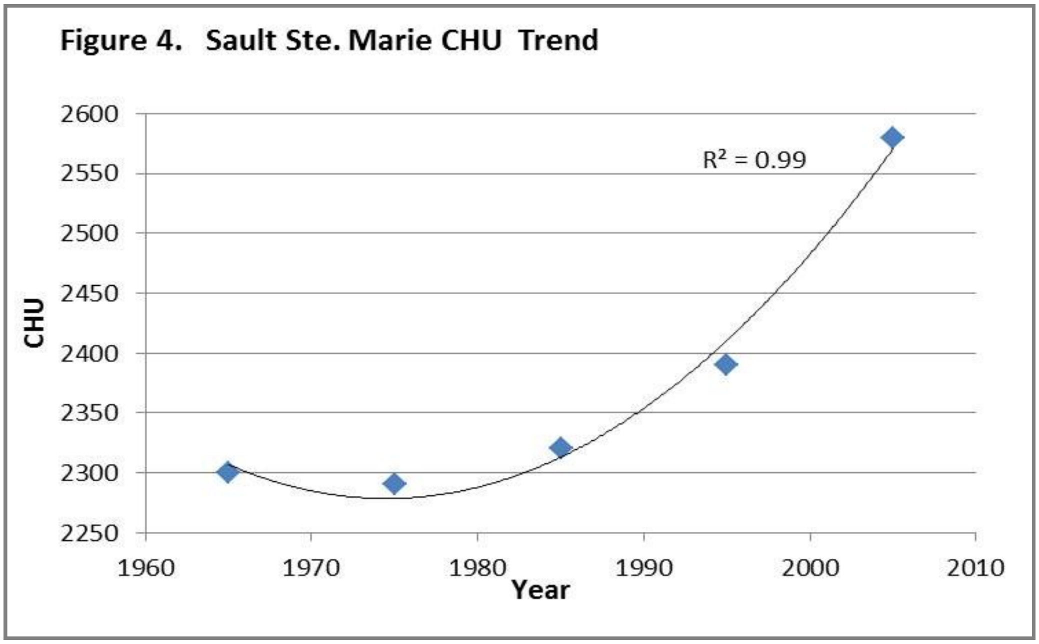
Adapted from Bootsma, A., 2013. Eastern Cereal and Oilseeds Research Center, Ottawa.
Final Report, 2013

The trend for North Bay was an increase of 100 CHU per decade, going from approximately 2300 to 2700 CHU from 1965 to 2005 (Figure 3).

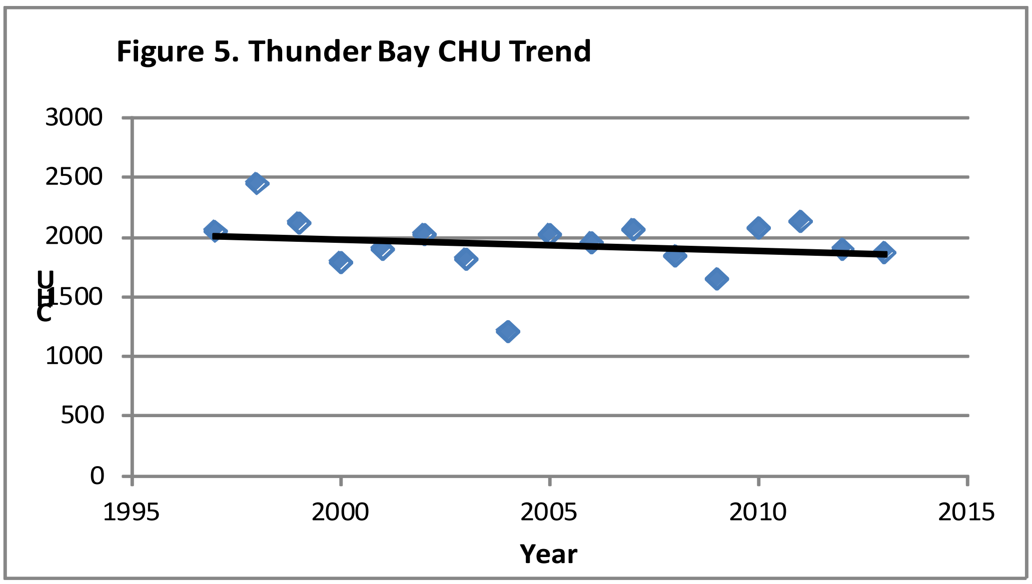


Adapted from Bootsma, A., 2013. Eastern Cereal and Oilseeds Research Center, Ottawa.
Final Report, 2013

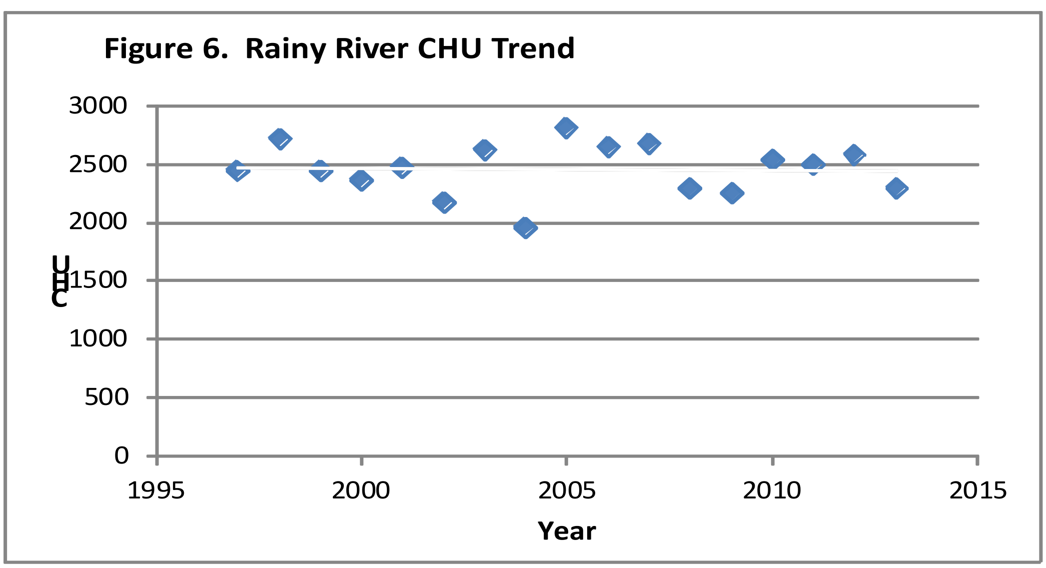
Sault Ste. Marie CHUs show a different pattern, exhibiting a trend which had little change in CHUs from 1965 to 1985, followed by a sharp increase from 1985 to 2005 (Fig. 4). The rate of increase from 1985 to 2005 was approximately 130 CHU per decade.



Adapted from Bootsma, A., 2013. Eastern Cereal and Oilseeds Research Center, Ottawa. Final Report, 2013



Based on data from Thunder Bay Agricultural Research Station.



Based on data from Emo Research Station.

In contrast to the other 3 stations, data from Thunder Bay and Rainy River showed no significant change in seasonal CHU from 1997 to 2013 (Figures 5 and 6).

The increase of 300-400 heat units at Kapuskasing, North Bay and Sault Ste. Marie have had a significant effect on the yield of and type of crops which can be grown at these locations. For example, canola is now grown in the Kapuskasing area, while grain corn and soybeans are part of cropping systems in the New Liskeard area. This is in contrast to a couple of decades ago, when field crops in these areas were dominated by cereal grains such as barley and oats. Surprisingly, the 2 stations in the Northwest have not experienced any change in CHU over the past 15 yrs.

Why the Differences Between Northwest and Northeast Locations?

Hudson's Bay exerts a large cooling effect on the climate of Northeastern Ontario, with the effect increasing the closer a location is to the Bay. The Bay freezes over in the winter, creating a light coloured surface that reflects a lot of solar radiation, leading to colder air temperatures, and forming a mass of ice which takes a long time to melt in spring, slowing the advance of spring. However, the ice free period on Hudson's Bay has increased steadily during the last several decades, with the ice forming later in fall and melting earlier in spring. This has had a warming effect on the surrounding landscape due to a shortening of time during which the "refrigerator effect" is happening, and by increasing the length of time the darker (ice free) water surface is available to absorb solar radiation. As well, the Bay is a relatively shallow body of water which heats up more quickly than a deeper body of water would.

Since Kapuskasing is much closer to Hudson's Bay than the other stations, it has likely experienced a greater effect from changes in ice cover in the Bay than the other locations. North Bay is likely influenced to a weaker extent by Hudson's Bay. Sault Ste. Marie presents an interesting case, located close to 3 Great Lakes. They may be responsible for moderating the climate from 1960 to 1980, when the earth's overall warming trend overcame that effect, with warming then occurring at a rapid rate up to the present. Thunder Bay is located on Lake Superior, a large volume of cold water which would tend to slow the impact of any global temperature increase. Rainy River is located far from Hudson's Bay and relatively far from Lake Superior. The reason for it experiencing no change in annual CHUs, compared with the increases in the Northeastern locations is not clear.

Based on the data reviewed for this article, the growing conditions in Northeastern Ontario have improved markedly over the last 30-40 years, resulting in improved crop yields and widening the array of crops which can be grown. In contrast, Northwestern Ontario locations have not seen any change in growing conditions over the shorter time frame for which data was available.

[i]Pearson, David. Climate Change in Northern Ontario. Kapuskasing Agricultural Symposium, 2013.

Thanks to Rudy Buitenhuis, OMAF and MRA for Thunder Bay and Rainy River data.

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Growing Forward 2 | Cultivons l'avenir 2

Growing Forward 2 Funding Assistance Program for Producers, Organizations and Collaborations

Growing Forward 2 (GF2) is a federal-provincial-territorial program aimed at encouraging innovation, competitiveness and market development in Canada's agri-food and agri-products sector. In Ontario, farm, food and bioproduct businesses, collaborations and organizations can build their own plan and select opportunities to help grow their profits, expand their markets and manage risks.

Areas of Focus for GF2 Funding Assistance
Producers, organizations and collaborations can apply for funding assistance in six focus areas, with an emphasis on innovation:

- Environmental and Climate Change
- Assurance Systems (Food Safety, Traceability and Animal Welfare)
- Market Development
- Animal and Plant Health
- Labour Productivity Enhancement
- Business and Leadership Development

Capacity Building Funding Assistance
Cost-share is available to support eligible clients to acquire additional skills, to undertake in-depth assessments and audits, and to develop business plans.

Building capacity helps prepare clients to apply for further cost-share to implement a project. Applications for capacity building funding assistance will be accepted on a continuous basis.

Some examples of Capacity Building activities are:

- Cost-share fees for qualified consultants (e.g. Professional Engineer) to conduct an assessment.
- Produce a written report and plan that provides recommendations for implementing improved irrigation and fertigation management BMP's (e.g. field and greenhouse operations).
- Energy Use Assessment for existing farm buildings that will reduce the dependency on power and fossil fuels and reduce greenhouse gas emissions.
- Prevention plan for Wildlife Damage - help reduce crop, livestock or property damage caused by managed wildlife species.
- Market Assessment, Marketing Plan, Communication Material Design.
- Integrated Pest Management Planning.
- Cost of Production Assessment.
- Succession Plans, Expansion Plans, Human Resources Plan, Business Plan.

Implementation Funding Assistance
Clients may be eligible for cost-share for projects that help to achieve their business goals. Applications for project implementation will be reviewed and assessed based on merit. Having a detailed business and/or workplan, budget and applicable permits and approvals in place prior to submitting an application will increase your success in securing cost-share.

Individual farm businesses may be eligible to receive up to $350,000 over the five-year program (April 1, 2013 to March 31, 2018)

Producers are strongly encouraged to attend a free capacity building workshop such as the Canada-Ontario Environmental Farm Plan (New 4th edition) and Growing Your Farm Profits workshop.

Please visit the GF2 website at: www.ontario.ca/growingforward2

You can access a full listing of programs and services for Ontario farmers
on the website at www.omafra.gov.on.ca/english/busdev/facts/progserv.htm or by calling the Agricultural Information

Important Dates:

Capacity Building Funding Assistance – ongoing intake from all eligible clients

Implementation Funding Assistance intakes for producers

April 1, 2014 to May 1, 2014

August 4, 2014 to August 28, 2014

November 10, 2014 to December 11, 2014

Implementation Funding Assistance intakes for processors

February 3, 2014 to May 1, 2014

May 5, 2014 to August 28, 2014

September 1, 2014 to December 11, 2014

Implementation Funding Assistance intakes for organizations and collaborations

January 31, 2014 to March 13, 2014

March 14, 2014 to April 1, 2014

April 2, 2014 to June 3, 2014

June 4, 2014 to August 28, 2014

August 29, 2014 to October 16, 2014

October 17, 2014 to December 11, 2014

Ontario Livestock Manifest

The Canadian Cattle Identification Agency has spearheaded the development of the Cattle Industry Traceability Plan for the furthering of cattle traceability in Canada. As part of the implementation, the Plan assumes that a common shipping manifest containing key pieces of ownership and traceability information is in place in all provinces. This common manifest would be used for commercial livestock tracking purposes, as well as include information that could be required under future traceability regulations.

Recognizing that Ontario does not currently have such a manifest, an industry led group was formed to develop one for the Ontario livestock sector. The group is comprised of representatives from the Ontario Cattlemen's Association, Ontario Cattle Feeders Association, Ontario Livestock Dealers Association, Ontario Livestock Auction Markets Association, and Ontario Trucking Association, as well as the Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs.

The group has collaborated to draft a manifest that contains all of the key data elements called for by the national Plan. The manifest has been developed as a triplicate form, allowing copies to be kept by the shipper, transporter and receiver of the animals and is bound in books of 25 manifest sets.

Use of the manifest is completely voluntary and the information is not required to be reported. However, the use of a common shipping manifest provides many benefits:

- It provides proof of shipment, which could prove important in the event of a non-payment.
- It provides multiple party verification in the event of a dispute regarding the number of animals shipped or received, the type of animals, etc.
- The use of a common form that can be accessed could shorten response times in the event of an animal health emergency.
- It brings Ontario into alliance with the national Cattle Industry Traceability Plan and prepares for potential future federal traceability regulations.

The manifest is being distributed through Service Ontario at no charge (shipping charges apply). To order, contact Service Ontario at www.publications.serviceontario.ca or 1-800-668-9938 and order publication number 018681. The manifest will also be available from some auctions, dealers and producer organizations.