

2013

COEXISTENCE PLAN

FOR ALFALFA HAY IN EASTERN CANADA

PLANNING FOR CHOICE

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PLANNING FOR CHOICE

THREE PRODUCTION SYSTEMS CAN COEXIST FOR HAY PRODUCTION IN EASTERN CANADA

Canadian farmers benefit from a diversity of markets and an array of production methods are used to capture these markets. The Coexistence Plan for Alfalfa Hay in Eastern Canada is intended to give farmers choices when serving their markets.

The Coexistence Plan seeks to prepare farmers for the arrival of genetically modified (GM) alfalfa in Canada, and to establish a set of Best Management Practices (BMPs) to allow GM alfalfa hay production systems to be successful and coexist with non-GM alfalfa production systems.

Coexistence plans establish guidelines and best management practices that, when followed, allow crop producers to successfully establish and/or maintain the production systems that best serve their operations and their current and future markets.

This brochure is designed to help farmers understand and follow these newly established BMPs. It also contains a tear-off checklist to aid farmers in following and recording these best management practices on their farms.

BACKGROUND

Ontario and Quebec comprise over 70% of Canada's dairy industry¹ which is the primary market for alfalfa hay and is the focus of interest for the commercializer of genetically modified alfalfa. This coexistence plan serves the potential introduction of GM alfalfa hay into Eastern Canada. **It does not serve GM alfalfa seed production or the introduction of any GM alfalfa to Western Canada.**

This coexistence plan has been designed through a value chain process with a focus on alfalfa hay in Eastern Canada. Alfalfa is a cross-pollinated perennial crop that is grown throughout Canada. Although GM crops such as corn and soybeans have been grown in Canada for several years, there are no GM perennial crops or forages currently licenced for sale in Canada. However, alfalfa which has been genetically modified to be resistant to the glyphosate herbicide; Roundup® (Roundup Ready® Alfalfa) was given full approval for food, feed and environmental release in 2005 and the herbicide was approved for over-the-top use on Roundup Ready® Alfalfa in 2012. This product is therefore the closest to commercialization in Canada.

It is acknowledged that there are very strongly held views on both sides of the debate on GM alfalfa. This plan does not advocate for or against the commercialization of GM alfalfa. Nor does it favour one production system over another. This plan strives to anticipate the future. Its purpose is to identify clear practises that will allow all alfalfa hay production systems to be successful in Eastern Canada.

PRINCIPLES OF COEXISTENCE

1. The goal of coexistence planning is to provide producers with freedom of choice and opportunity to pursue diverse markets.
2. Coexistence plans will be based on good communication and mutual respect between neighbours, individuals and companies who have opted for different approaches to production, to capture different market opportunities (e.g. organic, conventional and biotechnology)
3. Coexistence standards/practises/tolerances must be practical, achievable and economically feasible, and must be focussed on market opportunity. They are not meant to address health and safety of food, feed and the environment. This is the focus of regulation in Canada.
4. Coexistence plans are built on science based stewardship programs and tools for monitoring the efficacy of such programs.
5. Those who benefit from each system must accept the responsibility for implementing the practises required to achieve a coexistence standard.

ALFALFA HAY PRODUCTION SYSTEMS IN EASTERN CANADA

I. ORGANIC ALFALFA HAY PRODUCTION IN EASTERN CANADA

Agricultural products in Canada must be certified in order to be labelled with the word “organic” or to carry the Canada Organic logo. The regulatory requirements for organic certification are outlined in the Canada Agricultural Products Act, Organic Products Regulations, 2009 (SOR/2009-176). For all organic crop production systems, the requirements are stated in CAN/CGSB-32.310-2006 (Organic Production Systems - General Principles and Management Standards) which includes:

- Designating land use to include buffer zones or other physical barriers to prevent contact with prohibited substances
- Minimizing the physical movement of prohibited substances from neighbouring areas onto organic farmland and crops
- Maintaining the fertility and biological activity of soil through crop rotations practices such as plough-down, legumes, catch crops or deep-rooting plants
- Managing crop pests, weeds and disease centred using cultural practices and mechanical techniques, while also adhering to CAN/CGSB-32.311, Organic Production Systems – Permitted Substances Lists
- Using organic seed and planting stock, except in cases where organic seed is not commercially available. In these cases, non-organic seed may be used as long as it is untreated or treated with allowable substances

Organic regulations contain a zero tolerance to any genetically modified (GM) materials and products in Canadian certified organic crop production. The Organic Production Systems –General Principles and Management Standards² states:

1.4.1 When producing or handling organic products, it is forbidden to use any of the following substances or techniques:

a. all materials and products produced from genetic engineering as these are not compatible with the general principles of organic production and therefore are not accepted under this standard, except for vaccines only that have been grown on genetically engineered substrates but are not themselves a product of genetic engineering, as specified in CAN/CGSB-32.311, Organic Production Systems – Permitted Substances Lists

In order for a product to be certified as organic in Canada, a federally accredited certification body must verify that the production and processing of the product complies with all of the Canadian Organic Standards.

Production of Organic Hay - In Canada, the production of organic alfalfa is estimated to be 2.4% of total alfalfa production³. Exact acreage of organic alfalfa production in all of Eastern Canada could not be obtained, but several pieces of data can be used to estimate production. The breakdown of organic forage production in Ontario is shown in Table 1. The total acreage of organic alfalfa and other forages in 2010 was 17 703 hectares, which is 1.4% of the total alfalfa acreage in Ontario⁴. Although not a large portion of the total alfalfa production area, organic alfalfa production is an important sector in some areas of the province.

TABLE 1: AREA OF CERTIFIED ORGANIC FORAGE PRODUCTION IN ONTARIO IN 2010

LAND USE	ACRES	HECTARES
Hay / pasture	33 499	13 556
Pasture	2 408	974
Hay	3 935	1 592
Green manure / plowdown	3 516	1 423
Total organic forages Ontario	43 745	17 703

Source: "Certified Organic Production Ontario 2010" by Anne Macey for the Organic Council of Ontario. Data was compiled from certification bodies throughout the province. Numbers have been rounded to the nearest whole number.

In Quebec, the total acreage certified for organic crop production in 2010 was 42 492 hectares, with an average organic farm size of 68.95 hectares⁵. These numbers are quite similar to the organic sector in Ontario in 2010, which had a total acreage of 49 911 hectares and an average organic farm size of 72.86 hectares⁴. Based on the similarities in the average farm size and the total organic acreage, it is estimated that the production of organic alfalfa in Quebec is in the same order of magnitude as Ontario organic alfalfa production. In 2009, Atlantic Canada had a total 153 certified organic farms with 8 076 hectares of total farmed land⁶.

Uses of organic alfalfa hay - The predominant use of organic alfalfa hay is feed for organic livestock production, either as dry hay, silage or pellets. Alfalfa is also an important green manure or plow down crop in organic crop rotations. Organic hay is processed into soil fertility amendment pellets and alfalfa leaves are also marketed as a health food product or dietary supplement.

Current and potential markets for organic alfalfa hay - The number of acres in certified organic production in Quebec rose dramatically between 2006 and 2008, but remained constant for the period 2008-2010⁵. Similarly, the number of certified organic farms in Ontario rose dramatically between 2002

and 2007, but remained relatively unchanged for the period between 2007 to 2010⁴.

The largest market for organic forages in Ontario and Quebec is organic dairy feed, and so the future market for organic alfalfa hay depends largely on the demand for organic milk products. The amount of organic milk produced in Ontario rose from 45000 hectolitres (hl) in 2000 to 255768 hl in 2010, but with surplus production in some areas of the province, organic dairy production in Ontario is not expected to grow in the near future⁴. In 2011/2012, Atlantic Canada produced 1% of the organic milk in Canada, but this number is expected to grow as more producers become certified⁶. The global organic dairy product industry, valued at \$7 billion in 2009, is expected to expand with increasing demand in emerging markets such as Brazil, China and India⁷.



2. CONVENTIONAL ALFALFA HAY PRODUCTION IN EASTERN CANADA

Production - Alfalfa and alfalfa mixes account for 15% of the total crop land in Eastern Canada, excluding pasture¹. Although Eastern Canada produces less than 20% of the alfalfa in Canada¹, the value of the hay industry in Eastern Canada is estimated to be \$1.2 billion⁸. Table 2 shows the acres of land in Eastern Canada devoted to alfalfa and other forages.

TABLE 2: AREA OF ALFALFA AND OTHER FORAGES IN CANADA

LAND USE	CANADA		EASTERN CANADA		% OF TOTAL ACREAGE LOCATED IN EASTERN CANADA
	acres	hectares	acres	hectares	
Alfalfa and alfalfa mixtures	11 230 105	4 544 662	2 130 579	862 215	18.97%
Irrigated alfalfa, hay & pasture	550 260	222 682	2 495	1 009	0.45%
Tame or seeded pasture	13 671 483	5 532 652	1 080 175	437 141	7.90%
Total	25 451 848	10 299 996	3 213 249	1 300 365	

Source: Statistics Canada. Census of Agriculture 2011.

Uses of conventional alfalfa hay - Alfalfa hay is premium forage for dairy cattle and horses. Typically, 85-90% of alfalfa hay is fed to on-farm livestock, 5-10% is destined for farm-to-farm sales, while 5% is sold for export⁹. Alfalfa is generally fed in the form of hay or silage, but can also be used as a pasture crop, or processed as alfalfa pellets or cubes. Alfalfa is also used in crop rotation to improve soil structure and add fixed nitrogen to the soil.

Current and potential markets for conventional alfalfa hay and hay products: Processing -

There are two types of alfalfa hay processing: alfalfa dehydration and hay compaction. Processed products include dehydrated alfalfa meal and pellets, sun-cured alfalfa pellets, alfalfa cubes, and compressed bales of alfalfa or mixed hay. Most processing facilities concentrated in western Canada, but some processing done in eastern Canada (specifically Ontario, Quebec and New Brunswick). A 2010 report estimated the number of processing facilities in Eastern Canada as follows: Ontario – 1 low density

press, 1 cuber and 1 pelleter; Quebec – 1 double compressor, 2 low density press and 1 pelleter; Maritimes – 1 pelleter¹⁰.

Current and potential markets for conventional alfalfa hay and hay products: Domestic -

In Eastern Canada, the primary markets for alfalfa hay are the dairy industry, the horse industry, and other livestock, such as beef cattle, dairy goat and sheep. Each market has different requirements for hay quality. The dairy industry prefers nutrient quality over quantity, while the horse market prioritizes mould-free and dust-free hay. Alfalfa hay may potentially be used as a source of biomass to supply the domestic and EU markets for biomass pellets for combustion. Future markets may also include the use of alfalfa biomass for incorporation into plastics and other bioproducts.

Current and potential markets for conventional alfalfa hay and hay products: Export -

Alfalfa hay is generally exported as dehydrated meal, pellets

and cubes or compressed bales. The hay export market accounts for approximately 5% of Canada's forage export market. Japan and the United States comprise Canada's main export market, followed by several smaller markets (Figure 1). A recent study indicated that in 2011, less than 50,000 tonnes of the 5.4 million tonnes of hay produced in Ontario were exported. (Less than 1%)¹¹. The export market in Ontario and Quebec is predominantly for Eastern US dairy and equine markets, Florida equine market and EU markets. The export market for conventional hay in Atlantic Canada is predominantly for the French Islands, Saint Pierre and Miquelon¹⁰.

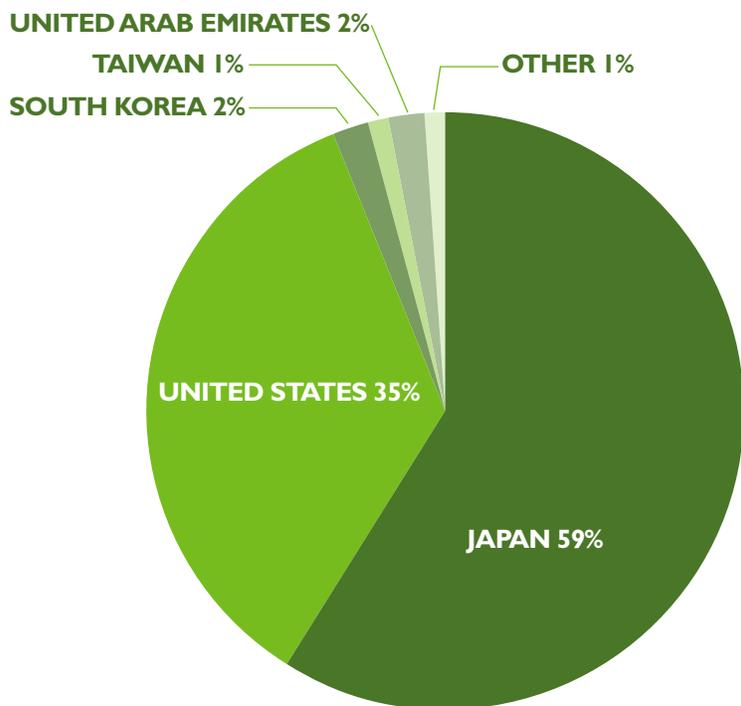


FIGURE 1: MAJOR FORAGE EXPORT MARKET FOR CANADIAN HAY (2009).

Data source: Statistics Canada 2010.

The first export of Canadian forage to China occurred in 2012, and demand for imported forages in China is expected to grow as China's dairy production grows. Most exports of hay to Asia are from Western Canada because of the large transportation advantage that Western producers have to Asian markets.

The Middle East is also expected to increase forage imports as domestic production decreases because of water restrictions. The Middle East may be a potential market for hay from Eastern Canada. Export to markets in Europe is not as lucrative, as the price per tonne is lower.

Of Canada's forage export markets, there is varying tolerance for GM technology. The EU has a zero tolerance policy for non-approved GM seed, while the Roundup Ready® trait is approved in both the United States and Japan. Despite its regulatory approval, some export customers may have different requirements for the presence of GM material in hay. Some producers at the coexistence workshop indicated that their export customers specifically request GM-free hay.



3. GENETICALLY MODIFIED ALFALFA HAY PRODUCTION IN EASTERN CANADA

Production of GM alfalfa hay - No GM alfalfa varieties have been registered for sale in Canada. In 2011, a few small demonstration trials of Roundup Ready® alfalfa (RRA) were grown in Ontario and Quebec to evaluate the suitability of GM alfalfa for the dairy forage market.

Uses of GM alfalfa hay - The first product being considered for release in Canada, Roundup Ready® Alfalfa (RRA), allows for weed control in alfalfa stands by the application of Roundup® herbicide over the top of alfalfa. The uses of GM hay are the same uses as conventional hay, namely: dairy, horse and other livestock feed. The potential uses of Roundup Ready® hay are anticipated to be the same as conventional potential markets, livestock feed, processing and biomass.

Other biotechnology traits are currently in the pipeline; for example, a GM reduced lignin alfalfa variety has been developed by Forage Genetics International. Reducing the lignin content in alfalfa increases fiber digestibility, and this and other new GM varieties may permit new uses for alfalfa hay in Eastern Canada.

Domestic and export approval status - Regulatory approvals for the importation of RRA

feed and/or food purposes has been granted by Japan, Canada, Mexico, Korea, Philippines, Australia, the United States and New Zealand. None is required at the present time for feed import to Taiwan.

China currently does not allow importation of RRA, but approvals are in process. Several other importing countries (e.g., UAE, Saudi Arabia, Costa Rica) have no government approval process so regulatory approvals per se cannot be obtained for RRA at this time.

With the exception of the specialty livestock market sector (e.g., organic, grass fed, GM free), most Asian producers are currently importing and feeding other Roundup Ready and GM trait feedstuffs to their dairy and livestock. This includes corn, cottonseed, soybean, and several other GM products, primarily for livestock feeds. RRA does not differ substantially from these other products, since it contains the same gene.

Although there are no regulatory restrictions on the importation of RRA into Japan and several other major importing countries, export buyers have made decisions not to purchase RRA since its inception in 2005. Some have stipulated in their contracts that the hay be non-GM. Some importers have rejected RRA (or at least expressed preferences for non-GM alfalfa) due to concerns about the sensitivity of their markets.



THE BIOLOGY OF ALFALFA – POTENTIAL FOR GENE/POLLEN TRANSFER

In order to ensure that producers have access to both GM-tolerant and GM-sensitive markets, genetic purity must be maintained. In order to understand the potential for undesirable gene flow of transgenic material into non-GM crops, the specific biology of alfalfa must be examined. This section describes the key aspects of alfalfa biology and examines their relevance to the establishment of a coexistence plan for the production of organic, conventional and GM alfalfa hay in Eastern Canada using a science-based approach.

Alfalfa Reproduction: Flowering and Pollination - Alfalfa seed is formed predominantly by cross-pollination and relies on insects to “trip” the flowers to release pollen¹⁵. Two of the five alfalfa flower petals form a “keel” that encloses the reproductive organs, and the disruption of these petals by pollinating insects causes the stamens to be released from underneath the petals and pollen is released¹². Tripping the flower also causes a membrane on the stigma to break, permitting fertilization¹³. Alfalfa has varying degrees of self-incompatibility, and self-fertilization may occur, although this typically results in fewer and less competitive seeds than cross-pollinated cases.

Because of the alfalfa floral structure, alfalfa requires an insect pollinator to visit each flower. Wind alone cannot act as a pollinator¹². Gene flow from a GM crop would require the insect-mediated tripping of a GM flower and the subsequent carrying of that pollen by an insect, by wind, or by other means (such as adherence to machinery) to a susceptible non-GM alfalfa plant. This pollen flow still does not equal gene flow, as the GM pollen would have to successfully land on a female floral pistil, fertilize the ovule, and produce seed¹⁵.

Alfalfa Seed: Hard Seed and Autotoxicity - In the Eastern Canadian environment, post-fertilization, alfalfa requires 6 to 8 additional weeks to develop viable seed, depending on growing conditions and varietal differences¹⁵. Alfalfa seed is contained in a coiled, non-shattering pod. Seed dispersal is local and not likely to be dispersed by the wind. Seed dispersal by animals feeding on ripe pods is possible. As managed hay fields are generally harvested long before seed maturation, dispersal of seed by animal feeding is unlikely to occur in the context of GM-alfalfa hay fields.

For harvested alfalfa seed, a portion of every lot is considered “hard seed” which displays post-harvest dormancy. This hard seed may remain dormant after planting, but can often subsequently germinate in field conditions, and may represent a source of volunteer alfalfa plants in following crops. The appearance of GM alfalfa from hard seed in a field's following crops is a topic for best management practices.

The phenomenon of autotoxicity refers to the release of compounds by an alfalfa plant and alfalfa debris that prevent the germination of alfalfa seeds in close proximity to an existing alfalfa stand. This autotoxic effect has implications for alfalfa best management practices with regards to feral populations, as seeds produced by feral plants would experience low germination rates due to the autotoxic compounds produced by the feral stand.

Alfalfa Populations: Cultivated and Feral Populations in Eastern Canada - There are no known wild relatives of alfalfa that may cross-pollinate with cultivated alfalfa, however one potential source of gene transfer is through the cross-pollination from GM plant pollen with feral alfalfa in roadsides or ditches. In Eastern Canada, few alfalfa plants are found outside of the field, and feral alfalfa is not expected to be a major risk for GM gene flow⁸. In addition to the relative scarcity of feral populations, alfalfa is not a good seed producer in Eastern Canada and auto-toxicity would prevent feral/GM alfalfa seedling establishment. Another potential source of GM pollen

is volunteer alfalfa in the crop following a GM-alfalfa crop. Because hay fields are harvested pre-bloom or in early bloom, it is unlikely that a mature viable seed would be produced from a GM hay crop. Volunteer plants may result from delayed hard seed germination as described in the 'Hard Seed and Autotoxicity' section above, or from the re-growth of the previous alfalfa stand. The management of volunteer alfalfa using best practices should be considered in coexistence planning.

ROUTES TO UNINTENDED LOW LEVEL PRESENCE OF GM ALFALFA

There are several ways the Roundup Ready trait could occur as low level presence (LLP) in conventional alfalfa hay. These could be from seed co-mingling during planting of a hay crop, pollen flow during hay production, rotation of a non GM crop after production of a GM alfalfa crop, and inadvertent mixing of GM alfalfa and conventional hay during harvest, transportation, and storage. Of these, a low level presence in seed and the possibility of mixing hay after harvest are clearly the most likely routes to LLP (and the most easily addressed). Adventitious presence due to pollen flow and crop rotation problems are less likely sources of LLP due to a range of biological factors.

MITIGATING THE RISK OF LOW LEVEL PRESENCE WITH BEST MANAGEMENT PRACTISES

Coexistence plans establish guidelines and best management practices that, when followed, assist producers to successfully establish and/or maintain the production systems that best serve their operations and their current and future markets, whether they are

producing hay for organic or conventional markets or are making use of modern biotechnology.

It is acknowledged that there are very strongly held views on both sides of the debate on GM alfalfa. This plan does not advocate for or against the commercialization of GM alfalfa. Nor does it favour one production system over another. This plan strives to anticipate the future. Its purpose is to identify clear practises that will assist all alfalfa hay production systems to be successful in Eastern Canada.

COMPLIANCE REQUIREMENTS

It is mandatory for producers who choose organic or genetically modified (GM) production systems to adhere to strict compliance measures established either in regulation (organic certification) or in contracts (organic and GM systems). These contracts and regulations generally contain detailed stewardship requirements. In most cases, these regulations and contracts also include agreement to provide access to production fields, storage and handling facilities to monitor compliance, and they include penalties for non-compliance.

It is important that producers fully understand these requirements, and agree to comply with them. It is equally important that the contracts for the use of GM product are monitored by the seed supplier and that early steps are taken to correct non-compliance.

VOLUNTARY BEST MANAGEMENT PRACTISES

The use of these voluntary Best Management Practises, including good record keeping, will assist producers to comply with regulatory and contract requirements; and to employ management practises that are designed to enable producers to continue to have the choice of production system that best meets the needs of their businesses, farming operations and customers.

BEST MANAGEMENT PRACTISES FOR PRODUCTION OF GENETICALLY MODIFIED ALFALFA

A Record Keeping

- To ensure confidence that the BMPs have been followed, maintain accurate records of production practises. A check-list has been developed to facilitate record keeping (see page 14).

B Preventing Adventitious Presence (AP)¹ at Planting

- If you choose to plant GM alfalfa, you will be required to sign a technology use agreement and agree to comply with stewardship requirements.
- Do not plant GM alfalfa seed for the purpose of seed or alfalfa sprout production.
- Do not plant GM alfalfa in wildlife feed plots or in any area where the alfalfa will not be actively managed to ensure timely cutting.
- Ensure that the GM seed you purchase is clearly identified to distinguish it from organic or conventional alfalfa seed. The commercializing company has indicated that the seed will be coloured purple.
- Record all alfalfa seed purchase dates and source of supply, and keep pedigreed seed tags.
- Thoroughly clean planting equipment to ensure that it is free of any unknown alfalfa seed.
- Do not load or clean planting equipment that has been used for GM alfalfa seed in or adjacent to conventional or organic fields, or in areas where non-GM seed is stored. Dispose of the products of cleaning by burial (or planting) in the centre of the GM field; deep burial outside of the field; or return the material to the seed supplier for disposal.
- It is recommended that seed suppliers accept the return of all unopened GM seed. If you choose to retain unused GM seed, store it apart from conventional and organic seed in a sealed and clearly labelled container, or dispose of it in the manner described above for products of cleaning².

C Reducing the Risk of AP from Gene Flow

While the risk of gene flow is considered to be low for most hay production systems, it is not zero, and reasonable steps can be taken to further reduce this risk.

- Talk to your neighbours in order to be aware of the location of organic and conventional alfalfa fields. Be aware of nearby pollinator colonies, and consider locations for GM alfalfa that are not adjacent to organic and conventional fields.
- Regularly inspect field edges, ditch banks and road sides. If alfalfa is found in those areas, mow them early – before chance of flowering^{1,4}.
- Harvest GM alfalfa stands at or before 10% bloom³.

D Preventing of Mixing During Harvest

- Thoroughly clean all harvest equipment (swathers, rakes, balers, wagons etc.) to ensure that they are free of partial bales, or any plant parts and supervise contract harvesters to ensure that contract equipment is also thoroughly cleaned.

E Preventing Mixing during Handling and Storage

If your production is destined for a non-GM market

- Store GM, conventional and organic hay lots in separate locations, and transport separately.
- Label your hay lots to clearly identify the production system used.
- Thoroughly clean all loading and transportation equipment and loading areas between shipments, and dispose of the products of cleaning as described above.
- Do not clean equipment used to handle or transport GM hay, near conventional or organic hay fields or storage areas.

F Stand Take Out

- Follow procedures for stand take-out prescribed in your signed stewardship agreement. Consult your local agronomist, or your seed dealer to identify the best options to completely eliminate a stand GM alfalfa. This could include a combination of herbicide application to “burn down” the crop; and physical tillage.
- Record the measures taken to eliminate the stand and the dates they were taken.

¹ Adventitious Presence definition: The unintentional presence, at low levels, of seed containing a GM trait in non-GM seed

² Canadian organic regulations do not permit organic production systems to exist on the same production unit as conventional or GM production systems, except in the case of the production of seed or propagating material.

BEST MANAGEMENT PRACTISES FOR PRODUCTION OF GENETICALLY MODIFIED ALFALFA

- Do not let volunteers establish. Regularly scout the field to identify and eradicate any remaining alfalfa plants either with physical removal or an herbicide application. Volunteers must be eradicated before flowering occurs.
- Inspect field edges, road sides and ditch banks and eradicate, before bloom, any alfalfa that may be growing there.

Preventing Volunteers from a Prior GM Crop

- Follow effective stand take out procedures required by your stewardship agreement, in consultation with your local agronomist or seed dealer – to ensure that the field is clean of alfalfa before planting to another crop.
- Ensure that you comply with the requirements of your stewardship agreement when following a herbicide tolerant alfalfa crop with a crop (e.g. corn, soybeans) that is tolerant to the same herbicide.
- Regularly scout fields previously planted to GM alfalfa – particularly early in the growing season when alfalfa is more visible, and eradicate the alfalfa plants.
- Avoid planting alfalfa destined for organic or conventional markets in a field from which a GM alfalfa crop has recently been removed.
- Do not allow volunteer alfalfa to establish. Eradicate volunteer alfalfa before flowering in subsequent crops, either with physical removal of the plants, or with a combination of herbicides as advised in Provincial Guides to Weed Control¹⁶.
- Inspect field edges, road sides and ditch banks and eradicate any alfalfa that may be growing there prior to bloom.

Preventing Weed Shifts and Weed Resistance in Glyphosate Tolerant Alfalfa

It must be noted that weed resistance and weed species shifts is not an issue of coexistence, but rather of stewardship of a trait or attribute. However the specialists who developed these best management practises believe that it needs to be highlighted as a potential issue for farmers who wish to grow glyphosate resistant alfalfa.

In general, any time you chose to grow a herbicide tolerant crop, you should carefully re-evaluate your weed management program to understand how the use of the herbicide in the new crop changes the weed selection pressure on your farm, and work with your local agronomist or seed supplier to adjust your weed management practices to account for the new use.

The developer of the technology, Monsanto, is vitally concerned with both protecting the trait and with the potential of weed species shifts and the selection of weed species. Monsanto includes clear stewardship requirements in the mandatory agreements that with which farmers who wish to use its technology must comply. In order to access the Genuity Roundup Ready[®] technology, farmers are required to have in place a signed *Monsanto Technology/ Stewardship Agreement*, and to abide by the most recent *Technology Use Guide (TUG) and Genuity Roundup Ready Alfalfa TUG Addendum*.

To help you to comply with these agreements and to help prevent possible weed species shifts and selection for resistant weeds⁴, you are advised:

- To understand the weed populations in your area. Be able to identify weeds⁵, particularly at the seedling stages and understand their competitiveness and control.
- Planning the timing of seeding to avoid weed germination, and planning the timing of irrigation and harvest management are some agronomic practises that can help suppress problem weeds. Talk to your local agronomist.
- As required in stewardship agreements, ensure that you are applying weed control at the appropriate time in the life of the alfalfa stand and at the recommended rates.
- Frequently monitor alfalfa fields for weeds that have escaped weed control and eradicate them.

³ This provision will need to be re-assessed as new GM traits enter the approval and commercialization process.

⁴ Avoiding Weed Shifts and Weed Resistance in Roundup Ready[®] Alfalfa Systems, University of California <http://anrcatalog.ucdavis.edu/pdf/8362.pdf>

⁵ The Ontario government provides weed identification resources on line at <http://www.omafra.gov.on.ca/english/crops/facts/ontweeds/weedgal.htm>
The Quebec government provides an identification guide in hard copy <http://www.craaq.qc.ca/Publications-du-CRAAQ/identification-guide-to-the-weeds-of-quebec/p/PED10133>
The Government of Nova Scotia provides an on line guide to weed identification in Atlantic Canada http://www.govns.ca/agri/nir/weedid/index_id.shtml

BEST MANAGEMENT PRACTISES FOR ALFALFA HAY AND HAY PRODUCTS DESTINED FOR NON-GM MARKETS

Note that Canadian Certified Organic products must be produced in compliance with standards established in regulation by the Canadian Food Inspection Agency. The standards and practises can be found at <http://www.inspection.gc.ca/food/organic-products/labelling-and-general-information/certified-choice/eng/1328082717777/1328082783032>

A Record Keeping

- To ensure confidence that the BMPs have been followed, maintain accurate records of production practises. A check-list has been developed to facilitate record keeping (see page 14).

B Preventing Adventitious Presence (AP)⁶ at Planting

- Talk to your neighbours. Be aware of the location of nearby GM alfalfa stands and consider locations that are not adjacent to GM alfalfa fields.
- When choosing fields to produce conventional or organic alfalfa hay for non-GM markets, consider choosing fields that have not been previously produced GM alfalfa.
- Choose seed of a variety that does not contain GM traits.
- To ensure that you are using a pure variety that is true to its description, including the presence or absence of intentional GM traits, purchase only pedigreed seed from an authorized and reputable seed supplier.
- Record all alfalfa seed purchase dates and source of supply, and keep pedigreed seed tags.
- Thoroughly clean planting equipment to ensure that it is free of any unknown alfalfa seed.

C Preventing AP at Harvest

- Consider harvesting hay destined for non-GM conventional or organic markets before harvesting GM hay.
- If the harvesting equipment being used in a non-GM field has previously been used in a GM field, thoroughly clean swathers, rakes, balers, wagons etc. to ensure that they are free of partial bales, or any plant parts, and supervise contract harvesters to ensure that contract equipment is also thoroughly cleaned.
- An additional way to prevent mixing at harvest is to eliminate the first one or two bales, depending on size, from hay lots destined for non-GM conventional or organic markets.
- Some non-GM conventional or organic markets may require the added assurance of GM trait testing. Testing of hay lots destined for sensitive markets can be done using protein test strips.

⁶ Adventitious Presence definition: The unintentional presence, at low levels, of seed containing a GM trait in non-GM seed



BEST MANAGEMENT PRACTISES CHECKLIST

GETTING STARTED

Purchase certified seed
Record name of supplier
Record date of purchase
Record variety name and amount purchased
File seed tags by date
If the purchase is GM seed:
Is it coloured?
Sign technology use agreement
Understand and sign stewardship contract
Consult neighbours
Note the location of your GM fields
Note locations of conventional and organic alfalfa fields
Note locations of nearby pollinator colonies

PLANTING

Clean planter to remove all previous alfalfa seed
Record date planting begins
Record date planting is completed
Return unopened GM seed to seed supplier
If unused GM seed is not returned:
Store unused GM seed in sealed solid container
Label the container
Store the container away from conventional or organic seed OR
Dispose of unused seed by burning or with deep burial

STAND MANAGEMENT

Mow any alfalfa on field edges, in ditches and roadsides near GM and organic alfalfa hay fields – before flowering
Record herbicide application dates and types
Clean haybines, swathers, balers and wagons
Harvest GM alfalfa fields before 10% bloom
Record date harvest begins
Set aside first bale when harvesting non-GM hay after harvesting GM hay
Record date harvest is completed
If hay is destined off farm:
Store GM, conventional and organic hay in separate locations
Label GM hay
Label Organic hay
Clean loading, handling and transportation equipment and loading areas between shipments
Testing required? Record date tested and the result of the test

END OF GM ALFALFA STAND MANAGEMENT

Comply with the requirements of your stewardship agreement. Consult with agronomist or seed dealer to identify options
Record herbicide choices
Record date of herbicide application for “burn down”
Till field 7 to 12 days after “burn down”
Record date field was tilled
Record date(s) field scouted
Eradicate any living alfalfa plants
Record method of eradication and dates

POST GM ALFALFA

Record subsequent crop planted on the field (do not follow GM alfalfa with alfalfa)
Record dates crop scouted
Eradicate any alfalfa plants
Record eradication method and dates

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For additional information or to view the full Coexistence Plan, please go online to
<http://cdnseed.org/news/facilitating-choice-through-coexistence/>