Discussion Document:
Crop Placement for Forages

1. Background

1.1 Forages in Canada

Across Canada, more than 26 million hectares of land are used for grazing and the production of forage products. Of this, about 16 million hectares are native or unseeded pasture. About 7 million hectares are cultivated tame hay and fodder crops with over 3 million used as tame or seeded pasture.

Annual crops such as barley or corn are used as forages. However this document will focus on perennial crops used for pasture or stored feed for livestock. Ruminant livestock use about 80% of the forage produced. Other important uses of forage species that are included are: turf and amenity purposes; soil conservation and reclamation; seed production for domestic and export markets; and production for processing industries such as dehydrated alfalfa and compressed hay.

Perennial forages are very important for soil conservation and soil improvement. With minimal cultivation, they provide a permanent ground cover to reduce soil erosion and are well suited to marginal lands and erosion prone soils. Reclamation uses include ground cover for rights of way, such as pipelines and road sides, reforestation areas and mine tailings. They can also be used to control salinity and alkalinity as well as cover for drought prone areas and wetlands.

Recently, there is interest in utilization of seed of native species or ecovars to regenerate rangeland and special environments.

The forage species currently listed in Schedule III of the *Seeds Regulations* (the Regulations) (Table 1 below) are subject to variety registration. There are many forage species used in the forage industry that are not listed in Schedule III. There are also species that are not considered as “forage type” because they are developed for specialty uses such as turf or ground cover. That is why the term “forage type” appears in brackets beside the species names in Schedule III. Crop types that do not appear in Schedule III are exempt from variety registration.

Table 1. Forage Species in Schedule III, Part I, of the *Seeds Regulations*.

SCHEDULE III PART I

(Section 65)

Species, Kind or Type	Scientific Name	Registrations	
		Total	**Last 5 years**
Alfalfa (forage type)	*Medicago sativa* L. (including *M. sativa* L. spp. *falcata* (L.) Arcangeli)	187	40
Bird's foot trefoil	*Lotus corniculatus* L.	11	2
Bromegrass, meadow	*Bromus riparius* Rehm.	7	4
Bromegrass, smooth	*Bromus inermis* Leysser	12	-
Canarygrass, annual	*Phalaris canariensis* L.	6	-
Canarygrass, reed	*Phalaris arundinacea* L.	6	-
Clover, alsike	*Trifolium hybridum* L.	4	-
Clover, red	*Trifolium pratense* L.	31	3
Clover, sweet (white blossom)	*Melilotus alba* Medikus	1	-
Clover, sweet (yellow blossom)	*Melilotus officinalis* (L.) Pallas	2	-
Clover, white	*Trifolium repens* L.	12	-
Fescue, meadow (forage type)	*Festucapratensis* Hudson	7	2
Fescue, red (forage type)	*Festuca rubra* L. var. *rubra*	1	-
Fescue, tall (forage type)	*Festuca arundinacea* Schreber	21	3
Orchardgrass	*Dactylis glomerata* L.	41	7
Ryegrass, annual (forage type)	*Lolium multiflorum* Lam.	17	1
Ryegrass, perennial (forage type)	*Lolium perenne* L.	17	2
Timothy (forage type)	*Phleum pratense* L.	56	10
Wheatgrass, beardless	*Agropyron spicatum* (Pursh) Scribn. & J.G. Smith f. *inerme* (Scribn. & J.G. Smith) Beetle	1	-
Wheatgrass, crested	*Agropyron cristatum* (L.) Gaertner, *Agropyron desertorum* (Fischer ex Link) Schult.	6	-
Wheatgrass, intermediate	*Agropyron intermedium* (Host) Beauv.	2	-
Wheatgrass, northern	*Agropyron dasystachyum* (Hook.) Scribn.	1	-
Wheatgrass, pubescent	*Agropyron trichophorum* (Link) Richter	1	-
Wheatgrass, Siberian	*Agropyron sibiricum* (Willd.) Beauv.	-	-
Wheatgrass, slender	*Agropyron trachycaulum* (Link) Malte ex H.F. Lewis	2	-
Wheatgrass, streambank	*Agropyron riparium* Scribn. & Smith	1	-
Wheatgrass, tall	*Agropyron elongatum* (Host) Beauv.	1	-
Wheatgrass, western	*Agropyron smithii* Rydb.	1	-
Wildrye, Altai	*Elymus angustus* Trin.	3	-
Wildrye, Dahurian	*Elymus dahuricus* Turcz ex Griseb.	2	-
Wildrye, Russian	*Elymus junceus* Fischer	4	-

Please see Appendix I for an overview of the forage crop types subject to variety registration.

This discussion document will focus on the rationale for a placement change of the forage crop types from Part I to Part II or III of Schedule III of the Regulations.

1.2 The Registration of Forage Varieties

Variety registration is required prior to the sale or import for sale of seed of varieties. This requirement includes both pedigreed and non-pedigreed seed. However, there are restrictions on the use of variety names on non-pedigreed seed of forage varieties.

Currently, all forage species that are subject to variety registration are listed in Schedule III, Part I. Part I is described as:

> *Part I (status quo): The registration of new varieties of crop kinds in Part I would require pre-registration testing and merit assessment to determine whether the variety performs as well as or better than reference varieties. This part is intended for crop kinds for which there is a continuing need for stringent government oversight to ensure that varieties meet minimum performance standards.*

Table 1 provides a summary of the total number of varieties currently registered for each species (and type). Of the 31 species listed in Schedule III, Part I, 21 species have fewer than 10 varieties registered. In the last five years, 22 species have had no new registrations approved and only three species have had 10 or more registrations.

Recommending committees are recognized to establish testing protocols for the evaluation of varieties, and to make recommendations to the CFIA as to whether the variety was tested according to protocol, and whether the variety has merit. A variety is considered to have merit if it performs better than or equal to reference varieties.

1.3 Current Variety Registration Requirements for Forage Legumes

Under the current variety registration system, all forage type alfalfa varieties are subject to registration, however, reclamation type varieties are not required to be registered. Red, white and alsike clover are required to be registered in Canada as well as white and yellow sweet clover; however, Persian, subterranean and strawberry clovers are not required to be registered in Canada.

The merit criterion evaluated by the recommending committees for forage legumes is yield (dry matter yield). Other ratings such as winter hardiness/winter survival/persistence, disease reaction (e.g., bacterial wilt resistance in alfalfa) are determined by the applicant and supplied with the variety registration application to the Canadian Food Inspection Agency (CFIA). In certain cases, tolerance to frequent grazing and feeding quality (% protein, digestibility) may also be considered in the assessment of merit.

1.4 Current Variety Registration Requirements for Forage Grasses

Variety registration is required for forage type fescue, ryegrass, wheatgrass, timothy and wildrye, but turf and ornamental grasses are exempt.

Similar to forage legumes, the merit criterion evaluated by the recommending committees for forage grasses is yield (dry matter yield). The registrant may provide ratings for winter hardiness; winter survival or persistence; alkaloid levels for reed canary grass; and disease reaction to the CFIA. In certain cases, tolerance to frequent grazing and feeding quality (protein content, digestibility) may also be assessed considered in the assessment of merit.

1.5 Recommending Committees for Variety Registration

As of March, 2010, there are six recommending committees recognized by the CFIA to make recommendations as to the testing and merit of forage varieties. They are listed below.

Alberta Forage Variety Committee
Atlantic Field Crops Committee
Manitoba Forage Crops Committee
Ontario Forage Crop Committee
Quebec Forage Committee
Saskatchewan Advisory Committee on Forage Crops

A recommending committee in British Columbia was previously recognized by the CFIA. However, this committee no longer exists. There is no recommending committee currently recognized for the BC region. Varieties tested in BC may be assessed by recommending committees in other jurisdictions.

In some regions, established testing systems have been in place for many years. In others, the systems have run on a more ad hoc basis. Funding for these trials has not been consistent, and all regions have reduced the number of test sites over the years. In some regions, new trials are not seeded every year. Not all species are tested in all regions.

It is more costly to test perennial forage species compared to annual field crops. When measuring dry matter yield, there are two to four harvest periods per year and the various recommending committees require two or three years of data from each trial for merit assessment. In forage trials, no data is collected in the year of seeding, as many species are slow to establish. Thus, it takes three to four years from seeding before recommending committees have the data necessary to assess new lines.

Table 2 provides more detail on the source of the recommendation for registration for varieties approved in the last five years.

Table 2. Number of Registered Varieties recommended by committees in the last five years.

Species, Kind or Type	Recommending Committee	Registrations (2005-2010)
Alfalfa (forage type)	Ontario Forage Crop Committee	32
	Manitoba Forage Crops Committee	4
	Alberta Forage Variety Committee	2
	Saskatchewan Advisory Committee on Forage Crops	1
	Quebec Forage Committee	1
Bird's foot trefoil	Atlantic Field Crops Committee	1
Bromegrass, meadow	Saskatchewan Advisory Committee on Forage Crops	3
	Alberta Forage Variety Committee	1
	Manitoba Forage Variety Committee	1
Bromegrass, smooth		-
Canarygrass, annual		-
Canarygrass, reed		-
Clover, alsike		-
Clover, red	Atlantic Field Crops Committee	1
	Quebec Forage Committee	1
Clover, sweet (white blossom)		-
Clover, sweet (yellow blossom)		-
Clover, white		-
Fescue, meadow (forage type)	Alberta Forage Variety Committee	1
	Ontario Forage Crops Committee	1
Fescue, red (forage type)		-
Fescue, tall (forage type)	Alberta Forage Variety Committee	3
Orchardgrass	Alberta Forage Variety Committee	3
	Saskatchewan Advisory Committee on Forage Crops	2
	BC Cultivar Evaluation Committee[1.]	1
	Ontario Forage Crop Committee	1
Ryegrass, annual (forage type)	Atlantic Field Crops Committee	1
	Alberta Forage Variety Committee	1
Ryegrass, perennial (forage type)	Alberta Forage Variety Committee	1
	Ontario Forage Crop Committee	1
Timothy (forage type)	Ontario Forage Crop Committee	2
	Quebec Forage Committee	2
	Atlantic Field Crops Committee	1
	Alberta Forage Variety Committee	1
	Saskatchewan Advisory Committee on Forage Crops	1
Wheatgrass		-
Wildrye		-

[1] Discontinued as a Recommending Committee

Note: Some varieties were recommended by multiple recommending committees.

A recommendation fro a recommending committee as to the testing and merit of a candidate variety are currently required prior to the registration of a variety. Although these recommendations are based on regional data, the registration is not restricted to that particular region. In other words, varieties are granted national registration based on a recommendation for from a regional recommending committee. The CFIA only has the authority to restrict a registration to a certain region if the variety could cause

adverse effects if grown outside of that region. The region of adaptation is not considered in the region of registration. The recommending committees are not required to follow exactly the same protocols for the assessment of candidate varieties. However, all recommending committee protocols are reviewed and approved by the CFIA.

1.6 Variety Development

Public Sector Variety Development

Table 3. Number of Public Forage Crop Breeders in Canada

Table 6. Number of Public Forage Crop Breeders in Canada (1975-2008)

Province	Location	1975	1990	2008
British Columbia	University of British Columbia	1	1	0
Alberta	University of Alberta	1	0	0
	AAFC Lethbridge	2	1	1
	AAFC Lacombe	1	0	0
	AAFC Beaverlodge	1	1[a]	0
Saskatchewan	AAFC Swift Current	2	1	0.5[a]
	AAFC Saskatoon	2	2	0
	University of Saskatchewan	0	0	1[b]
Manitoba	University of Manitoba	1	1	0
	AAFC Brandon	1	1[a]	0
Ontario	University of Guelph	2	2	1
	AAFC Ottawa	2	1	0
Québec	MacDonald College McGill University	1	1	0
	AAFC Ste-Foy	2	2	1
Atlantic Canada	Charlottetown	1	1	0
	AAFC Kentville, Nova Scotia Ag. College	0	0	1
Total		20	15	5.5

[a]Native grasses only
[b]Collaborative program with AAFC Saskatoon
Note: Many of the above do not work exclusively on forage crops.

The profile of public sector forage crop breeding has changed, as illustrated in Table 3. This is important because it contributes to the reduction in the number of varieties from public sources summarized in Table 1.

It is noteworthy that the variety *Boreal* Red Fescue - developed at AAFC Beaverlodge and registered in 1966 - is still widely grown in Alberta and BC, and still accounts for the

largest export volume of any fescue variety. Similarly, *Climax* Timothy was developed and registered by AAFC Ottawa in 1947 and still represents significant export volume to European Union (EU) customers.

Public sector forage breeding is not expected to increase. The process of testing forage varieties for both variety registration purposes and post registration testing has benefited from "in kind" contributions from public breeding programs.

Changing crop placement from Part I to Part II or III in Schedule III is not expected to change the trend in public breeding in Canada.

Private Sector Variety Testing

Private sector forage seed suppliers have recognized the decline in the public sector and large suppliers of forage seed have increased activity where possible. A large supplier in Western Canada has published a guide that indicates that "over 4,000 plots were evaluated for winter survival, yield potential, regrowth, forage quality, salt and traffic tolerance and other factors."

Another national supplier of forage seed has three test locations in Ontario, three in Quebec and four in Western Canada. Yield and other quality traits are evaluated on 35-45 alfalfa lines per year; of these, one or two elite varieties may advance into the product line.

Other seed companies either conduct their own trials or contract testing in other regions of Canada.

1.7 Post-Registration Testing

Post-registration testing is not part of variety registration requirements, and is not under the authority of the Regulations. Publication of data and on-going testing following an variety registration is not currently considered within the mandate of the CFIA. Seed suppliers and agronomists recognize that considerable information is required. The information that is available in the marketplace is assembled from other sources and is published by private and provincially funded organizations.

Buyers of seed require data that compares promising new varieties to known varieties that are adapted to their region. Provincial Agriculture Ministries often provide variety comparison guides for forage species and other agronomic information on their provincial agriculture websites or in print format.

Private suppliers of seed also publish comparison guides and variety fact sheets. In addition, there is an extensive amount of information on forage mixtures that are recommended for specific growing conditions. For example, dairy producers may require variety comparison data expressed as milk production per hectare.

Ongoing or post-registration testing is beyond the mandate of variety registration, regardless of the placement of crop kinds within the three Parts of Schedule III.

1.8 Flexible Variety Registration System

The Government of Canada implemented regulatory changes in July 2009 to create a more flexible variety registration system with reduced regulation while continuing to maintain the integrity of seed certification and environmental, food, and feed safety.

Previously, all crop types requiring variety registration were subject to the same pre-registration testing and merit assessment requirements. The Regulations now partition the list of crop types requiring registration of varieties (Schedule III) into three Parts with differing requirements for each Part.

- Part I will continue to require pre-registration testing and merit assessment. This includes recommending committee recommendation that the variety was tested according to appropriate protocols and that the variety is equal to or better than reference varieties.
- Part II will require pre-registration testing. In this model, recommending committees would establish protocols for the testing of varieties. These protocols would be reviewed and approved by the CFIA. The protocols could include public and/or private testing. Testing would need to be completed prior to recommending committee assessment of whether the variety was tested according to protocols established by the committee. Recommending committee recommendation that the variety was tested according to appropriate protocols would be required as part of the application for registration submitted to the CFIA.

- Part III will require basic registration information only. Applications for registration would be submitted directly to the CFIA. The applications for registration would include a reference sample, application for registration, details of the pedigree and history of development of the variety, variety description, whether the variety contains a novel trait, fees, etcetera.

In order for a specific crop kind to move from one Part of Schedule III to another, a regulatory amendment is required. These subsequent regulatory amendments can proceed once a rationale and consensus for change have been established through the CFIA's consultation with individual crop sectors. Many stakeholders have submitted opinions and rationale for changes in crop placement for forage crops.

For the purposes of discussion, minor and major forage crops could be treated separately as they have differing rationales.

2. Issue to be addressed

There is a need to ensure that the regulatory burden (time, cost, and requirements) imposed at the time of variety registration is commensurate with risk and is not unnecessarily burdensome.

Given the reduction in the availability of variety testing across Canada, the maintenance of the status quo (i.e. keeping all species in Part I) may lead to prohibitively burdensome variety registration requirements. Particularly for the minor species, small plot testing is not available in some regions, and may not be available at all in Canada in the near future. This issue reduces the availability of new cultivars of these species to producers.

Concerns have also been raised that there is a perceived need for national consistency in registration requirements. Currently, there are differing field testing requirements for the determination of merit of varieties by different recommending committees. While permitted under the Regulations, concerns have been raised as to the impact of this policy.

3. Proposed Changes

3.1 Minor forage crops

(bird's foot trefoil, alsike clover, sweet clover, white clover, fescue, wheatgrass, wildrye)

There is a strong rationale and consensus for moving minor forage crops to Part III because the merit testing regimes are difficult to manage due to the small number of new varieties. In the feedback received to date, there appears to be a high degree of consensus for the movement of minor forage crops to Part III, and a general recognition that the current system may not be practical.

3.2 Major forage crops

(alfalfa, bromegrass, red clover, orchardgrass, ryegrass, timothy)

While there appears to be a rationale and consensus for the removal of merit assessment for the major forage crop kinds, there are diverse perspectives on whether these crop kinds are best suited for Part II or Part III of the new registration system. The CFIA is seeking to consult on the potential impacts of placement of major forage crops in Part II or III of the new registration system.

3.3 Process

Once the rationale and consensus for changes to crop placement in Schedule III have been established, the regulatory change process will be initiated. The proposed change in crop placement in Schedule III would be pre-published in the *Canada Gazette*, Part I for a public comment period. Comments would be reviewed and addressed and, barring any significant issues, the amendments would come into force when published in the *Canada Gazette*, Part II.

4. Potential Impacts of the Proposed Changes

The CFIA has received feedback as to the potential impacts of the proposed changes through fora such as the October 27, 2009 Workshop on Seed Program Modernization.

4.1 Impact of the Removal of Merit Assessment Requirements (i.e., Part II)

- The removal of merit with the continued requirement for the testing of varieties according to recommending committee protocols would maintain the involvement of recommending committees in the assessment of varieties.

- There could be continued involvement of provincial testing programs in the pre-registration testing of varieties. However, private company testing according to recommending committee protocols may also meet the needs of this regulatory requirement.

- It is expected that the removal of merit requirements would encourage investment in the development of new varieties due to increased predictability of the eligibility of varieties for registration, thus providing producers with more choice in new varieties.

- It is expected that the movement of forage crop kinds to Part II of Schedule III would have a minimal impact on the time to market for new varieties. Multiple years of testing would be required prior to eligibility for registration.

4.2 Potential Impact of the Removal of Recommending Committee Assessment of Testing Protocols and the Merit of Varieties (i.e., Part III)

- The removal of recommending committee assessment of testing protocols and merit of varieties would reduce the regulatory burden and associated costs for public and private developers of new forage crop varieties. This is particularly important for forage crops because of the longer time required to generate data for merit assessment due to the one year required for establishment and multiyear testing for perennial crops.
- Movement of forage crop species listed in Schedule III from Part I to Part III would lead to more timely availability of new varieties to producers across Canada. Although there is relatively little activity in forage varieties development in the Canadian private sector, this more timely release of new varieties may increase activity in this sector.
- Seed multiplication can start sooner because a change in placement would remove the uncertainty of obtaining support for registration from a provincial recommending committee, where a decision may not be forthcoming due to ad hoc meetings or the lack of resources to meet.
- New varieties can be introduced sooner without the three to five year delay necessary for a decision to support the variety for registration.
- This change could result in an increase in the number of varieties of low sales volume species, as the high costs and delays associated with merit testing and recommendation would be reduced.

- There would be no change to the post-registration yield information currently gathered in some regions by federal, provincial, regional institutions and by the private sector. This information, plus that from other sources, is readily available for a seed buying decision from provincial and private websites and publications. This will continue to be available and is independent of species placement within Schedule III.
- Committees that allocate resources for registration testing may be able to reallocate those resources to more post-registration testing
- Concerns have been raised as to whether there would be a continued need for CFIA oversight of the reaction of alfalfa varieties to bacterial wilt. The CFIA currently requires that all varieties of alfalfa be resistant to bacterial wilt.
- Registration of forage species would continue to be a decision of the CFIA. The introduction of new varieties would still be regulated under Schedule III, Part III. As such, requirements such as alkaloids in reed canarygrass would continue to be required. Also, varieties could continue to be de-registered "for cause" by the Registrar.
- The CFIA would continue to prevent fraudulent practices via the characterization and identification of varieties and ensure an appropriate level of regulatory oversight that is commensurate with risk and thereby maintain market confidence in the regulatory framework.

4.3 Potential Impacts of Changes on Producers

It is expected that the movement of all forages to Part III would maximize competitiveness through timely access to promising new varieties and maximize producer choice in the varieties they grow. This would also enable producers to make decisions as to the value of a variety for their particular needs. If major forage crop kinds are moved to Part III, producers would need to obtain and assess published data from other sources upon which to make decisions as to whether a new variety is suited to their needs.

4.4 Potential Impacts of Changes on Pedigreed Seed Growers

If forage crop kinds are moved to Part II, it may allow for continued reliable and early access to performance information to ensure pedigreed seed growers are multiplying seed for which there will be a market demand. If forage crop kinds are moved to Part III, there may be reduced pedigreed seed grower early access to pre-registration performance information.

4.5 Potential Impacts of Changes on Variety Developers

It is expected that the movement of forage crop kinds to Part II or III would maximize competitiveness and market positioning through increased predictability of the eligibility of varieties for registration. Also, in Part III, external costs associated with mandatory pre-registration variety trials and merit assessment would be minimized. The removal of merit is expected to promote innovation via shortening product development cycles.

However, the variety registration requirements within Part II or III would continue to enable competition on a level playing field where fraudulent practices are prevented via regulatory oversight of the characterization and identification of varieties.

4.6 Potential Impacts of Changes on End Users

It is anticipated that the removal of merit and testing requirements would contribute to competitiveness through timely access to promising new varieties, and the development of a dynamic, diverse and rapidly changing market to ensure competitiveness on a global scale.

5. Consultation Questions

Your feedback on the impact of this proposal is being sought. From your perspective:

1. What would be the positive and/or negative impacts of the movement of minor forages crops to Part III (i.e., the removal of the requirements for recommending committee assessment of testing procedures and merit of candidate varieties)?

2. What would be the positive and/or negative impacts of the movement of major forages crops to Part II (i.e., the removal of the requirements for recommending committee assessment of merit of candidate varieties and retaining the role of recommending committee assessment of the testing procedures for varieties)?

3. What would be the positive and/or negative impacts of the movement of major forages crops to Part III (i.e., the removal of the requirements for recommending committee assessment of testing procedures and merit of candidate varieties)?

Please provide your feedback directly to Cindy Pearson at the co-ordinates below by May 24, 2010. Also, please do not hesitate to contact me for additional information.

Thank you for your input and collaboration in this process to improve the variety registration system.

Best regards,

Cindy Pearson
Senior Specialist, Variety Registration
Canadian Food Inspection Agency
613 221-7535
cindy.pearson@inspection.gc.ca

Appendix I: Overview of Forage Crop Types that Require Variety Registration

Appendix I provides a brief description of forage legume and forage grass species that are important to Canada as well as data on forage production and domestic and export markets.

(A) Description of forage legume and forage grass species

Forage Legumes

ALFALFA (*Medicago sativa*)

Alfalfa is the most widely grown forage legume in Canada and is highly valued as an excellent source of protein, energy and digestible fibre for feed. It is also valued for its wide adaptability and importance in crop rotation by nitrifying and improving soil structure.

Alfalfa has various end uses, including: seed production for domestic and export use; dehydration into meal, pellets and cubes; compressed hay; human consumption as sprouts; soil conservation and land reclamation; for on-farm grazing; stored feed for ruminant livestock; and in pest management. Major insect pests for alfalfa seed and forage production include: Lygus bugs; blue, pea and spotted alfalfa aphids; alfalfa seed chalcid; potato leafhopper; alfalfa weevil; alfalfa plant bug; and meadow spittlebug. Serious diseases for alfalfa include fungal and bacterial wilts, leaf spots, crown and root rots, downy mildew, viruses and nematodes, although many resistant cultivars are available.

BIRD'S FOOT TREFOIL (*Lotus corniculatus*)

Birdsfoot trefoil is used in agriculture as a forage plant, grown for pasture, hay and silage. There are two distinct plant types currently available in Canada: the New York or "Empire" type; and the European type. The Empire is a low growing variety used primarily for pasture while the European type is taller growing and may be used for pasture or hay. Birdsfoot trefoil has a lower yield potential than alfalfa, so it is only recommended for hay production in areas where alfalfa will not grow well. Because birdsfoot trefoil seedlings are slow to establish, it will usually take at least a year to get a satisfactory stand. Moreover, because of the slow seedling growth, grass and weed competition must be controlled.

Crown and root rots are the most significant diseases of birdsfoot trefoil. In addition, *Rhizoctonia* blight, a fungus the spreads in thick, tall stands during hot, humid summer months is also destructive.

CLOVER (*Trifolium* spp.)

The genus Trifolium contains many species worldwide. In Canada, red clover (*Trifolium pratense*) white or Dutch closer (*T. repens*) and to a lesser extend, alsike clover (*T. hybridum*) are grown. A large proportion of Canadian clover production is exported, with the United States being the single most important market. Major diseases of clover

include fungi, bacteria, viruses, nematodes and mineral deficiencies. Of these, fungi are the most important causal factors because they attack foliage, seed coats, and crowns. Black stem, seedling blight, and northern anthracnose are a few examples.

FORAGE GRASSES

BROMEGRASS (*Bromus* spp,)

Bromegrass species are widely grown for hay, pasture and land reclamation in North America. Smooth bromegrass (*Bromus inermis*) and meadow bromegrass (*Bromus riparius*) are the most commonly cultivated bromegrass species. In Canada, most seed of smooth bromegrass is produced in the southern portions of the Prairie Provinces. An average seed yield is 100-125 kg/ac, but high yields in excess of 350 kg/ac have been recorded. Domestic sales of smooth bromegrass seed in Canada have dropped in recent years, as meadow bromegrass has become the preferred species for pasture and rotational grazing systems, especially in the Western Canadian prairies. Demand for seed of meadow bromegrass soared once its dramatic re-growth potential and reduced creeping nature became well-known.

FESCUE (*Festuca* spp.)

Fescues are divided into two functional groups, those destined for turf and those destined for forage. Tall fescue (*Festuca arundinacea*) is the most commonly registered type of fescue.

ORCHARDGRASS (*Dactylis glomerata* L.)

Orchardgrass is a bunch-type, tall-growing, cool-season perennial grass. It is utilized in the eastern provinces and in high production areas of Western Canada.

REED CANARYGRASS (*Phalaris arundinacea* L)

Reed Canarygrass is very tolerant of flooding, especially if temperatures are low. It is successfully used for pasture, hay, and silage. Reed canarygrass contains alkaloids which reduce palatability and, as such, alkaloid ratings are a requirement for variety registration.

TIMOTHY (*Phleum pratense*)

Timothy is a very winter hardy crop that is widely adapted to temperate, moist climates. Timothy is predominantly grown for use as stored feed, either for hay or silage. Manitoba is the largest producer of timothy seed.

WHEATGRASS (*Agropyron* spp)

Wheatgrass is a highly drought resistant, perennial species that is an excellent source of forage and habitat for livestock and wildlife. Crested Wheatgrass is the major species and ranks second only to smooth bromegrass in acreage among cultivated grasses in Western Canada.

WILDRYE (*Elymus* sp)

Wildrye is an excellent source of forage and habitat for livestock and wildlife.

B. Summary of the domestic forage market

Seed Production

Table 4 is a summary of Certified seed production by members of the Canadian Seed Growers' Association in 2007-2008. A total of 176,000 acres was planted to produce seed to be sold as certified seed in future years. In the same period, Table 5 estimates the amount of Certified seed of Schedule III species planted by the forage industry.

Table 4. Canadian Production of Pedigreed Forage Seed in 2007-08 (acres) by province for crop kinds subject to variety registration.

	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	BC	Total
Alfalfa			13,863	25,513	17,680		57,056
Birdsfoot trefoil			5,201				5,201
Bromegrass			951	1,766	9,513		12,230
Canarygrass				1,263			1,263
Clover			1,005	1,218	1,962		4,185
Fescue			5,412		14,491	2,995	22,898
Ryegrass			21,858	2,672			24,530
Timothy			19,597	2,436	13,094	3,090	38,217
Wheatgrass				2,621	5,907		8,528
Miscellaneous (less than 500 acres)	<500	<500	<500	<500	<500	<500	-
Total	<500	<500	67,887	37,489	62,647	6,085	174,108
	0%	0%	39%	22%	36%	4%	100%

Forage Crop Production

There is no data available for individual forage species used for tame hay production because the vast majority of perennial crops seeded for pasture and stored feed are mixtures of grasses and legume species. Table 5 provides a summary of the retail domestic and international sales of seed. The individual components of mixtures are reported in the species total.

Table 5. Sales of seed (All types) in metric tones in 2007-08

Species, Kind	Common Seed	Certified Seed	% Certified
Alfalfa certified		5,598	58%
Alfalfa other than certified	4,056		
Bird's foot trefoil	159	182	53%
Bromegrass, meadow	1,288	811	39%
Bromegrass, smooth	1,529	866	36%
Canarygrass, annual			
Canarygrass, reed	7	120	94%
Clover, alsike	7,869	52	1%
Clover, red	3,020	810	21%
Clover, sweet (white blossom)			
Clover, sweet (yellow blossom)	612	40	6%
Clover, white	363	195	35%
Fescue, meadow	82	18	18%
Fescue, red Certified		1,058	9%
Fescue, red other than Certified	10,552		
Fescue, tall	343	1,243	78%
Orchardgrass	370	467	56%
Ryegrass, annual	3,097	617	17%
Ryegrass, perennial	3,874	2,105	35%
Timothy Certified		2,741	33%
Timothy other than Certified	5,491		
Wheatgrass, beardless			
Wheatgrass, crested	92	204	69%
Wheatgrass, intermediate	6	6	50%
Wheatgrass, northern			
Wheatgrass, pubescent			
Wheatgrass, Siberian			
Wheatgrass, slender	79		0%
Wheatgrass, streambank			
Wheatgrass, tall			
Wheatgrass, western			
Wildrye, Altai	73	9	11%
Wildrye, Dahurian			
Wildrye, Russian			
Total	42,962	17,142	29%

In 2007-08, a total of 17,142 tonnes of certified seed and 42,962 tonnes of common seed were used for domestic planting. Variety registration regulations do not apply to common seed sales, representing 71% of total sales, because variety names cannot be used on common seed.

C. Summary of the forage export market

In 2007, the export market value of dehydrated alfalfa meal and pellets was $35.7 million with $17.2 million in dehydrated cubes. The export value of compressed hay was $140.5 million which was mostly timothy destined for Japan.

Table 6 reports the export market for forage seed of Schedule III species to be $125.4 million. The export statistics also provide a breakout for the value of uncertified alfalfa, red fescue and timothy which would mostly be destined for the US. The bulk of Certified seed export is foreign varieties being multiplied for re-export from Canada under the OECD Seed Schemes. Seed of varieties for re-export using the OECD Seed Schemes are exempt from variety registration.

Table 6: Sales of seed (All types) Canadian dollars in 2007-08

Species, Kind	Export	Import
Alfalfa certified	16,587	4,223
Alfalfa other than certified	21,923	
Bird's foot trefoil	3,085	309
Bromegrass, meadow	1,031	113
Bromegrass, smooth	913	47
Canarygrass, annual		
Canarygrass, reed		
Clover, alsike	2,005	2,049
Clover, red	4,931	
Clover, sweet (white blossom)		53
Clover, sweet (yellow blossom)	767	
Clover, white	202	1,129
Fescue, meadow	537	84
Fescue, red Certified	7,662	613
Fescue, red other than Certified	25,542	
Fescue, tall	2,603	812
Orchardgrass	25	1,089
Ryegrass, annual	1,972	1,217
Ryegrass, perennial	25,357	5,440
Timothy Certified	6,184	122
Timothy other than Certified	587	
Wheatgrass, beardless		
Wheatgrass, crested	2,719	395
Wheatgrass, intermediate		
Wheatgrass, northern		
Wheatgrass, pubescent		
Wheatgrass, Siberian		
Wheatgrass, slender		
Wheatgrass, streambank		
Wheatgrass, tall		
Wheatgrass, western		
Wildrye, Altai	753	
Wildrye, Dahurian		
Wildrye, Russian		
Total	125,385	17,695