BC Forage Action Plan Project
Consultation Summary

Background Report

Prepared for the BC Ministry of Agriculture

Growing Forward 2
A federal-provincial-territorial initiative

British Columbia

Canada

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Growing Forward 2
A federal-provincial-territorial initiative
BRITISH COLUMBIA
Canada

EXECUTIVE SUMMARY

Introduction

Forage crops and land devoted to pasture comprise a significant share of total farmland use in British Columbia. Various species of legumes, grasses and other plants are raised in order to grow or sustain livestock for the purpose of food, recreation and culture. Forages contribute directly to the profitability of livestock operations, provide a local food source for recreational livestock and generate a range of ecosystem goods and services across the province. However, as a sector forage has not been of significant focus for the BC Ministry of Agriculture in terms of resource allocation or strategic planning for the past two decades, although front line staff continued to support the sector with limited resources.

The purpose of the Forage Action Plan Consultation project was to consult broadly with forage stakeholders and stakeholder organizations across British Columbia and conduct other research necessary, including a review of existing documents and data and an environmental scan of forage sector priorities and actions from other jurisdictions, to ensure that forage-related challenges and priorities are well understood and communicated to the BC Ministry of Agriculture; and, to support the development of a Forage Action Plan that will assist stakeholders and the Ministry to take directed and appropriate advantage of opportunities to improve the quality, quantity and return on investment of forages grown on private land in BC.

The Forage Action Plan project is a multi-phased approach that includes:

- Stakeholder Consultation
- Analysis of opportunities and challenges
- Development of an Action Plan
- Implementation of Action Plan

This Consultation Summary Report supports the Stakeholder Consultation phase of the overall Forage Action Plan Project. The scope of the Forage Action Plan Cosultation project includes all forage and forage-related stakeholders, with a specific focus on private agricultural land. As such, the project and this report do not directly address forage challenges or priorities as they relate to Crown or Indigenous land in BC. A second phase of the project is anticipated to focus on forage challenges and priorities as they relate to range, leasehold and other crown land.

Research Methods

The project was designed to be a regional and stakeholder consultation process. The findings contained in this report were gathered from multiple sources and triangulated to present a comprehensive overview of regional stakeholder challenges and priorities across British Columbia. Source of information included existing documents and data relating to the sector; initial one-on-one interviews and teleconferences with Ministry of Agriculture Technical Working Group and Forage Action Plan Steering Committee members; interviews with approximately 10 other subject matter experts including researchers, producers and representatives of regional stakeholder organizations and provincial government staff; seven regional engagement session focus groups held across the province with a broad range of stakeholders including forage and forage seed producers, livestock producers/owners (e.g. beef, dairy, sheep, equine), forage brokers and exporters, service providers (e.g. custom farming, seed sales) and others; and, a provincial online stakeholder survey.

Overview of Forages and Livestock in BC

British Columbia's farmland makes up just 2.8% of the jurisdictional land area of the province. Nonetheless, that amounts to more than 2.5 million hectares. In 2016, over 75% of all farmland in BC was devoted to forage production, including natural land for pasture (1.4 million hectares); tame or seeded pasture (226,000ha); and, land on which hay

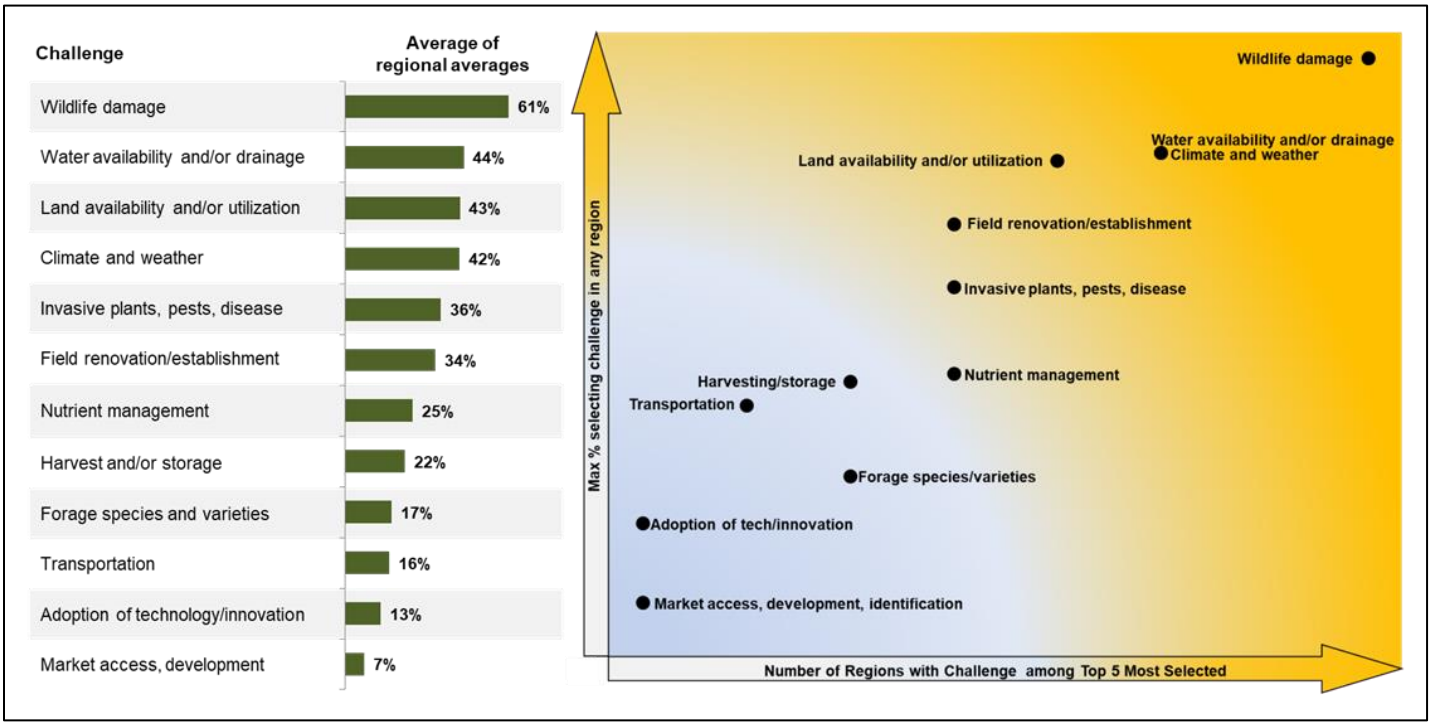
crops are grown including alfalfa and mixes (198,000ha) and other tame hay and fodder crops (150,000ha). Additionally, corn is grown for silage (17,000ha) and there are areas devoted to growing forage for seed (15,000ha). A wide variety of species are grown as forage in BC. Survey respondents were most likely to indicate growing orchardgrass, alfalfa, timothy or clover species. Other forages such as tall fescue, bromegrass, corn, and reed canarygrass were very common within a few regions but are less widespread than the leading varieties. Cereals grown as forage were reported by participants from every region, but in no region did more than half say they grew cereals as forage. Wild rye was reported only from Vancouver Island-Coast respondents.

Despite some other limited uses for forage crops and an international export market, the vast majority of forage grown in the province is used to feed livestock living in BC. As such, forages are inextricably linked to the major livestock sectors including beef, dairy, equine, sheep & lambs, goats and others. In 2016 there were over 776,000 livestock reported on farms in British Columbia, including over 659,000 cattle and calves; 59,000 sheep & lambs; 33,000 horses & ponies; 14,500 goats; 6,500 bison; 2,500 llamas & alpacas; and, 520 non-wild deer. Sheep, lambs and goats as well as horses, llamas & alpacas are the most broadly distributed livestock in BC, reported in 25 of 29 regional districts. Meanwhile bison were reported in just 5 of 29 regional districts with 78% of all bison located in the Peace River regional district. Dairy cows & replacements are largely concentrated in the southwest of the province in the Fraser Valley, Metro Vancouver, Nanaimo and Comox Valley regional districts. Beef cows and replacements are primarily found in the Thompson-Nicola, Peace, Cariboo and Bulkley-Nechako regional districts.

Current Challenges Affecting the Forage Sector

Challenges affecting the forage and forage-related sectors are diverse and while many vary in impact among regions there are a number of issues that are common across the province. The following figure shows survey results related to challenges faced by the forage sector in British Columbia. The left hand side of the figure shows the share of respondents selecting a given challenge as significant to their operations or region, ordered by the average of all regional averages. The right side of the figure shows relative intensity and commonality of challenges by plotting the maximum percentage of respondents selecting a given challenge in any region against the number of regions for which that challenge was among the top-5 most selected. In the top right, wildlife damage followed by water availability/drainage and climate and weather are the challenges that are most widespread and elicited the highest within-region share of participant responses.

Figure: Stakeholder Challenges - Survey Results



Source: Forage Action Plan Provincial Survey

The following points summarize the nature of the major challenges identified by survey respondents, engagement session participants, other stakeholders and/or documentation. Later sections of this report include additional challenges and nuances on a regional basis.

Wildlife and invasive plants, pests and disease

- Respondents noted that throughout the province, waterfowl, ungulates and bears cause significant damage to forage. In many cases the impact is getting worse over time. Several factors including deliberate management and policy goals (e.g. restoring or expanding wildlife populations) and climate change have led to higher numbers of wildlife in some areas. Meanwhile, the share of the land base devoted to forage sector agriculture is decreasing and high value crops (e.g. orchards) are increasingly protected by fencing; remaining farms have to absorb a larger share of a growing problem. The impact of wildlife damage goes beyond the direct loss of forage and has led to impacts on farming practices. For example, stakeholders described being unable to grow certain crops due to predation or that they had been forced to grow annuals instead of perennials because establishment had become impossible. Others reported being unable to grow any winter crops or to experiment with techniques such as swath grazing that would otherwise provide significant benefit to their operations but are unfeasible due to the expected wildlife damage. Some stakeholders are satisfied with the level and coverage for wildlife damage to forage available through existing Business Risk Management programming, but many others indicated that the problem of wildlife damage is exacerbated by inadequate compensation and/or insufficient coverage.
- Invasive plants, insects and pests are a significant challenge for the forage sector across BC. Forage quality and value is limited by the presence of weeds and from soil in cut forage because of rodents such as moles. Production is limited by competition between desired and undesired plants and by insect and disease attacks. In some cases, the level of damage can be severe and can spread rapidly leading to large crop losses. Stakeholders are concerned that there is a lack of monitoring and proactive focus on avoiding future outbreaks and wider geographic spread of invasive insects such as the true army worm or Western corn rootworm.

Climate, weather and water

- Weather and climate patterns are changing and for many regions in British Columbia the impacts are felt most directly through water issues; drought conditions are becoming more common and many areas lack the precipitation or access to irrigation water during the growing season needed to optimize production, meanwhile there is often too much precipitation at other times in the year making drainage issues worse and negatively affecting the seeding or harvesting of forage crops or the available window for manure application.
- Many stakeholders described their water challenges as being exacerbated by the high cost of water and water infrastructure (irrigation, storage) and by the regulations of the *Water Sustainability Act.* Some producers with irrigation infrastructure said they are often constrained by regulations to the point that they cannot access irrigation water when it is needed for crop production; others indicated that the regulations are not relevant to the conditions in their area and so are being inefficiently misapplied resulting in limited farm productivity.

Land use, availability and affordability

- Stakeholders in several regions of the province indicated that the non-optimal use, expense and availability of farmland suitable for forage are significant challenges facing the sector. Some stakeholders characterize the farm tax thresholds as being too low which compounds the pressure placed on farmland by industrial and urban growth. Meanwhile, development adjacent to farmland introduces several challenges including increasing land prices, conflict with non-agricultural land owners, congestion, increased spread of invasive plants, drainage issues, and others.

Research and knowledge transfer

- The lack of locally relevant research and extension services is a challenge for the sector throughout most of the province. Lacking the coordination and financial contribution of government many producers and stakeholder organizations have managed to undertake research and knowledge transfer activities on their own; however, this approach limits the impact, replicability and dissemination of research and results. Many stakeholders perceive a lack of reliable and unbiased sources of information which limits forage quality, quantity and return on investment.

Transportation and market access

- British Columbia is geographically vast and forage is grown in nearly every region of the province. Transportation issues are prevalent though quite specific to the needs of each region. In areas with urban and industrial development pressure forage sector stakeholders report congestion and difficulty competing for access to transportation infrastructure including rail; in remote areas the cost of transportation causes significant market distortions and the relatively low population density limits the availability of supportive services; and the availability of necessary inputs is often limited by transportation costs and not the cost of the input itself.

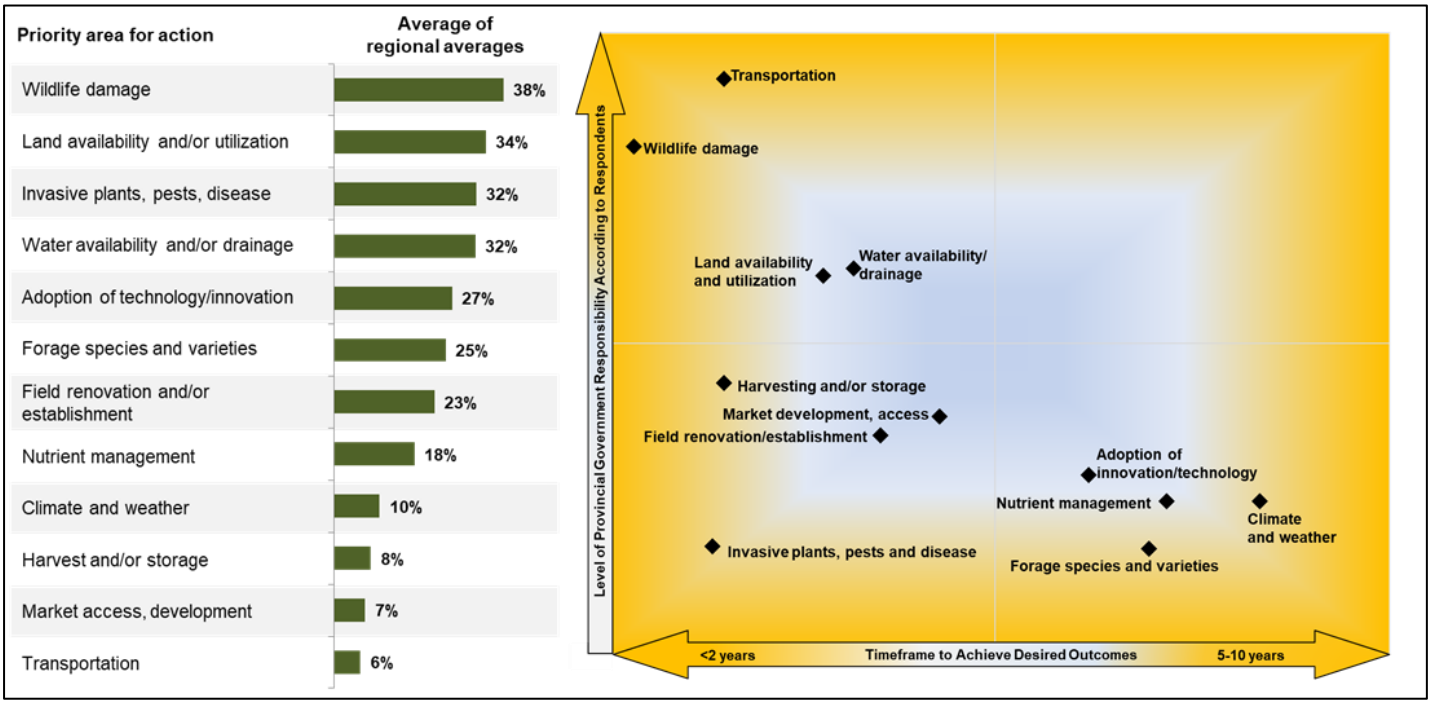
Soil health and forge quality

- Some regions of the province lack the soil or growing conditions to support the production of alfalfa or higher protein grasses. In other areas, stakeholders report that soil health has been neglected and that management techniques, soil testing and input analysis that would support improved soil health are not generally adopted due to insufficient research and/or a perceived low return on investment for producers.
- The equine sector requires low-sugar hay and horses experience health problems when provided a diet consisting only of high quality, high sugar hay. Meanwhile, other forage users prefer higher sugar forages and tend to have a greater influence over what is produced regionally. This presents a challenge to horse owners who risk feeding unhealthy food to their animals because they are either unaware or unable to obtain low-sugar feed, or who face higher prices for feed than other livestock sectors.

Stakeholder Priorities and Recommendations

The following figure shows survey results related to: priority areas for action; the degree to which the provincial government is considered to be the entity responsible for a given action; and, the timeframe over which respondents expect outcomes related to a given priority area to be achieved. As indicated on the left side of the figure: wildlife damage; land availability and/or utilization; and invasive plants, pests and disease are the categories most prioritized by provincial survey respondents when the regional averages are taken together. The right side of the image shows that transportation, wildlife damage, land availability and utilization, and water availability/drainage are the issues for which participant recommendations are seen to be primarily provincial government responsibilities and for which outcomes are expected in the short term. Items shown in the bottom right have recommended actions applied to multiple actors and longer term expected outcomes.

Figure: Stakeholder Priority and Outcome Survey Results



Source: Forage Action Plan Provincial Survey

The following points summarize the nature of the priorities and recommendations identified by survey respondents, engagement session participants, other stakeholders and/or documentation.

Research and knowledge transfer:

- In every region stakeholders expressed the need for more resources directed towards forage-related research, development and knowledge transfer. Many topics were recommended by stakeholders who want research to include development and trial of forage species and varieties and also trials of forage management practices and systems. Stakeholders want to ensure that they are able to be involved in setting priorities and carrying out research, but recommend an approach that uses partnerships between government, universities and producers. Additionally, stakeholders recommend that research be regionally focused with any new resources directed towards research and knowledge transfer be made available or distributed to regionally-based entities. Finally, research and knowledge transfer funding should provide for ongoing administrative costs and core funding to help build capacity

among stakeholder organizations and recognize that forage research can be a long term endeavour that will often need to outlive more than one funding cycle if done correctly.

- Stakeholders want the Ministry of Agriculture to regain its status as a supportive and impartial source of knowledge, capacity and expertise for the forage sectors. Stakeholders want more front line resources and expertise including forage specialists within the Ministry, and want the government to carry out more collection, monitoring and dissemination of baseline data such as weather data, soil and forage quality, production statistics, etc.
- A focus on research and knowledge transfer activities is consistent with approaches recommended or underway in forage sectors in other jurisdictions. For example: the Canadian Forage and Grassland Association's Strategy for the Future emphasises the need for increased research and training capacity to improve yields and nutritional quality of tame, native and annual forage species and seeks to enhance producer adoption of improved forage management opportunities through provincial and national technology transfer and extension education programs; the Beef Cattle Research Council's National Beef Strategy seeks to use research and development to increase production efficiency, and the organization's Research and Technology Transfer Strategy establishes a plan to use research and knowledge transfer to reach several identified outcomes to strengthen the sector; the Alberta Beef, Forage & Grazing Centre's goals include developing an extension plan, extension products and to translate research knowledge to producers; the Government of Saskatchewan has several research frameworks including those focused on forage crop breeding, feed research and development, and cow-calf and forage systems; the Manitoba Forage Council has laid out several Strategic Solutions for the sector including to ensure that research addresses the forage and grassland industry needs, extension services are enhanced to improve producers' agronomic and farm management/marketing practices. More information related to other jurisdictions can be found in Appendix I.

Wildlife and invasive plants, insects and pests:

- Stakeholders in many regions of the province want improvements made to the level and breadth of compensation available to them when wildlife causes damage to forage. While many stakeholders expressed gratitude that there are compensation programs available of any sort, they also described many examples of how current programming is not adequate in the amount paid in response to damage or is otherwise perceived to be of little benefit to their operations. Additionally, some stakeholders perceive an imbalance in that they are subsidizing the public desire for wildlife existence by growing crops that are inevitably preyed upon by that very wildlife. In this context, the limited compensation reflects an unfulfilled social contract between the public at large and the agricultural community. Other stakeholders would prefer that wildlife numbers are managed through increased hunting to reduce pressure in areas where wildlife damage to forage is especially prevalent.
- Stakeholders want a more proactive and consistent application of the *Weed Control Act* to be part of the approach to limiting the negative impacts of unwanted plants, along with increased monitoring and inspections. The widespread perception is that private and public landowners throughout the province are contributing to the problem by not managing their lands according to noxious weed regulations and that provincial authorities are not compelling them to do so despite having such power under the *Act*.
- Stakeholders want research into development of crops that are unattractive to wildlife or are more resilient when preyed on, and also resources devoted to research, education and knowledge transfer that will reduce the impact and spread of invasive plants, pests and disease.

Climate, weather and water

- Stakeholders want improved access to water that is not subject to prohibitive regulation or high cost. Development of water storage and irrigation infrastructure is required but expensive, so stakeholders recommend that the government play a role in reducing the cost borne by farmers. These infrastructure investments are perceived to be very important for sustainable management of water and to ensure the ongoing production of forages in the context of dryer spring and summer weather which is expected for most of the province as a result of climate change.
- Stakeholders want resources directed to locally based and relevant research, trials and knowledge transfer that will

help mitigate the effects of climate change and in the meantime, they want improved support for managing the impacts of extreme weather such as improved insurance and compensation for losses related to winterkill.

- Stakeholders want established forages to be assessed for their carbon sequestration impact and carbon credits or other subsidies rewarded to producers accordingly.
- Forage sector priorities and actions identified in other jurisdictions include a focus on environmental sustainability. For example: the Canadian Forage and Grassland Association seeks to quantify the environmental benefits of Canada's forage/hay/fibre/seed production and grassland for carbon sequestration; the Beef Cattle Research Council's environmental sustainability research outcomes are to include science-based information to inform the development of effective public communication and policy development regarding environmental goods and services provided by the beef industry. More information related to other jurisdictions can be found in Appendix I.

Land use, availability and affordability

- Stakeholders would like tax or other land use regulations used to incentivize the productive use of land suitable for forages as well as other measures taken to limit the loss of farmland to non-agricultural uses and to ensure that existing farmland is used to its best potential.
- Stakeholders want the "right to farm" to be affirmed and to receive greater support from government when issues arise that place farmers and the public in opposition. This could include information directed at the public that reinforces the importance of farming to economic and societal well-being.
- Stakeholders in other jurisdictions have also emphasized the need to have the "right to farm" be affirmed. For example, the Alberta Beef Producers have a Strategic Objective to ensure that government land, water, and environmental policies support the interests of farmers and ranchers. More information related to other jurisdictions can be found in Appendix I.

Transportation and market access

- Transportation related priorities tend to be region-specific, but most regions have some transportation related challenges. Stakeholders on Vancouver Island want BC Ferries to be compelled to adopt a policy that prioritizes livestock access on full crossings, while stakeholders in areas with urban and industrial congestion and divided parcels called for improved ability to cross roadways with agricultural equipment. Stakeholders across many regions want the availability of necessary inputs supported through travel subsidies or financial incentives/disincentives that result in reduced input costs and reliability of supply for farmers. Stakeholders have reported that gaining access to rail transportation has become a significant challenge, particularly in the Peace River region.
- Many stakeholders called on government or industry to facilitate an efficient and effective hay marketing system and some stakeholders called for greater marketing and promotion of British Columbia forages to international markets.

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I: INTRODUCTION

A. Project Background

The purpose of the Forage Action Plan Consultation project was to consult broadly with forage stakeholders and stakeholder organizations across British Columbia and conduct other research necessary, including a review of existing documents and data and an environmental scan of forage sector priorities and actions from other jurisdictions, to ensure that forage-related challenges and priorities are well understood and communicated to the BC Ministry of Agriculture; and, to support the development of a Forage Action Plan that will assist stakeholders and the Ministry to take directed and appropriate advantage of opportunities to improve the quality, quantity and return on investment of forages grown on private land in BC.

The Forage Action Plan project is a multi-phased approach that includes:

- Stakeholder Consultation
- Analysis of opportunities and challenges
- Development of an Action Plan
- Implementation of Action Plan

This Consultation Summary Report supports the Stakeholder Consultation phase of the overall Forage Action Plan Project. As originally envisioned, the overall objectives of the BC Forage Action Plan are to: increase quantity and quality of forage produced; increase access to domestic and global forage markets; increase livestock performance from improved forage quality; increase innovation to enhance forage production; and increase capacity for producers to respond to market signals and climate change.

The project was supported by a Technical Working Group comprised of Ministry of Agriculture staff and a Steering Committee comprised of representatives from major stakeholder organizations. Major project activities occurred between October 2017 and April 2018.

B. Research Methods

The findings contained in this Background Report reflect data gathered from the following sources:

- **Document, data and environmental scan**
  - We identified and reviewed relevant documents and data that pertain to the forage and forage-related sectors in British Columbia to ensure an understanding of the current state of the sector; to inform the development of research questions and the survey questionnaire, and to ensure that stakeholder challenges, priorities and recommendations identified through primary research methods are comprehensively addressed in the draft Background report and the Forage Action Plan. Overall, the number of documents that describe challenges and priorities of the forage sector in BC are limited so the data and document review was most useful for providing an overview of regional production and for the environmental scan. The focus of this document is to reflect the voice of stakeholders engaged through project activities.
  - We conducted an environmental scan to identify priorities and strategic actions identified by forage and forage related sectors in jurisdictions outside of British Columbia.

- **Initial interviews with Regional Agrologists and Industry Representatives**
  - We conducted telephone interviews and teleconferences with members of the Forage Action Plan Technical Working Group and other Ministry of Agriculture representatives. These representatives engage with producers often on a variety of issues so were able to provide a current overview of the sector and of challenges facing a wide range of forage sector stakeholders in their respective regions.

- We conducted telephone interviews and teleconferences with members of the Forage Action Plan Steering Committee. Steering Committee members are leaders within provincial stakeholder organizations; they were able to provide a provincial overview of the challenges and priorities for their particular sector (e.g. beef, equine, dairy) as they relate to forage.

➢ **Interviews with other subject matter experts:**

- We conducted approximately 10 ad-hoc interviews with other subject matter experts including researchers, producers, representatives of regional stakeholder organizations, and provincial government staff. The individuals interviewed were able to provide detailed information related to their area of expertise, sector or region.

➢ **Regional Engagement Sessions**

- We conducted a total of 7 regional engagement session focus groups across British Columbia between November 2017 and January 2018. Total attendance for all sessions was 65 participants (plus an additional 17 Ministry of Agriculture participants) which included a broad range of stakeholders including forage and forage seed producers, livestock producers (e.g. beef, dairy, sheep, equine), forage brokers and exporters, service providers (e.g. custom farming, seed sales) and others; together they were able to provide a comprehensive overview of the strengths, challenges and priorities for the forage and forage-related sector in each given region. The following table provides additional information including the date, location and total number of attendees for each regional session.

Table 1: Regional Engagement Sessions

Region	Location	Date	Stakeholders	Ministry of Agriculture
Vancouver Island/Coast	Nanaimo	January 19, 2018	9	3
Mainland Southwest	Abbottsford	November 28, 2017	9	5
Thompson Okanagan	Kamloops	January 23, 2018	7	5
Cariboo	Williams Lake	December 7, 2018	8	2
Kootenay	Creston	January 30, 2018	11	2
North Coast/Nechako	Vanderhoof	December 13, 2017	10	3
Peace	Fort St. John	November 30, 2017	10	3
Total			65	17 unique

➢ **Provincial online survey**

- We developed an online survey for interested stakeholders to provide feedback about the challenges and priorities they see as most important for their region or specific operations as well as to gather any recommendations stakeholders have that would address challenges and improve quality, quantity and/or return on investment of forages grown on private farmland in BC. Survey results also provide information related to innovation in the sector, varieties of forages produced, prevalence of forage and soil testing, and other items.
- The survey was distributed primarily by stakeholder organizations and Steering Committee members who agreed to share the open survey link with their forage sector contacts. Other known stakeholders were sent the link directly by Ference and Company or by members of the Technical Working Group. This approach was used because it afforded the best possible opportunity to reach a broad range of stakeholders but is limited in that the total population is unknown and therefore the representativeness of the survey is undetermined.
- A total of 147 individuals completed or substantially completed the survey. The final survey results cross tabulated by region and sub-sector are included in this report as Appendix II. The following table describes the region and sector of operations for individual respondents.

Table 2: Survey Participants by Region and Sector

Region	Total
Vancouver Island/Coast	17
Mainland Southwest	33
Thompson Okanagan	25
Cariboo	24
Kootenay	16
North Coast/Nechako	21
Peace	17
Sector	
Forage Producer	91
Beef and/or other cattle producer	73
Dairy producer	40
Equine owner/producer	45
Sheep, goats, fallow deer, other small livestock owner/producer	14
Forage seed producer	2
Bison producer	1
Forage handler (e.g. hauler, broker, processor)	7
Forage sector supplier	3
Feedlot operator	5
Researcher/academic	5

C. Purpose of the Background Report

The purpose of the draft Background Report is to present the results of the background research to ensure that all major challenges, priorities and stakeholder recommendations are adequately reflected; and, support the development of a Forage Action Plan.

D. Structure of the Report

Chapter II provides an introduction to forage and livestock in British Columbia. Chapters III through IX include a brief overview of the forage sector and a summary of the regional challenges for Vancouver Island and Coast; Mainland Southwest; Thompson Okanagan; Cariboo; Kootenay; North Coast/Nechako; and Peace River. Chapter X is a summary of stakeholder priorities and recommendations identified through the project activities described in the above section. Appendix I provides the results of an environmental scan that describes priorities and strategic actions for the forage sectors in other jurisdictions; Appendix II provides cross-tabulated survey results by region, sub-sector and total respondents.

II: FORAGE IN BRITISH COLUMBIA

A. Provincial Overview

1. Forage in British Columbia

According to the Census of Agriculture, British Columbia's farmland makes up just 2.8% of the jurisdictional land area of the province. Nonetheless, that amounts to more than 2.5 million hectares; 78% of which is devoted to raising forage crops. Farmland in BC devoted to forage production includes natural land for pasture; tame or seeded pasture; and, land on which hay crops are grown. Additionally, corn is grown for silage and there are other lands devoted to growing forage for seed.

As described in the following table, natural land for pasture amounted to over 1.4 million hectares province wide in 2016, or 55% of all farmland. Tame or seeded pasture was the next most common forage category in 2016 with over 226,000 hectares followed by alfalfa and mixes (198,000ha) and other tame hay and fodder crops (150,000ha). Corn for silage and forage seed for seed accounted for the fewest hectares although corn for silage was the only category to achieve significant growth between census years (23% additional hectares). The following table describes the number of farms reporting and total hectares for 2011 and 2016 for the major categories of forage farmland use.

Table 3: Forage Categories by Number of Farms and Total Hectares, British Columbia

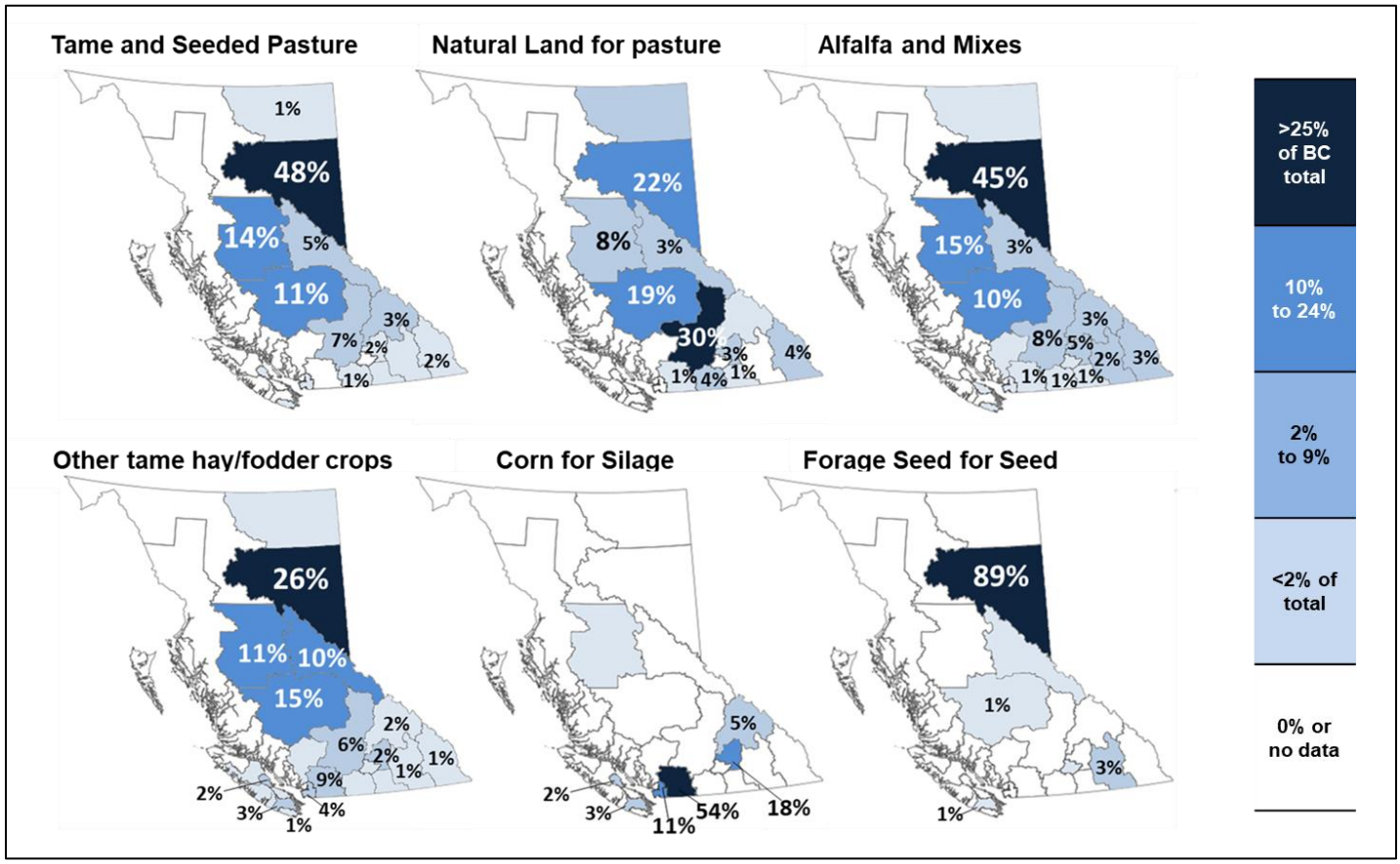
Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	8,553	7,399	-13%	1,385,359	1,433,202	3%	55%
Tame or seeded pasture	5,439	4,319	-21%	226,298	205,872	-9%	8%
Alfalfa and alfalfa mixture	4,498	3,593	-20%	217,898	198,243	-9%	8%
Other tame hay/fodder crops	5,016	4,132	-18%	166,417	150,388	-10%	6%
Corn for silage	488	512	5%	13,840	17,079	23%	1%
Forage seed for seed	178	151	-15%	17,041	15,467	-9%	1%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

As shown in the following figure, types of forage land uses are not evenly distributed throughout the province. The Peace River regional district in the north east of the province had 48% of all hectares in the province of tame and seeded pasture in 2016, along with 22% of natural land for pasture, 45% of alfalfa and mixes, 26% of other tame hay and fodder crops and the vast majority (89%) of all hectares of forage seed for seed. Meanwhile, the Fraser Valley Regional district had 56% of all corn for silage acres. Large regional districts through the central and northern regions account for a large share of total provincial hectares of forage.

The category "other tame hay and fodder crops" was the most common in terms of the total number of regional districts province wide that reported production (23 of 29 regional districts). Corn for silage (7 of 29) and forage for seed (6 of 29) were reported in the fewest regional districts in BC for 2016.

Figure 1: Distribution of total provincial hectares of forage categories by regional district, 2016



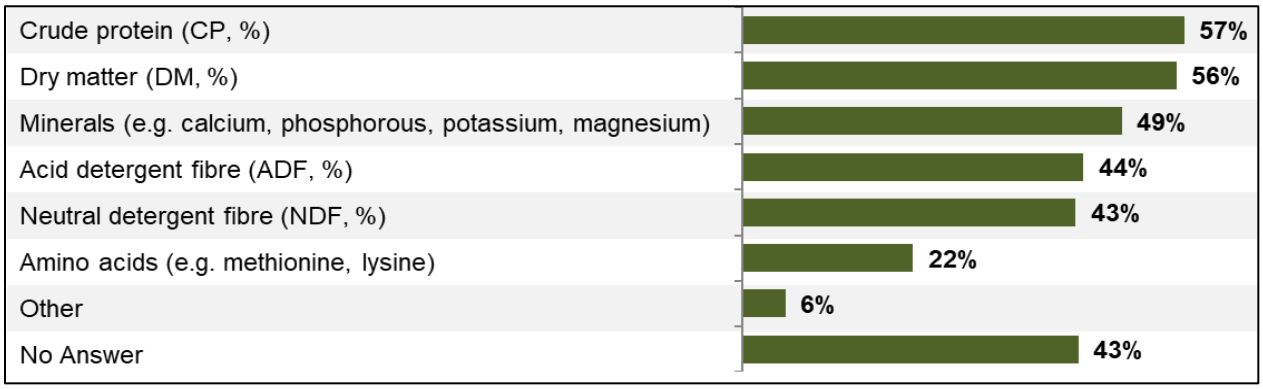
Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

Survey participants were asked to indicate which forage species they grow. Survey results showed significant regional variation but also species that are common across much of the province. For example, over 50% of respondents from 5 of 7 regions indicated growing orchardgrass, alfalfa, timothy or clover species. Others such as tall fescue, bromegrass, corn, and reed canarygrass were very common within a few regions but are less widespread than the leading varieties. Cereals grown as forage were reported by participants from every region, but in no region did more than a quarter say they grew cereals as forage. Wild rye was reported only from Vancouver Island-Coast respondents.

As shown by the following figure, survey respondents were most likely to indicate that they test their forage to determine crude protein and dry matter, followed by minerals, acid and neutral detergent fibre, and amino acids.

Figure 2: Share of Survey Respondents Testing Forage

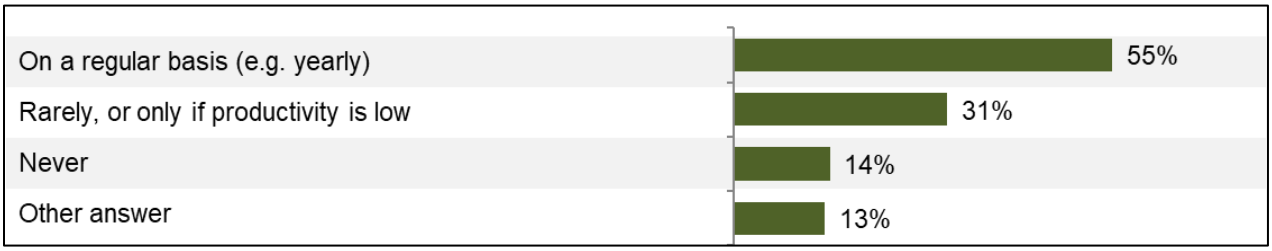
(Do you regularly have your forage tested to determine any of the following? n=68)



Source: Forage Action Plan Provincial Survey

Approximately one-third of survey respondents indicated they have regular soil testing conducted, but nearly as many indicated that they rarely conduct soil testing or only if productivity appears low.

Figure 3: Share of Survey Respondents Testing Soils
(How often do you have your forage soils tested? n=68)

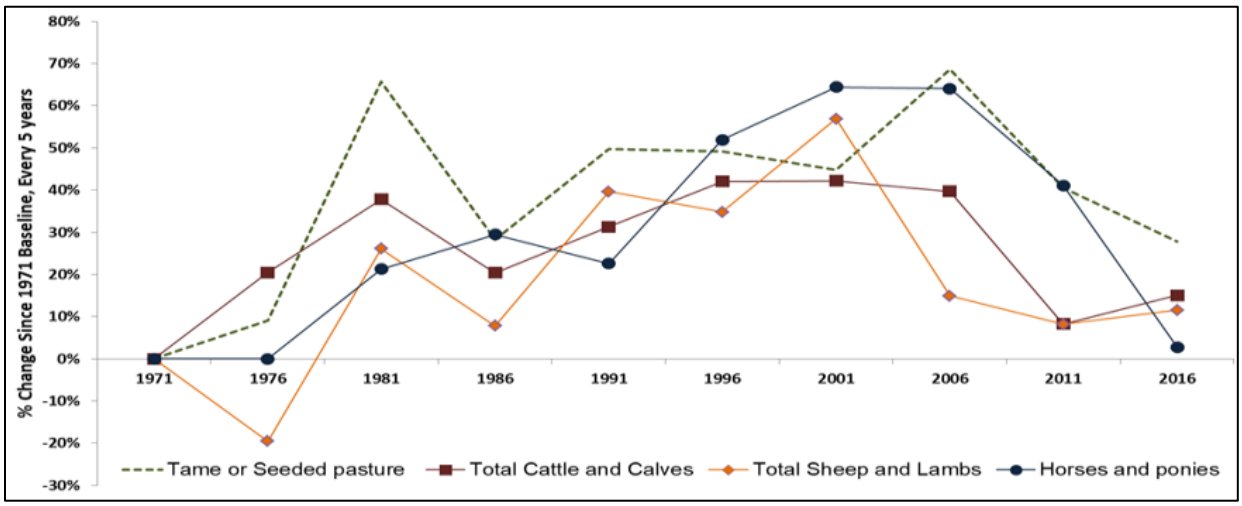


Source: Forage Action Plan Provincial Survey

2. Livestock in BC

Despite some other limited uses for forage crops and an international export market, the vast majority of forage grown in the province is used to feed livestock living in BC. As such, forages are inextricably linked to the major livestock sectors including beef, dairy, equine, sheep & lambs, and others. The high degree of correlation is visually apparent in the following figure which illustrates the forage-livestock relationship by plotting the 5-year percentage change in the number of major livestock relative to a 1971 baseline through to 2016; and, as a general proxy for forage production, the change in total hectares devoted to tame or seeded pasture on private land in BC.

Figure 4: Percentage change in number of animals, hectares of tame or seeded pasture, every 5 years relative to 1971 baseline



As shown in the following table, there were over 776,000 livestock in British Columbia in 2016, including over 659,000 cattle and calves; 59,000 sheep & lambs; 33,000 horses & ponies; 14,500 goats; 6,500 bison; 2,500 llamas & alpacas; and, 520 non-wild deer.

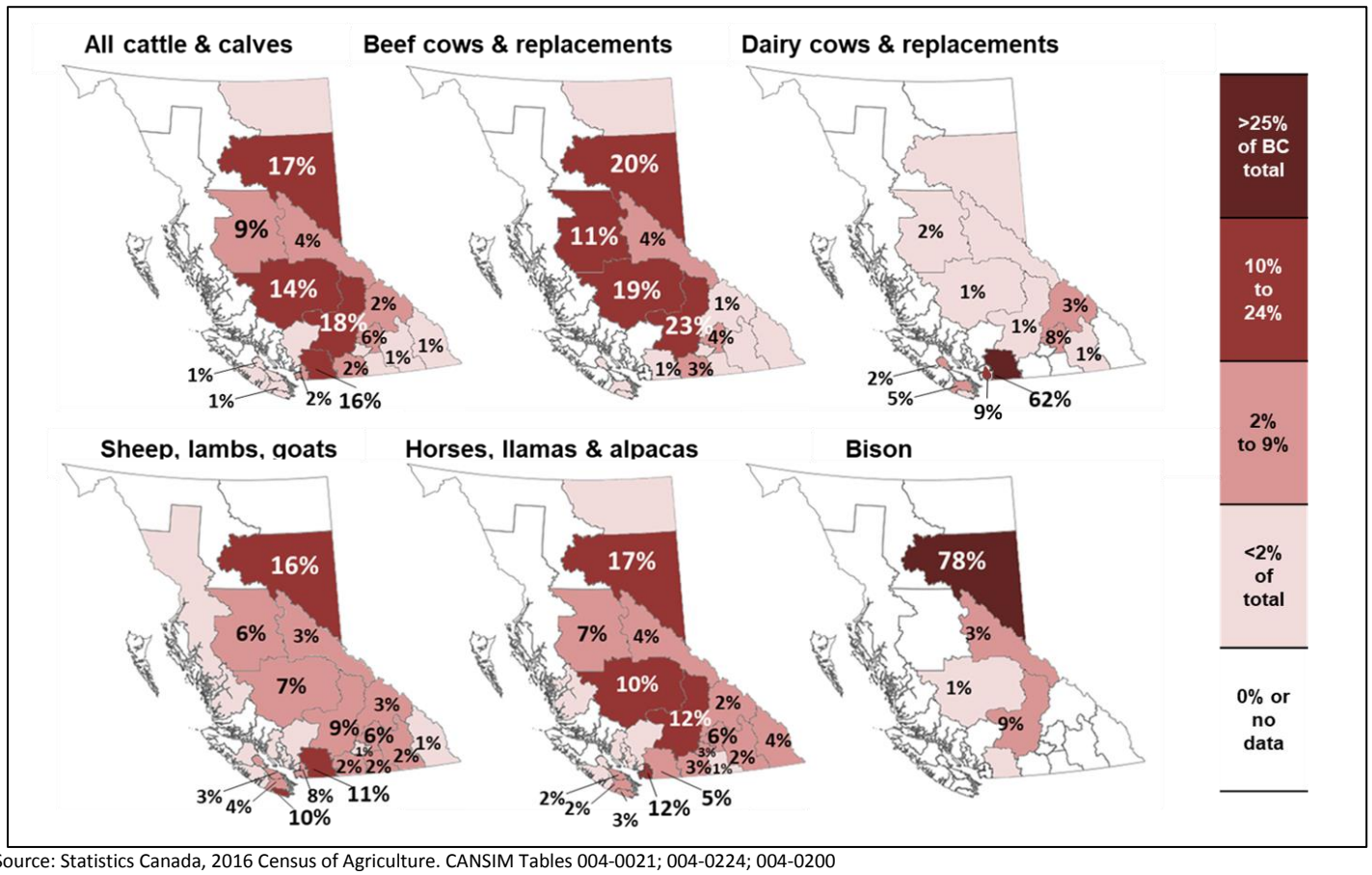
Table 4: (Selected) Animals on Farms, British Columbia

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**5,790**	**5,126**	**-11%**	**620,638**	**659,441**	**6%**	**85%**
Beef cows & replacements	*3,839*	*3,483*	*-9%*	*257,969*	*278,415*	*8%*	*36%*
Dairy cows& replacements	*740*	*687*	*-7%*	*109,731*	*114,861*	*5%*	*15%*
Calves	*4,569*	*4,206*	*-8%*	*199,601*	*220,363*	*10%*	*28%*
Steers & bulls	*3,122*	*2,853*	*-9%*	*53,337*	*45,802*	*-14%*	*6%*
Sheep & Lambs	**1,587**	**1,693**	**7%**	**57,456**	**59,249**	**3%**	**8%**
Horses & Ponies	**6,087**	**4,767**	**-22%**	**45,791**	**33,363**	**-27%**	**4%**
Goats	**882**	**975**	**11%**	**14,649**	**14,508**	**-1%**	**2%**
Bison	**71**	**55**	**-23%**	**9,206**	**6,504**	**-29%**	**1%**
Llamas & Alpacas	**701**	**521**	**-26%**	**4,982**	**2,535**	**-49%**	**<1%**
Deer	**19**	**12**	**-37%**	**831**	**520**	**-37%**	**<1%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

As shown in the following figure, livestock are not evenly distributed throughout the province. Sheep, lambs and goats as well as horses, llamas & alpacas are the most broadly distributed livestock, reported in 25 of 29 regional districts. Meanwhile bison were reported in just 5 of 29 regional districts with 78% in the Peace River regional district. Dairy cows & replacements are largely concentrated in the southwest of the province in the Fraser Valley, Metro Vancouver, Nanaimo and Comox Valley regional districts. Beef cows and replacements are most concentrated in the Thompson-Nicola, Peace, Cariboo and Bulkley-Nechako regional districts.

Figure 5: Distribution of total provincial livestock by regional district, 2016



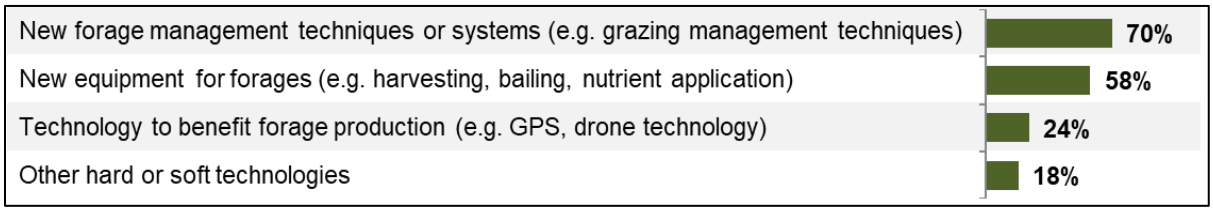
Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

3. Innovation among forage stakeholders

Survey participants were asked if they had adapted or adopted technology over the past five to ten years, as well as what the barriers are adopting or adapting new technology, processes or techniques. Among this group, adoption of new forage management techniques was the most common form of innovation, followed by adoption of new equipment for forages and adaption of technology that can be used to benefit their operations.

Figure 6: Rates of Innovation and Technology Adaption – Survey Results

(Over the last 5-10 years have to adapted or adopted: n=67)

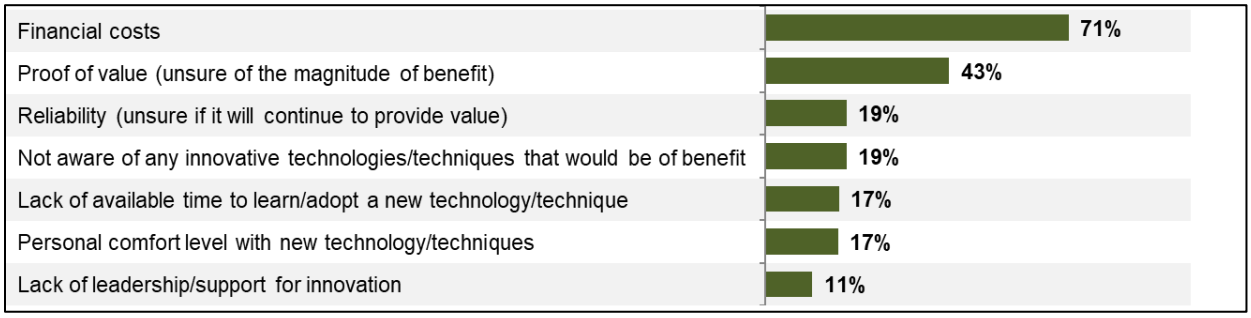


Source: Forage Action Plan Provincial Survey

As shown in the following figure, survey participants were most likely to indicate that financial costs are a barrier to adopting or adapting new technology, processes or techniques that might otherwise benefit their forage-related operations.

Figure 7: Barriers to Innovation – Survey Results

(What barriers do you face in terms of adopting or adapting new technology, processes or techniques that might otherwise benefit your forage-related operations?: n=67)



Source: Forage Action Plan Provincial Survey

III: VANCOUVER ISLAND - COAST

A. Regional Overview

Vancouver Island – Coast region is comprised of the Capital, Cowichan Valley, Nanaimo, Alberni-Clayoquot, Strathcona, Mount Waddington, Comox Valley, Powell River and Central Coast regional districts. The region contains a total of 9% of BC's land base but because of geographic constraints such as mountain ranges is home to just 2% of the farmland and 2.4% of the Agricultural Land Reserve. Farm land is concentrated in the Capital (26% of regional farmland hectares), Nanaimo (22%), Comox Valley (22%) and Cowichan Valley (22%) regional districts.

Climate change projections for the Cowichan Valley specifically are for a strong increasing trend towards higher temperatures in all seasons, less precipitation in the summer months and more of the winter precipitation falling as rain as opposed to snow. Many forms of weather extremes are also expected, such as more warm days and more extremely hot days; increased frequency, intensity and magnitude of extreme rainfall and increased risk of wildfires.[1]

1. Regional Strengths and Advantages

Major strengths and advantages for the forage and forage-related sectors identified by half or more of survey respondents active in the region include: favourable weather and climate for forage production; the presence of irrigation infrastructure; and, long growing season/sunlight hours. Other strengths identified by between 25% and 49% of regional respondents include: affordable farm land; available farm land suitable for forage production; and, favourable soils for forage production.

Engagement session participants also described regional strengths and advantages of the forage and forage related sectors:

- **Favourable weather and climate for growing forages**. Participants noted that there is relatively few instances extreme weather in the region and with available water the growing potential is very good.
- **Forage producers benefit from a relatively closed market**. Demand for forage exceeds local supply, so producers in the region with a surplus are able to sell it. The cost of transportation to Vancouver Island and Coastal areas by ferry or barge creates the conditions for local hay producers to charge a price premium while still out-competing the cost of forage transported from the mainland.
- **In some areas of the region farmland is available and relatively affordable**, according to some engagement session participants. Even in areas that are becoming more populated, one participant noted that non-farmer land owners tend to prefer hay fields to other crops or animal production which creates the conditions for available forage production land for lease.

2. Summary of Forage Production in the Region

Relative to the province overall, farmland in the Vancouver Island and Coast region is less devoted to natural land for pasture but has a higher proportion of total farmland in tame hay and non-alfalfa forage crops. Though accounting for just 2% of total farmland in the region in 2016, the number of hectares of corn grown for silage was 9% higher in 2016 than in 2011.

1 British Columbia Agriculture & Food Climate Action Initiative (July 2013). Regional Adaptation Strategies series: Cowichan.

Table 5: Forage on Farms, Vancouver Island - Coast

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	1,318	1,163	-12%	9,719	8,734	-10%	17%
Tame or seeded pasture	784	643	-18%	4,627	4,259	-8%	8%
Alfalfa and alfalfa mixture	128	83	-35%	1,532	983	-36%	2%
Other tame hay/fodder crops	990	852	-14%	12,840	12,306	-4%	24%
Corn for silage	36	44	22%	870	949	9%	2%
Forage seed for seed	15	22	47%	589	316	-46%	1%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

Survey participants based in the region indicated growing a wide variety of forage species. The most common included orchard grass, tall fescue, timothy, corn for silage, and white clover; others with multiple mentions included red clover, wild rye, and reed canary grass.

3. Summary of Livestock in the Region

As of 2016, the region's livestock include over 22,700 cattle and calves; 13,200 sheep & lambs; 2,500 horses & ponies; 1,900 goats; 590 llamas & alpacas; 400 non-wild deer and some bison. While in BC overall cattle and calves make up 85% of all livestock, in the region the proportion is just 55%, with sheep & lambs comprising 32% of the total livestock number compared to just 3% province wide. Vancouver Island and the Coast has just 2% B.C.'s total farmland in 2016 but was home to 18% of the province's smaller livestock (sheep & lambs, goats, llamas & alpacas, and non-wild deer).

Dairy is more common than beef in terms of the number of cows, however the total number of beef cow & replacement heifers increased by 17% while the number of dairy cows and replacements fell by 17% over the same 5 year period. The number of farms reporting either dairy or beef cows also fell between 2011 and 2016 along with a marginal decrease in the total number of cattle and calves.

The following table describes 2011 and 2016 data related to animals on farms in the Vancouver Island and Coast region.

Table 6: Animals on Farms, Vancouver Island – Coast

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**652**	**529**	**-19%**	**23,229**	**22,767**	**-2%**	**55%**
Beef cows & replacements	*401*	*332*	*-17%*	*5,052*	*5,898*	*17%*	*14%*
Dairy cows& replacements	*92*	*83*	*-10%*	*10,822*	*8,951*	*-17%*	*22%*
Calves	*472*	*399*	*-15%*	*5,944*	*6,311*	*6%*	*15%*
Steers & bulls	*253*	*215*	*-15%*	*1,411*	*1,607*	*14%*	*4%*
Sheep & Lambs	**497**	**500**	**1%**	**14,923**	**13,266**	**-11%**	**32%**
Horses & Ponies	**671**	**515**	**-23%**	**3,447**	**2,535**	**-26%**	**6%**
Goats	**200**	**222**	**11%**	**1,710**	**1,914**	**12%**	**5%**
Bison	**1**	**2**	**100%**	x	x	x	x
Llamas & Alpacas	**127**	**91**	**-28%**	**1,235**	**596**	**-52%**	**1%**
Deer	**7**	**4**	**-43%**	**483**	**405**	**-16%**	**1%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the Vancouver Island/Coast region support the forage and forage-related sectors, including:

- Island Milk Producers Association
- Comox Valley Farmers Institute
- Cowichan Agricultural Society
- Local Chapters of the Horse Council of BC
- Inter-Island Sheep Breeders Association

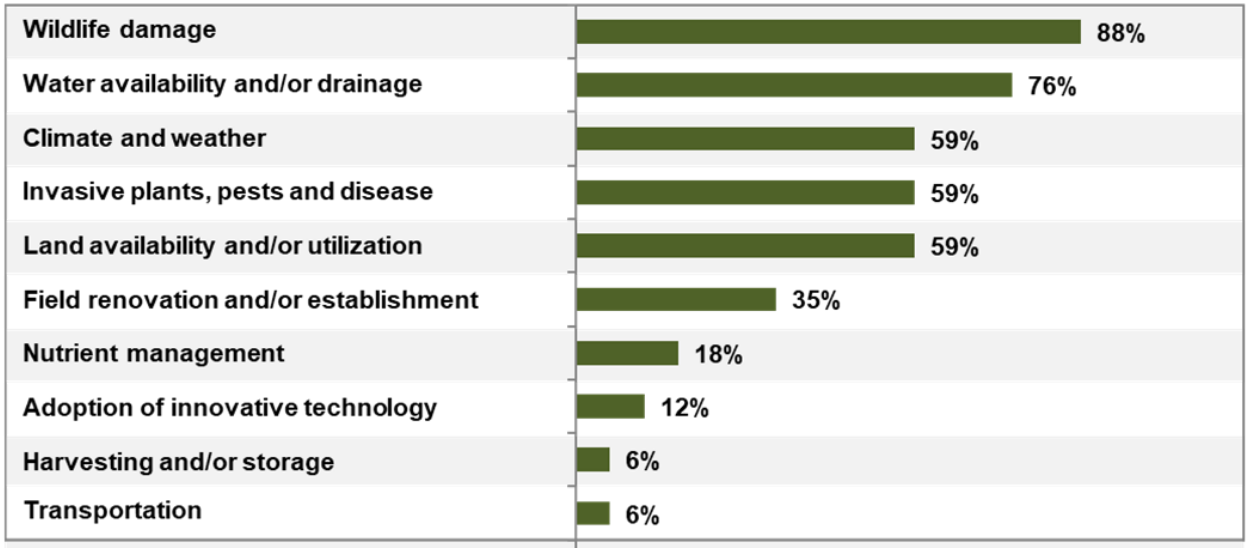
B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Nanaimo on January 19, 2018; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in the Vancouver Island-Coast region.

Figure 8: Regional Challenges Identified by Survey Participants

(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=17)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Wildlife damage

- **Wildlife damage to forages caused by waterfowl**
  - Regional stakeholder session participants described reduced yields and financial costs resulting from waterfowl predation to their established and seeded forage crops. Problem birds include geese, swans, ducks and widgeons. To emphasize the extent of bird-caused damage, one participant added that even seagulls are a problem on their farm. Another stated that the impact of the problem "cannot be overemphasized".
  - Some participants noted that the problem has become worse over time, indicating that while in the past the area had no overwintering populations of geese and swans, now there are. As a result, farming practices

have been altered; for some it is no longer feasible to plant winter crops.

- Forage grown near rivers and other natural water sources appear most likely to suffer significant impact from waterfowl.
- Almost all survey participants from the region said that one of the most significant challenges facing their forage related operation was damage caused to established and seeded forage caused by waterfowl.

➢ **Wildlife damage to forages caused by ungulates and bears**

- In addition to the damage caused by waterfowl, regional stakeholder session participants indicated that deer, elk and bears also present a problem to the forage sector on Vancouver Island/Coast.
- Most examples of the problem provided by participants described damage to corn crops. "They will wipe out acres of corn," said one participant. "The deer come in and chew it all down" added another. Another described a situation in which a large family of bears became an established presence in a corn field.
- The damage leads to decreased yields and other costs, as well as a change to crop selection. A farmer from the Black Creek area on Vancouver Island said that the damage caused by bears eating his corn led to the farm no longer growing corn.
- Because of their size, elk in particular can cause significant damage to fencing. "They rip out thousands of feet of fencing", described one participant.
- Some regional stakeholder session participants expressed that there is a conflict between the desired outcomes of the Ministry of Environment and other conservation interests on one side, and forage stakeholders on the other. These participants described being unable to get support from various levels of government in terms of wildlife compensation or control, while at the same time there are efforts underway to increase the elk population on Vancouver Island.
- Over half of all survey participants from the region said that damage caused to established and seeded forage by ungulates was among the most significant challenges to their operations.

2. Climate, weather and water

➢ **Water**

- Several regional engagement stakeholders indicated that while their forage production could be increased with greater use of irrigation, they are limited by the cost of water and infrastructure and by regulations contained in the *Water Sustainability Act*. In the circumstances described by those participants *WSA* regulations presented financial and non-financial barriers to increasing irrigation of forage crops on their farms.
- Unmatched timing of water availability and water need was a challenge mentioned by several participants. These participants described situations such as only being allowed to irrigate in the months they do not require it (during the hot summer the river is too low for agricultural use) or being unable to economically store an adequate volume of winter precipitation to use for irrigation though the summer.
- Water availability and/or drainage was selected by three-quarters of survey respondents from the region as a significant challenge to their or other's forage operations. Among that group, drought conditions and lack of irrigation were the most common challenges, followed by prohibitive water regulations and legislation. Poor drainage and flooding were also mentioned.

➢ **Changing climate and weather patterns**

- Much of the region has experienced dryer than usual spring and summer weather over the past few years. In the words of one regional stakeholder participant, "a lot of farms here are experiencing climate change".
- Drought conditions limit water availability, which decreases the length of the growing season and the overall quantity and quality of forages grown. Adaptation is complex, as described by one participant: "We have a short growing season due to the drought. We do have an early grass if the geese do not get it, but then we have trouble with the soggy soils and drainage becomes the issue."
- Over 50% of survey respondents from the region said that climate and weather is a significant challenge. Among this group, the leading challenges were the ways in which a changing climate and weather trends are

negatively affecting the growing season for forage, the seeding of forage, and are increasing the prevalence of invasive plants, pets and disease. Some respondents said that the changing weather and climate are negatively affecting forage harvest, increasing the prevalence of wildlife damage, negatively affecting nutrient management, and increasing the likelihood of winterkill.

3. Invasive plants, insects and pests

➢ Invasive weeds and pests

- Many engagement session participants expressed concern over the presence of invasive weeds and or insects. Japanese knot weed, armyworm, wireworm and leatherjackets were mentioned. "We are knocking on wood that the corn rootworm doesn't appear", said a participant.
- One participant indicated that contrary to popular belief, the armyworm is now overwintering in some locations on Vancouver Island.
- Invasive plants, pests and/or disease was selected by more than half of survey respondents from the region as a significant challenge. Insects and other pests were the most commonly mentioned challenge, followed by weeds, then disease.

4. Land use, availability and affordability

➢ Non-optimal use, expense and availability of farmland

- In some areas of the region urban expansion and other development has led to a loss in farmland.
- One stakeholder suggested that as a result of increased land prices there has been a shift towards producers leasing land owned by non-farmers. This type of contractual arrangement between owner and renter does not create an incentive for either party to make long term investments in the production capacity of the leased land.
- The majority of survey respondents from the region indicated that among the most significant challenges for themselves or the sector was the lack of available farmland for forage production and the prohibitive cost of farmland in the region.

➢ Development adjacent to farmland

- While some areas of Vancouver Island remain primarily agricultural and forested, other areas in the region are experiencing significant urban and suburban development. This can lead to the sense of "living in a fish bowl" – a phrase given by an engagement session participant. Other participants warned of the potential for flooding and the need for improved water retention controls as land surfaces are paved or otherwise covered in areas adjacent to farmland.

5. Transportation and market access

➢ Transportation

- The cost of ferry travel or freight transportation from the mainland to Vancouver Island/Coast is significant for many forage stakeholders in the region. Despairingly, a participant in Nanaimo wondered what the trend of increasing costs could mean for the region: "When does it end, when we have no more production of animals on the island?"
- One specific issue related to transportation cost is the need for ongoing application of lime to soils in the region as well as the input of other soil amendments (e.g. manure, other fertilizers). Stakeholders described that the coastal forest soils are naturally acidic and require regular application of lime to maintain the soil pH required by forage crops. While there is a local source of agricultural lime available at present, some concerns were voiced with respect to the sustainability of that source and the increased likelihood of incurring high transportation costs for a necessary input.
- Participants described the unique challenge of transporting animals on BC Ferries vessels, and in particular the challenges from the lack of a priority placed on livestock access to sailings. It is dangerous in many cases for animals to be delayed due to a missed ferry and be forced to spend additional time in trailers however the ferry corporation lacks any policy that places priority on customers transporting livestock.

6. Other challenges

- **Concerns expressed about upcoming manure regulations**
    - Some engagement session participants indicated that they are concerned that new regulations will impose application timelines that cannot be adhered to through the normal course of farming operations.

- **Equine feed requirements**
    - The region is home to many horses, but the majority of forage grown in the region is for the dairy market. Horses require low-sugar hay and experience health problems when provided a diet consisting only of high quality, high sugar hay. Meanwhile, dairy operations require higher sugar forages. As such, purchasers of horse quality hay must often pay a premium for transportation from the mainland.

IV: LOWER MAINLAND – SOUTHWEST

A. Regional Overview

Lower Mainland – Southwest region is made up of the Fraser Valley, Metro Vancouver, Sunshine Coast and Squamish-Lillooet regional districts. The region has about 4% of total BC farmland, which is proportionate to its share of the provincial land base.

Climate change projections for key agriculture areas in the region including Delta and the Fraser Valley are for a strong increasing trend towards higher temperatures in all seasons and the potential for less precipitation in the summer months and more of the winter precipitation falling as rain as opposed to snow. Many forms of weather extremes are also expected, such as more warm days and more extremely hot days; increased frequency, intensity and magnitude of extreme rainfall; and dryer conditions in summer.[2]

1. Regional Strengths and Advantages

Major strengths identified by half or more survey respondents active in the region include: favourable soils for forage production; favourable weather and climate for forage production; and, long growing season and sunlight hours. Other strengths identified by between 25% and 49% of regional respondents include: presence of irrigation infrastructure; and, the strength of the local producer community.

Engagement session participants focused on the long growing season, favourable climate, soils and growing conditions. "Our ability to grow cool season perennials is amazing", said one participant. Another added: "Our climate is a huge benefit; we can do four to five cuts per year."

2. Summary of Forage Production in the Region

The region is home to just 3% of all BC hectares devoted to forage and forage seed crops but the growing conditions and market demand from the dairy sector allow it to account for 65% of the total area of corn grown for silage in 2016. Compared to 2011 there were significantly fewer hectares devoted to forage crops in the region, including over 11,000 fewer hectares of natural land for pasture (36% decline); 3,600 fewer acres of other tame hay and fodder crops (-15%); 3,200 fewer hectares of tame or seeded pasture (-41%); and 1,000 fewer hectares of alfalfa and alfalfa mixtures (-21%). In fact, corn for silage was the only category to significantly increase hectares in 2016 relative to 2011 (+21%).

Table 7: Forage on Farms, Lower Mainland – Southwest

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	1,619	1,432	-12%	32,088	20,683	-36%	19%
Tame or seeded pasture	1,002	761	-24%	7,856	4,633	-41%	4%
Alfalfa and alfalfa mixture	236	192	-19%	4,816	3,802	-21%	4%
Other tame hay/fodder crops	1,389	1,119	-19%	23,738	20,085	-15%	19%
Corn for silage	332	332	0%	9,102	11,015	21%	10%
Forage seed for seed	24	20	-17%	493	499	1%	0%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

Survey participants based in the region were most likely to indicate growing orchard grass, corn for silage, and tall fescue. Relative to other regions in BC, survey responses were concentrated among fewer forage varieties.

2 British Columbia Agriculture & Food Climate Action Initiative (July 2013). Regional Adaptation Strategies series: Delta; Fraser Valley

3. Summary of Livestock in the Region

As of 2016, the region's livestock are dominated by over 127,000 cattle and calves comprising 86% of all livestock in the region. Among those, dairy cows vastly outnumber beef cows; in fact, the region is home to 73% of all dairy cows & replacements in BC. Though there was an overall decrease in the number of farms reporting cattle or calves, the total number of animals was 9% higher in 2016 than in 2011. The growth was led by the dairy sector. In fact, the number of beef cows and replacements as well as the number of steers & bulls decreased.

Among most other livestock there has been large percentage decreases between 2011 and 2016: there are over 3,000 fewer horses & ponies in the region, a decrease of 34%; the number of llamas & alpacas and deer decreased by about 40%; and, sheep & lambs, the most numerous livestock after cattle, decreased by 8%.

Goats were the only livestock in the region besides dairy cows & replacements and calves to increase in number between 2011 and 2016 census. As of 2016 there are over 6,000 goats in the region.

The following table describes 2011 and 2016 data related to animals on farms in the Lower Mainland – Southwest region.

Table 8: Animals on Farms, Lower Mainland – Southwest

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**1,279**	**1,089**	**-15%**	**117,344**	**127,508**	**9%**	**86%**
Beef cows & replacements	*507*	*392*	*-23%*	*9,661*	*9,268*	*-4%*	*6%*
Dairy cows& replacements	*398*	*354*	*-11%*	*76,451*	*83,826*	*10%*	*56%*
Calves	*936*	*806*	*-14%*	*27,304*	*30,677*	*12%*	*21%*
Steers & bulls	*415*	*323*	*-22%*	*3,928*	*3,737*	*-5%*	*3%*
Sheep & Lambs	**373**	**375**	**1%**	**9,066**	**8,328**	**-8%**	**6%**
Horses & Ponies	**1,195**	**863**	**-28%**	**8,961**	**5,920**	**-34%**	**4%**
Goats	**265**	**291**	**10%**	**5,177**	**6,068**	**17%**	**4%**
Bison	**2**	**5**	**150%**	**x**	**18**	**n/a**	**<1%**
Llamas & Alpacas	**191**	**147**	**-23%**	**1,126**	**670**	**-40%**	**<1%**
Deer	**5**	**5**	**0%**	**118**	**69**	**-42%**	**<1%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the Lower Mainland-Southwest region support the forage and forage-related sectors, including:

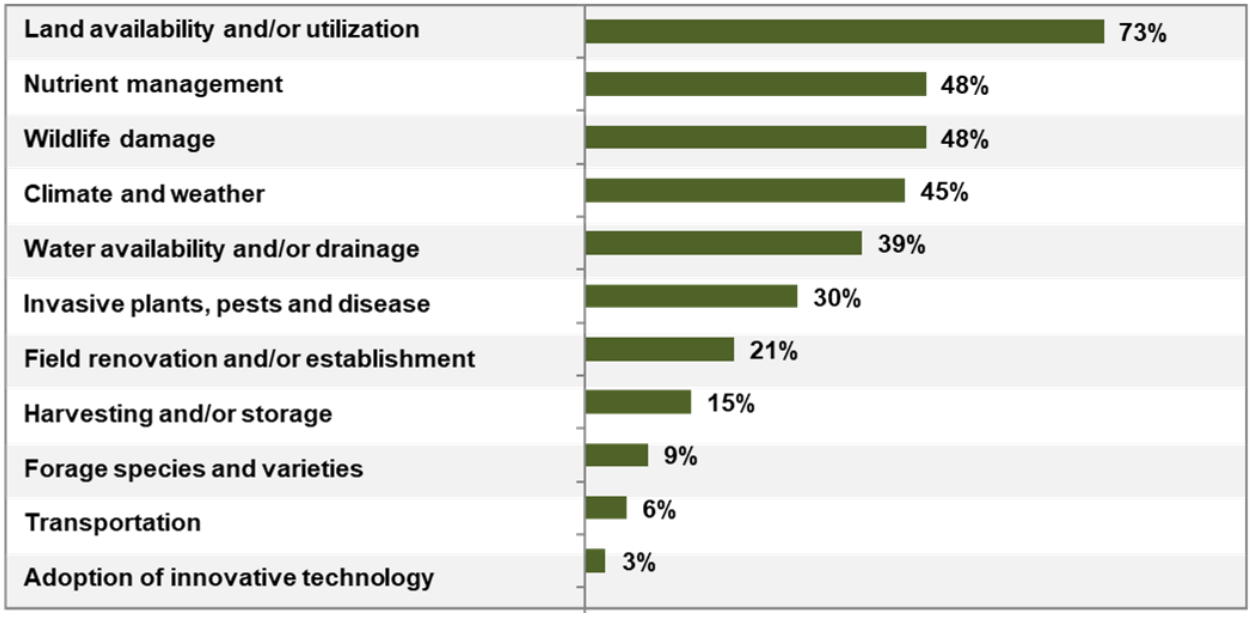
- Pacific Field Corn Association
- Mainland Milk Producers
- Lower Mainland Sheep Producers Association
- Delta Farmers Institute

B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Abbottsford on November 28, 2017; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in the Mainland-Southwest region.

Figure 9: Regional Challenges identified by Survey Participants
(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=33)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Land use, availability and affordability

- **Land cost and return on investment**:
  - Increased land values in the region resulting from urban expansion or the transition to crops with higher expected values negatively affect some forage stakeholders. Dairy farmers in the region commented during the regional engagement session that the issue of land prices affects them in particular because they require land for the purpose of nutrient management. For some, it may not make economic sense to use land for forage production (i.e. it would be more cost effective to purchase forage) except for the benefits it provides them with respect to nutrient management. "We can't live long enough" to realize a return on investment given the cost of land, commented one participant.
  - Three-quarters of all survey participants from the region said that a significant challenge to the sector or their operations is the prohibitively high cost of available land while over 50% of respondents said a challenge is the lack of available land for forage production.

- **Loss of farmland**:
  - Participants expressed concern at the amount of farmland they witness being taken out of production or underutilized. Land is converted for industrial and urban development, to be the site of greenhouse-based farming operations or used primarily as residential property (i.e. the "monster home" issue). Even in cases where the land itself remains relatively unchanged, as in the case of large residential properties, participants surmised that many such property owners are motivated only to meet the threshold necessary to claim farm status for the purpose of reduced property taxes but are unconcerned with managing the land to its full agricultural potential. Another consequence of the issue is the fragmentation of farmland into smaller parcels. This can affect the use of equipment and as one participant explained, add considerable cost to equipment rental (trucking, etc.) because of the time spent waiting to cross busy roadways to access

disparate parcels.

- **Public interest and perception of farm practices:**
  - Some participants expressed that members of the public often hold opinions about how farming should take place without having any direct practical knowledge related to agriculture. Additionally, other public interests appear to supersede the right to farm in the opinion of some participants. For example, the public aim to restore salmon populations in local streams or rivers was characterized as being supported and regulated in a manner that unduly harms farmers and the use of farmland.

2. Research and knowledge transfer

- **Lack of locally available and/or relevant research and extension services**
  - Several engagement session participants said that the lack of research and extension in the region and the long period of absence from the Ministry of Agriculture in forages is a challenge facing the sector. Many indicated that they had themselves conducted various trials and farm-level research but that this is not an optimal way to carry out research. They stressed the negative impact caused by a lack of provincial involvement and coordination of research and extension activities.

- **Lack of information and research on nutrient management techniques and principles**
  - Nearly 50% of survey participants from the region said that nutrient management represents a significant challenge to their operations or the regional sectors. Among this group the challenge was most often defined as a lack of available information or research on nutrient management techniques and principles and restrictive laws and regulation affecting nutrient management.

3. Wildlife and invasive plants, insects and pests

- **Wildlife damage to forages caused by waterfowl**
  - Waterfowl is the key challenge facing forage production in the Mainland/Southwest region according to several engagement sector participants. Several described the way in which waterfowl, namely snow geese but also other species, undermine efforts to invest in new technology, soil heath and other interventions aimed at increasing productivity. In the words of one participant, “Waterfowl really limit the potential. We could have the best production in Canada if not for the waterfowl. This is very frustrating for producers.”
  - Stakeholders noted that as result of climate change there are increasing numbers of geese in the average year’s flock; meanwhile as a result of pressure on farmland in the South Coast area there are fewer fields available for waterfowl to use while residing in the area. The remaining farmers are forced to absorb a larger share of a growing problem.
  - Participants described the ways waterfowl damage has altered their practices. These included transitioning to growing almost entirely corn as opposed to grasses; ceasing to grow perennial crops in favour of annuals (which introduces additional nutrient management challenges); ceasing to grow any winter crops; spending time and financial resources to try new varieties and mixes
  - Participants described other ways that they have tried to manage the problem, such as attempting new mixes of perennials or varieties they hoped would be less palatable to waterfowl, using lasers to deter waterfowl, planting “lure” fields (Delta Farmland Wildlife Crop Trust), laser levelling forage fields to reduce ponding and resultant attractiveness to waterfowl. Each of these were said to offer some short term benefit but none has altered the worsening trajectory of the problem from the perspective of forage production.
  - Among regional participants of the survey, the leading challenge was damage caused to seeded forages, followed by damage to established forage stands.

- **Invasive plants and insects**
  - The presence of the true armyworm and the Western corn rootworm were indicated by engagement session participants as being of particular concern.

- 30% of survey respondents from the region indicated that invasive plants, pests and disease is a significant challenge. Among this group, insects were the more common challenge followed by weeds and invasive plants.

4. Climate, weather and water

➢ Changing climate and weather

- Nearly half of all survey respondents from the region indicated that climate and weather is a significant challenge to their operations or for the forage sector in the region. Among this group, negative impacts on forage harvest was the most commonly indicated challenge, followed by impacts on the growing season, increased prevalence of invasive plants, pests or disease, and negative impacts on the seeding of forage.

➢ Water issues and irrigation infrastructure

- While many participants have irrigation infrastructure they also indicated that there are areas in the region without it and also indicated that the *Water Sustainability Act* presents obstacles to irrigation. One participant found the fact that there are water availability issues in a region with a massive river system to be ironic.
- Most concerns voiced about water availability were based in the experiences in past years with drought. Many participants had noticed changes in the distribution of precipitation throughout the year and the increasing commonality of drought conditions through summer. “It’s been really bad for us the past few years”, commented one participant.
- Along with dry summers, participants noted that at other times of the year there is too much precipitation.
- Over one-third of survey respondents indicated that water and drainage was a significant challenge to their operations or to the forage sectors in the region. Among this group the most common challenges related to poor drainage and flooding conditions followed by the challenge of increasing prevalence of drought conditions. Others are challenged by lack of irrigation or regulations on water usage.

V: THOMPSON – OKANAGAN

A. Regional Overview

The Thompson – Okanagan region is made up of the Okanagan-Similkameen, Thompson-Nicola, Central Okanagan, North Okanagan and Columbia Shuswap regional districts. The region has about 30% of total BC farmland, 70% of which is concentrated in the Thompson-Nicola regional district.

Climate change projections for the Okanagan region are for a strong increasing trend towards higher temperatures in all seasons and the potential for less precipitation in the summer months and more of the winter precipitation falling as rain as opposed to snow. Many forms of weather extremes are also expected, such as more warm days and more extremely hot days (up to 7X more); increased frequency, intensity and magnitude of extreme rainfall; and more extremely wet days.[3]

1. Regional Strengths and Advantages

Major strengths identified by at least two-thirds of survey respondents active in the region include: favourable weather and climate for forage production and favourable soils for forage production. Other strengths identified by between 50% and 66% of regional respondents include: irrigation infrastructure, access to local/regional markets and availability of land suitable for forage production.

Engagement session participants also described regional strengths and advantages of the forage and forage related sectors:

- The region is a forage deficit area which creates a strong market for local producers of forages. There are many horse owners in the region who pay a premium for horse hay. Additionally, there is an increase in dairy production in the region which creates a market for high quality forages while allowing lower quality to be used for beef production.
- High quality soils, availability of water and a good supply of nutrients.

2. Summary of Forage Production in the Region

Three-quarters of all private farmland in the Thompson-Okanagan is categorized as natural land for pasture, whereas province wide natural land for pasture accounts for 55% of farmland. In 2016 the region had approximately 22% of all provincial hectares of corn for silage and had 15% more land devoted to corn compared to the region in 2011.

Table 9: Forage on Farms, Thompson – Okanagan

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	2,183	1,888	-14%	493,007	573,028	16%	74%
Tame or seeded pasture	1,330	1,048	-21%	28,886	27,928	-3%	4%
Alfalfa and alfalfa mixture	1,801	1,366	-24%	42,418	36,247	-15%	5%
Other tame hay/fodder crops	705	612	-13%	18,742	16,960	-10%	2%
Corn for silage	99	113	14%	3,344	3,852	15%	<1%
Forage seed for seed	13	12	-8%	178	86	-52%	0%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

Survey participants based in the region indicated that they grew a wide variety of forage species, the most common included alfalfa and orchard grass; others with multiple mentions included timothy, corn for silage, red clover, smooth and meadow bromegrass, crested wheatgrass, and cereals as forage.

3 British Columbia Agriculture & Food Climate Action Initiative (July 2013). Regional Adaptation Strategies series: Okanagan

3. Summary of Livestock in the Region

As of 2016, the region's livestock include over 192,000 cattle and calves, which is just less than 30% of the entire provincial herd. While beef cows and replacements outnumber dairy cows and replacements in the region by a factor of 6:1, the region does have an active dairy sector and is home to over 50% of all dairy cows and replacements found outside of the Lower Mainland – Southwest region. Key informants indicated that many of the dairy replacements found in the region are destined for dairy production in the Lower Mainland. The total number of calves in 2016 was 20% higher than in 2011, double the provincial 5-year increase of 10%.

There were approximately 2,500 fewer horses & ponies, 850 fewer goats and 600 fewer llamas & alpacas in the region in 2016 than there was in 2011. A total of 50 more farms reported sheep & lambs in 2016 but the total number of animals was slightly lower than it was in 2011.

The following table describes 2011 and 2016 data related to animals on farms in the Thompson-Okanagan region.

Table 10: Animals on Farms, Thompson – Okanagan

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**1,401**	**1,278**	**-9%**	**171,000**	**192,851**	**13%**	**88%**
Beef cows & replacements	*913*	*873*	*-4%*	*81,040*	*91,141*	*12%*	*42%*
Dairy cows& replacements	*119*	*114*	*-4%*	*16,224*	*15,987*	*-1%*	*7%*
Calves	*1,081*	*1,024*	*-5%*	*56,796*	*68,051*	*20%*	*31%*
Steers & bulls	*715*	*684*	*-4%*	*16,940*	*17,672*	*4%*	*8%*
Sheep & Lambs	**313**	**363**	**16%**	**13,603**	**13,257**	**-3%**	**6%**
Horses & Ponies	**1,632**	**1,306**	**-20%**	**11,672**	**9,141**	**-22%**	**4%**
Goats	**188**	**198**	**5%**	**3,534**	**2,688**	**-24%**	**1%**
Bison	**19**	**12**	**-37%**	**686**	**647**	**-6%**	**<1%**
Llamas & Alpacas	**170**	**112**	**-34%**	**1,177**	**602**	**-49%**	**<1%**
Deer	**4**	**2**	**-50%**	**180**	**x**	**x**	**<1%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the Thompson-Okanagan region support the forage and forage-related sectors, including:

- Locals of the BC Cattlemen's Association including: Clinton & District Cattlemen's Association; Kamloops Stockmen's Association; Nicola Stockbreeder's Association; North Okanagan Livestock Association; Southern Interior Stockmen's Association
- Kamloops Okanagan Dairy Association
- North Okanagan Dairy Extension Advisory Committee

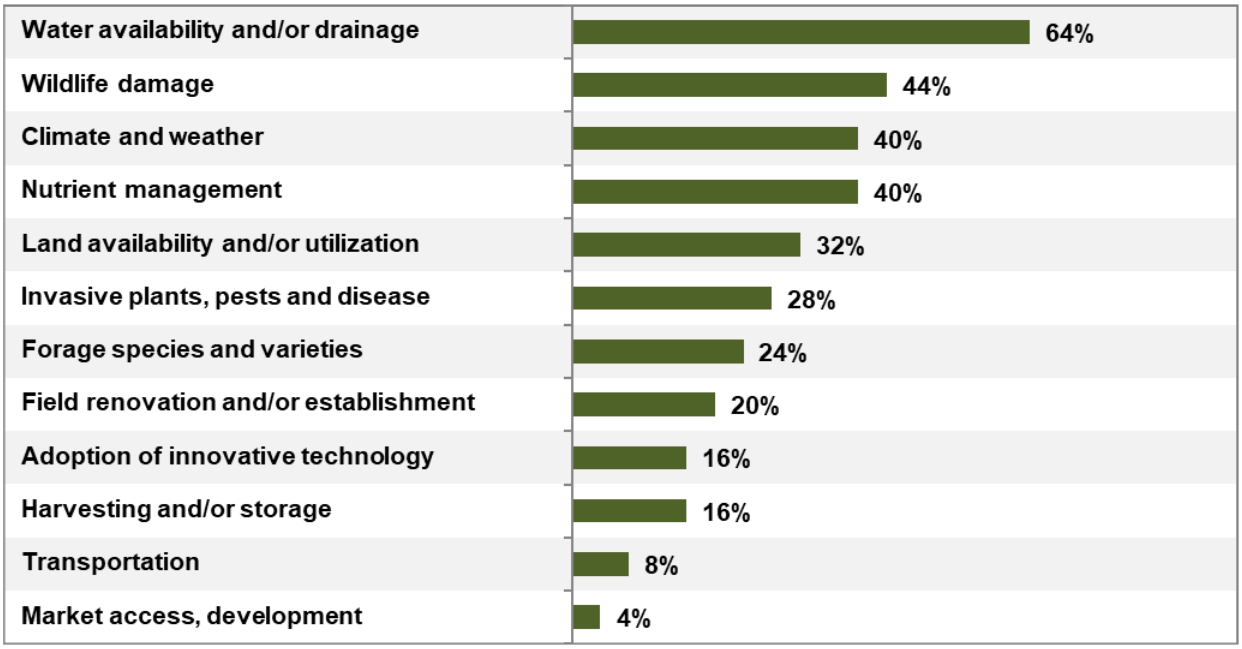
B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Kamloops on January 23, 2018; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in the Thompson-Okanagan region.

Figure 10: Regional Challenges identified by Survey Participants

(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=25)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Climate, weather and water

- **Water based challenges**
  - Participants expressed that the region does not receive enough rain during the growing season, and at times receives too much while farmers are trying to dry their hay.
  - Lack of water limits the production of forages.
  - Some participants expressed concern and uncertainty about how they will be affected by the *Water Sustainability Act*.
  - Almost all survey participants from the region indicated that a significant challenge is increasingly common drought conditions which negatively affect forages. Over half said that lack of irrigation is a challenge. Others reported being challenged by prohibitive water regulations and legislation.

- **Climate and weather**
  - 40% of survey respondents indicated that climate and weather is a significant challenge in the region or facing their operations. Among this group, the most common challenge is that changing climate and weather trends are negatively affecting forage harvest, although half of all respondents reported challenges related to the growing season for forage while one in four respondents indicated that , seeding, an increased prevalence of wildlife damage and winterkill and an increasing prevalence of invasive plants, pests and or disease.

2. Wildlife and invasive plants, insects and pests

- **Invasive plants and pests**
  - Participants described significant concerns regarding the spread of invasive plants and pests throughout the region, including hoary alyssum, knapweed, alfalfa weevil and gophers.
  - There are several causes according to participants including frequent transportation of hay within the region

(to supply hobby farms, equine sector, etc.); lands owned by individuals who are unmotivated to care for and maximize productivity of the land; and unkempt roadways and other public property where weed species tend to thrive and spread to adjacent farmland.

- Some participants described that due to toxicity concerns effective products are no longer permitted for use (e.g. "gopher getter") and this compounds the negative impact sustained by their farms.
- About one-third of survey respondents from the region indicated that invasive plants, pests and disease are a significant challenge. Among this group, weeds and invasive plants was the top concern followed by insects and other pests.

➢ **Negative impact caused by wildlife**

- Participants described sustaining damage to forage stands from deer. The problem is getting worse because much of the land base is transitioning to higher-value crops and those crops tend to be protected by deer fencing. As a result, areas remaining in forage have to absorb the increased impact.
- Livestock producers in the area experience predation of their animals from large predators such as bears and cougars and participants indicated there are limited ways available to them to mitigate the problem.
- Some participants noted that despite the challenges the wildlife compensation program was working well for them.
- For survey participants from the region, damage caused to established forage stands by ungulates was the top challenge followed by damage caused by ungulates to seeded fields.

3. Research and knowledge transfer

➢ **Lack of locally-based research and information**

- Participants described a lack of government resources for forage. As a compromise they describe relying on other producers and on private sector suppliers (e.g. seed marketers) for information related to species and varieties of forage crops, pest management, etc. The inherent bias that is possible in that relationship was well acknowledged by most participants.
- Participants described that there was a federal research station in the region but it has since closed. "There have been no alfalfa or grass trials around here since about 2002", according to one participant.
- Participants described hearing about practices and techniques used elsewhere in Canada such as polycropping and expressed that without unbiased local research they are prevented from taking the risk towards what might be a beneficial practice.

➢ **Limited information and research on nutrient management techniques and principles**

- 40% of survey respondents from the region said that nutrient management represents a significant challenge to their operations or the regional sectors. Among this group the challenge was most often defined by a lack of available information or research on nutrient management techniques and principles.

4. Land use, availability and affordability

➢ **Land not being used to its full potential**

- Participants indicated that there is land in the region that is not being grazed or otherwise used for forage production because of aging farmers and a lack of new generation farmers to take over. Even in instances where land is leased there may be a lack of incentive from either the owner or the renter to invest in inputs to improve production.
- Others mentioned that the low income threshold for farm status may contribute to this problem.

➢ **Pressure on the land base, other crops**

- The region is experiencing urban and industrial development that places pressure on farmland and the cost of farmland. One participant indicated that "we have to be careful here around land speculation" as development accelerates in the region.
- High value crops, such as grapes and cherries, are an increasing share of the land base. A producer admitted to making more off a small section of grapes than from their primary operation as a beef producer: "Just to keep the land and the water for growing forage is a challenge for us here."
- Another participant indicated that forest infill practices have also removed land from forage production.

➢ **Availability and cost of land**
- Three-quarters of survey respondents indicated that among the significant challenges facing their operations or sector is the lack of available farmland suitable for forage production and the prohibitive cost of available land.

5. Transportation and market access

➢ **Cost of transportation and freight**
- "The transportation is worth more than the hay, so it makes it hard to do what we are doing" commented one participant involved in forage production and marketing.
- The issue is said to be compounded by a lack of local resources in the custom cropping and other custom businesses relative to other regions.

VI: KOOTENAY

A. Regional Overview

The Kootenay region is made up of the East Kootenay, Central Kootenay and Kootenay Boundary regional districts. The region accounts for about 5% of total BC farmland.

Climate change projections for the Kootenay Region are for a strong increasing trend towards higher temperatures in all seasons and the potential for less precipitation in the summer months and more of the winter precipitation falling as rain as opposed to snow with significant decrease in spring snowfall. Many forms of weather extremes are also expected, such as more warm days and more extremely hot days; increased frequency, intensity and magnitude of extreme rainfall; dryer conditions in summer; and increased risk of wildfires and their intensity.[4]

1. Regional Strengths and Advantages

Major strengths identified by half or more survey respondents active in the region include: favourable weather and climate for forage production and strong and supportive producer community. Other strengths identified by between 30% and 49% of regional respondents include: access to local/regional markets, affordable farm land, irrigation infrastructure, low prevalence of noxious weeds and low prevalence of wildlife damage to forage crops.

Engagement session participants also described regional strengths and advantages of the forage and forage related sectors:

- Favourable growing conditions including moisture, sunlight hours, river access and irrigation infrastructure. "We can produce good hay here and dry it. We can graze seven months of the year". However, according to participants it has become such that there is no "normal" weather.
- The region is well situated to sell into several markets including the local market, Alberta, United States, and the Lower Mainland. There is an export compression plant in the region providing additional market access.
- Strong local community among producers and a local population in areas that is willing to pay a premium for locally produced and healthier food.

2. Summary of Forage Production in the Region

Over three-quarters of all farmland in the Kootenay region is devoted to forage. However, all forage categories described in the following table had fewer hectares declared in 2016 relative to 2011. In fact, taken together the reductions from 2011 for tame or seeded pasture (-44% change in number of hectares), other tame hay and fodder crops (-18%), alfalfa and mixes (-10%) and natural land for pasture (-9%) totals over 15,000 fewer hectares in 2016 compared to 2011. A small number of operations include corn for silage and forage seed for seed but data is unavailable to protect confidentiality.

Table 11: Forage on Farms, Kootenays

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	645	551	-15%	82,587	75,029	-9%	59%
Tame or seeded pasture	382	304	-20%	11,282	6,279	-44%	5%
Alfalfa and alfalfa mixture	495	412	-17%	14,400	12,945	-10%	10%
Other tame hay/fodder crops	262	235	-10%	6,798	5,575	-18%	4%
Corn for silage	12	8	-33%	x	x	N/A	<1%
Forage seed for seed	9	5	-44%	814	x	N/A	<1%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

4 Pacific Institute for Climate Science

Survey participants based in the region indicated that they grow a wide variety of forage species, the most common included alfalfa, timothy and alsike clover; others were mentioned including red clover, Kentucky bluegrass, orchard grass and bromegrass.

3. Summary of Livestock in the Region

As of 2016, the Kootenay region's livestock include approximately 30,000 cattle and calves; 3,500 sheep & lambs; 2,400 horses & ponies; 660 goats; 150 llamas & alpacas; and some bison.

Compared to 2011, the number of all livestock was lower in 2016 with the exception of dairy cows & replacements, which increased by 14%, and sheep & lambs, which increased by 63% or about 1,350 animals.

The following table describes 2011 and 2016 data related to animals on farms in the Kootenay region.

Table 12: Animals on Farms, Kootenay

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**424**	**377**	**-11%**	**32,696**	**30,820**	**-6%**	**82%**
Beef cows & replacements	*311*	*279*	*-10%*	*15,497*	*14,482*	*-7%*	*39%*
Dairy cows& replacements	*27*	*27*	*0%*	*2,269*	*2,596*	*14%*	*7%*
Calves	*340*	*315*	*-7%*	*12,981*	*11,885*	*-8%*	*32%*
Steers & bulls	*243*	*237*	*-2%*	*1,949*	*1,857*	*-5%*	*5%*
Sheep & Lambs	**88**	**115**	**31%**	**2,152**	**3,506**	**63%**	**9%**
Horses & Ponies	**460**	**380**	**-17%**	**3,404**	**2,387**	**-30%**	**6%**
Goats	**51**	**68**	**33%**	**741**	**660**	**-11%**	**2%**
Bison	**3**	**2**	**-33%**	**x**	**x**	**x**	**<1%**
Llamas & Alpacas	**44**	**34**	**-23%**	**267**	**150**	**-44%**	**<1%**
Deer	**1**	**0**	**-100%**	**x**	**0**	**N/A**	**0%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the Thompson-Okanagan region support the forage and forage-related sectors, including:

- Locals of the BC Cattlemen's Association including: Kootenay Livestock Association; Windermere District Stockmen; Robson Valley Cattlemen's Association; Creston Valley Beef Grower's Association
- Kootenay & Boundary Farm Advisors
- Windermere & District Farmers' Institute

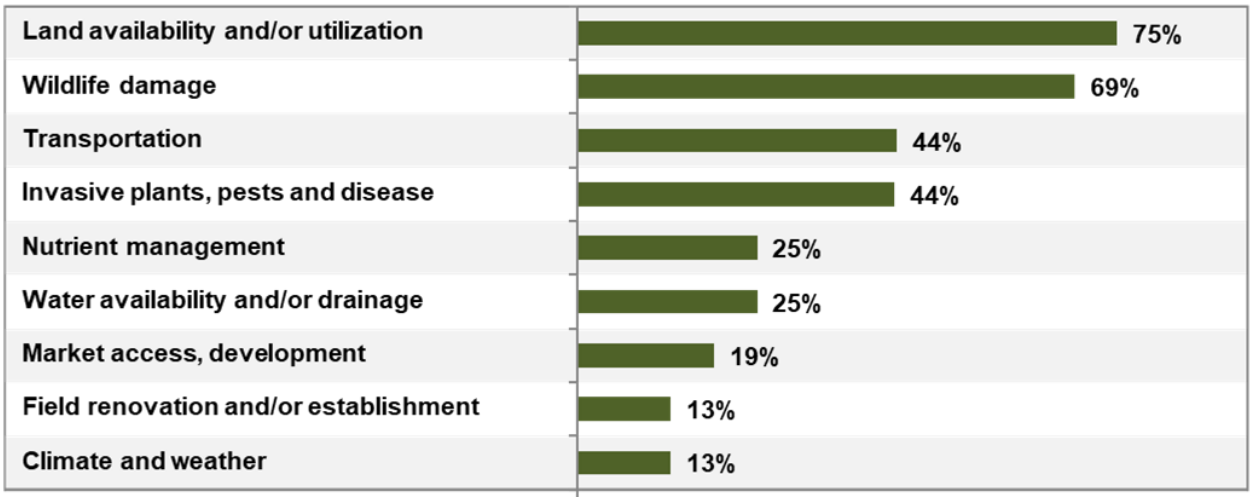
B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Creston on January 30, 2018; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in the Kootenay region.

Figure 11: Regional Challenges identified by Survey Participants

(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=16)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Wildlife and invasive plants, insects and pests

- **Invasive plants and pests**
  - Engagement sessions described the increasing prevalence of weeds and pests including gophers, voles, and bulbous bluegrass. "Voles on the south end of the Creston bench - it is horrible for making hay down there".
  - Participants largely blamed the neglect of public and other land as the root cause of the worsening weed conditions. Speaking of the permissive culture around unkempt lands, "their hands are never held to the fire, and we suffer from having dirty right-of-ways".
  - Unknown weeds are also presenting a problem for producers in the region. It is difficult to control weeds when there is a lack of knowledge over what to use and how to stop their spread.

- **Wildlife damage to forage**
  - Engagement session participants described significant impacts caused by elk. "I lost 50% of my corn to elk last year", said one participant; "With newly under-seeded timothy I've seen 200 elk come through and totally consume it."
  - Some participants praised wildlife compensation as having improved over time by recognizing a more diverse set of damages but other gave examples of being ineligible despite incurring large losses. "As long as you grow higher value crops, you will have predators" rationalized one participant.
  - Geese and bears also cause damage in the region.
  - Over half of survey respondents from the region indicated that wildlife damage is a significant challenge. Damage caused to established forage by ungulates and to seeded fields by waterfowl were the most common challenges.

2. Land use, availability and affordability

- **Land availability and/or utilization**
  - Three-quarters of survey respondents from the region selected availability and/or utilization of land as a significant challenge. Among this group the top challenge is the high cost of farmland followed by a lack of available land for forage production, and land that is suitable for forage production being left out of production.

3. Transportation and market access

- **Transportation and consequences of isolation**
  - Despite the relatively central location to markets, the region does suffer the consequences of isolation and high transportation and freight costs. Similarly, there is a lack of custom farming services available in the region and in most cases the transportation from other regions is prohibitive.
  - Engagement session participants indicated that the problem may become even more acute due to the potential for reduced bus service. Already, they said, it can take about 4 days for a part to arrive on the bus as opposed to the past when there was overnight serve and twice daily Greyhound arrivals.
  - Participants spoke of stocking important parts themselves or sharing among the producer community, but these methods of compensating do add additional costs.
  - Transportation issues were selected by nearly half of all survey respondents from the region as a significant challenge to their or other's forage-based operations.

4. Climate, weather and water

- **Water and drainage**
  - Some participants indicated that drainage of winter and spring precipitation is an issue; meanwhile there can be a lack of water in summer and many farms lack irrigation infrastructure. Investments in water infrastructure such as dams was said to be desirable but not feasible without some form of assistance.

5. Research and knowledge transfer

- **Lack of locally-based research and variety trials**
  - Participants indicated that there had been very little local research conducted in the past two decades. There had once been a research station.
  - "To have insight into forages that will take our climate is a big deal, there has been so little of it done here over the past years, so I don't know where to start"

- **Keeping current with environmental and other regulations**
  - As one participant noted: "You used to be able to just dig a ditch."

6. Soil health

- **Soil fertility and management practices**
  - One participant mentioned that the cost of fertilizer is a significant expense to their operation and that in parts of the region the soil has been over-mined. Meanwhile, the individual suggested that there is less adoption of improved management practices such as rotational grazing in the region which serves to compound issues with productivity or return on investment.

VII: CARIBOO

A. Regional Overview

The Cariboo region is made up of the Cariboo and Fraser-Fort George regional districts. The region accounts for about 18% of total BC farmland, the majority of which is located in the Carbioo regional district.

Climate change projections for the Cariboo region are for a strong increasing trend towards higher temperatures in all seasons and the potential for slightly less precipitation in the summer months and more of the winter precipitation falling as rain as opposed to snow. Many forms of weather extremes are also expected, such as more warm days and more extremely hot days (up to 6X more); and, increased frequency, intensity and magnitude of extreme rainfall.[5]

1. Regional Strengths and Advantages

Major strengths identified by half or more survey respondents active in the region include: favourable weather and climate for forage production and available and affordable farm land suitable for forage production. . Other strengths identified by between 30% and 49% of regional respondents include: low prevalence of pests affecting forage crops and favourable soils for forage production.

Regional engagement session participants also described the regional strengths and advantages of the forage and forage related sectors.

- **Farmland that is unsuitable for other uses**. In some areas of the region the soil and other growing conditions are unsuitable for farming other types of crops that have higher input requirements.
- **Affordable farmland and access to crown range land**.
- **Productive farmland**. In some areas there is very productive land, particularly in areas that are naturally irrigated along river flats.
- **Favourable local market conditions for growers**. In most years the area is in a forage deficit, which creates favourable market conditions for those selling hay within the region give the cost of transportation to obtain hay from other regions.

2. Summary of Forage Production in the Region

Approximately 85% of all farmland in the Cariboo region is devoted to forage. Natural land for pasture is by far the most common with over 305,000 hectares in 2016, up slightly compared to 2011. Other forage categories had fewer acres in 2016 than in 2011, including over 9,000 fewer hectares of tame or seeded pasture (-22% change); 4,600 fewer hectares of other tame hay and fodder crops (-11%); and 3,200 fewer hectares of alfalfa and alfalfa mixtures (-12%).

Table 13: Forage on Farms, Cariboo

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	1,200	1,022	-15%	299,943	305,540	2%	65%
Tame or seeded pasture	722	520	-28%	42,630	33,376	-22%	7%
Alfalfa and alfalfa mixture	525	453	-14%	27,786	24,570	-12%	5%
Other tame hay/fodder crops	810	631	-22%	41,109	36,462	-11%	8%
Corn for silage	5	6	20%	x	x	N/A	<1%
Forage seed for seed	10	9	-10%	248	227	-8%	<1%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

5 British Columbia Agriculture & Food Climate Action Initiative (July 2013). Regional Adaptation Strategies series: Cariboo

Survey participants based in the region indicated that they grew a wide variety of forage species, the most common included timothy, orchardgrass, alfalfa and reed canarygrass; others with multiple mentions included meadow bromegrass, alsike clover, tall fescue, cereals for forage, red clover and corn.

3. Summary of Livestock in the Region

As of 2016, the Cariboo region had approximately 115,000 cattle and calves; 6,500 sheep & lambs; 4,700 horses & ponies; 960 goats; 280 bison; and 230 llamas & alpacas. The region's livestock are slightly more concentrated among cattle and calves (90%) than the provincial average (85%).

The total number of beef cows & replacements, calves, and steers & bulls remained fairly constant in 2016 relative to 2011, but all other livestock categories reported fewer animals in 2016 than in 2011, including: llamas & alpacas (-67%), bison (-42%), horses & ponies (-30%), goats (-28%), dairy cows & replacements (-27%), and sheep & lambs (-7%).

The following table describes 2011 and 2016 data related to animals on farms in the Cariboo region.

Table 14: Animals on Farms, Cariboo

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**860**	**779**	**-9%**	**113,223**	**115,657**	**2%**	**90%**
Beef cows & replacements	*719*	*672*	*-7%*	*60,390*	*61,385*	*2%*	*48%*
Dairy cows& replacements	*26*	*37*	*42%*	*1,744*	*1,266*	*-27%*	*1%*
Calves	*730*	*696*	*-5%*	*42,765*	*44,533*	*4%*	*35%*
Steers & bulls	*630*	*567*	*-10%*	*8,324*	*8,473*	*2%*	*7%*
Sheep & Lambs	**153**	**129**	**-16%**	**7,045**	**6,547**	**-7%**	**5%**
Horses & Ponies	**906**	**670**	**-26%**	**6,770**	**4,720**	**-30%**	**4%**
Goats	**84**	**77**	**-8%**	**1,340**	**966**	**-28%**	**1%**
Bison	**12**	**8**	**-33%**	**484**	**282**	**-42%**	**<1%**
Llamas & Alpacas	**87**	**52**	**-40%**	**703**	**235**	**-67%**	**<1%**
Deer	**1**	**0**	**-100%**	**x**	**0**	**-100%**	**0%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the Cariboo region support the forage and forage-related sectors, including:

- Locals of the BC Cattlemen's Association including: Cariboo Cattlemen's Association; Quesnel Cattlemen's Association; South Cariboo Regional Cattlemen's Association; Prince George Cattlemen's Association
- District H Farmers Institute
- Kersley Farmers Institute
- North Cariboo Sheep Producer's Association

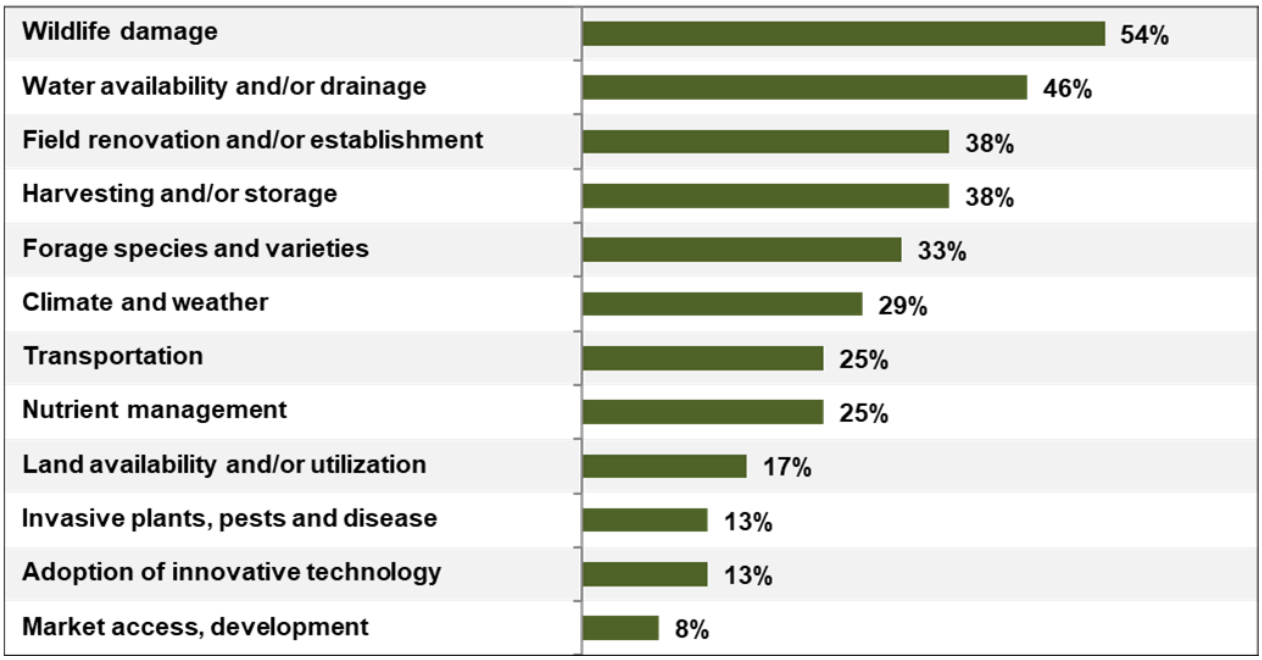
B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Williams Lake on December 7, 2017; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in the Cariboo region.

Figure 12: Regional Challenges identified by Survey Participants

(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=24)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Wildlife and invasive plants, insects and pests

➢ **Predation by wildlife and lack of adequate compensation**

- Engagement session participants described damage to existing stands of forage caused by deer, elk and bears and damage to seeded areas from waterfowl.
- In addition to damage to growing forages, participants indicated that the wildlife issues prevent them from taking advantage of certain farming practices such as bail grazing or swath grazing because the losses to wildlife would be too great.
- About half of survey respondents from the region indicated that wildlife damage is a significant challenge. Among this group the leading challenge was damage caused to established forage stands by ungulates followed by damage to seeded forage fields by ungulates and damage caused by waterfowl.

➢ **Weeds and lack of enforcement**

- Engagement session participants mentioned the presence of weeds as a significant and increasing problem. Imported hay (containing weed seeds) was identified as one vector, however the greater blame appears to lay with public and other lands such as transportation corridors, railways, large residential properties, etc. From here, weeds establish unabated and spread to adjacent farmland.
- Compounding the problem, according to some participants, is that the Weed Control Act is not enforced despite containing adequate powers, that if used would significantly improve the issue.

2. Land use, availability and affordability

➢ **Underutilized land**

- Some participants described large pieces of land such as natural meadows that if improved would have the

potential of being productive forage stands.

- Others expressed concern that the issue may become worse in the future because of the lack of farm succession options: many young people are not interested in taking over their family farm.
- About a third of survey participants indicated that field renovation and/or utilization was a significant challenge, with most of that group indicating that the challenge is the cost of renovation and/or establishment. Others indicated that there is a lack of region-specific information on selecting and growing forages and regarding techniques and best practices.

3. Climate, weather and water

➢ Water and changing climate

- Engagement session participants indicated that drought has become a significant challenge in the region, which is largely based around dryland production. "Climate change is a problem" said one producer. One quarter of all Cariboo survey respondents indicated that a significant challenge was the common drought conditions negatively affecting forages.
- Meanwhile, the Water Sustainability Act is a way in which the "government has hindered us", in the words of one participant. These participants characterized the Act as being designed for a different region but being applied to them and as a result unnecessarily restricting access to water and/or increasing operational costs for their business.
- Survey participants for whom weather and climate represents a significant challenge most commonly said that the changing climate and weather trends were affecting the seeding of forage, the growing season for forage, and harvesting of forage.

4. Research and knowledge transfer

➢ Lack of locally relevant research and variety trials

- Some participants noted that there has been very little research such as variety trials conducted in the region for the past many years. The compromise for some producers is to look at research conducted in other regions of the province, but they noted that this is not ideal given the dramatic differences in climate and soils throughout BC.
- Representatives of stakeholder associations commented that while they have the knowledge and available manuals for conducting variety trials they lack administrative funding and that presents a major challenge to conducting local research.
- In the context of responding to the 2017 wildfires, respondents indicated that local research is needed in order to be able to adequately respond to the aftermath of fire with varieties and techniques that will allow forages to become re-established and provide value within the short-medium term.

5. Soil health and forage quality

➢ Lack of high protein forage production

- Engagement session participants indicated that in much of the region the conditions do not support the production of alfalfa or other higher protein grasses. "Forage quality is the issue more than forage quantity."
- "Most people have to use concentrates for sheep, because we don't have the quantity of alfalfa"

6. Transportation and market access

➢ Transportation costs

- Transportation was discussed by engagement session participants. The negative impact of the circuitous route between Anahim Lake and Vanderhoof was mentioned specifically.
- Almost all survey respondents indicated that a significant challenge facing their or regional operations was the fact that availability of services and supportive industries is limited due to transportation costs and constraints.

VIII: NORTH COAST – NECHAKO

A. Regional Overview

The North Coast region is made up of the Skeena-Queen Charlotte and Kitimat-Stikine regional districts. The Region has 13% of the BC land base, but just 0.3% of all farm land. For the purpose of this report the region has been combined with the Nechako region, which includes the Bulkley-Nechako and Stikine regional districts. Together, the combined region accounts for nearly 10% of all BC farmland.

Climate change projections for the Bulkey-Nechako region are for a strong trend towards higher temperatures in all seasons and the potential for slightly less precipitation in the summer months and more of the winter precipitation falling as rain as opposed to snow with significant decrease in spring snowfall. Many forms of weather extremes are also expected, such as more warm days and more extremely hot days; increased frequency, intensity and magnitude of extreme rainfall; and dryer conditions in summer.[6]

1. Regional Strengths and Advantages

Major strengths identified by half or more survey respondents active in the region include: availability of farm land suitable for forage production and favourable soils for forage production. Other strengths identified by between 30% and 49% of respondents included: access to local/regional markets; affordable farm land and favourable weather and climate for forage production.

Regional engagement session participants also described the strengths and advantages of the forage and forage related sectors.

- **Productive land base**: Participants described the potential for high production and cited several examples. “We know a guy on the Fraser who got three cuts and 6.7 tons per acre. Amazing feed.”. “I think we can produce more per acre in one cutting than the Peace River”.
- **Favourable climate and weather for forages**: Participants indicated that the climate is good for growing forages although noted that the timing of harvest can pose a challenge.
- **Availability of affordable farmland:** Participants agreed that there is farmland available and costs less than in many other regions. “We moved up here from the Okanagan. Sold 10 acres and bought 2000.”
- **Proximity to markets/transportation:** The Port of Prince Rupert was cited by some participants as a significant advantage in that it affords access to international markets for locally grown product.
- **Supportive farming community:** “The farming community is amazing”.
- **Relatively few invasives:** Some participants indicated that because of the relative isolation of the region they benefit from a lower prevalence of invasive plants, pests and disease than some other regions.

2. Summary of Forage Production in the Region

Fewer total forage hectares were reported for farmland in the North Coast and Nechako regions in 2016 than in 2011. The decline was most significant among hectares of alfalfa and alfalfa mixes (-12% change), however hectares of natural land for pasture and tame or seeded pasture both fell by 2%. There was approximately 450 more hectares declared for other tame hay and fodder crops in 2016. Presumably there was an increase in the total hectares of corn for silage (as the number of farms reporting increased from 1 to 5) but the 2011 figure for total hectares was supressed for confidentiality.

6 Pacific Institute for Climate Science

Table 15: Forage on Farms, North Coast/Nechako

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	690	584	-15%	126,880	123,795	-2%	49%
Tame or seeded pasture	459	392	-15%	30,611	30,097	-2%	12%
Alfalfa and alfalfa mixture	461	384	-17%	33,274	29,165	-12%	11%
Other tame hay/fodder crops	363	318	-12%	17,778	18,320	3%	7%
Corn for silage	1	5	400%	x	57	N/A	<1%
Forage seed for seed	3	4	33%	142	x	N/A	<1%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

Survey participants based in the region indicated that they grew a wide variety of forage species, the most common included alfalfa, timothy, orchard grass, smooth bromegrass, red clover, tall fescue, cereals for forage, and meadow bromegrass.

3. Summary of Livestock in the Region

As of 2016, the combined North Coast/Nechako region had approximately 57,000 cattle and calves; 3,400 sheep & lambs; 2,500 horses & ponies; 1,200 goats; 75 llamas & alpacas; and some bison. Beef cows & replacements outnumber dairy cows & replacements by a factor of 15:1. Province wide there were 14% fewer steers & bulls reported in 2016 than in 2011, but in the North Coast/Nechako the total number was 50% less than in 2011.

The total number of beef cows & replacements, calves, and goats remained fairly constant in 2016 relative to 2011, while the number of dairy cows & replacements increased by 16% and the number of sheep & lambs increased by 16%. Among llamas and alpacas (-71%) and horses & ponies (-27%) the total number of animals decreased.

The following table describes 2011 and 2016 data related to animals on farms in the North Coast/Nechako region.

Table 16: Animals on Farms, North Coast/Nechako

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**519**	**478**	**-8%**	**62,609**	**57,315**	**-8%**	**89%**
Beef cows & replacements	*420*	*406*	*-3%*	*30,247*	*30,018*	*-1%*	*46%*
Dairy cows& replacements	*39*	*46*	*18%*	*1,782*	*1,948*	*9%*	*3%*
Calves	*446*	*426*	*-4%*	*20,426*	*20,473*	*0%*	*32%*
Steers & bulls	*361*	*336*	*-7%*	*10,154*	*4,876*	*-52%*	*8%*
Sheep & Lambs	**81**	**111**	**37%**	**2,994**	**3,488**	**16%**	**5%**
Horses & Ponies	**475**	**391**	**-18%**	**3,429**	**2,514**	**-27%**	**4%**
Goats	**44**	**55**	**25%**	**1,171**	**1,257**	**7%**	**2%**
Bison	**1**	**2**	**100%**	**x**	**x**	**x**	**x**
Llamas & Alpacas	**32**	**29**	**-9%**	**255**	**75**	**-71%**	**<1%**
Deer	**0**	**0**	**N/A**	**0**	**0**	**N/A**	**0%**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the North Coast – Nechako region support the forage and forage-related sectors, including:

- Locals of the BC Cattlemen's Association including: Nechako Valley Regional Cattlemen's Association; Skeen Regional Cattlemen's Association; Bulkley Valley Cattlemen's Association

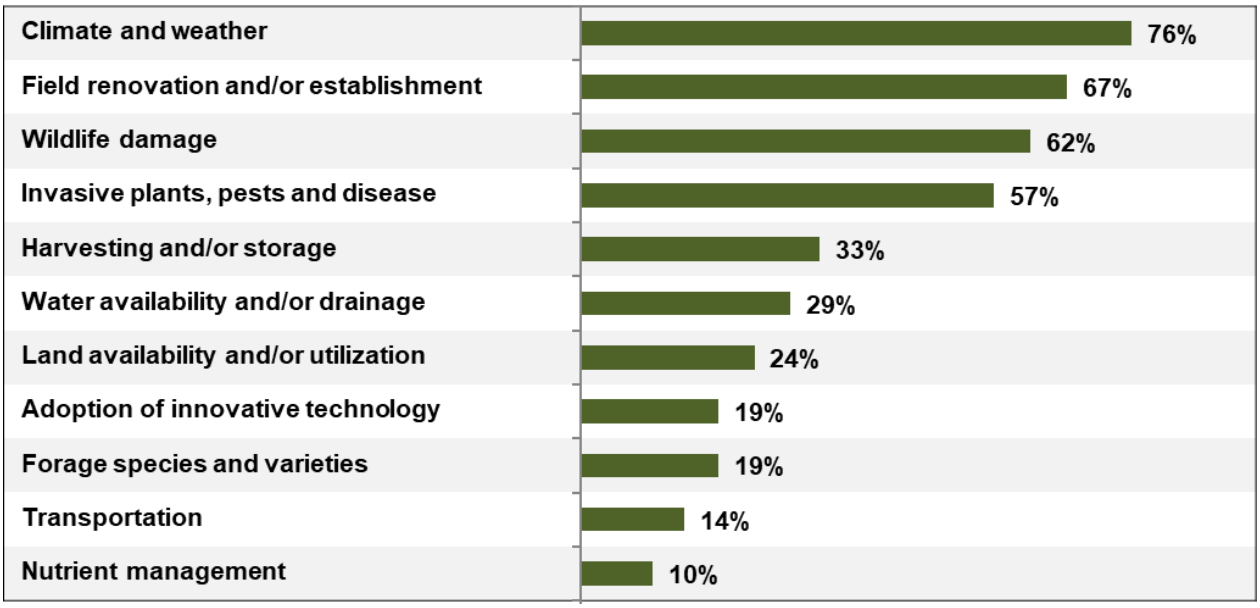
- Bulkley Valley Dairymen's Association

B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Vanderhoof on December 13, 2017; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in the North Coast-Nechako region.

Figure 13: Regional Challenges identified by Survey Participants
(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=21)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Climate, weather and water

➢ **Changing climate and weather patterns**

- The production levels achieved in the past in some areas of the region have been reduced because of dryer growing seasons. Meanwhile there is too much rain when harvesting which limits the ability to dry hay. "You have to make silage if you want to make good quality feed in this region". "You have to keep a mix of grass if you are growing alfalfa to mitigate against the rain, unless you want to wrap it all and put it into silage." Overall the conditions in the region create a short window for harvest of forages.
- Variation in weather from year-to-year presents additional challenges according to engagement session participants.
- Winter kill in 2016 was significant and a worrying concern for producers in the region.
- Approximately three-quarter of survey respondents from the region indicated that changing climate and weather trends are a significant challenge, with the increased prevalence of winterkill being the most commonly selected challenge, followed by negative effects on forage harvest, an increased prevalence of invasive plants, pests and disease and negative effects on seeding.

2. Wildlife and invasive plants, insects and pests

- **Invasive species**
    - Approximately two-thirds of survey respondents from the region indicated that invasive plants, pests or disease is a significant challenge to their forage operations or to the region at large. Among that group, weeds and invasive plants were the top challenge followed by insects and other pests.

- **Insufficient support available through crop insurance**
    - Several engagement session participants described inadequacies they had identified within the current production insurance schemes. They described fewer human resources devoted to the area and related issues such as being unsure of how the programs work; an out-dated model that does not align with the economic climate and business models in present day farming; inability of the program to respond adequately to winterkill; and problems with the average production values ascribed to policy holders who lack a record of production history.

- **Wildlife**
    - Participants described impacts from elk. In some areas of the region the problem is particularly bad. “On an annual basis elk causes more damage than all other animals combined”
    - Over half of survey respondents said that damage to established or seeded forages is a significant challenge.

3. Soil health and forage quality

- **Soil mining/productivity and soil health concerns**
    - Some participants described challenges related to a historical mining of the soils. Without adopting new practices, the region is limited in the ways it can mitigate climate change or improve productivity and nutrition of forages. “We are in a long term slide in soil productivity from the days of land clearing”.
    - However, a related challenge expressed by a participant is the uncertain return on investment for forages. To the degree it is factual, the lack of investment in soil health through inputs and farming practices are associated with the expected market price for forage or finished animal products. In the words of that participant “if we made every field really productive then what do you do with it if you can’t sell it for more than it costs to grow it?” This is consistent with over two-thirds of survey respondents from the region who indicated that a significant challenge to their operations or the region at large is that the cost of renovating or establishing fields is prohibitively expensive.

4. Research and knowledge transfer

- **Lack of research, variety trials and extension**
    - Engagement session participants described the long term absence of the Ministry of Agriculture and other government bodies in the sector, remembering times in the past when there were locally based research stations and ongoing testing and communicating of results conducted by the Province. “I’ve noticed how the Ministry was gutted by the government. Compared to a full office in Prince George, now look at it. It’s a huge problem and I blame the government directly for that”.
    - Participants also implicated the producer community for lacking communication, sharing best practices, and just generally talking with one another to find innovative solutions.

5. Other challenges

- **Lack of standards in hay market**
    - One participant commented on the lack of standards (e.g. quality, weight of bails) and regular business practices (contracts, deposits, integrity) in the hay market.

- **Limited succession planning and a lack of younger farmers.**

IX: PEACE RIVER

A. Regional Overview

The Peace River region is made up of the Peace River and Northern Rockies regional districts. The Region contains nearly one-third of all farmland in the province, the vast majority of which is located in the Peace River regional district.

Climate change projections for the Peace River region are for a strong increasing trend towards higher temperatures in all seasons, a possible increase in summer and winter precipitation and a significant decrease in spring snowfall. Many forms of weather change are also expected, such as more extreme high temperatures; fewer extreme low temperatures; longer dry periods in the summer; and, increased frequency, intensity and magnitude of extreme rainfall.[7]

1. Regional Strengths and Advantages

Major strengths identified by half or more survey respondents active in the region include: available farm land suitable for forage production; favourable soils for forage production; favourable weather and climate for forage production; a strong and supportive producer community; and long growing season/sunlight hours.

Regional engagement session participants also described the regional strengths and advantages of the forage and forage related sectors.

- **Favourable growing conditions for forages:** Regional engagement participants described the natural strengths of the region's climate and weather including long sunlight hours during the growing season which is especially suited to the growth of legumes and grasses; land that is suitable for forages; and the ability to store water that falls as snow.
- **Large land base and relatively inexpensive farmland:** The region contains a significant share of the total farmland in BC as well as of the Agricultural Land Reserve, which is a strength for the sector along with the relatively affordable cost of farmland according to engagement session participants.
- **Contribution to ecosystem goods and services:** participants indicated that their operations provide benefits to the ecosystem and society through carbon sequestration in forage stands as well as through the feeding of wildlife.
- **Strong producer community.** Participants indicated the region's large producer community is well organized and supportive of one another. The success of regional stakeholder associations was described as a component of this strong community.
- **Low prevalence of noxious weeds:** Some regional engagement session participants indicated that the region is fortunate to have avoided much of the impact of invasive weeds relative to many other regions in BC. However, there is no inherent protection, so these participants stressed the need to remain vigilant in order to maintain noxious weed free conditions.
- **Potential to benefit from regional research conducted in Alberta:** The Peace River region spans provincial borders and both sides share similar growing conditions. Engagement session participants were optimistic about a recent addition of forage research resources at nearby AAFC Beaver Lodge. Interprovincial barriers to partnerships that would benefit the BC forage sector are seen as completely nonsensical to these participants.
- **Access to market:** Some participants indicated that there were advantages in being able to sell into Alberta and even Alaska. Some forms of industrial development have created markets for forage seed to be used in reclamation and slope management.

7 British Columbia Agriculture & Food Climate Action Initiative (July 2013). Regional Adaptation Strategies series: Peace.

2. Summary of Forage Production in the Region

Approximately 70% of farmland in the Peace River region is devoted to forages, which in 2016 included over 326,000 hectares of natural land for pasture; 99,000 hectares of tame or seeded pasture; 90,000 hectares of alfalfa and mixes; and 40,000 hectares of other tame hay and fodder crops. The region also counted over 13,700 hectares of forage seed for seed, which is over 89% of the total land devoted to forage seed province wide. Across all categories there was fewer forage hectares reported in 2016 than in 2011.

Table 17: Forage on Farms, Peace River

Type of Forage Production	Total number of farms reporting		% Change	Total Hectares		% Change	% total farmland
	2011	2016	2011-16	2011	2016	2011-16	2016
Natural land for pasture	898	759	-15%	341,136	326,392	-4%	41%
Tame or seeded pasture	760	651	-14%	100,406	99,301	-1%	12%
Alfalfa and alfalfa mixture	852	703	-17%	93,673	90,530	-3%	11%
Other tame hay/fodder crops	497	365	-27%	45,412	40,682	-10%	5%
Corn for silage	3	4	33%	11	x	N/A	<1%
Forage seed for seed	104	79	-24%	14,577	13,726	-6%	2%

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0213; 004-0203

Survey participants based in the region indicated that they grew a wide variety of forage species, the most common included alfalfa, timothy, smooth bromegrass, alsike clover, and red clover; others with multiple mentions included meadow bromegrass, orchard grass, trefoil and creeping red fescue.

The region, along with the Alberta component of the Peace River region produces a wide variety of forage seed crops including alfalfa, birdsfoot trefoil, alsike clover, red clover, sweet clover, smooth bromegrass, meadow bromegrass, hybrid bromegrass, tall fescue, meadow fescue, creeping red fescue, fine fescues, orchard grass, reed canarygrass, timothy, wheatgrasses and numerous species of native grasses.[8]

3. Summary of Livestock in the Region

As of 2016, the Peace River region had approximately 112,000 cattle and calves; 10,400 sheep & lambs; 6,100 horses & ponies; 900 goats; 200 llamas & alpacas; and some number of bison and non-wild deer. The region has 24% of all beef cows and replacements in BC and outnumbers dairy cows & replacements by a factor of 170:1.

The number of sheep & lambs in the region was over 2,790 (36%) animals higher in 2016 relative to 2011, while province wide the number of sheep & lambs increased by only 3%. There were nearly 2,000 fewer horses & ponies reported in 2016 than in 2011. The following table describes 2011 and 2016 data related to animals on farms in the Peace River region.

Table 18: Animals on Farms, Peace River

Type of Livestock	Total number of farms reporting		% Change	Total number of animals on farms		% Change	% of all regional livestock
	2011	2016	2011-2016	2011	2016	2011-2016	2016
Total Cattle and Calves	**655**	**596**	**-9%**	**100,537**	**112,523**	**12%**	**86%**
Beef cows & replacements	*568*	*529*	*-7%*	*55,959*	*66,123*	*18%*	*51%*
Dairy cows& replacements	*39*	*26*	*-33%*	*562*	*387*	*-31%*	*0%*
Calves	*564*	*540*	*-4%*	*33,385*	*38,433*	*15%*	*29%*
Steers & bulls	*505*	*491*	*-3%*	*10,631*	*7,580*	*-29%*	*6%*
Sheep & Lambs	**82**	**100**	**22%**	**7,673**	**10,466**	**36%**	**8%**
Horses & Ponies	**748**	**642**	**-14%**	**8,108**	**6,146**	**-24%**	**5%**

8 Peace River Forage Seed Association (2003). Five year strategic plan.

Goats	**50**	**64**	**28%**	**976**	**955**	**-2%**	**1%**
Bison	**33**	**24**	**-27%**	**x**	**x**	**x**	**x**
Llamas & Alpacas	**50**	**56**	**12%**	**219**	**207**	**-5%**	**<1%**
Deer	**1**	**1**	**0%**	**x**	**x**	**x**	**x**

Source: Statistics Canada, 2016 Census of Agriculture. CANSIM Tables 004-0021; 004-0224; 004-0200

4. Regional Stakeholders and Associations

Several stakeholder organizations in the Peace River region support the forage and forage-related sectors, including:

- Peace River Forage Association
- Peace River Forage Seed Association
- Locals of the BC Cattlemen's Association including: Peace River Regional Cattlemen's Association; North Peace Cattlemen's Association; South Peace River Stockmen's Association; Upper Cache Creek Cattlemen's Association

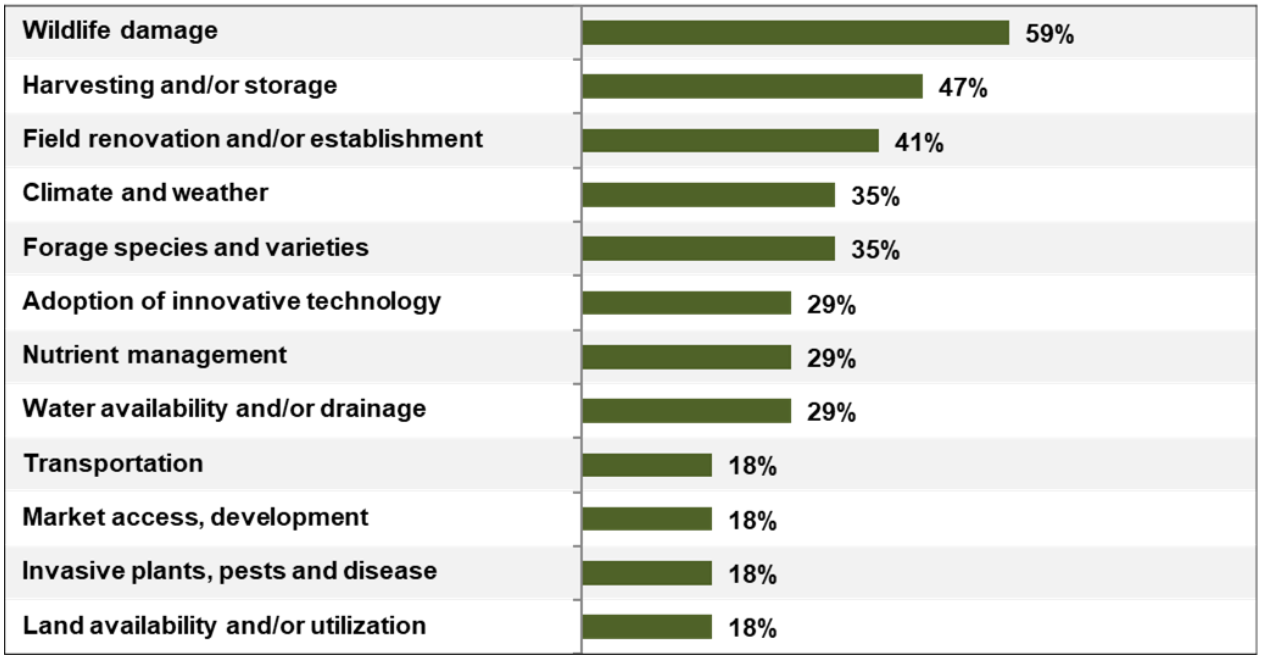
B. Regional Challenges

Regional challenges were identified through the Forage Action Plan Consultation project regional engagement session held in Fort St. John on November 30, 2017; survey results from stakeholders based in the region; interviews with other stakeholders and subject matter experts with knowledge of forage and forage-related issues in the region; and, available literature that pertains to the region.

The following figure shows the survey results for participants with forage-related operations based in Peace River region.

Figure 14: Regional Challenges identified by Survey Participants

(Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?; n=17)



Source: Forage Action Plan Provincial Survey

The following bullets describe regional challenges:

1. Wildlife and invasive plants, insects and pests

- **Wildlife damage and lack of sufficient compensation**
    - Engagement sessions participants indicated that damage caused to forage stands and forage establishment by wildlife, primarily elk, is a significant challenge in the region. Not only does it cause a loss in forages and related damage it prevents the adoption of farming practices that would otherwise be beneficial, such as swath grazing. Similarly, it requires additional costs and effort to protect stored feed from wildlife.
    - Some participants criticized the existing insurance program available for forages. "It needs a full review" commented one participant. The program was said to be limited in that it does not provide compensation for lost bails or swath, only standing forage. "It is essentially useless except for the establishment insurance".
    - Half of survey respondents from the region indicated that wildlife damage is a significant challenge. This group was most likely to point to damage caused by ungulates to seeded forage fields, followed by damage to established forage stands by ungulates.

2. Climate, weather and water

- **Climate and weather**
    - Many participants described challenges related to the region's weather and growing conditions. Specifically, the prevalence of dryland production in the region makes producers very dependent on spring and summer precipitation to maximize production. Meanwhile, too much precipitation can occur at unfavourable times and impair hay drying.
    - Some producers described having experienced winterkill of their forage stands.
    - Survey participants from the region who expressed that weather and climate is a significant challenge in the region were most likely to indicate that changing climate and weather trends are negatively affecting forage harvest. Almost all also indicated that drought conditions are becoming increasingly common and are negatively affecting forages.

3. Transportation and market access

- **Transportation and market access**
    - Despite some participants praising the region's access to Alberta and Alaska markets, others commented that a challenge for the region is the lack of rail and other transportation available for exporting hay and forage seed from the region. Meanwhile the economics of trucking hay and other products make it a poor substitute for the efficiency of rail.
    - Some participants expressed that if there were more efficient transportation the region would generate market demand from across the province because of the excess and superior forage grown in the region.
    - Some participants indicated that market access is easier to achieve with small square bails, but the region primarily produces large round bails. The cost of purchasing relevant equipment to satisfy that demand is prohibitive for most operations hence the lack of transition to date.

4. Research and knowledge transfer

- **Lack of region specific research and variety development**
    - Some participants described the lack of new variety development specific to the region's climate and growing conditions to be a challenge for the sector.
    - These participants described the inherent conflict of interest that exists when variety development and other research is led entirely by the private sector. For example, producers prefer long lasting varieties whereas private enterprise would prefer that farmers are required to purchase and reseed more frequently.
    - A related issue identified by some participants is the lack of knowledge transfer that occurs within the sector and from lessons learned outside of the region.
    - There was optimism expressed at the addition of a forage specialist at AAFC Beaver Lodge.

5. Soil health and forage quality

- **Soil and forage quality**
  - Some participants indicated that in some areas of the region the health of the soil has suffered as a result of a lack of focus on nutrient inputs. The land clearing for most agricultural land has occurred relatively recently compared to other agricultural regions in BC and has allowed producers over the past 30-40 years to benefit from previously forested soils, however participants suggest that some of that soil health has been taken for granted and efforts need to be taken to rebuild soil health and structure.

6. Other challenges

- **Forage seed production is not always conducive to new or younger farmers**
  - Some participants noted that younger farmers may face economic pressure to plant annual crops which provide a yearly return rather than forage seed which may require an upfront investment which is not realized until sufficient seed is generated for sale years later.

- **Competition with other industries for labour and transportation**
  - Participants indicated that supportive industries, labour and equipment have become either more expensive, less available or both as a result of the success of other sectors including grain production and oil and gas extraction. One participant described the change by saying: “even 10 years ago it wasn’t so hard to find someone with a truck to move your cows or haul hay; now, they have all moved to the patch.”

X: Stakeholder Priorities and Recommendations

This chapter includes the priorities and recommendations made by participants of regional engagement sessions and the provincial survey as well as comments made in key informant interviews and that have been already captured in recent literature or other formal recommendations made by stakeholder or other organizations.

The following figure shows survey results by region to illustrate which categories of challenges participants said should be prioritized by government, industry associations, researchers, producers and others. Categories are organized according to the average of the regional averages, led by: invasive plants, pests and disease; land availability and/or utilization; and wildlife damage.

Figure 15: Priorities identified by Survey Participants

(Where should government, industry associations, researchers and other entities focus their actions in order to best improve forage production (quality/quantity), marketability or return on investment?; n=141)

	Vancouver Island/Coast	Mainland - Southwest	Thompson - Okanagan	Cariboo	Kootenay	North Coast - Nechako	Peace River	Avg.
Invasive plants, pests, disease	47%	13%	35%	42%	50%	6%	32%	32%
Land availability and/or utilization	35%	55%	35%	8%	56%	35%	16%	34%
Wildlife damage	65%	16%	22%	54%	38%	47%	26%	38%
Adoption of technology/innovation	35%	23%	30%	25%	13%	24%	37%	27%
Water availability and/or storage	59%	39%	43%	25%	19%	18%	21%	32%
Forage species and varieties	6%	32%	35%	33%	0%	29%	42%	25%
Field renovation and/or establishment	6%	16%	13%	33%	38%	0%	53%	23%
Nutrient management	18%	23%	13%	21%	6%	41%	5%	18%
Climate and weather	6%	10%	9%	0%	13%	6%	5%	7%
Harvest and/or storage	0%	3%	0%	13%	0%	35%	21%	10%
Market access, development	0%	10%	17%	0%	13%	18%	0%	8%
Transportation	6%	0%	0%	13%	6%	6%	11%	7%

Source: Forage Action Plan Provincial Survey

Survey participants had the option of recommending actions that should be taken in response to their priority challenges. Summarized participant recommendations are included throughout the next section of this chapter. However, the following table describes findings related to which entity among the provincial government, federal government, industry associations, researchers/academics and producers should be responsible for enacting their recommended action(s). Individual recommendations that relate to transportation, wildlife damage, water availability and/or storage, and land availability or utilization were the most likely to be directed towards the provincial government. Categories are ordered according to the percentage of respondents who said their related actions(s) should be wholly or in part enacted by the provincial government. Respondents were able to select multiple answers, so categories may sum to greater than 100%.

Table 19: Responsible entity for recommended actions, by priority challenge – Survey results

(You indicated that [category] should receive priority attention. What specific actions should be taken and by whom?)

Priority	Provincial Government	Federal Government	Industry Association	Researchers/ Academic	Producers
	% of recommended actions				
Transportation (n=7)	86%	29%	43%	14%	0%
Wildlife damage (n=29)	75%	31%	6%	16%	9%
Water availability/drainage (n=32)	72%	28%	13%	6%	9%
Land availability or utilization (n=40)	69%	19%	7%	10%	14%
Climate and weather (n=11)	67%	44%	0%	44%	11%
Field renovation, establishment (n=26)	58%	23%	12%	23%	8%
Technology/innovation adoption (n=22)	55%	36%	55%	50%	32%
Harvest and/or storage (n=11)	55%	9%	27%	27%	9%
Market access, development (n=8)	50%	25%	50%	0%	13%
Invasive plants, pests, disease (n=51)	47%	29%	8%	22%	12%
Forage species and varieties (n=36)	47%	22%	33%	33%	28%
Nutrient Management (n=23)	46%	4%	38%	46%	27%

Source: Forage Action Plan Provincial Survey.

Participants were also asked if they had specific outcomes that relate to their recommended actions, and if so, under what timeframe would they expect outcomes to begin to be achieved. Categories in the following table are ordered according to the share of desired outcomes for a given category of challenge that participants said should be achieved in 2 years or less. Outcomes related to wildlife damage, transportation, land availability/utilization and harvest and/or storage were most likely to have short term expectations among survey respondents. Respondents were able to select multiple answers so categories may sum to greater than 100%.

Table 20: Expected timeframe for outcomes, by priority challenge – Survey results

(What specific outcomes should be pursued, and over what timeframe should the outcome be achieved?)

Priority	2 years or less	3-4 years	5-10 years	Over 10 years
	% of desired outcomes			
Wildlife damage (n=29)	83%	4%	13%	9%
Transportation (n=7)	83%	0%	0%	17%
Land availability or utilization (n=40)	69%	17%	11%	9%
Harvest and/or storage (n=11)	63%	25%	13%	0%
Market access, development (n=8)	63%	38%	25%	0%
Invasive plants, pests, disease (n=51)	62%	29%	13%	11%
Field renovation, establishment (n=26)	57%	29%	14%	0%
Water availability and/or drainage (n=32)	52%	22%	15%	22%
Technology/innovation adoption (n=22)	31%	23%	23%	31%
Forage species and varieties (n=36)	30%	26%	37%	19%
Nutrient Management (n=23)	24%	48%	38%	5%
Climate and weather (n=11)	17%	17%	50%	17%

Source: Forage Action Plan Provincial Survey

A. Wildlife and invasive plants, insects and pests

1. Wildlife damage, compensation and mitigation

- **Stakeholders want an improved compensation program for damage caused to forage by wildlife.**
    - Regional engagement session participants in the Mainland-Southwest, Peace River, North Coast-Nechako, and Kootenay regions specifically mentioned that the level and breadth of coverage available seeded, standing and cut forage should be improved. Some participants indicated that the production assumed by

compensation is far lower than the actual potential of their forages.

- Maximizing the quality and quantity of forages grown in BC requires ongoing investment by farmers; however a perception of inadequate insurance protection for forages among producers limits the level of investment.
- "We could use some help in this area, current programming is not very common-sense oriented" said a regional engagement participant in Vanderhoof.
- One-quarter of all recommended actions made by survey participants concerning wildlife damage were to improve the amount and/or extent of wildlife compensation for forages.

➢ **Farmers want acknowledgement and compensation for subsidizing the public want for wildlife**

- Stakeholders in the Peace River, North Coast-Nechako, and Vancouver Island-Coast specifically mentioned that they are subsidizing the feeding of wildlife through their operations. Meanwhile, much of the public generally supports causes to support or increase wildlife populations; therefore, farmers are deserving of more public support (i.e. compensation) for the losses suffered.

➢ **Stakeholders want research into development of crops that are unattractive to waterfowl**

- A participant in the Mainland – Southwest engagement session wondered if it would be possible to use bioengineering to develop forage that waterfowl will not want to eat.

➢ **Participants in the Kootenays in particular indicated that widespread installation of elk fencing needs to be supported and prioritized**

- One-in-five recommended actions made by survey participants concerning wildlife damage were to increase support or incentives to install infrastructure solutions like fencing.

➢ **Some stakeholders want policy to reduce wildlife populations**

- Of all recommended actions made by survey participants regarding wildlife damage, 54% were to allow for wildlife reduction through increased and open-season hunting or similar policies in areas where wildlife damage is significant.

2. Invasive plants, pests and disease

➢ **Stakeholders want more effective application of the *Weed Control Act***

- Engagement session participants in several regions blame negligent land owners, including the Crown, for much of the widespread proliferation of weeds affecting forages. They expressed confidence that, if enforced, the regulations and penalties in the act would improve the issue significantly.
- In fact, over one-third of all actions recommended by survey participants concerning invasive plants, pests and disease relate to the need for weed control programs and efforts to be carried out across private and public land in BC; one in six recommended actions was to use the existing regulations to compel land owners to maintain their lands free of weeds.

➢ **Monitoring for and preventing the spread of invasive plants, pests and disease needs to be a priority.**

- In regions with low prevalence of noxious weeds, for example, stakeholders want to ensure that conditions remain that way; meanwhile, other areas that may be combatting invasive pests are worried that new and more troublesome species will arrive from other regions. One suggestion put forward by stakeholders is to locate weed inspectors within local regional districts to inspect hay being imported into the region to limit the spread of invasives between regions.

➢ **Stakeholders want recognition that the use of pesticides or herbicides is the best option under certain circumstances**

- Many participants indicated that the weed issue has become so bad in places that the only solution is application of herbicides. Others indicated that certain effective products have been removed from sale or

are not labelled for use in their area because the return on investment for a company to include a small region in labelling is usually not in their financial interest. In this context some stakeholders call on the provincial government to undertake localized testing of some products to demine efficacy and provide additional options for control of unwanted plants and other pests.

- However, participants also indicated that the societal trend is moving away from the use of sprays and that the focus should be on developing crops and practices that can help limit pests and disease without chemical application.

➢ **Alternative approaches**

- Some participants want a focus on programs that support alternative approaches to invasives; this could include research and education around farm practices that reduce the spread of invasive plants, pests and disease; or the use of small livestock, such as sheep, to help combat the spread of invasive plants.

➢ **Stakeholders want increased resources devoted to research, education and knowledge transfer that will reduce the impact and spread of invasive plants, pests and disease.**

- Over one-third of all recommended actions made by survey participants that relate to invasive plants, pests and disease were to increase the amount of research and education undertaken to mitigate the effects of weeds and pests. This includes research into varieties or management practices that reduce impacts and the dissemination of best practices to land owners and forage producers.

B. Research and knowledge transfer

1. Research

➢ **In every region, stakeholders want more resources directed towards forage-related research, development and knowledge transfer.**

➢ **A multitude of research types and topics are recommended in order to address several priorities:**

- **Research needs to address a variety of region-specific challenges** related to the expected and ongoing effects of climate change; be focused on mitigating the damage of wildlife, pests and disease; consider alternative crops; support improvements to water efficiency
- **Development and trial of forage varieties:** Stakeholders want reliable and region specific research carried out to determine new and best varieties that will improve their production of forages. Changing climate and weather patterns and the increase in losses to wildlife and invasives motivate the concern for widespread trials based research.
- **Trials of forage management practices and systems:** Stakeholders want reliable and region-specific research carried out to determine the efficacy and best practices for new or improved forage management practices and systems such as rotational grazing, intensive pasture management and other alternative grazing systems; no till practices, other soil management techniques
- **Outside of the box" thinking and research has a potential role to play:** some stakeholders are optimistic that new methods such as growing forages in large greenhouses, methods to extend grazing, polycropping approaches and other ideas hold promise.

➢ **Stakeholders want the Ministry of Agriculture to regain its status as a supportive and impartial source of knowledge, capacity and expertise for the forage sectors.**

- Many stakeholders can remember the breadth of service and research provided by the BC Ministry of Agriculture to the forage sector in the past. In all regions of the province the reduction or cessation of those services was described as having had a range of negative impacts on the sector over time. Most stakeholders do not expect conditions to return to what existed in the past as they recognize the paradigm shift that has occurred in the role played by government generally and the significant cost that such a re-resourcing would require.

- Stakeholders in many regions would like to see enhancements to the number and role of Regional Agrologists including the hiring of forage specialists within the Ministry.
- The Ministry is seen as an unbiased and neutral body to carry out research, trials and dissemination of information.

- **Stakeholders from several regions indicated that they want their local post-secondary institutions to be more involved in conducting forage research and to provide agricultural courses and programs.** Many stakeholders also want agricultural education to be taught in the BC public school system.

- **Stakeholders recommend a partnership model for research where government, universities and producers work together to establish priorities and implement research projects**. One recommendation was to establish a research council made up of those entities and provide base funding and access to local land to conduct research on that will benefit local areas.

- **Stakeholders want to set research priorities but also be involved in conducting research.** Programs that would incentivize on farm research and make the cost of doing so less prohibitive (e.g. a program that provides seed to farmers for testing).

- **Stakeholders expressed several overarching principles that should be used to design and deliver future cost-sharing and other programs**
  - **Regional focus and regional distribution or availability of funds:** the diverse growing conditions and regions of BC require that research and knowledge transfer be executed at local and regional levels.
  - **Research priorities should be determined by stakeholder organizations but coordinated and facilitated with help of government**
  - **Research and knowledge transfer funding should allow for administrative costs and provide core funding to build ongoing organizational capacity for stakeholders: Some stakeholders expressed that while project** grants are useful and appreciated the approach limits the scope of the research, the effectiveness of coordination, and perhaps most significantly the dissemination of results. Most stakeholder organizations that have worked to conduct research or information sharing projects in the province rely on volunteer labour or temporary contract staff.
  - **Recognize that forage research can be a long term endeavour** and needs to be sustainable over more than one funding cycle to result in the most useful findings and positive net effect for the sector.

- **Stakeholders indicated a demand for knowledge transfer related a wide variety of topics**
  - Including: the factors of production and how to both measure and optimize return on investment; forage quality and nutritional inputs required for different animals (e.g. horses); soil health and nutrient management; water management and sustainability.

- **Knowledge transfer should be supported and delivered in a variety of ways.**
  - A concerted effort must be made to translate academic science into practical advice.
  - To bring knowledge from other regions into their local area many stakeholders suggested that sending producers to conferences or other knowledge transfer opportunities in other regions is positive; as is brining researchers and producers from other regions to the local area to share with a base of local producers.
  - Activities that bring producers together should be encouraged; e.g., field days, agricultural exhibitions, mentorship programs
  - Past research needs to be recovered and digitized or otherwise disseminated if it is still relevant. Stakeholders are concerned that relevant knowledge is lost to government storage.
  - The use of webinars and other technology-assisted learning approaches should be supported

- **Baseline data and monitoring collection and dissemination needs to be improved:** Stakeholders indicated a need

for more widely available feed analysis, soil testing and advice, fecal analysis, weather data, etc. This includes educating people to the importance of conducting feed analysis.

C. Climate, weather and water

- **Many stakeholders require improvement to or development of water storage and irrigation infrastructure and want government to support improvements to water efficiency on farms**
  - Many participants described the need to improve their access to water, especially in the context of a changing climate and weather patterns. Engagement session participants in several regions specifically described requiring water storage, including in the North Coast-Nechako, Cariboo, Vancouver Island, Thompson-Okanagan and Kootenay regions.
  - Stakeholders recommend that the provincial government incentivize transition to improved weather efficiency. For example, supporting the transition to pivot or drip line irrigation.

- **Stakeholders want improved access to water that is not subject to prohibitive regulation or high cost**
  - Participants described a disconnect between what is subject to fish bearing or other environmental regulations and what they know as a simple dugout or other water storage system.
  - Improved access to water rights including ground and surface water.

- **Stakeholders want resources directed to locally based and relevant research, trials and knowledge transfer that will help mitigate the effects of climate change**

- **Stakeholders want better insurance and compensation for losses related to winterkill**

- **Stakeholders want established forages to be assessed for their carbon sequestration impact and reward carbon credits or other subsidies to producers.** Some participants link the principle to an argument that farmers should not be required to pay the provincial carbon tax.

D. Land Use, availability and affordability

- **Stakeholders would like tax or other land use regulations used to incentivize the productive use of land suitable for forages**
  - Throughout the province, though specifically in areas adjacent to urban or industrial expansion, stakeholders expressed concern at the loss or unproductive use of farmland and want less land removed from the Agricultural Land Reserve and stricter limits on the uses of farm land in order to mitigate against the increasing price of land in many regions of the province.
  - In many areas, stakeholders indicated that the minimum threshold to qualify for preferential property tax treatment is too low and should be increased to incentivize landowners to put more land into intensive production of forages.

- **Stakeholders want the "right to farm" to be affirmed**
  - Stakeholders across the province expressed frustration at the many obstacles that affect the efficient and profitable operation of farms.
  - This includes ensuring that regulations are not unnecessarily affecting farm operations but also includes recommendations that the government supports the agricultural sector by educating the public about the importance of the sector and promoting a greater acceptance and appreciation for the sector.

E. Transportation and market access

- **Stakeholders on Vancouver Island want BC Ferries to be compelled to adopt a policy that prioritizes livestock**

access on full crossings

- The purpose of such a policy would be to protect livestock from having to wait long periods of time in transport trailers.

- **Stakeholder in the Peace River region want rail companies to be compelled to allocate more access for agricultural producers.**

- **Stakeholders across many regions want the availability of necessary inputs supported through travel subsidies or financial incentives/disincentives that reduce cost to obtain inputs.**
    - Inputs mentioned included: lime; gypsum; ash by-products; manure, other soil amendments. Similarly, the cost of transportation round bail plastic off of Vancouver Island for recycling is cost prohibitive and stakeholders called for similar solutions to reduce the cost burden on farmers.
    - Some stakeholders thought that bulk purchases and other forms of pooling resources could be an effective method of reducing the cost of inputs and could be organized by stakeholder organizations.

- **Some stakeholders in areas with congestion and divided parcels called for improved ability to cross roadways with agricultural equipment.**
    - One specific example of a solution provided by a stakeholder was a railway-style crossing to benefit agricultural equipment operators on busy roads.

- **Some stakeholders called for greater marketing and promotion of British Columbia forages in international markets**
    - The need for basic market analysis regarding BC production and costs of production were indicated to be foundational components that are currently lacking.

- **Many stakeholders called on government or industry to facilitate an efficient and effective hay marketing platform**
    - The purpose would be to reliably and efficiently facilitate local, regional and provincial hay sales.

APPENDIX I: ENVIRONMENTAL SCAN

This section includes a description of priorities and actions recommended or underway in a sample of other jurisdictions including: Canada (i.e. nationally-focused organizations), Alberta, Saskatchewan, Manitoba, and New Zealand.

Jurisdiction: Canada

Organization: Canadian Forage and Grassland Association (CFGA)

Relevant Document(s): Canadian Forage and Grassland Association's Strategy for the Future (May 2014)

An objective the CFGA is to increase research capacity across Canada in the areas of: development of annual and perennial forage varieties with improved establishment, increased yield, improved adaptation to stressors such as drought, flooding, saline soils, improved ensilability and nutritional value; and, the improvement of grass/rangeland/hay land management and utilization to increase productivity, longevity and sustainability.

Outcome 1: Research and Training Capacity.

- Short term: Establish forage industry research chairs focused on tame grass and legume breeding, forage management and utilization to serve Central and Eastern Canada, the Prairies and B.C.
- Long term: Reinvigorate and enhance long-term breeding, forage management and utilization research programs, while capturing near term opportunities that are currently under development.

Outcome 2: Improvement in Yields and Nutritional Quality of tame, native and annual species through improved pasture, forage/hay and grazing management and plant breeding.

- Short term: Improved grazing and management strategies that optimize hay or silage yields and livestock production from native range and tame pastures; Optimize nutritional quality of perennial and annual forage species throughout the grazing season through the development of new management technologies and grazing systems (e.g. extended, stockpiled or swath grazing) and germplasm improvement or new species utilization; Increase the capacity of perennial and annual forage species to maintain nutritional quality throughout the ensiling process.
- Medium-Long term: New annual and perennial grass and legume varieties with improved stand longevity for perennial species, quality, yield and adaptability (e.g. flood and drought resistance, winter tolerance) through traditional and/or advanced plant breeding techniques.

Outcome 3: Environmental Sustainability

- Short term: Quantify the environmental benefits of Canada's forage/hay/fibre/seed production and grassland for carbon sequestration, plant and animal biodiversity, species at risk, soil erosion, and watershed protection, and the socio-economic (environmental goods and services) impact of the forage-livestock grazing sector in Canada, including the effects of optimal environmental production practices (e.g. stocking rates, riparian area protection).

Outcome 4: Extension, Outreach and Policy

- Short term: Enhance producer adoption of improved forage management opportunities through provincial and national technology transfer and extension education programs, such as: Grazing Mentorship Program and formal producer extension programs used to encourage pasture and hay land rejuvenation, improved grazing and pasture management strategies and the adoption of grazing-tolerant, drought resistant and bloat-safe legumes into pasture mixtures; Enhanced public education regarding the impact of Canada's forage and grazing industry on Canada's environment and economy; Enhance uptake of new and alternative annual and perennial forage varieties that show significant benefits for livestock production; Enhance the development of On-farm decision making tools improving the return-on-investment. Improved management on pasture and hay and bio-fibre land, through weed control, fertilization and other best management practices.

Jurisdiction: Canada

Organization: Beef Cattle Research Council

Relevant Document(s): Canada's National Beef Strategy (2014)

The National Beef Strategy is about positioning the Canadian beef industry for greater profitability, growth and continued production of a high quality beef product of choice in the world. Focus areas and actions are organized according to the 4 pillars and goals of the National Beef Strategy:

Beef Demand: increase carcass cutout value by 15% by 2020.

- **Domestic & Global Marketing:** Establish the Canadian Beef Advantage (CBA) as the most recognized and loyalty-based beef program in the world; Get the right product to the right customer every time;
- **Market Access**: Reduce non-tariff and tariff barriers in our export markets for beef, live cattle, and beef cattle genetics; Gain equal or preferential access in key export markets for Canadian beef, live cattle, and beef cattle genetics; Eliminate remaining BSE market access restrictions
- **Validate & Enhance the CBA**: Validate CBA attributes to identify those that are most likely to impact carcass value and beef demand in global markets; Verify the CBA to assess the effectiveness of efforts to improve product attributes; Develop a National Total Quality Management System to enhance the CBA; Develop new and enhanced tools to communicate the financial contribution of the quality and yield of Canadian beef cattle; Further enhance the CBA through the development of a Supply Chain Strategy; Research and development to improve consumer satisfaction with Canadian beef and validate the CBA
- **Consumer Confidence**: Enhance consumer confidence in Canadian beef across all markets; Improve the effectiveness and reach of consumer communication; Promote the health and nutritional benefits of beef to consumers; Support consumer food safety education to demonstrate the effectiveness of our science based food safety system; Research and extension to drive the reduction of food safety incidences and improve food safety along the supply chain
- **Social License:** Enhance the public image of Canada's beef industry by emphasizing positive industry benefits, and improvements in environmental sustainability, animal health & welfare, and food safety practises. Increase public recognition of the beef industry's direct and indirect contributions to the Canadian economy and society; Increase public recognition of the contribution of beef production to sustainability; Increase public understanding of beef industry animal husbandry practices and how they are held up by the Beef Code of Practice.

Competitiveness: Reduce cost disadvantages compared to main competitors by 7% by 2020.

- **Supportive Regulatory Environment:** Advocate and uphold a scientific risk based regulatory system; Pursue outcome based flexible alternatives to prescriptive tactic based regulations; Pursue regulatory cooperation with major trading partners; Advance implementation of the three pillars of Traceability within a national system.
- **Access to Competitively Priced Inputs:** Improve access to affordable skilled labor; Improve access to competitively priced inputs including animal health products, feed grains and forages, and new technologies
- **Maintain & Enhance Research Capacity:** Establish an internship program to mentor new scientists with industry collaborators in partnership with the CYL program; Increase research capacity and programming focusing on beef quality, food safety and related attributes of the CBA; Increase research capacity and programming focused on the breeding and production of feed sources; Maintain feed efficiency research capacity to drive innovations to support both cow-calf and feedlot production; National food safety, antimicrobial resistance and production limiting disease surveillance programs enhanced/developed.
- **Sustainability:** Support the Global and Canadian Roundtables for Sustainable Beef; Economic – Improve return on investment and long term profitability of the beef industry; Environmental – Continually improve natural resource use, validate beef production impacts, and support verifiable supply chains; Maintain Canada's beef industry's social license to operate through validating production practices and identifying opportunities for continuous improvement in areas of public concern

Increase production efficiency by 15% by 2020.

- **Genetic Selection:** Improve cattle performance for desired traits; transitioning research into tools/technologies for the seedstock sector; Improve genetic selection for non-traditional traits; Encourage the adoption of superior genetics in commercial herds.
- **Research & Development:** Improved forage and grassland productivity; Improved feed grain productivity and feed efficiency; Improved animal health and welfare

- **Technology Development & Adoption:** Engage academic and research organizations to develop new technologies that will benefit the beef cattle industry; Ongoing industry surveillance of international and domestic research; and technology transfer activities; Increase the proportion of producers adopting new technology with reduced lag from development to adoption.
- **Enhance Information Flow:** Communicate market demands along the production chain, using information technology and verification programs; Facilitate genetic improvement with the link to genetic, genomic and branded beef program information; BIXS 2.0 be the industry's common repository database; a minimum of 2 million calves per year in the database; Develop regular reporting mechanisms, improve collaboration and services provided; Research technologies to enhance the ability to sort cattle, carcasses at line speed in packing plants, and product by quality

Connectivity: enhance synergies within Industry and connect positively with consumers, the public, government and partner industries.

- **Industry Communication:** Delivery of timely, concise, & effective crisis communications; Develop a Reputation Management Strategy; Enhance industry's ability to speak with a common voice; Increase the number of future leaders that are able to speak and advocate on behalf Canada's beef industry.
- **Engage Industry Partners:** Ongoing engagement with the National Beef Strategic Planning Group (NBSPG); Creation of an annual national industry event to include multiple industry organizations; Expand cross organizational engagement; Encourage greater stakeholder engagement in programs;
- **Engage Government, Industry/Global Partners:** Engage government and regulatory agencies to build and maintain long-term relationships; Participate in consumer discussions and forums to obtain feedback and provide information regarding the Canadian beef industry; Invest in developing long-term relationships with domestic & international organizations, encouraging collaboration in areas of mutual interest.

Jurisdiction: Canada

Organization: Beef Cattle Research Council

Relevant Document(s): Canadian Beef Research and Technology Transfer Strategy 2018-2023 (January 2017)

The document contains intended research outcomes for 2018-2023 that relate to the forage sector, including:

Feed Grains and Feed Efficiency research outcomes 2018 – 2023

- **Outcome 1: Improved feed efficiency through animal breeding.** Quantify the genetic relationships between feed intake and efficiency in cow-calf and feedlot production, and their relationships with other economically relevant beef production traits (longevity, fertility, weaning weight, wintering costs, carcass weight, yield and quality grades, tenderness, etc.); Identify genes with functional roles in microbiological and physiological processes that affect feed intake and efficiency in feedlot and cow-calf production; Determine the impact of cow-calf management practices on feed intake and efficiency in feedlot calves; Develop a cost-effective method to easily and accurately quantify forage intake in grazing cattle.
- **Outcome 2: Improved feed supply and utilization.** Identify cost-effective agronomic strategies to increase feed grain energy yield per acre; Develop new feed grain varieties with improved feed grain energy yield per acre, N and water use efficiency; Identify, evaluate and calculate the cost-effectiveness of alternative / by-product energy feeds, considering impacts on animal performance, health, product quality, and nutrient management; Develop feeding strategies to optimize animal performance, nutritional value and cost of gain (e.g. ideal forage inclusion rates, grain processing/blending, high moisture corn, wheat, etc.)
- **Outcome 3: Maintained feed grains and feed efficiency research and training capacity.** Ensure maintenance and transition of key feed efficiency research and extension expertise and facilities.
- **Outcome 4: Extension, outreach and policy.** Enhance producer education to improve feed efficiency through management techniques to the point of highest profitability while responsibly maintaining animal welfare and environmental stewardship; Improve feed efficiency through genetic selection, in breeds for which EPDs for feed efficiency exist.

Forage and Grassland Productivity research outcomes 2018 – 2023

- **Outcome 1: 15% Improvement in yields and nutritional quality of tame, native and annual species through improved pasture, forage and grazing management and plant breeding.** Develop new annual and perennial grass and legume varieties with improved stand longevity, quality, yield, and adaptability (e.g. flood and drought resistance) through traditional and/or advanced plant breeding techniques; Characterize corn and cereal forage variety differences in nutrient profile and ensiling potential; Quantify varietal and species differences in the ability of grasses, legumes and annual forages to maintain nutritional quality throughout the grazing season and in extended stockpiled or swath grazing systems to help inform producers' seed selection decisions; Identify or develop improved grazing and range management strategies that optimize forage and beef production from native range and tame perennial pastures; Investigate and refine regionally-appropriate methods of combining native, tame (annual and perennial) species and extended winter grazing practices to lengthen the grazing season and reduce winter feed costs, while meeting animal requirements; Quantify the economic and agronomic benefits of integrated annual crop, forage and beef production systems.
- **Outcome 2: Maintained forage research and training capacity.** Establish industry research chairs focused on forage and grazing management and economics established to serve Central and Eastern Canada and in the Prairies and B.C.; Reinvigorate and enhance long-term breeding programs, while capturing near-term opportunities that are currently under development.
- **Outcome 3: Extension, outreach and policy.** Producer extension programs used to foster collaboration between producers and researchers and the adoption of cost-effective, sustainable production and management practices; Improve native and tame pasture management for optimum yields and forage quality and responsible environmental stewardship, including species establishment, fertilization, weed control and grazing management or harvesting techniques that have the highest and longest lasting return on investment for the regional conditions; Increase information exchange between forage producers and forage seed growers to help inform decisions to improve forage production and minimize weeds; Increase understanding of the costs, risks and benefits (economic and environmental) of pasture rejuvenation, weed control, fertilization, and the incorporation of forages into cash crop rotations and the development of on-farm decision making tools to quantify the return on investment of these various strategies.

Environmental Sustainability Research Outcomes 2018 – 2023

- **Outcome 1: Science-based information to inform the development of effective public communication and policy development regarding environmental goods and services provided by the beef industry.** Develop cost-effective methods of reducing GHG emissions in forage-based diets; Quantify factors impacting the rate and extent of C sequestration in tame and native pastures across Canada; Quantify the impacts of native and tame pasture management on plant, animal, bird and insect biodiversity across Canada; Quantify the impacts of native and tame pasture management on water use, cycles and watersheds across Canada; Identify cost-effective cleaning technologies to reduce water use in beef packing and processing facilities; Quantify N and P excretion rates in grazing animals, and N impacts on GHG emissions and P runoff and leaching impacts on water quality / eutrophication; Develop feedlot manure management best practices to reduce the risk of phosphorus overload in soils.
- **Outcome 2: Extension, outreach and policy.** Increase the uptake of manure management practices that protect soil and water resources, including handling systems which minimize nutrient emission to air and leaching or run-off during storage or use; Enhance public education regarding the impact of Canada's forage and beef industry on Canada's environment and economy

Technology Transfer research outcomes 2018 – 2023

- **Outcome 1: Improved efficiency and effectiveness of technology transfer in the Canadian beef industry through greater collaboration and empowerment of technology transfer agents.** Host regular National Beef Technology Transfer Workshops to discuss opportunities, challenges, best practices and priorities; establish collaborative working groups to assemble, update or create comprehensive technology transfer resource packages focused on a particular topic or outcome and encourage industry-wide utilization of the resources to reach and maintain desired adoption levels. Project topics may include: Forage and grazing management, How and when to utilize genomic selection, Feed testing / ration supplementation / nutritional management to improve reproduction and longevity of cowherd, Identifying, collecting and using the key records that help inform management decisions; Enhance awareness and consideration of relevant international research and development activities to avoid duplication and identify opportunities for collaboration; Continued industry mentorship of new scientists, with an additional 15 scientists completing the BCRC's Beef Researcher Mentorship program by 2023; Increase influence on research institution administrators to appreciate the value that industry places on academics' participation in technology transfer with the goal to increase scientists' ability and motivation to incorporate technology transfer as a key component of their

research projects and careers; Develop and deliver tools and guidelines that assist scientists in their development and execution of technology transfer initiatives; Develop resources that assist veterinarians and other technology transfer agents to easily and effectively deliver information of greatest benefit to producers as opportunities for education, persuasion, decision making, implementation or confirmation arise; Measure and monitor adoption of innovations by compiling known adoption rates of various innovations through existing data collection means and enhance measurement of innovation adoption levels where necessary and possible; Improve understanding of how to effectively facilitate adoption of innovations across industry sectors to enable further refinement of technology transfer and extension activities; enhance understanding of producers' evaluation of short- and long-term costs (economic and otherwise) of adoption versus short- and long-term benefits of adoption; enhance understanding of the influences and tipping points of operations' profitability and sustainability (economic, environmental and social sustainability).

- **Outcome 2: Increased producer adoption of relevant technologies and production practices through improved information management**. Encourage thorough record keeping by producers and analysis of their data in order to identify opportunities for improvement, make informed decisions, and determine the impacts of modifications to production practices; Enhanced information sharing between members of the beef supply and forage supply chains within the Canadian beef industry to enable decision making that supports the achievement of priority technology transfer outcomes.

Jurisdiction: Alberta

Organization: Alberta Beef Producers

Relevant Document(s): Alberta Beef Producers Plan 2016/2017; Alberta Beef Producers Plan 2017/2018

Alberta Beef Producers mission is to strengthen the sustainability and competitiveness of the beef industry for the benefit of beef producers in Alberta.

Strategic Objectives for 2017/2018:

- **Maintain and enhance our relations with the Government of Alberta to ensure that ABP is recognized as a respectful, strong, and credible advocate for cattle and beef producers in Alberta.** Actions: continued government relations meetings and activities; submission of letters and policy positions on key issues; ongoing discussions of industry issues with government officials; expressions of support for government legislation and policies that are beneficial for the industry
- **Enhance our dialogue with consumers to build greater consumer confidence and public trust in Alberta Beef and the Alberta beef industry.** Actions: develop a new Alberta Beef marketing campaign focused on consumers, but also speaking to producers; enhance communications with consumers through social media, brochures, and public events; pursue opportunities for conversations between producers and consumers; continue education activities for school children; support Sangita Sharma research and work with the public.
- **Ensure that Alberta government land, water, and environmental policies support the interests of farmers and ranchers.** Actions: continued communication with government on ABP grazing lease and climate leadership policy positions; continued work to increase government understanding of the benefits of grazing leases for producers and Albertans; gain government support for sound grazing lease policies; communications leading to producer support for the development of a new grazing lease rental rate framework; assess the impacts of the Alberta carbon levy and work with the government to address these impacts and provide benefits for producers through the Climate Leadership Plan.
- **Ensure the sustainability of our industry by creating conditions supporting viable succession in the industry:** Actions: continued leadership on industry social license through the CRSB and VBP+; identify and address the physical and financial challenges to young producers entering the industry; work to ensure that tax rules are not an impediment to orderly farm and ranch succession; continue promotion and support of young producer programs such as 4-H, CYL, and YCC.
- **Improve the access of Alberta cattle and beef producers to the information and technology necessary for sustainable and competitive operations.** Actions: continued coordination with BCRC and other partners on research priorities and projects; completion of projects under forage and antimicrobial research calls; continued support for feed grain and forage research; support and enhance the technology transfer activities of the BCRC; implement the climate change and cow calf sector sustainability extension initiatives.
- **Resolve current industry funding issues and establish predictable funding levels for future years.** Actions: Continue discussions with the government and industry

partners on the future of the service charge; approach grass roots producers to determine their position on a non-refundable service charge; pursue the regulation amendments necessary to increase the national check-off.

Strategic Objectives for 2016/2017:

- **Ensure that the regulations and standards developed for Bill 6 reflect the interests of producers and the unique and diverse nature of farm and ranch work.** Actions: active participation in the AgCoalition; development of clear ABP positions on labour relations, employment standards, and Occupational Health and Safety (OH&S) standards; collaboration and consultation with the government on regulations and standards.
- **Address the industry funding challenges facing ABP and our partner organizations.** Actions: collaboration with industry organizations on a funding strategy; pursue regulatory changes to increase the National Check-Off (NCO); consultation with the Government of Alberta on a non-refundable service charge.
- **Protect the interests of cattle producers through potential changes in legislation and policies regarding crown land under grazing dispositions, including grazing leases and other grazing dispositions on public land.** Actions: use ABP grazing lease policies to address the issues raised by the Auditor General and the Alberta Land Institute (ALI); contribute to the development of a new grazing lease rental rate framework; ensure that the Government of Alberta understands the benefits of grazing leases for producers and Albertans, follow ABP policy by continuing to work with the Alberta Grazing Leaseholders Association (AGLA), the Western Stock Growers Association (WSGA), and the Northern Alberta Grazing Association (NAGA).
- **Enhanced perceptions of Alberta Beef, the Alberta beef industry, and ABP with consumers and producers.** Actions: new communications plan directed at producers, government, industry organizations, and consumers; new marketing plan to enhance promotion of Alberta Beef as a complement to Canada Beef marketing; continued leadership in industry sustainability and social licence initiatives.
- **Manage ABP provincial research program to bring more value to Alberta cattle and beef producers.** Actions: continued coordination with BCRC on research priorities; management of projects under forage research call and selection of projects for antimicrobial call; continue to seek balance between feed grain and forage research programs.
- **Improved policies and programs for managing impacts of wildlife on cattle producers.** Actions: complete development of ABP policy on managing wildlife impacts; establish effective and collaborative processes with other organizations and the Government of Alberta to address wildlife impacts; pursue Ecosystem Services (ES) approaches to providing benefits to producers from wildlife habitat and populations.

Jurisdiction: Alberta

Organization: Alberta Beef, Forage & Grazing Centre

Relevant Document(s): Presentation March 7, 2017 to the Alberta Forage Industry Network

The mission of the Alberta Beef, Forage & Grazing Centre is to develop and transfer knowledge, innovative processes, and tools to improve the forage/beef industry.

Strategic Plan Goals:

- Reduce winter feeding costs by 50%; reduce environmental footprint of the cowherd by 15%; improve cow efficiency by 15%; reduce backgrounding costs by 50%; improve late summer/fall pasture productivity by 30%; build and maintain research and extension.

Extension Goals:

- Develop extension plan for the Centre; ensure communication & clear objectives; deliver on commitments – extension products; translate research knowledge and facilitate adoption; brand & deliver the Centre as the “Go To Place” for beef and forage information.

Jurisdiction: Saskatchewan

Organization: Government of Saskatchewan

Relevant Document(s): Saskatchewan Livestock Strategy (2014); Forage Crop Breeding Program Framework; Feed Research and Development Program Framework; Economics of Cow-Calf Production Program Framework; Cow-Calf and Forage Systems Program Framework; Ministry of Agriculture Operational Plan for 2017-18.

Goal of the **Livestock Strategy** is to enhance the long-term competitiveness and sustainability of SK's livestock sector based on natural attributes of the province. The strategy is guided by three pillars:

Competitiveness – Creating an environment for growth
Safeguards – Protecting the health of the public, animals and the environment
Market Expansion – Enhanced trade advocacy, trade missions.

- 2014 Action items: Full implementation of the Western Livestock Price Insurance Program; Customize the Alberta premises identification database (PID) to fulfill Saskatchewan's traceability obligation; Quantify and benchmark labour availability challenges and labour supply options to assist livestock producers find employees; Proactively work with rural municipalities to identify livestock development opportunities and challenges; Work with Saskatchewan's beef cattle sector to pursue global beef market opportunities.

The goal of the **Forage Crop Breeding Program** is to enable development and commercialization of research technologies developed in Saskatchewan and worldwide to extract increased value from feed, improve the competitive position of the livestock industry and increase economic returns to Saskatchewan.

Program Outputs:

- Creation of a systems-based research strategy aligned with Ministry of Agriculture and industry priorities that enhance the economic viability of the integrated crops-livestock production system; Optimized feeding systems and linking key feed constituents to specified consumer products, including high value designer products; New feedstocks with pro- or pre-biotic characteristics that enhance animal health, productivity, and consumer product quality and safety; Increased livestock feed efficiencies with reduced input costs and reduced environmental nutrient and green house gas loading; Access to global technologies and practices that industry can commercialize into differentiated, higher value Saskatchewan products.; Access to research results by Ministry of Agriculture staff which will implement technology transfer strategies and sector development.

Desired outcomes:

- Efficient, environmentally sustainable and profitable livestock industry; Increased livestock and feed production efficiencies tied to improved livestock product quality and reduced environmental impact; Improved livestock production efficiency and product quality and safety attributes resulting in increased profitability and competitiveness; Improved functionality, nutritional value and cost of production for feeds derived from Saskatchewan commodities and ingredients; Highly qualified people trained in ruminant nutrition and feed science.

The goal of the **Feed Research and Development Program** is to develop and make available high yielding and high quality forage crop cultivars which will reduce the cost of production for producers, thus increasing economic returns.

Research Focus:

- Major Focus genetic improvement of the more important perennial forage crops seeded in Saskatchewan, including alfalfa, meadow bromegrass, hybrid bromegrass, and crested wheatgrass, with other priority species to be identified through stakeholder consultation.
- Secondary foci include: Genetic improvement of barley and oat for forage purposes to be carried out in conjunction with the SRP chair in barley and oat breeding;

Collaboration in the exploration, assessment and development of native germplasm for forage crops.

Expected Outcomes:

- Higher yielding cultivars (either biomass or seed yield); Higher quality cultivars; More stress tolerant cultivars; Sequence or partial sequence of genomes of several species; Useful genetic markers to facilitate selection; New hybrid populations

The goal of the **Cow-Calf Production Program** is to enable the development and adoption of beef and forage production technologies which increase the profitability and efficiency of the Saskatchewan cow-calf producer that will maximize economic returns to the producer. Thorough evaluation of relevant technologies will be conducted in a research setting followed by dissemination and promotion of those technologies that will optimize the economic returns to cow-calf producers.

Research and Program Activities

- Conduct cow-calf cost of production study with producers across Saskatchewan. Review past procedure and revise it so that the research provides the most value to cow-calf producers; Conduct Benchmark Studies to validate indicator variables of cow-calf and forage sector strengths and weaknesses; Cost-benefit analysis of research projects being conducted at Termuende Research Farm; Determine economic, financial, and other benefits of research. Gross margin analysis determining returns to research; Evaluation of the economic and production benefits of different calving seasons in western Canada.; Provide economic and financial expertise for the research activities of the SRP Forage Research Chair.; Determine production variables to be used in developing economic models beef production.; Provide insight to producers in more efficiency selling and marketing their product through effective production management and financial planning.

The goal of the **Cow-Calf and Forage Systems Program** is to conduct research that will enable the development and adoption of research technologies developed in SK and worldwide that optimize the productivity, intensification and efficiency of the cow-calf pair ultimately increasing the economic returns to the producer.

Research and Program Activities directly related to forage:

- Research to support feeding and water management regimes for the cow, calf and back-grounded animal with a focus on intensive grazing and forage/grass management; Conduct research evaluating forage varieties and their suitability under different grazing systems; Conduct research that will develop programs in forage finished beef

The **Operational Plan for 2017-18** includes actions related to forage to support ministry goals of: targeted investment in infrastructure, science and innovation; and, partnerships to promote the benefits of agriculture.

- Collaborate with industry to improve coordination of research investments and technology transfer, including project funding, research capacity and funding for on-farm demonstration of new knowledge and technologies.; Guide the transition of the Western Livestock Price Insurance Program from its current pilot phase to being an effective tool for Saskatchewan's livestock producers; Assist the beef industry through continued support of the transition of former federal community pasture lands; Maximize the agricultural and public benefits of Crown land through modernized sales and leasing programs; Support the patrons of the Saskatchewan Pastures Program during the transition to non-publically managed operations; Support the establishment of the Livestock and Forage Centre of Excellence (LFCE) and integrate the Western Beef Development Centre into the LFCE
- Work with industry to provide science based technical and regulatory information to ensure farmers and ranchers are "doing the right thing" for sustainable production and maintaining social licence; increase the percentage of Saskatchewan residents with a positive perception of agriculture

Jurisdiction: Saskatchewan

Organization: Saskatchewan Cattlemen's Association

Relevant Document(s): Saskatchewan Beef, Feed & Forage Industry Research Strategy (2003)

The Saskatchewan Cattlemen's Association has identified key research priorities it believes are critical to the success of the Saskatchewan livestock industry.

Genomics

- Support for research which identifies the benefits of birth to slaughter information programs while incorporating genomic advances, should be encouraged. The success measures of this research will include better feed efficiency, gains realized through forage utilization, progress with animal health and fertility issues and measurable improvements to carcass and beef quality.

Animal Health, Nutrition and Management

- The SCA believes that continued research in the area of animal health, nutrition and management is important from the perspective of animal welfare, beef quality and public safety and producer's profitability. Areas of concern include: Receiving and processing protocols; Vaccine development; Use of antibiotics and development of antimicrobial resistance; New feed product development; Feed safety as increasing amounts of ergot and vomitoxin require testing and mitigation strategies; Nutritional management; Interaction of nutrition, behaviour and health.

Environmental Stewardship

- The SCA believes that one of the greatest challenges facing the growth of the beef industry is the need to adapt to evolving government environmental regulations and the need to enhance the public perception of the effects of the industry on the environment. Important research areas include: Environmental effects of extensive beef cattle production practices such as swath and bale grazing; Impact of intensive feeding operations on ground and surface water and air quality; Role of forage management in maintaining a healthy environment; Manure management applications - precision nutrient management; Impact on the environment of intensive livestock grazing management practices.

Forage and By-products

- Forages create value; in economic and environmental terms. There is a clear link between forage and livestock. The forage industry is the foundation for much of animal agriculture, and investment in forage research, development and technology transfer will be of mutual benefit to both sectors. Long term funding is critical for effective forage research since a one or two year commitment is not long enough to allow forage research projects to be completed. Current opportunities identified for industry focus and investment include: Expanded communication and technology transfer programs which target producers; Development of species which are regionally specific and adapted for identified purposes; Support for forage seed growers and seed market research; Support for long term forage breeding and research programs with a focus on improved forage yields and quality; Better utilization of forages and by-products to decrease dependence on feed grains.

Research Infrastructure, Human Resource Development and Technology Transfer

- Saskatchewan is at a cross roads in terms of beef production research infrastructure. While the facilities that currently exist have fulfilled the need to date, the growth of the industry in Saskatchewan depends on modernizing research infrastructure, including partnerships which are national in scope. Technology transfer is a key component of research. There is currently a disconnect between end users and researchers in terms of information transfer, which needs to be addressed. Government funded projects require a clear plan to disseminate findings to producers. The SCA is committed to ensuring research information is communicated through its communication channels, including the Saskatchewan Cattlemen's Connection and the SCA website.

Jurisdiction: Manitoba

Organization: Manitoba Forage Council

Relevant Document(s): Manitoba Forage & Grassland Industry Strategic Plan (2010)

Strategic Plan and Implementation Plan developed during 2009 and utilized input from many producers and industry representatives, including from a Strategic Planning Workshop. Several Strategic Solutions were described:

Strategic Solution #1: Ensure that research addresses the Manitoba forage and grassland industry's needs

- Collaborate with representatives from MFC, MCPA, U of M and AAFC to coordinate forage/grassland research in Manitoba (i.e. to set research priorities, develop research initiatives and assist in securing funding for implementation); Initiate the development of a National Centre of Excellence for Forage and Grassland Development and a Manitoba Forage and Grassland Foundation to initiate and support research and technology transfer; Encourage the development of more systems-based approaches to research where many disciplines are involved in the research.

Strategic Solution #2: Enhance extension services to improve forage and grassland producers' agronomic and farm management/marketing practices

- Prioritize and coordinate extension programs to ensure information is readily available to producers while reducing duplication of efforts; Ensure that existing and future marketing related extensions initiatives: promote the development of new business opportunities; educate producers regarding specific needs of exporters and customers; Encourage governments and telecommunications companies to provide high-speed internet service to all areas of Manitoba

Strategic Solution #3: Encourage the capacity of the Manitoba forage and grassland industry to develop leadership and sustainability strategies.

- For the Manitoba Forage Council to continue its historic leadership role it needs adequate and sustainable funding. This could come from annual memberships, administrative fees, sponsorship, check-off programs, partnerships, trusts, collaborations with government agencies; The industry needs a coordinator and administrator of resources for extension and research projects to gather producer input to improve these projects; The industry needs to re-establish priorities (for research, extension, government policy changes) annually and to develop an on-going survey system to determine the current needs and priorities of the industry; The industry needs to provide leadership and participate in the development of a Canadian Forage & Grasslands Council to reflect the concerns of issues of Manitoba forage/livestock producers on national and international issues; The industry needs to provide input into periodic strategic reviews of various programs such as: forage crop insurance; improvements in crown lands management; climate change initiatives; quantifying the benefits of maintaining grasslands; innovative uses of forage crop residues; support for ecological goods and services programs.

Strategic Solution #4: Improve market opportunities through improved logistics and infrastructure, particularly to move hay to export markets and to process livestock locally for niche markets.

- Work with ruminant livestock producers to support establishment of local processing to supply niche markets; Continue to build on the forage marketing potential of the Manitoba forage industry by identifying new markets that Manitoba producers and exporters can feasibly supply on an ongoing basis, especially local markets for high quality forage (e.g. dairy, equine, forage finished beef/lamb) and emerging export markets. Also consistent local markets are needed for lower quality forage and crop residues.; Initiate a study by the University of Manitoba Transport Institute to compare costs in the Canadian hay supply chain compared to the costs in competitors' (e.g. US) supply chains and to identify opportunities to harmonize freight policies with the US; address differences in infrastructure between Canada and competitive exporting countries; identify additional infrastructure that Canada needs to enable it to be a leader in supplying forage to international markets.; Work with Federal and Provincial Governments and the forage marketing sector (forage exporters) to develop programs that promote the development of export markets for Manitoba forage production; Continue to work with the Churchill Gateway Development Corporation to develop opportunities to use the port of Churchill for hay exports; Partner with other agricultural groups such as the Canadian Special Crops Association to present a united front and to use a proactive approach to advance the industry's concerns to legislators and regulators (particularly in rail); Establish stronger partnerships with Export Development Canada, government officials and selected private sector leaders to ensure that systems are in place that guard against non-payment for forage exports; Create relationships with key government policy makers in importing countries; Encourage producers who wish to pursue export markets to convert to production of small or larger square bales. They are more efficient to transport than large round bales and are more acceptable to buyers.

Strategic Solution #5: Improve the image of agriculture in general and forage/grassland production in particular

- Work with media; Develop school information packages for use by teachers on various forage/livestock issues and ensure consistent delivery among all teachers

Jurisdiction: New Zealand

Organization: James Morrison Consulting Ltd

Relevant Document(s): New Zealand Pastoral Industry Forage Discussion Document (November 2017)

The document presents an integrated strategy developed for the forage industry and intended to guide the sector for the next 20 years. The objective of the integrated strategy is to increase the value of forage grown on New Zealand farms so that individual farmers are more profitable and sustainable. Developed in response to a lack of a framework for investing in the industry, the unified plan enables everyone to work together in a formal way for the benefit of the whole industry. The plan is split into four themes supported by strategic actions.

Theme 1 - Working Together

- Formalise the role of the Pastoral Industry Forage Steering Group as the facilitating body across all stakeholders, collaborations and consortiums; Collate a more complete and accurate view of forage sector investment in New Zealand; The Pastoral Industry Forage Steering Group to convene a Forage Science and Agriculture Advisory Group to coordinate with government and other investors on funding priorities for forage-related research and development; Identify common interests with the Australian pastoral sector and initiate discussions around joint investment in research and development; Convene the Science and Agronomy Advisory Group to develop the overarching brief for the forage-related biosecurity plan, and effectively pre-empt the inevitable operational agreements to be formed under the GIA plan; Develop an over-arching New Zealand Forage Sector biosecurity plan in partnership with all forage sector stakeholders; Develop a specific initiative to set standards for agricultural contractors and machine operators to better manage the containment of forage pests and diseases; Engage with the New Zealand Story to ensure that pastoral agriculture is not left behind, and the kaitiaki, integrity and resourcefulness of New Zealand's forage-based farming sector is better promoted; Establish the business case for a New Zealand grass-fed minimum standard supported by scientific and marketing evidence, and develop this standard for adoption in both the red meat and dairy sectors; Industry groups to maintain a watching brief on new forage and feeding practices in conjunction with the export marketing companies; The forage sector needs to work collectively with government to ensure the GMO regulations which apply to GM forages continue to be consistent and workable as the technology evolves; The forage sector will engage with AGCARM to include them in the science and agronomy advisory group as it considers agrichemicals; Conduct a joint review of agrichemical use and alternatives in New Zealand, and the assessment and re-registration process, to clarify the potential implications and outcomes for the sector; Identify funding options and re-commence research into forages and feeding regimes for reduced greenhouse gas emissions; Work collaboratively to inform policy and investment affecting the exposure of the sector to risks from both inclusions in the ETS and non-tariff trade barriers related to emissions; Work with stakeholders and policy makers to enable the introduction of new forage species where this is justified.

Theme 2 – Forage Improvement

- Extend the current Forage Value Index to include new traits, including quality and persistence, underway in a partnership between DairyNZ & NZPBRA; Validate the current Forage Value Index using a three to five-year strain trial; Beef + Lamb New Zealand, NZPBRA and DairyNZ partner to evaluate the opportunity and costs for extending FVI to other species and systems, and identify a suitable funding model where the effort is justified; Contingent on a valid business case and viable funding model, develop a version of the Forage Value Index methodology suitable for sheep and beef farm systems, and re-evaluate cultivars accordingly; Contingent on a valid business case and viable funding model, develop a Forage Value Index to include additional forage species; Identify and develop a better understanding of key traits needed for future forage breeding objectives including environmental outcomes, and anticipated environmental stresses under climate change. Identify genetic markers associated with key forage traits, particularly in the major forage species; Coordinate collection missions for the Margot Forde Forage Germplasm Centre towards obtaining genetic material most likely to meet future requirements such as from regions which have environmental conditions likely to match the future New Zealand environment, and provide genetic diversity to plant breeders; Evaluate minor species for their importance to future New Zealand forage systems, and then develop

strategies for sustainable sourcing of the most important species; Work with commercial seed companies to identify the best pathway for the introduction of minor species; Develop a New Zealand forage hybrid plan which identifies options for introducing key traits required in target species via hybridisation; Target the collection of novel germplasm for improved forage hybrids; Research investment to develop hybrid breeding schemes for selected forage species; Develop genomic estimated breeding values for ryegrass to enable genomic selection and accelerate genetic gain in perennial ryegrass cultivars; Implement genomic selection for ryegrass in commercial breeding programmes at proof of concept scale; Implement genomic selection for ryegrass in commercial breeding programmes at commercial scale, noting that the timeframe for release of improved cultivars is currently of the order eight to 10 years from starting; Complete offshore trials of GM forages to validate performance of new traits, with commercial development in New Zealand contingent on regulatory stance; Commercialise F1 hybrid perennial ryegrass in New Zealand; Re-engineer and improve the processes for the development of novel endophytes, with the goal of increasing the rate of discovery; Evaluate new approaches to forming genetic variation in endophytes; Introduce the same pan-industry governance and forage evaluation structures for forage legume-rhizobia selection as has been done for ryegrass and endophytes; Validate the usefulness of improved rhizobia-legume matches for New Zealand pastures with field trials such as that the improved rhizobia can supplant endemic strains; Develop genomic selection technologies for rhizobia and apply these to enhance selection of optimal rhizobia-legume matches for New Zealand pastures; The pastoral sector must actively support the development of biological controls, and research that maximises their effectiveness, to build greater involvement and expertise directed towards the pastoral forage sector.

Theme 3 – On Farm Innovation

- The sector must actively identify and prioritise forage system innovations for investment. Industry good organisations will take a leadership role in their respective farming areas. The suggested criteria for investment are relevance and scale, and validating this for each should be the first step; Prioritise investment into systems for pasture renewal/establishment in hill country as an area of immediate relevance and scale; Farm system research expertise must be actively developed through investment of levies and public monies in relevant forage-related initiatives; Forage System Innovation must be approached as a co-innovation initiative, with innovations validated on commercial farm-scale operations; Proven forage system innovations with a high potential for enhancing farm system profitability and sustainability must be demonstrated in relevant regions. This demonstration must be planned as a follow-on from forage system innovation research as part of the overall programme; Forage system demonstration must be supported with extension activities. Where there is a degree of complexity involved this will ideally include one-on-one support; Invest in technology packages to enable the rapid adoption of forage system innovations

Theme 4 – Ready and Responsible

- The farming sector must work with processing and market companies to develop New Zealand-wide protocols for product testing, and include this in the research and development programmes for new forage innovations; The farming sector must conduct research trials to develop protocols for the use of new forage innovations to protect animal health and welfare; Any protocols for new forage innovations necessary to protect the health and welfare of animals must be included in the extension and demonstration efforts to promote the innovation; Develop and validate a portfolio of techniques for sustainable pasture renewal and cultivation; Specific sectors to invest in soil sampling of under-represented farm classes to build a more complete picture of soil status; Develop and coordinate the population of a comprehensive soils database aligned with the pastoral sector and other land users.

APPENDIX II: CROSS TABULATION OF SURVEY RESULTS BY SECTOR

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
N=	147	91	73	40	45	40
In what ways are you directly involved with the forage and forage-related sectors in BC?						
Forage producer	62%	100%	71%	63%	58%	70%
Beef and/or other cattle producer	50%	57%	100%	13%	47%	53%
Dairy producer	27%	27%	7%	100%	7%	10%
Bison producer	1%	1%	0%	0%	0%	3%
Sheep, goats, fallow deer, other small livestock owner/producer	10%	11%	10%	5%	20%	35%
Equine owner/producer	31%	29%	29%	8%	100%	50%
Forage seed producer	1%	2%	3%	0%	4%	5%
Forage handler (e.g. hauler, broker, processor)	5%	7%	4%	0%	7%	18%
Forage sector supplier	2%	3%	1%	0%	4%	8%
Feedlot operator	3%	3%	7%	5%	0%	13%
Researcher/Academic	3%	4%	4%	0%	7%	13%
Where are your forage-related operations located?						
Vancouver Island/Coast	12%	10%	1%	33%	7%	5%
Lower Mainland/Southwest	22%	18%	3%	45%	24%	18%
Thompson Okanagan	17%	16%	18%	8%	24%	15%
Cariboo	16%	16%	26%	8%	13%	18%
Kootenay	11%	5%	14%	5%	11%	13%
North Coast - Nechako	14%	18%	23%	3%	9%	20%
Peace River	12%	16%	15%	0%	11%	28%
What are the key strengths and advantages of the forage and forage-related sectors in your region?						
Affordable farm land	27%	29%	27%	28%	22%	38%
Available farm land suitable for forage production	43%	52%	48%	30%	42%	55%
Access to local/regional markets	33%	35%	34%	15%	56%	53%
Access to provincial/national markets	5%	4%	5%	0%	7%	5%
Access to international markets	4%	7%	8%	0%	4%	5%
Strength of the local producer community	26%	25%	21%	28%	38%	38%
Favourable weather and climate for forage production	67%	68%	63%	83%	67%	68%
Favourable soils for forage production	59%	66%	56%	75%	60%	65%
Long growing season/sunlight hours	34%	37%	25%	50%	42%	48%
Locally based forage variety trials	8%	7%	7%	15%	9%	8%
Locally based forage research and researchers	4%	7%	3%	10%	7%	5%
Irrigation infrastructure	29%	29%	26%	53%	27%	28%
Low prevalence of noxious weeds	10%	11%	12%	8%	4%	8%
Low prevalence of pests affecting forage crops	20%	22%	30%	10%	20%	15%
Low prevalence of wildlife damage to forage crops	12%	11%	16%	5%	11%	10%
Other	5%	7%	5%	0%	9%	10%
Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?						
Forage species and varieties	18%	25%	19%	10%	20%	18%
Nutrient management	25%	32%	25%	23%	31%	25%

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
Invasive plants, pests & disease	35%	34%	40%	48%	33%	25%
Wildlife damage	50%	56%	59%	68%	29%	40%
Field renovation and/or establishment	34%	42%	41%	20%	38%	38%
Climate and weather	45%	41%	37%	45%	47%	48%
Water availability and/or drainage	42%	45%	36%	58%	29%	40%
Harvesting and/or storage	23%	33%	25%	10%	38%	38%
Land availability and/or utilization	45%	43%	37%	63%	47%	40%
Market access, development and/or identification	6%	5%	8%	3%	4%	13%
Adoption of innovative technology, processes and/or forage management techniques and systems	13%	15%	15%	8%	16%	18%
Transportation	15%	14%	18%	10%	11%	10%
Other	7%	8%	7%	3%	7%	13%
What are the specific challenges related to: Forage species and varieties						
Limited availability of forage species and/or varieties that are available elsewhere	19%	22%	7%	75%	22%	22%
Local growing conditions limit the possible species and varieties	52%	57%	43%	25%	67%	67%
Lack of region-specific information on selecting and growing forage crops	41%	35%	64%	0%	33%	33%
Other	7%	9%	7%	25%	0%	0%
What are the specific challenges related to: Nutrient Management						
Lack of information available about nutrient management techniques and principles	54%	44%	58%	17%	78%	78%
Restrictive laws and regulation affecting nutrient management	13%	17%	0%	50%	0%	0%
Lack of research/testing necessary for understanding nutrient management requirements	42%	50%	50%	33%	22%	22%
Other	21%	22%	33%	0%	22%	22%
What are the specific challenges related to: Invasive plants, pests, and/or disease						
Weeds and invasive plants	72%	70%	84%	47%	100%	100%
Insects and other pests	51%	61%	32%	93%	13%	13%
Crop disease	8%	13%	0%	20%	0%	0%
Other	0%	0%	0%	0%	0%	0%
What are the specific challenges related to: Wildlife damage						
Damage caused to established forage stands by waterfowl	49%	46%	38%	70%	50%	50%
Damage caused to seeded forage fields by waterfowl	56%	59%	45%	83%	50%	50%
Damage caused to established forage stands by ungulates	81%	78%	97%	70%	83%	83%
Damage caused to seeded forage fields by ungulates	72%	78%	76%	61%	83%	83%
Other	5%	7%	10%	0%	0%	0%
What are the specific challenges related to: Field renovation and/or establishment						
Lack of innovation available regarding techniques and best practices	34%	31%	26%	33%	33%	33%
Lack of region-specific information on selecting and growing forage crops	37%	31%	35%	0%	50%	50%
The cost of renovation and/or establishment is prohibitive	68%	66%	65%	50%	67%	67%
Other	24%	28%	26%	50%	25%	25%
What are the specific challenges related to: Climate and weather						

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
Changing climate and weather trends are negatively affecting nutrient management	12%	19%	5%	25%	7%	7%
Changing climate and weather trends are negatively affecting seeding of forage	42%	59%	47%	63%	27%	27%
Changing climate and weather trends are negatively affecting growing season for forage	58%	48%	53%	69%	53%	53%
Changing climate and weather trends are negatively affecting forage harvest	60%	67%	63%	38%	80%	80%
Changing climate and weather trends are negatively affecting forage storage	10%	7%	5%	6%	27%	27%
Increasing prevalence of wildlife damage	15%	19%	21%	19%	7%	7%
Increasing prevalence of invasive plants, pests and or disease	35%	26%	37%	44%	20%	20%
Changing climate and weather trends are increasing the prevalence of winterkill	31%	30%	47%	31%	7%	7%
Other	2%	0%	0%	0%	7%	7%
What are the specific challenges related to: Water availability and/or drainage						
Drought conditions are common and negatively affect forages	77%	71%	73%	78%	75%	75%
Flooding conditions are common and negatively affect forages	18%	17%	0%	43%	17%	17%
Lack of irrigation	44%	51%	35%	48%	50%	50%
Poor drainage	31%	32%	27%	48%	25%	25%
Prohibitive water regulations and legislation	28%	29%	27%	35%	17%	17%
Other	7%	2%	4%	4%	8%	8%
What are the specific challenges related to: Harvesting and /or storage						
Limited time available for harvest due to climate and weather	81%	79%	88%	100%	80%	80%
Harvesting equipment limits utilization of forage	19%	21%	19%	0%	27%	27%
Stored forage negatively affected by wildlife predation	19%	21%	19%	0%	20%	20%
Lack of locally based best practice information for forage harvesting and/or storage	16%	18%	6%	0%	27%	27%
Other	9%	7%	0%	0%	20%	20%
What are the specific challenges related to: Land availability and/or utilization						
Lack of available land for forage production	67%	74%	65%	71%	52%	52%
Land that could be used for forages is left out of production	31%	41%	50%	8%	48%	48%
Available land is prohibitively expensive	77%	72%	77%	79%	90%	90%
Other	8%	5%	8%	0%	24%	24%
What are the specific challenges related to: Market access, development and/or identification						
Unaware of potential market opportunities	70%	67%	71%	0%	100%	100%
Unable to access potential markets	10%	0%	14%	0%	0%	0%
Lack of supportive services for marketing forage resources	80%	100%	86%	100%	100%	100%
Cost of transportation is prohibitive	60%	33%	71%	100%	0%	0%
Lack of time available to identify potential markets	40%	67%	29%	0%	100%	100%
Other	0%	0%	0%	0%	0%	0%
What are the specific challenges related to: Adoption of innovative technology, processes and/or forage resources						
Lack of local leadership/examples of new technology, processes and/or techniques	74%	67%	58%	100%	86%	86%
Cost is prohibitive	16%	20%	17%	0%	14%	14%
Other	37%	47%	42%	0%	43%	43%

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
What are the specific challenges related to: Transportation						
Cost to transport forage in/out of the region is prohibitive	24%	17%	38%	0%	25%	25%
Transportation for forage in/out of the region is unavailable/constrained	14%	17%	23%	0%	0%	0%
Availability of services/supportive industries is limited due to transportation costs/constraints	71%	92%	77%	100%	0%	0%
Other	19%	8%	0%	25%	75%	75%
Where should government, industry associations, researchers and other entities focus their actions in order to best improve forage production (quality/quantity), marketability or return on investment?						
Forage species and varieties	28%	33%	36%	24%	17%	24%
Nutrient management	15%	14%	16%	8%	17%	18%
Invasive plants, pests & disease	32%	28%	41%	34%	31%	18%
Wildlife damage	38%	43%	41%	55%	10%	26%
Field renovation and/or establishment	23%	31%	29%	8%	26%	24%
Climate and weather	7%	3%	3%	3%	12%	8%
Water availability and/or drainage	30%	28%	23%	66%	19%	21%
Harvesting and/or storage	10%	13%	7%	0%	14%	21%
Land availability and/or utilization	36%	33%	31%	37%	57%	45%
Market access, development and/or identification	9%	7%	7%	0%	17%	13%
Adoption of innovative technology, processes and/or forage management techniques and systems	28%	30%	27%	26%	36%	24%
Transportation	6%	6%	6%	3%	5%	3%
Other	5%	5%	3%	0%	7%	13%
What are the specific priorities related to: Forage species and varieties						
Trials / developments / demos	58%	60%	53%	50%	60%	67%
Funding / Subsides / Tax breaks / legislative support from government	21%	27%	27%	0%	40%	0%
Research / information sharing	63%	53%	67%	50%	80%	67%
Appointment of suitable personnel	5%	0%	7%	0%	0%	0%
Soil testing	11%	7%	13%	0%	0%	0%
Other	11%	13%	13%	0%	0%	33%
What are the specific priorities related to: Nutrient Management						
Funding / support	46%	63%	57%	0%	43%	50%
Increased awareness	23%	25%	29%	100%	29%	50%
Research / trials	46%	63%	71%	0%	29%	0%
Collaboration with producers and support organisations	15%	13%	14%	0%	14%	25%
Soil / nutrient management	62%	63%	57%	100%	71%	75%
Other	15%	13%	14%	0%	14%	0%
What are the specific priorities related to: Invasive plants, pests & disease						
Introduce, expand, properly resource weed control programs including financial support programs for farmers to do the treatment	58%	58%	73%	20%	67%	40%
Research and education and information about weeds and pests	63%	50%	47%	100%	44%	80%
Improved crop insurance for pests	13%	17%	0%	60%	0%	0%
Allow expanded use of herbicides/insecticides by farmers	8%	8%	13%	0%	11%	0%
require land users to avoid spreading weeds	21%	17%	27%	20%	22%	60%

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
Other	4%	8%	7%	0%	11%	0%
What are the specific priorities related to: Wildlife damage						
Allow hunting, reduce wildlife populations,	68%	71%	55%	86%	0%	100%
Improve compensation	37%	29%	55%	14%	100%	0%
Elk fencing, other infrastructure-based solutions	26%	21%	36%	14%	0%	40%
Other	11%	14%	9%	14%	100%	0%
What are the specific priorities related to: Field renovation and/or establishment						
Tax incentive / Financial assistance / Funding / costs	43%	42%	33%	0%	60%	50%
Field renovation / Land redevelopment / land allocation	50%	42%	56%	33%	40%	50%
Research / Education	21%	25%	22%	33%	20%	25%
The use of greenhouses / regulation and or/rules surrounding the use of greenhouses	7%	8%	11%	0%	20%	25%
Assistance for the purchase of equipment	14%	17%	11%	0%	40%	50%
Best practices for seeding / farming techniques / the use of a soil consultant	21%	25%	22%	33%	20%	0%
Other	7%	8%	0%	33%	0%	0%
What are the specific priorities related to: Climate and weather						
Education	14%	0%	0%		25%	0%
Research / funding to determine how to deal with climate change affects	71%	100%	100%		75%	50%
Review of farm tax credits / property tax	14%	0%	0%		25%	0%
Invest in renewable energy and new tools	29%	0%	0%		50%	0%
What are the specific priorities related to: Water availability and/or drainage						
Improved drainage systems / management	58%	54%	25%	70%	50%	0%
Funding for the assistance of enhance drainage	11%	8%	13%	10%	0%	0%
Less red tape around water usage / rules and regulation around it / Water conservation / water licensing	37%	31%	50%	20%	100%	100%
Access to irrigation	26%	23%	50%	10%	0%	0%
Other	11%	15%	13%	20%	0%	50%
What are the specific priorities related to: Harvesting and/or storage						
Research / Education around hay production	17%	17%	11%	0%	30%	60%
Storage of hay	9%	17%	22%	0%	10%	0%
External bodies able to assist with hay production	13%	25%	11%	0%	30%	40%
What are the specific priorities related to: Land availability and/or affordability						
Protecting the ALR from residential zoning or non-ag purposes. Prioritise land for purely ag use	74%	67%	78%	86%	80%	60%
Access to more land and affordable land	30%	33%	22%	14%	30%	40%
Support for farmers and not just farm land	17%	8%	11%	29%	30%	20%
Use of greenhouses	13%	17%	11%	29%	10%	20%
Other	13%	0%	11%	14%	30%	20%
What are the specific priorities related to: Market access, development and/or identification						
Better coordination between groups to better access the market	75%	100%	100%		50%	100%
Government assistance	25%	0%	50%		0%	0%
Advertising	25%	0%	0%		50%	0%
What are the specific priorities related to: Adoption of innovative technology, processes and/or forage management techniques and systems						

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
Trials of new technologies and continuation of demos	19%	22%	29%	0%	14%	33%
Research of new technologies / methods of doing things	44%	44%	43%	80%	29%	33%
Information sharing / awareness / education	31%	33%	29%	40%	14%	0%
Assistance in accessing equipment	13%	11%	14%	0%	14%	0%
Making use of land which is currently not used for farming	13%	0%	0%	0%	29%	33%
Other	6%	0%	0%	0%	14%	0%
What are the specific priorities related to: Transportation						
Prioritisation of ag cargo	50%	67%	33%	100%	100%	0%
Government assistance	50%	33%	67%	0%	0%	100%
Fewer restrictions when transporting ag	25%	33%	0%	100%	0%	0%
Other	0%	0%	0%	0%	0%	0%
We would like to understand the extent to which you have adopted or adapted technology and/or techniques to improve forage production, marketability and/or return on investment. Over the last 5-10 years have you:						
Adopted new forage management techniques or systems	70%	68%	83%	52%	87%	75%
Adopted the use of new equipment for forages	58%	70%	57%	81%	47%	55%
Adapted technology to benefit forage production	24%	30%	23%	43%	13%	25%
Other	18%	7%	11%	24%	20%	20%
What barriers do you face in terms of adopting or adapting new technology, processes or techniques that might otherwise benefit your forage-related operations?						
Lack of leadership/support for innovation	11%	11%	14%	9%	6%	10%
Personal comfort level with new technology/techniques	17%	16%	20%	5%	19%	20%
Financial costs	71%	78%	71%	73%	69%	60%
Lack of available time to learn/adopt a new technology/technique	17%	18%	23%	23%	19%	25%
Proof of value (unsure of the magnitude of benefit)	43%	51%	51%	45%	31%	25%
Reliability (unsure if it will continue to provide value)	19%	24%	23%	9%	19%	25%
Not aware of any innovative technologies/techniques that would benefit me	19%	13%	6%	23%	31%	10%
Other	7%	9%	6%	0%	19%	25%
How many livestock do you have at any given time?						
Beef Cattle & Calves: Average	222	316	404	43	140	128
Lactating Dairy Cows: Average	56	69	12	167	0	22
Replacement Heifers: Average	61	76	47	127	14	32
Sheep & Lamb: Average	19	22	9	0	50	63
Horses & Ponies: Average	4	4	4	0	11	4
Goats: Average	0	0	1	1	2	2
Bison: Average	1	2	0	0	0	4
In an average year, what percentage of your forage requirement do you purchase?						
0%	29%	36%	43%	26%	16%	39%
1-24%	40%	43%	38%	57%	32%	17%
25-49%	9%	12%	5%	9%	0%	11%
50-99%	15%	10%	14%	9%	26%	28%
100%	7%	0%	0%	0%	26%	6%
Approximately how many acres of forage crops did you have on private agricultural land in 2017?						
Average	390	512	557	396	287	493
How many of those acres are irrigated?						

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
% of total (above)	33%	33%	30%	47%	32%	22%
Which of the following forage crops did you grow on private land in 2017?						
Alfalfa	32%	32%	47%	18%	38%	40%
Alsike Clover	13%	11%	18%	0%	14%	10%
Red Clover	15%	12%	23%	3%	14%	13%
White Clover	6%	4%	5%	6%	3%	3%
Milkvetch	1%	1%	2%	0%	3%	0%
Foxtail	1%	1%	2%	0%	3%	0%
Creeping Red Fescue	5%	5%	8%	0%	10%	7%
Timothy	29%	25%	42%	15%	28%	33%
Kentucky Bluegrass	5%	5%	7%	0%	10%	0%
Wild Rye	2%	2%	0%	6%	0%	0%
Sanfoin	1%	1%	2%	0%	3%	0%
Orchard Grass	42%	36%	38%	65%	24%	27%
Tall fescue	23%	18%	15%	47%	7%	0%
Corn	18%	16%	7%	53%	0%	7%
Smooth Bromegrass	15%	15%	22%	6%	17%	17%
Meadow Bromegrass	13%	12%	22%	3%	7%	10%
Crested Wheatgrass	6%	7%	12%	0%	17%	3%
Tall Wheatgrass	3%	3%	5%	0%	7%	3%
Reed Canarygrass	13%	12%	15%	12%	14%	3%
Trefoil	3%	2%	5%	0%	7%	3%
Brassica *sp.*	2%	1%	2%	0%	0%	3%
Cereals for forage	15%	14%	18%	12%	14%	10%
Other	6%	5%	5%	3%	7%	13%
Do you regularly have your forage tested to determine any of the following?						
Dry matter (DM, %)	56%	61%	44%	91%	31%	33%
Crude protein (CP, %)	57%	64%	47%	91%	38%	28%
Acid detergent fibre (ADF, %)	44%	50%	26%	87%	19%	17%
Neutral detergent fibre (NDF, %)	43%	48%	24%	87%	13%	17%
Amino Acids (e.g. methionine, lysine)	22%	25%	6%	57%	0%	11%
Mineral content (e.g. calcium, phosphorous, potassium, magnesium)	49%	55%	38%	87%	19%	17%
Other	4%	5%	6%	0%	13%	0%
How often do you have your forage soils tested?						
Never	14%	5%	9%	10%	40%	18%
Rarely or only if there is a noticeable problem with productivity	31%	29%	37%	19%	33%	24%
On a regular basis (e.g. every 1-3 years)	55%	67%	54%	71%	27%	59%
Over the past 3 years have you sold any of the forage you have produced?						
Yes	28%	27%	24%	44%	16%	27%
No	31%	22%	34%	24%	31%	24%
No answer	41%	51%	42%	32%	53%	48%
Where are the end markets for the forage you produce and sell?						
Local regional market	97%	96%	93%	100%	100%	89%
Other regions in BC	15%	20%	20%	13%	0%	33%

Summary of Key Survey Responses	Total Sample	Forage Producer	Beef Producer	Dairy	Equine	All other
Other Canadian markets outside of BC	0%	0%	0%	0%	0%	0%
International markets	0%	0%	0%	0%	0%	0%
What sectors are the end markets for the forage you produce and sell?						
Cow-calf	45%	52%	60%	40%	60%	67%
Dairy	45%	44%	27%	73%	0%	33%
Equine	58%	64%	87%	40%	80%	67%
Other livestock	12%	16%	7%	27%	0%	11%
Other	3%	0%	0%	0%	0%	11%
Do you sell your forage directly or through a broker?						
Direct	94%	92%	93%	87%	100%	88%
Direct and by Broker	6%	8%	7%	13%	0%	13%
Broker only	0%	0%	0%	0%	0%	0%

APPENDIX III: CROSS TABULATION OF SURVEY RESULTS BY REGION

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
N=	17	33	25	24	16	21	17
In what ways are you directly involved with the forage and forage-related sectors in BC?							
Forage producer	53%	48%	60%	63%	31%	76%	88%
Beef and/or other cattle producer	6%	6%	52%	79%	63%	81%	65%
Dairy producer	76%	55%	12%	13%	13%	5%	0%
Bison producer	0%	0%	0%	2%	0%	0%	0%
Sheep, goats, fallow deer, other small livestock	10%	12%	8%	8%	13%	10%	12%
Equine owner/producer	18%	33%	44%	25%	31%	19%	29%
Forage seed producer	0%	0%	0%	0%	0%	0%	12%
Forage handler (e.g. hauler, broker, processor)	0%	0%	4%	0%	0%	10%	24%
Forage sector supplier	0%	0%	0%	4%	0%	5%	6%
Feedlot operator	0%	0%	0%	13%	0%	10%	0%
Researcher/Academic	12%	3%	12%	4%	6%	5%	12%
Where are your forage-related operations located?							
Vancouver Island/Coast	100%	3%	4%	4%	6%	5%	6%
Lower Mainland/Southwest	6%	100%	4%	4%	6%	5%	6%
Thompson Okanagan	6%	3%	100%	4%	6%	5%	6%
Cariboo	6%	3%	4%	100%	6%	5%	6%
Kootenay	6%	3%	4%	4%	100%	5%	6%
North Coast – Nechako	6%	3%	4%	4%	6%	100%	6%
Peace River	6%	3%	4%	4%	6%	5%	100%
What are the key strengths and advantages of the forage and forage-related sectors in your region?							
Affordable farm land	29%	6%	20%	58%	31%	38%	41%
Available farm land suitable for forage production	29%	18%	52%	58%	25%	62%	82%
Access to local/regional markets	6%	18%	56%	29%	44%	48%	24%
Access to provincial/national markets	0%	9%	0%	0%	0%	10%	12%
Access to international markets	0%	0%	0%	0%	0%	29%	0%
Strength of the local producer community	18%	27%	8%	4%	50%	19%	65%
Favourable weather and climate for forage production	71%	73%	80%	67%	81%	38%	65%
Favourable soils for forage production	41%	79%	72%	38%	25%	52%	71%
Long growing season/sunlight hours	53%	55%	32%	8%	13%	10%	53%
Locally based forage variety trials	0%	21%	0%	4%	0%	14%	6%
Locally based forage research and researchers	0%	12%	8%	0%	0%	0%	0%
Irrigation infrastructure	59%	27%	56%	13%	31%	5%	0%
Low prevalence of noxious weeds	12%	9%	4%	8%	31%	10%	0%
Low prevalence of pests affecting forage crops	6%	18%	12%	46%	31%	14%	6%
Low prevalence of wildlife damage to forage crops	0%	21%	8%	4%	19%	19%	6%
Other	6%	3%	4%	0%	0%	5%	24%
Which of the following categories represent the most significant challenges facing your forage-related operations or the forage-related sectors in your region?							

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
Forage species and varieties	0%	9%	24%	33%	0%	19%	35%
Nutrient management	18%	48%	40%	25%	6%	10%	29%
Invasive plants, pests & disease	59%	30%	28%	13%	44%	57%	18%
Wildlife damage	88%	48%	44%	54%	69%	62%	59%
Field renovation and/or establishment	35%	21%	20%	38%	13%	67%	41%
Climate and weather	59%	45%	40%	29%	13%	76%	35%
Water availability and/or drainage	76%	39%	64%	46%	25%	29%	29%
Harvesting and/or storage	6%	15%	16%	38%	0%	33%	47%
Land availability and/or utilization	59%	73%	32%	17%	75%	24%	18%
Market access, development and/or identification	0%	0%	4%	8%	19%	0%	18%
Adoption of innovative technology, processes and/or forage management techniques and systems	12%	3%	16%	13%	0%	19%	29%
Transportation	6%	0%	8%	25%	44%	14%	18%
Other	0%	3%	12%	8%	0%	0%	24%
What are the specific challenges related to: Forage species and varieties							
Limited availability of forage species and/or varieties that are available elsewhere		0%	50%	25%		0%	0%
Local growing conditions limit the possible species and varieties		67%	0%	75%		0%	100%
Lack of region-specific information on selecting and growing forage crops		33%	50%	38%		100%	0%
Other		0%	17%	13%		0%	0%
What are the specific challenges related to: Nutrient Management							
Lack of information available about nutrient management techniques and principles		33%	88%	33%		100%	33%
Restrictive laws and regulation affecting nutrient management		33%	0%	0%		0%	0%
Lack of research/testing necessary for understanding nutrient management requirements		33%	50%	100%		0%	0%
Other		11%	13%	0%		0%	100%
What are the specific challenges related to: Invasive plants, pests, and/or disease							
Weeds and invasive plants	63%	38%	100%	100%	100%	70%	100%
Insects and other pests	100%	75%	20%	0%	0%	40%	50%
Crop disease	38%	0%	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%	0%
What are the specific challenges related to: Wildlife damage							
Damage caused to established forage stands by waterfowl	100%	83%	33%	55%	71%	13%	11%
Damage caused to seeded forage fields by waterfowl	85%	100%	56%	64%	100%	13%	11%
Damage caused to established forage stands by ungulates	85%	17%	100%	91%	100%	100%	67%
Damage caused to seeded forage fields by ungulates	69%	17%	89%	82%	86%	88%	78%
Other	0%	0%	0%	18%	0%	0%	11%
What are the specific challenges related to: Field renovation and/or establishment							
Lack of innovation available regarding techniques and best practices	0%	67%	25%	38%	0%	22%	50%
Lack of region-specific information on selecting and growing forage crops	0%	50%	50%	50%	0%	33%	33%
The cost of renovation and/or establishment is prohibitive	0%	100%	50%	88%	100%	78%	33%

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
Other	100%	0%	25%	0%	0%	0%	83%
What are the specific challenges related to: Climate and weather							
Changing climate and weather trends are negatively affecting nutrient management	22%	15%	13%	17%		0%	0%
Changing climate and weather trends are negatively affecting seeding of forage	44%	38%	25%	67%		55%	20%
Changing climate and weather trends are negatively affecting growing season for forage	100%	62%	50%	50%		45%	20%
Changing climate and weather trends are negatively affecting forage harvest	33%	69%	63%	33%		64%	100%
Changing climate and weather trends are negatively affecting forage storage	11%	23%	0%	17%		0%	0%
Increasing prevalence of wildlife damage	22%	0%	25%	17%		27%	0%
Increasing prevalence of invasive plants, pests and or disease	44%	46%	25%	0%		55%	0%
Changing climate and weather trends are increasing the prevalence of winterkill	22%	23%	13%	17%		73%	20%
Other	0%	0%	13%	0%		0%	0%
What are the specific challenges related to: Water availability and/or drainage							
Drought conditions are common and negatively affect forages	85%	62%	93%	64%	100%	67%	100%
Flooding conditions are common and negatively affect forages	31%	54%	0%	0%	0%	0%	0%
Lack of irrigation	54%	46%	53%	18%	100%	83%	20%
Poor drainage	38%	69%	13%	27%	0%	0%	0%
Prohibitive water regulations and legislation	46%	15%	47%	18%	25%	67%	20%
Other	0%	8%	13%	9%	0%	0%	0%
What are the specific challenges related to: Harvesting and /or storage							
Limited time available for harvest due to climate and weather	100%	100%	100%	89%		100%	38%
Harvesting equipment limits utilization of forage	0%	0%	25%	33%		20%	13%
Stored forage negatively affected by wildlife predation	0%	0%	25%	0%		0%	63%
Lack of locally based best practice information for forage harvesting and/or storage	0%	0%	0%	33%		0%	25%
Other	100%	0%	0%	0%		0%	25%
What are the specific challenges related to: Land availability and/or utilization							
Lack of available land for forage production	90%	57%	75%	100%	58%	50%	67%
Land that could be used for forages is left out of production	10%	22%	38%	0%	42%	100%	67%
Available land is prohibitively expensive	80%	87%	75%	0%	83%	50%	100%
Other	0%	4%	0%	0%	17%	0%	67%
What are the specific challenges related to: Market access, development and/or identification							
Unaware of potential market opportunities			100%	50%	67%		67%
Unable to access potential markets			0%	50%	0%		0%
Lack of supportive services for marketing forage resources			100%	50%	67%		100%
Cost of transportation is prohibitive			0%	100%	100%		33%
Lack of time available to identify potential markets			100%	0%	0%		67%
Other			0%	0%	0%		0%
What are the specific challenges related to: Adoption of innovative technology, processes and/or forage resources							
Lack of local leadership/examples of new technology, processes	100%	100%	100%	100%		60%	40%

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
and/or techniques							
Cost is prohibitive	0%	0%	0%	33%		40%	0%
Other	0%	0%	0%	0%		40%	100%
What are the specific challenges related to: Transportation							
Cost to transport forage in/out of the region is prohibitive	100%		0%	40%	0%	33%	33%
Transportation for forage in/out of the region is unavailable/constrained	0%		0%	0%	29%	0%	33%
Availability of services/supportive industries is limited due to transportation costs/constraints	0%		100%	100%	57%	67%	67%
Other	0%		0%	20%	43%	0%	0%
Where should government, industry associations, researchers and other entities focus their actions in order to best improve forage production (quality/quantity), marketability or return on investment?							
Forage species and varieties	6%	32%	35%	33%	0%	42%	29%
Nutrient management	18%	23%	13%	21%	6%	5%	41%
Invasive plants, pests & disease	47%	13%	35%	42%	50%	32%	6%
Wildlife damage	65%	16%	22%	54%	38%	26%	47%
Field renovation and/or establishment	6%	16%	13%	33%	38%	53%	0%
Climate and weather	6%	10%	9%	0%	13%	5%	6%
Water availability and/or drainage	59%	39%	43%	25%	19%	21%	18%
Harvesting and/or storage	0%	3%	0%	13%	0%	21%	35%
Land availability and/or utilization	35%	55%	35%	8%	56%	16%	35%
Market access, development and/or identification	0%	10%	17%	0%	13%	0%	18%
Adoption of innovative technology, processes and/or forage management techniques and systems	35%	23%	30%	25%	13%	37%	24%
Transportation	6%	0%	0%	13%	6%	11%	6%
Other	0%	3%	4%	4%	13%	0%	12%
What are the specific priorities related to: Forage species and varieties							
Trials / developments / demos		67%	100%	50%		50%	25%
Funding / Subsides / Tax breaks / legislative support from government		0%	0%	50%		50%	0%
Research / information sharing		67%	0%	75%		75%	100%
Appointment of suitable personnel		0%	0%	0%		25%	0%
Soil testing		0%	0%	25%		25%	0%
Other		0%	0%	0%		25%	25%
What are the specific priorities related to: Nutrient Management							
Funding / support	100%	20%	0%	0%			100%
Increased awareness	0%	20%	0%	100%			25%
Research / trials	0%	20%	100%	0%			75%
Collaboration with producers and support organisations	0%	20%	0%	0%			25%
Soil / nutrient management	100%	60%	0%	100%			75%
Other	0%	20%	50%	0%			0%
What are the specific priorities related to: Invasive plants, pests & disease							
Introduce, expand, properly resource weed control programs including financial support programs for farmers to do the treatment	25%	0%	71%	67%	75%	50%	100%

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
Research and education and information about weeds and pests	75%	100%	43%	67%	100%	25%	100%
Improved crop insurance for pests	75%	0%	0%	0%	0%	0%	0%
Allow expanded use of herbicides/insecticides by farmers	0%	0%	14%	33%	0%	0%	0%
Require land users to avoid spreading weeds	0%	0%	0%	33%	75%	25%	0%
Other	25%	0%	0%	0%	0%	0%	0%
What are the specific priorities related to: Wildlife damage							
Allow hunting, reduce wildlife populations,	75%	100%	0%	60%	100%	50%	75%
Improve compensation	25%	0%	100%	60%	0%	50%	25%
Elk fencing, other infrastructure-based solutions	25%	0%	0%	0%	100%	100%	25%
Other	25%	0%	0%	20%	0%	0%	0%
What are the specific priorities related to: Field renovation and/or establishment							
Tax incentive / Financial assistance / Funding / costs	100%	0%	50%	60%	100%	0%	
Field renovation / Land redevelopment / land allocation	100%	50%	0%	40%	100%	67%	
Research / Education	0%	0%	0%	40%	0%	33%	
The use of greenhouses / regulation and or/rules surrounding the use of greenhouses	0%	50%	0%	0%	0%	0%	
Assistance for the purchase of equipment	0%	0%	0%	40%	0%	0%	
Best practices for seeding / farming techniques / the use of a soil consultant	0%	0%	50%	40%	0%	0%	
Other	0%	0%	0%	20%	0%	0%	
What are the specific priorities related to: Climate and weather							
Education	0%	0%	0%		100%		0%
Research / funding to determine how to deal with climate change affects	0%	100%	50%		100%		100%
Review of farm tax credits / property tax	0%	0%	50%		0%		0%
Invest in renewable energy and new tools	100%	0%	50%		0%		0%
What are the specific priorities related to: Water availability and/or drainage							
Improved drainage systems / management	100%	83%	33%	67%	0%	0%	
Funding for the assistance of enhance drainage	0%	0%	17%	33%	0%	0%	
Less red tape around water usage / rules and regulation around it / Water conservation / water licensing	0%	17%	50%	67%	100%	0%	
Access to irrigation	50%	0%	33%	33%	0%	100%	
Other	50%	0%	0%	33%	0%	0%	
What are the specific priorities related to: Harvesting and/or storage							
Research / Education around hay production		100%		0%		50%	100%
Storage of hay		0%		100%		50%	0%
External bodies able to assist with hay production		0%		100%		0%	100%
What are the specific priorities related to: Land availability and/or affordability							
Protecting the ALR from residential zoning or non-ag purposes. Prioritise land for purely ag use	100%	78%	50%	0%	100%	100%	33%
Access to more land and affordable land	0%	33%	50%	100%	0%	0%	67%
Support for farmers and not just farm land	0%	22%	0%	0%	50%	0%	0%
Use of greenhouses	0%	33%	0%	0%	0%	0%	0%
Other	33%	11%	0%	0%	25%	0%	0%

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
What are the specific priorities related to: Market access, development and/or identification							
Better coordination between groups to better access the market		50%			100%		100%
Gov assistance		0%			100%		0%
Advertising		50%			0%		0%
What are the specific priorities related to: Adoption of innovative technology, processes and/or forage management techniques and systems							
Trials of new technologies and continuation of demos	0%	20%	50%	0%	0%	0%	100%
Research of new technologies / methods of doing things	100%	0%	100%	0%	100%	33%	0%
Information sharing / awareness / education	33%	40%	0%	0%	0%	67%	0%
Assistance in accessing equipment	0%	20%	0%	0%	0%	33%	0%
Making use of land which is currently not used for farming	0%	40%	0%	0%	0%	0%	0%
Other	0%	20%	0%	0%	0%	0%	0%
What are the specific priorities related to: Transportation							
Prioritisation of ag cargo	100%			50%			0%
Government assistance	0%			50%			100%
Fewer restrictions when transporting ag	0%			50%			0%
Other	0%			0%			0%
We would like to understand the extent to which you have adopted or adapted technology and/or techniques to improve forage production, marketability and/or return on investment. Over the last 5-10 years have you:							
Adopted new forage management techniques or systems	50%	60%	80%	82%	83%	73%	63%
Adopted the use of new equipment for forages	100%	67%	60%	64%	17%	27%	75%
Adapted technology to benefit forage production	50%	20%	10%	36%	0%	27%	25%
Other	33%	27%	10%	0%	50%	9%	13%
What barriers do you face in terms of adopting or adapting new technology, processes or techniques that might otherwise benefit your forage-related operations?							
Lack of leadership/support for innovation	0%	6%	18%	14%	20%	18%	0%
Personal comfort level with new technology/techniques	0%	6%	0%	29%	0%	45%	33%
Financial costs	86%	56%	64%	79%	80%	82%	67%
Lack of available time to learn/adopt a new technology/technique	14%	17%	18%	21%	40%	9%	0%
Proof of value (unsure of the magnitude of benefit)	71%	44%	27%	50%	40%	27%	50%
Reliability (unsure if it will continue to provide value)	0%	11%	27%	36%	0%	27%	17%
Not aware of any innovative technologies/techniques that would benefit me	29%	22%	27%	14%	20%	0%	33%
Other	0%	17%	0%	0%	0%	0%	33%
How many livestock do you have at any given time?							
Beef Cattle & Calves: Average	21	0	636	373	74	133	245
Lactating Dairy Cows: Average	101	111	8	83	0	7	0
Replacement Heifers: Average	95	103	69	55	3	13	30
Sheep & Lamb: Average	0	5	15	18	0	12	100
Horses & Ponies: Average	4	1	5	7	5	3	5
Goats: Average	0	0	0	0	8	0	0
Bison: Average	0	0	0	5	0	0	0
In an average year, what percentage of your forage requirement do you purchase?							
0%	14%	18%	36%	25%	0%	50%	57%
1-24%	71%	41%	18%	58%	50%	30%	14%

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
25-49%	0%	18%	0%	17%	0%	0%	14%
50-74%	0%	6%	36%	0%	50%	20%	14%
100%	14%	18%	9%	0%	0%	0%	0%
Approximately how many acres of forage crops did you have on private agricultural land in 2017?							
Average	199	126	386	872	91	249	741
How many of those acres are irrigated?							
% of total (above)	60%	35%	56%	34%	48%	1%	0%
Which of the following forage crops did you grow on private land in 2017?							
Alfalfa	8%	0%	47%	47%	38%	39%	50%
Alsike Clover	8%	5%	0%	24%	25%	11%	25%
Red Clover	17%	0%	12%	18%	13%	28%	25%
White Clover	25%	5%	6%	6%	0%	6%	0%
Milkvetch	8%	0%	0%	0%	0%	0%	0%
Foxtail	0%	0%	0%	6%	0%	0%	0%
Creeping Red Fescue	8%	5%	6%	6%	0%	0%	13%
Timothy	25%	9%	18%	53%	25%	33%	44%
Kentucky Bluegrass	8%	0%	6%	12%	13%	0%	0%
Wild Rye	17%	0%	0%	0%	0%	0%	0%
Sanfoin	8%	0%	0%	0%	0%	0%	0%
Orchard Grass	50%	64%	47%	53%	13%	33%	13%
Tall fescue	50%	41%	0%	24%	0%	28%	6%
Corn	25%	50%	18%	18%	0%	0%	0%
Smooth Bromegrass	0%	5%	12%	12%	13%	33%	31%
Meadow Bromegrass	8%	0%	12%	24%	13%	17%	19%
Crested Wheatgrass	8%	0%	12%	12%	0%	6%	6%
Tall Wheatgrass	0%	0%	6%	12%	0%	0%	0%
Reed Canarygrass	17%	9%	6%	41%	0%	6%	6%
Trefoil	8%	0%	0%	0%	0%	0%	13%
Brassica *sp.*	0%	5%	0%	0%	0%	6%	0%
Cereals for forage	8%	18%	12%	24%	13%	22%	6%
Other	0%	9%	12%	6%	13%	0%	6%
Do you regularly have your forage tested to determine any of the following?							
Dry matter (DM, %)	57%	82%	55%	50%	0%	50%	38%
Crude protein (CP, %)	71%	82%	55%	50%	33%	40%	38%
Acid detergent fibre (ADF, %)	71%	76%	36%	50%	0%	20%	0%
Neutral detergent fibre (NDF, %)	71%	76%	36%	42%	0%	20%	0%
Amino Acids (e.g. methionine, lysine)	43%	53%	9%	17%	0%	0%	0%
Mineral content (e.g. calcium, phosphorous, potassium, magnesium)	71%	71%	36%	50%	0%	30%	38%
Other	14%	0%	18%	0%	0%	0%	0%
How often do you have your forage soils tested?							
Never	14%	19%	10%	9%	33%	0%	29%
Rarely or only if there is a noticeable problem with productivity	29%	13%	50%	18%	33%	67%	57%
On a regular basis (e.g. yearly)	57%	69%	40%	73%	33%	33%	14%

Summary of Key Survey Responses	Vancouver Island/Coast	Lower Mainland Southwest	Thompson Okanagan	Cariboo	Kootenay	North Coast Nechako	Peace River
Over the past 3 years have you sold any of the forage you have produced?							
Yes	33%	38%	26%	29%	25%	20%	25%
No	17%	29%	32%	53%	13%	35%	25%
No answer	50%	33%	42%	18%	63%	45%	50%
Where are the end markets for the forage you produce and sell?							
Local regional market	100%	100%	100%	100%	100%	100%	75%
Other regions in BC	0%	0%	40%	20%	0%	0%	50%
Other Canadian markets outside of BC	0%	0%	0%	0%	0%	0%	0%
International markets	0%	0%	0%	0%	0%	0%	0%
What sectors are the end markets for the forage you produce and sell?							
Cow-calf	75%	0%	80%	80%	0%	25%	75%
Dairy	0%	89%	60%	60%	0%	0%	25%
Equine	75%	22%	60%	60%	100%	100%	50%
Other livestock	25%	11%	20%	20%	0%	0%	0%
Other	0%	0%	20%	0%	0%	0%	0%
Do you sell your forage directly or through a broker?							
Direct	100%	100%	100%	60%	100%	100%	100%
Direct and by Broker	0%	0%	0%	40%	0%	0%	0%
Broker only	0%	0%	0%	0%	0%	0%	0%