BEST PRACTICES FOR INTRODUCING A NEW CROP

A Growers Guide

Special Crops Value Chain Roundtable

FINAL VERSION
March 31, 2015

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1.0 INTRODUCTION

As a successful grower, you continuously look for ways to increase efficiency and profitability and improve overall environmental sustainability. One of the recognized ways to do so is to introduce new, highly profitable crops into your operation.

Although there are a multitude of potential field crops that could provide profitable returns, ensuring that you have taken all considerations and precautions before introducing a new crop into your operation is a key component to reducing inefficiencies and ensuring success. In many cases, the lack of information can increase the risk of making misinformed decisions, which can have results that can cause economic, environmental or even legal concern either through market or agronomic challenges, competing rotational issues, pesticide challenges, sales issues or logistical concerns to name a few.

The information and examples included in this guide focus on a few groups of selected special crops that may have a fit in your operation including: small grains and seed crops (buckwheat, canary seed, mustard); minor oilseeds (sunflower, safflower, borage, camelina, carinata); forages, hay and clover (baled hay, silage, grazing, alfalfa pellets); industrial crops (hemp, biomass crops); culinary/medicinal crops and spices (coriander, caraway, fenugreek, hops), essential oil crops (mint, lavender). However the best practices, tools, information and questions can apply to any new crop that you are considering growing that you may not have previous experience with. The series of questions included can be used as a checklist to help make sure you aren't overlooking something that could be important and help to develop the best plan for market, economic and agronomic success.

This guide is intended to enhance the base of information and increase knowledge on how to efficiently and effectively introduce new field crops into an existing operation and provide information, decision making tools and best practices that growers can use to make informed decisions on what special crop they would like to introduce. This guide will not tell you what you should grow, nor is it a production manual, it is a guide to help you navigate the various market, regulatory, agronomic and economic aspects of efficiently and effectively introducing new crops into an existing operation.

1.1 Background

The Special Crops Value Chain Roundtable (SCVCRT)[1] led the development of this "Best Practices for Introducing a New Crop" Growers Guide, which began with

[1] The SCVCRT was launched to enhance special crops and brings together key leaders from across the value chain, including producers, processors and traders, and other stakeholders. The Roundtable focuses on seizing niche market opportunities based on superior products, trustworthy suppliers and health-enhancing attributes. It also focuses on transportation issues, health claims, the regulatory environment, traceability, value-added capacity, research and innovation and market intelligence. For more information on the Special Crops Value Chain Roundtable, please follow this link: http://www.agr.gc.ca/eng/industry-markets-and-trade/value-chain-roundtables/special-crops/?id=1385995694580

consultations with industry experts. The consultations helped to identify themes for the development of recommended steps to be taken and questions to be asked when introducing a new crop to an existing operation. Members also undertook a literature review and scan of existing information and best practices, adapted relevant “existing crop” information/questions to “new crop” information/questions and decision tools to support informed planting decisions. Although there is currently limited information on what is needed to consider when planting new crops, there are various crop specific information and general crop planning guides available and outlined in the guide.

1.2 Purpose of Grower Guide

The idea for this "Best Practices for Introducing a New Crop" Growers Guide originated from the need for credible information when adopting a new crop, and how a lack of information can lead to unintended results that can cause economic, environmental or legal concerns. This Growers Guide is intended to enhance the base of information and increase knowledge for growers and agronomists on how to identify and safely, economically and effectively introduce new (or new to grower) crops into an existing farming operation.

The Guide provides a framework for the steps to choosing a new crop and is intended to provide you with recommendations on what questions you should ask when researching the introduction of a new or different crop into your operation. For some of these crops, finding and accessing markets can be a challenge and there can be limited economic or agronomic information available. Finding out what will work best in a local area or on an individual farm and finding or developing a market may require additional time, research and information.

The user guide can be used as a separate information piece or can be incorporated/adapted to existing practices currently used in your operation. This grower guide also provides links to other tools and existing sources of information, key government, extension, and industry contacts.

- Start with the general information at the beginning of the guide to get an understanding of the various factors you should consider before navigating through the crop specific questions related to markets, regulatory and agronomic considerations.
- Complete a cost return analysis or enterprise budget to more completely understand the economics of this new crop and the impact on your overall operation. A sample budget is included, but there are many examples that can be used such as those available from your provincial agriculture departments and others.
- Use the links and contacts for more detailed research into potential crops, markets and best practices for success.
- Once these steps have been completed you should have most of the information necessary to make an informed decision as to what new crop you could transition to.

2.0 Getting Started - What to consider when planting a new special crop

Special crops are considered to be crops not included in the major grains and oilseeds or horticultural crop categories. Special crops are usually smaller acreage crops, often considered to be niche crops with specialized markets. Special crops may fit in a range of markets from food and non-food applications, industrial uses, forages, culinary and medicinal herbs and spices, essential oils and others. As compared with traditional agricultural commodities, there are generally few marketing structures in place, and there may be relatively little information regarding crop agronomics and management.

Before you plant a crop or make any serious investment you should understand what the product is that you are selling, how to grow and farm the crop, what the market demands and access are, what the regulatory requirements are and the time and money required. Talk to others who are already doing it, and find provincial, university and federal government departments that may be able to provide information. Again, this Guide will help you navigate the various market, regulatory, agronomic and economic aspects of efficiently and effectively introducing new crops into an existing operation; it is not a production guide.

Growers with experience say getting started is about 'research, research, research' and 'markets, markets, markets'.

2.1 Why grow a new crop?

Although it is important to consider the economics involved with special crops, sometimes the main reason in choosing to grow a special crop is not the direct economic value. There are various reasons why growers decide to introduce a new crop into their rotation and farm business. They range from:

- diversify operation
- improve economics and profitability of the farm
- improve cash flow and off-season income
- increase revenues to create a better financial situation and for risk management
- control of the market chain
- improve soils and fertility
- produce forage or feed for on-farm use
- address problem weeds, diseases or insect concerns and break problematic cycles
- enhance crop and herbicide rotation options
- better utilize existing land, equipment, labor and time
- meet a new market opportunity
- capture value by growing crops with unique traits for local and export markets and consumption
- diversify the timing of seeding and harvest operations for time management
- have a diverse line of products to market.
- provide economic stability.
- personal interest of trying something new
- expand on-farm employment (farm family members/next generation)

- enhance environmental sustainability

What is your main reason for adding a new crop to your existing operation? Have you every grown an alternative crop before? What are the implications on your time, your core farm business activities, cashflow, staffing, potential liabilities or long-term strategy. Having a personal interest or another driving force can help to stay motivated to undertake research, source buyers and develop a market and establish agronomic practices.

2.2 Benefits and Challenges

Special crops can have a higher potential return per acre than conventionally grown commodities, however the marketing, production and agronomic requirements can often be very different. Diversification may not actually increase profits in the short-term, but over the longer term may improve farm profitability, reduce risk and address other considerations such as soil and fertility improvements, enhance crop rotation options and reduce pest problems. New crops in rotation may be a way to better utilize existing land, equipment and resources.

One of the biggest challenges is that new crops often do not have established markets and growers will need to commit considerable effort to identify a market before planting. Where possible, contracts are recommended, but sometimes they are not available. For some crops, industry organizations are in place and can provide some assistance with markets and market development. For other crops, you may have to plan to do all of the market development and marketing yourself. In some cases, expertise and knowledge is often in very short supply, and often regarded as trade secrets and information will not be shared. Markets can be variable and price swings can make forecasting a challenge. Overproduction or shortages can dramatically affect prices, which can drop or escalate overnight.

Some special crops may involve relatively high capital investment to get started. There may be intensive labor and management requirements and special handling, storage and transportation. Inputs such as seed supply may be a challenge, and for some crops, few if any registered pest control products are available for weeds, diseases and insect problems. Information on varietal performance, agronomics, quality parameters and post-harvest handling and storage may be hard to find. Crop insurance may not be available for the special crop you are planning to grow.

2.3 Markets

Marketing and selling a special crop can be the biggest hurdle for introducing a new crop. You need to know what product you are producing, who you are producing it for, what volumes it is needed in, how it should be packaged, and when and where it should be delivered.

- Understand the market possibilities, determine if there is more than one market for the crop, what the requirements and specifications are for each market and how to access those different options.

- Study the market, research all of your options, talk to industry organizations and other growers, identify potential buyers and processors, consider direct marketing options, estimate market prices, trends over the last few years, distance and costs to market and gather as much information as you can.
- Understand the scope of the market is it local, national or international, what are the competing products, who are your competitors?
- Understand the product(s) you are going to be selling, for example, are you thinking of growing hemp for seed or for fiber or both? Are you planning to grow oil-type or confection-type sunflowers? Is it forage for hay, grazing or for the alfalfa pellet market? Is it coriander seed, which is harvested as a dry seed crop for the spice market or is it leafy coriander, known as cilantro, for the culinary herb market.

Without understanding the market, the value chain and the product specifications, it is often difficult to sell the product for the high value you thought is was worth, or you can end up storing the product until the prices and markets become available. With some crops, a few producers in a local or regional market can flood the market and cause prices to fall, while for other markets buyers may not be interested unless large enough quantities are available in a local area or region.

- Learn the Special Crop market standards required and understand what it takes to deliver the product to meet your contract, your buyer and market expectations.
- Understand the cost and implications of meeting contracts and buyer demands.
- Understand how the market specifications may require changes in your agronomic, harvest, storage, handling and record keeping practices.
- Evaluate your ability to meet standards for cleanliness, crop quality and specific traits, traceability, packaging, transportation etc.
- Understand the expectations and make sure you have the time, the capability and the interest to do the work required to deliver the expected product.

Developing markets and setting up contracts requires good communication skills, time and interest in talking to and people. To fully engage in this process will mean that you will need to contact others who are already active players and anyone in the business willing to share information and give you some of their time to learn. If that isn't something you are comfortable with, then perhaps there is someone else in your family or operation that is interested in taking this on, or maybe you can work with a broker, or perhaps growing and marketing a special crop isn't for you.

2.4 Regulatory/Certification/Standards

Some alternative crops require regulatory approvals to grow, so always check federal, provincial and municipal regulations to determine whether or not you require permits or the crop is legal to grow in your area. For example, crops like industrial hemp require a permit from Health Canada in order to grow the crop. Plan ahead as it can take some time to apply and receive approval.

Some herb crops may be classified as noxious weeds in certain municipalities, so do your research to find out if there are any concerns in your area before you choose to grow the crop. A crop that may be 'new' to Canada or no previous history of import into Canada require a CFIA pest risk assessment and prior approval. If seeds or plugs or other planting materials and inputs have to be imported from outside of Canada, Import permits will be required by CFIA. Check to make sure the new crop isn't considered a species at risk or restricted through CITES regulations.

There are also various standards, seals and certification programs available through third party certifiers, buyer programs and others that growers may choose to certify their crops under. These could be Certified Organic Standards, Good Agriculture and Collection Practices (GACP) Program, Identity Preserve Programs or others such as gluten-free, brand specific.

Growers should carefully research each program and determine if they have the interest, time and ability to meet the standards expected. Some requirements are rather unique, and these programs and options may require specific agronomic practices, handling, cleaning and storage protocols, record keeping, testing requirements, audits and other conditions to meet certification standards and buyer specifications. Carefully research each of the programs and specific requirements before deciding to commit. Although often there are premiums associated with these programs, there can be additional costs and time commitments that must be considered.

2.5 Economics

Consider your financial resources and the economics of introducing a new crop into your farm plan before trying a new crop. Determine how much it will cost to set up the new crop enterprise, how profitable will it be, how will you finance it. Develop an enterprise budget specific to the new crop and then integrate that into the whole-farm business plan to see how well a new enterprise can be integrated. Consider the financial investment required to produce and market the new crop, how long it will take to see a return on investment and whether or not you can you afford to lose the money invested in a new enterprise or venture if the crop fails or falls below projected revenues. Develop realistic price, yield and cost and returns.

For some crops there may be other factors aside from market and agronomics that influence cash flow and income expectations. For many new crops, processing and/or storage facilities are limited and may be a distance away from your location, adding additional expense for transportation. Some crops may require an initial investment of purchasing or renting new equipment. Perennial crops or forages may mean a gap of a few years between planting and harvest and sales. In some cases, the crop may never provide any financial return. The high cost of production, climate and environmental factors, poor management, difficult market access and changing markets are just some of the reason an enterprise may fail. Identify the best practices to reduce your risk and increase your success.

2.6 Resources - Equipment/Land/Labor/Location/Time

When deciding on a new crop to add to your operation, an assessment of your available resources is important. Look at all aspects of the crop and determine if your location, climate, soils, equipment, labor, infrastructure, time and access to markets are compatible with your current operation. Where feasible, choose crops that only require adjustment or some modification of your current equipment, rather than requiring significant investment in new or different equipment. If you don't have the necessary equipment, can you rent or lease equipment or find a custom provider? If you are considering growing a perennial crop and are renting or leasing land, do the terms match the time needed to complete the crop cycle and harvest. If the crop requires irrigation, do you have access to irrigation infrastructure?

Time is often the least available resource for many growers, so think about how much time you have to research the new crop, procure the necessary permits and inputs, equipment, labor, preparation for production and finding a market/buyer negotiating the contracts or sales and meeting any other requirements for record keeping, traceability, quality parameters, etc.

2.7 Agronomic/Production Considerations

Learn as much as you can about the agronomics and production requirements of a new crop. Experience with producing conventional crops may not necessarily translate directly to producing special and non-traditional crops. Start early, plan ahead and get all of the regulatory and market components/contracts set up first. Get seeds or planting materials lined up far ahead of spring as sometimes crop seeds or varieties sell out quickly and you won't be able to find a source. Ensure you have selected the right species and type of crop to meet your contract and market obligations, and that it meets your needs of purity, quality and other specifications.

Make sure you have selected the right location and field for the new crop. Understand the implications that the previous crop and inputs such as chemicals and fertilizers may have on the new crop and the implications of the new crop on the next or following crop in rotation. Think about diseases, weeds and insects and whether the new crop may pose a risk to your existing crops (eg. diseases such as sclerotinia, alternaria, aster yellows, clubroot and others), or if your existing cropping practices may impact the success of the new crop. Many special crops have few if any registered chemical or biological controls for weeds, diseases or insect problems, so you will have to plan ahead for management and control. Weed control is often the biggest challenge and may require non-chemical control strategies and manual weeding. You should start thinking about the new crop requirements at least a year in advance in preparation for planting the new crop.

Assess if you have the time, labor and equipment to meet the various production steps and any additional requirements. Can you do all of the necessary handling, cleaning, separation, storage and transportation requirements to get the harvested product to market? Review contract and market requirements and determine if you can meet the

production and product standards and specifications expected and agreed to. Some products and markets have very strict requirements for contamination and comingling of other crops, pesticides, diseases, weed seeds, insects and other factors.

Do your research far ahead and make sure the information comes from credible sources, is relevant and valid to your crop and area. Talk to other growers, extension specialists and buyers/processors to make sure you understand all of the aspects of production to improve the chances of success and reduce your risks. Doing things right will improve your ability to achieve higher yields, quality and financial returns of your investment into a new crop.

2.8 Other - Co-existence, Allergens, Gluten-free

There are various other factors that need to be considered when producing any crop, but in particular the impact of your current production system on the potential new crop and/or the potential impact of the new crop on your current production system.

For example, regulations and standards around allergens are increasingly a priority in Canada and around the world. Both wheat and soy are listed in the top 10 allergens of concern by Health Canada and CFIA. If allergens are a potential concern for the crop you are growing, or claims such as gluten-free, gmo-free, weed-free are specified by buyers and the market, then additional production, sampling, cleaning, handling, storage and transportation protocols and record keeping will be required. Plan ahead, research the requirements and decide if you are prepared to meet the standards and requirements for successful sales.

Ensuring you have the best practices in place to meet certification standards, regulatory and market demands can be challenging. CropLife Canada has developed a best management practices guide, "Cultivating Coexistence" to assist growers with understanding responsibilities and following best practices to allow for various types of production systems across agriculture areas, including conventional, organic and genetically engineered crops. This may apply to different crops and practices you use within your own rotation, or your neighbors.
http://www.croplife.ca/wp-content/uploads/2012/02/CLCCoexistenceBMPEN.pdf

Organizations such as the Canadian Seed Growers have standards and protocols in place for certified seed program that may also be useful to consider.
http://seedgrowers.ca/seed-growers/getting-started-in-seed-production/

Identifying and incorporating these best practices guidelines may be helpful when considering management of crops that have specific requirements such as organic, identity preserve, gluten-free, allergens, or other standards and certification. For example, it can extremely difficult to keep all traces of different crops from getting mixed in with each other at low levels. This unintended presence is most commonly referred to as co-mingling, but is sometimes referred to as inadvertent or adventitious presence, or agricultural cross contamination.

2.9 Records/Traceability/Quality/Testing

Understand the crop and product you will be selling and the expectations and specifications of your buyer, processor and market. It can mean the difference between top prices, sales or refusal. Some crops will require additional record keeping, traceability and testing for quality. Certification programs, Identity Preserve contracts and other standards will have specific requirements for record keeping and other measures. The specifications may be related to grades, moisture, purity, quality and other factors. This may require changes to your production practices as much as a year ahead to ensure you can meet these specifications.

Both domestic and export markets have requirements and regulations around pesticide residues, heavy metals and other components. Since many special crops have few if any pest control products registered for use, ensure you have best practices in place to prevent your special crop from spray drift or other pesticide residues and contamination and potentially market refusal.

Health Canada has established **Maximum Residue Limits (MRL)** for Registered Pesticides, as have other jurisdictions, some with even lower tolerances. An MRL applies to the identified raw agricultural food commodity as well as to any processed food product that contains it, except where separate MRLs are specified for the raw agricultural commodity and a processed product made from it.
http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/food-nourriture/mrl-lmr-eng.php

Do your due diligence, understand what your certifier, buyer and market expects from you and make sure to develop and adhere to best practices to meet the requirements and your obligations. Successful production, access to markets, long-term relationships and profitability are directly linked to meeting the specifications and requirements of buyers, processors and markets.

2.10 Research and Industry Networks

Find out of there is an established industry and industry organization for the crop you are planning to grow, provincially, regionally or nationally. They will be an invaluable resource for information about the new enterprise and should be one of the first points of contact when considering diversifying. Consider joining appropriate organizations early to gain benefit for their knowledge and networks to help you research information and get started. If there is no industry body, then the industry may be quite small and difficult to enter; information may be limited and difficult to source and the enterprise may carry increased risk.

Contact provincial and federal government departments, university research groups and research associations to find out what research information may be available or is underway for the crop you are considering. Keep informed about demonstration projects and annual field days that will provide opportunities to learn more about the crop in the

field and networks you can turn to for more information. Also link to other growers and industry research organizations who may have information that will help in your research. Search out other national and international organizations that may be able to provide basic information about the crop, global markets and general production considerations, however not all of the information will be directly applicable to your crop, location or growing conditions.

Many provincial government agriculture extension departments have information on special crops that are grown in their regions. For example, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has developed several comprehensive tools for special crop growers that can be useful for growers in other locations to start with, even if some of the crops are not applicable to your local area. Although the information is specific to Ontario, it is a great place to start and learn more about growing special crops, with specific information on over 100 special crops:

- **Special Cropportunities** http://www.omafra.gov.on.ca/CropOp/en/index.html
- **Growing Non-Traditional Crops in Ontario** http://www.omafra.gov.on.ca/english/crops/facts/09-043w.htm
- **ONSpecialcrops blog** www.onSpecialcrops.wordpress.com

2.11 Risks

Growers know there are always risks associated with farming, and adding a new crop will come with its own risks and benefits. As part of your research, make sure to evaluate the market, economic and agronomic risks that you may face in bringing in a new or different crop to your rotation and operation. Assess their probability of occurring and develop your enterprise budgets and farm plans and contingency plans with the risks included.

For example, some special crops are not eligible for crop insurance, so if climate or hail or some other problem occurs that reduces the value of the crop or you have a crop failure, are you prepared for the impacts on your business. What will you do if you can't meet your contract or delivery obligations? Do you have alternate markets in case the crop fails to meet the buyers specifications? Are you able to be flexible to meet changing market conditions?

Understand the risks in terms of time to market. Although contracts are recommended where available, if you couldn't sell the crop in the first year for whatever reason or prices were not what you anticipated, do you have the storage capacity and ability to hold on to the crop until you can sell it? Consider that an annual crop or a perennial forage crop that can be harvested every year once it is established is very different than some medicinal herb crops (e.g. ginseng, echinacea) that may require a few years of production before harvest. The financial risk of crop failure also increases the longer a crop takes to mature.

Assess and evaluate the risks of growing a new or different crop to you. Decide if you are comfortable with taking risks or is there something else you would rather be doing.

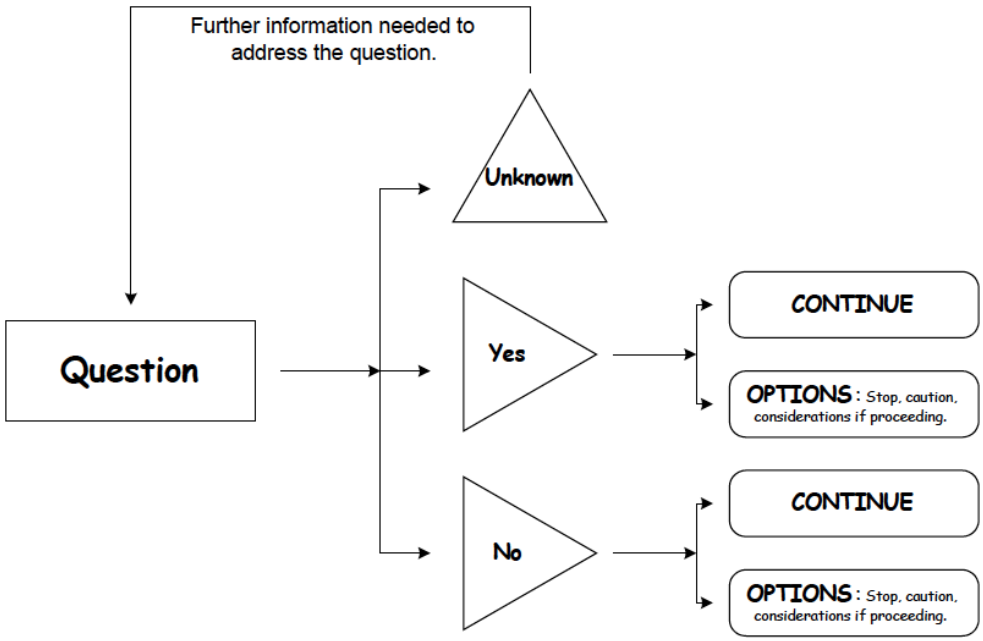
3.0 Crop Specific Considerations

Your experience as a grower with other crops means you may already have some of the information you need for considering a new or different crop to you. However, it is useful to go through the series of questions to make sure you haven't overlooked anything. This series of questions are not comprehensive, but give you a good overview of the main factors you should think about. You may wish to add additional questions that require more research as you go along. For questions you can't answer, highlight them and spend some time doing the research to get the answers. Consider having some of your background research information alongside as you work through the questions in this section. In the next section, economic considerations are addressed.

At the end of this document in *Section 7.1. Sources of Crop Specific Information* are links to selected special crops and extension or industry organization crop production factsheets to assist with your research. You may or may not be able to find specific information that is local to you, but the information will help with your initial research. OMAFRAs comprehensive Special Cropportunities Tool with information on over 100 special crops that grow in various locations in Ontario is also be a good starting point. Like other factsheets and information, recognize that not all crops may grow or be suitable to your operation, nor will all of the suggested agronomic practices be relevant to your climate, geographic location, soils or other factors. You will have to adapt the information and compare to more local sources and recommendations and your experience growing crops on your farm. Consider small plot trials to get more information before seeding a large acreage.

3.1 Model For Decision-Making

In each of the sections below, a series of questions are included in a checklist format to help you with finding information for your specific crop and to develop best practices for successful production. If you would prefer to use a guide, a decision model is included to provide a framework for asking and answering the questions and making a decision. Or you may have another model or method you prefer to use to work through the decisions and make sure you've thought about all of the aspects on introducing a new or different crop to you and to make sure that crop fits in your operation.



Source: http://www.al.gov.bc.ca/speccrop/publications/documents/evaluate_part2.pdf

3.2 Regulatory

Always check to see if you require any regulatory approvals or permits to grow a special crop, import seeds or plant starting materials or other factors. You may also face regulatory requirements for sales and export of your crop to another province and other countries. Make sure you do your research and due diligence and start far in advance to be ready to grow the crop when it is time. Some regulatory processes can take longer than others so don't wait until spring or the last minute to get things in place.

- ☐ Is the crop covered by any provincial or federal regulations?
- ☐ Are there regulations or restrictions governing the growth of the crop? If so what are they and what is required? Example: Health Canada licenses are required for growing hemp. http://www.hc-sc.gc.ca/hc-ps/substancontrol/hemp-chanvre/index-eng.php
- ☐ Do I need approval to grow this crop as a commercial crop? If so where can I obtain approvals? (Federal, Provincial, Municipal) Example: noxious weed in your municipality or province?
- ☐ Is the plant considered 'at risk' with respect to conservation status (provincial, federal, international). http://www.ec.gc.ca/cites
- ☐ Is the plant host of a regulated or quarantined pest? Check with CFIA before you import seeds or plants or try to bring a new crop into Canada. Import permits maybe required and

in some cases CFIA will need to conduct a pest risk assessment or other inspections.

Importing plants and plant products: what you need to know: http://www.inspection.gc.ca/plants/plant-protection/imports/primer/eng/1324568450671/1324569734910
Plant protection import requirements for plants and plant parts for planting: http://www.inspection.gc.ca/plants/plant-protection/directives/imports/d-08-04/eng/1323752901318/1323753560467

- [ ] Are you able to conform to regulations and can you demonstrate conformity based on the requirements?

- [ ] What are the legal/financial implications of not adhering to the regulations?

- [ ] Is there an industry or trade organization that can help you work through the requirements and regulations?

- [ ] Are there regulations governing the packaging, distribution and sales of the crop? (Provincially, Federally, Internationally) If so what are they? If planning on shipping a domestically produced product within Canada, interprovincial requirements may also apply.

- [ ] Is the crop considered a Novel food? If so can you adhere to the novel food requirements? http://www.agr.gc.ca/eng/industry-markets-and-trade/food-regulations/food-policy-and-regulatory-issues/current-food-policy-and-regulatory-issues/novel-foods/?id=1171285739616

- [ ] Are the by-products eg: meal, oil, hulls, biomass, spent herbs, approved for environmental release/sale?

- [ ] Are there licensing agreements required or royalties to pay under Plant Breeder's rights for seed, plugs or rhizomes? What do you need to do to comply?

- [ ] Do you need to implement a biosecurity management plan for your farm? CFIA has developed a voluntary guide for grains and oilseeds. http://www.inspection.gc.ca/plants/plant-protection/biosecurity/grains-and-oilseeds-sector/national-

voluntary-farm-level-biosecurity-standard/eng/1354649087792/1355168633095

3.3 Markets/Certification/Standards/Specifications

- [ ] What is your product?
- [ ] Is it a commodity, an ingredient or input?
- [ ] Is it a food or a grain? Do you understand the difference?
- [ ] Is it a culinary herb or spice or medicinal herb or natural health product, non-food or a bioproduct?
- [ ] Is it going to a non-food use such as birdseed, pet food, cosmetics and personal care, pharmaceuticals?
- [ ] Is it an industrial biomass crop for renewable energy, renewable chemicals, natural fibers or other industrial uses?
- [ ] Are there multiple uses for the crop? e.g. forage and grain, value-added products?
- [ ] Where are the markets for your crop?
- [ ] What is the size the market? Are there any limitations imposed by the market?
- [ ] Are you the marketer as well as the grower?
- [ ] Is there an established supply chain and access to markets?
- [ ] What is the best path to market? Grain elevator and brokers, processor, food or non-food manufactures, wholesaler, cooperative, export to international buyers, retailer, consumer?
- [ ] Is there an existing market - is it stable or emerging or saturated?
- [ ] Is the market local, national or international? Do you understand the differences in these markets?
- [ ] Have you investigated the integrity of the company buying your products? Beware of companies promoting and

supplying plants at low cost with dubious promises to buy back the product in a few years time.

- [ ] Are there critical volumes for market entry - do you need to collaborate with other growers?

- [ ] What is the market outlook and realistic price expectations? Have you researched prices and trends over the last three years?

- [ ] What is the estimated market price for your crop to be viable? Is that price point achievable and sustainable?

- [ ] Are contracts available?

- [ ] Is direct marketing a valid option?

- [ ] What marketing and/or promotional strategies will be required, and do you have the experience to deliver these?

- [ ] Is there infrastructure for transportation to available market?

- [ ] Do processing facilities exist for the crop in your area, if needed? (Example: some industrial and food crops require further processing to create a marketable product (e.g. hemp fibre, seed cleaning, dehulling and bagging, etc.).

- [ ] What packaging is required and is there a distribution mechanism?

- [ ] Do you understand the differences between food processors and non-food processors?

- [ ] Do you understand what differences this makes to your practices?

- [ ] Is there a high degree, or potential for a high degree, of competition within the market place (local, regional, national, international) and who is your major competition?

- [ ] How easy can this product be substituted for an alternative?

- [ ] Can you afford to store the product for a period of time (e.g. 1-2 years), and if so, will the quality be acceptable?

- [ ] What are the market requirements?
  Are there quality requirements, such as color, uniformity, size, seed weight, moisture, dockage, grain damage, oil content, weed seeds, contaminants, purity?

- [ ] Are you following a Organic certification or Identity Preserve program or another standard or certifications? Do you have all of the records and paperwork to meet the requirements?

- [ ] Do you have a list of approved inputs for Certified Organic and other programs?

- [ ] What records and documents must you provide?

- [ ] Do you need to provide traceability, what does that mean?

- [ ] What is your contingency plan in case of crop failure, or the crop quality does not meet the specifications of your buyer/market and is refused?

- [ ] Can the product be cleaned or processed to meet the specifications?

- [ ] Do you have a plan to salvage the crop? If not, do you have a disposal plan, for example if the crop for some reason has been contaminated with pesticides what will you do with it?

3.4 Agronomics and Production

3.4.1 Purpose of planting a new crop

- [ ] Why are you thinking of growing this crop?

- [ ] What is the purpose of this crop in your rotation?

- [ ] Does the production schedule of this new crop complement your existing production schedule or is it going overlap in tasks? Will it compete for equipment, labor, time?

- [ ] What specialized equipment and expertise do you need to grow the crops?

- [ ] Have you searched out other growers and crop specialists to

ask for advice on agronomics and markets of specific Special crops or value-added products. Will they share information or do they see it as 'trade secrets' and unwilling to share specifics?

3.4.2 Site Selection

- [ ] Are the growing conditions, climate, environmental and soil conditions ideal for this crop?
- [ ] Is the crop an annual or perennial?
- [ ] If it is a perennial that requires several years before harvest, do you have the land tenure required for the crop to reach maturity?
- [ ] Does this crop fit well into your existing rotation?
- [ ] Do you know the ideal crop rotation for your selected crops? This can impact insect, weed, and disease control as well as soil fertility building.
- [ ] What are the rotational benefits/challenges? What is the carryover nutritional value and scavenging capabilities of each rotation? What are the residue, water usage, and disease impact of rotations?
- [ ] How will this crop affect the next sequence? What is the rotational impact on subsequent crops?
- [ ] Are there are restrictions from the previous crop that could impact the new crop (eg. herbicide carryover, diseases or weeds, residues)? (eg. if you are trying to meet certain buyer specifications such as gluten free or reduce the risk of allergens, then the new crop should not follow cereals such as wheat, barley and other gluten crops)
- [ ] Will the new crop be a host for disease or insect pests that affect your other crops in rotation?
- [ ] How vigorous is the new crop relative to weeds - very competitive, somewhat, not competitive?
- [ ] What are the specific pest and disease pressures?

- [ ] What are the biological effects of rotation and timing?
- [ ] Will this crop be solid seeded, row planted, mulched rows, raised beds?
- [ ] Is irrigation required and if so is it available?
- [ ] Is the crop toxic to humans or animals?
- [ ] Have your grown the alternative crop in small-scale plots?
- [ ] Have you tried multiple varieties of the alternative crop if available?
- [ ] What are the equipment needs? Does exiting equipment they coincide with the new requirements or will you need new equipment for the crops (pre- and post-harvest)?

3.4.3 Pre-plant

- [ ] Have you planned ahead for any regulatory, permits, seed sourcing and contracts that need to be in place before everything is in place to start growing the new crop? Make sure to allow enough time to get all of the requirements and permits in place.
- [ ] Have you got your records and documents in place for recording requirements for any Organic Certification, GACP, Identity Preserve or other programs you will be using?
- [ ] Have you reviewed what inputs are approved for use on the crop, both regulatory and from any certification program you are following?
- [ ] Have you lined up a seed/plant source (plugs, rhizomes, transplants) for planting?
- [ ] Have you researched available varieties suited to your area?
- [ ] Do you know which varieties are suitable for your market? Make sure to choose the variety carefully.

Choosing the right variety

For example: when planting medicinal crops, seeds and plants must be selected based on their latin binomial (genus, species), as their value and constituents can vary substantially by genus and species as well as plant parts. Common names are very problematic, as they vary across industries and geographic locations. The common name sage for example can refer to *Salvia officinalis*, a culinary herb or many Artemisia species such as *Artemeisa frigida*, a common pasture or native grassland plant with potential non-food uses. Some medicinal plants such as Echinacea can cross pollinate, so be sure to know your seed source and what your buyer/market is expecting to be delivered (*E. angustifolia, E. pallida; E. purpurea*).

- [ ] Can you buy certified seed or buy from a reputable seed source? Beware of mislabelling, contaminated seed sources, poor quality, poor germination, etc.
  Is the seed source from an area that is suitable to grow in your location?

- [ ] Are there sufficient varieties, volumes and quality of seed available to ensure a consistent crop?

- [ ] Does the seed of the new crop require pre-germination treatment (dormancy, stratification, scarification)?

- [ ] Does the new crop grow in your soil zone, will it reach days to maturity within your typical growing season?

- [ ] Are soil amendments and fertilizers available?

- [ ] Are crop pests well documented and mitigation measures well understood and available?

- [ ] For help with weed identification: http://www.weedinfo.ca

- [ ] Are pest control products available for weeds, diseases, and insects - if not how will they be managed?

- [ ] Are there drainage or land grading operations required to prepare the site?

- [ ] Will the crop be planted in the field or into beds or high tunnels or other structures to extend the growing season?

3.4.4 Planting

- [ ] What are the seeding dates, soil temperatures, timing for optimum germination and plant establishment?
- [ ] What are the days to maturity?
- [ ] Is the crop produced from seeds, plants, rhizomes, propagules, transplants?
- [ ] Are you planting a mixture of seeds to create a mixed forage stand and does that create any special considerations?
- [ ] Do you have the right seeding equipment? If not can you rent or find a custom provider?
- [ ] Is your seeding equipment clean?
- [ ] Are there special handling requirements of the seed/plant materials?
- [ ] Do you know the seeding requirements, including: seeding depth, seeding rate, row spacing, row direction?
- [ ] When should fertilizer be applied? Can fertilizer be applied with the seed, or are there restrictions?
- [ ] Does the crop require transplanting?
- [ ] Does the crop require frost protection or mulching?

3.4.5 In-Crop

- [ ] Does this crop require pollinators? Do you have a plan to purchase or attract pollinators?
- [ ] Do you understand the scouting requirements and timing for pests of this crop?
- [ ] Do you know the weeds, diseases and insects that can affect this crop?

- [ ] Have you researched the proper pest control products and application requirements, timing, pre-harvest intervals, etc.?
- [ ] Do you know if there are any other in-crop cultural practices required, and timing, for example: cultivation, trellising, stringing, pruning, training, thinning?
- [ ] Does the crop have any shade requirements?
- [ ] Are wind breaks important for this crop?

3.4.6 Harvest

- [ ] When is harvest? Are there multiple harvests (2nd cuts)?
- [ ] Do you know what stage to harvest the crop?
- [ ] Do you know what plant part to harvest for medicinal or essential oil crops?
- [ ] What is the optimum timing for best quality?
- [ ] What is the best harvest method and equipment to use?
- [ ] Do you require specialized harvest equipment?
- [ ] Do you require extra labor for harvest?
- [ ] Do you know how to adjust your combine and other harvest equipment to minimize losses and damage to the crop?
- [ ] Are there any post-harvest field operations required to control volunteers, weeds or residue?
- [ ] What are the optimum conditions for harvest, such as moisture, maturity, color, seed size?
- [ ] What is the recommended moisture level for harvesting? Moisture calculators for some special crops: http://www.grainscanada.gc.ca/guides-guides/moisture-teneur/mtgm-mdteg-eng.htm
- [ ] Do you know how to sample properly? Example: https://www.viterra.com/documents/48315/312437/HarvestSamplingProgram/3b7856f8-a2e6-44e9-b088-ce69fec4130f

3.4.7 Storage

- [ ] If you require product identification and traceability, have you developed a proper identification system and have you assigned proper identification/tracking numbers to use throughout your operation?

- [ ] Does the crop have the ability to be stored? If so do you have adequate storage facilities?

- [ ] Do you have to transport the product to a storage facility? What is the distance and do you have the ability to transport yourself or hire someone to do the trucking?

- [ ] Do you have options for storing the crop, both short term or long term?

- [ ] Do you storage facilities that can keep organic or identity preserve or other crops separated?

- [ ] Can you properly clean bins and storage facilities to minimize cross contamination of grains, treated seed or other factors? For example: when possible store treated seed in separate bins, clean all equipment and bins after seeding and before harvest, visually inspect equipment and bins before harvest, before transferring grain between bins, and before transferring grain to a truck or railcar for delivery.

- [ ] Do you need to clean, dry or process the crop before it goes into storage?

3.4.8 Post-Harvest

- [ ] Is there processing required to sell the crop? For example, cleaning, dehulling, milling, grinding?

- [ ] Does the product require washing? Do you have a water source suitable for washing available?

- [ ] Do you require coolers or other specialized storage for the crop?

- [ ] Does the crop require drying? Do you have drying facilities

or access to proper drying facilities?

- [ ] Do you have separate drying and storage facilities for different crops? For example, some particularly aromatic herbs (e.g. feverfew) may need separate drying and storage facilities to prevent the odour being absorbed by other herbs or crops.

- [ ] Does the crop require value-added processing before it can be sold? For example, dried, cut and sifted, or cleaned and bagged?

3.4.9 Quality/Testing/Records

- [ ] What are the quality specifications of the crop? Eg. dockage, grain damage, oil content, color, size?

- [ ] Does the crop require cleaning before delivery?

- [ ] Does the crop require any testing before delivery, and if so who does the testing?

- [ ] What records do you need to have in place for delivery of your product?

- [ ] Are there any other regulatory, programs or standards requirements that need to be fulfilled?

3.4.10 Shipping and Logistics to Market

- [ ] Who is responsible for shipping and logistics to the buyer/market?

- [ ] Do you need to have food grade containers or trucks?

- [ ] How is the crop delivered, in bulk, totes, bags, bales or some other method?

- [ ] Who organizes shipments if there are several loads from several farmers?

- [ ] Do you have alternate markets in case the crop doesn't end up meeting the specifications of your buyer? Do you have a salvage or disposal plan?

- [ ] If you require traceability or identity preserve records, have you followed your system throughout the production of this crop and properly labeled the shipment?

4.0 Economics and Feasibility

Once you have narrowed down the crop you are thinking of growing and worked through the various regulatory, marketing and agronomic aspects of growing the crop, the next step is to work through the feasibility, economics and profitability of adding this crop to your rotation and farm business.

Review and make sure you:

- Understand the goal:
    - Develop your vision and understand the main objectives of your venture. What is the purpose of planting a new crop? rotation/improve soil quality? profit? research?

- Understand your business:
    - What stage of the business lifecycle is your operation/organization in? growth?, consistency? contraction? Are you financially, emotionally, physically prepared for growing a new crop?

- Understand your current risk profile:
    - Are you willing to take on the inherent risks of planting a new crop? (variable quality, shifting market demand, new competitors may flood the market, price uncertainty, etc)

- Understand the risks and your risk preparedness:
    - Can you accept the results of an impact on your business? Are you prepared to address these impacts? Have you evaluated the risks, assessed their probability of occurring, and developed/analyzed your business processes and contingency plans?

- Understand the market and the market potential:
    - Is there a demand for the product? Is demand growing? stable? contracting? How large is the market? Is the market export or domestic focused? Are prices consistent? Who are you competitors?

- Understand the market and value chain:
    - Is there suitable infrastructure to ensure the product gets to market? Are their existing sales channels? Is their suitable storage, transport and logistics? Or will you need to invest resources into developing those components? If new systems are to be developed are you capable/prepared to do so? What is your customers profile? Retail, wholesale? Direct to market? What are you customers looking for? Quality? Price? Ease of doing business? Where are you customers located?

- Understand your competitive advantage:
    - Why would your operation be well positioned to become a producer of the new crop? market access, location? experience? availability/leverage of resources ?

The profitability of the new crop will depend on how successful the crop is on your farm, whether or not the yields you think you can achieve are realized, if you can meet the specifications required for market and if the prices you target are achievable. Sometimes new crops may turn out to be equal to or less profitable than the old crops. Perennial crops can require a lengthy period of development and commercialization before any profit is realized, and prices and market factors may change by the time the crop is ready to harvest. Too many new entrants may out-compete those already established or flood the market, limiting the period of profitability.

- What is the estimated cost of production?
- What is the predicted revenue?
- Are contracts available and at what volumes?
- What risk management tools are available, crop insurance, others?
- Have you assessed production costs and compared them to your expected yields and market prices?
- What profit level are you aiming for?
- What are your cash flow needs?
- By what date would you like to have some pre-harvest sales made?
- What price is needed pre-harvest versus what would be accepted post-harvest?
- Are there some seasonal price tendencies you should try to capture?
- Do you have contingencies in place to address rising and declining prices?
- Should tax considerations play a role in your decision of when to sell?

4.1 Enterprise Budgets and Cost Return Analysis

While enterprise budgets can be a useful planning tool to give you an idea of what kind of returns you may expect from a particular crop, keep in mind that your information may be different from other growers. Balance your knowledge about your farm, cost of inputs and types of yields you can achieve with the information about the new or different crop to you as you work through the calculations and try to get a general idea of required inputs and potential returns. Try to be realistic about costs and returns, expected yields and prices. There are various ways to adjust your production practices so that you can lower your costs of production and strive to increase your profits. Prices received for products, however, are always changing. Include in your planning a range of prices so you can determine where your breakeven point is likely to be. Then study the price history and future projections for the crop you are interested in growing for the past few years if that information is available.

There are many crop planning guides, financial and enterprise budget tools and calculators available from provincial government websites and industry associations that

can be used as a guide to help evaluate the feasibility of new crops, the estimated costs and returns and break-even analysis. Some of the tools have been developed with provincial crop insurance data and other localized production data behind the calculations, therefore, you must use or develop your own numbers to enter into the tool to get the most value from the budgeting process. Always update the calculators with current prices and costs that represent your enterprise and your farm to get the best results.

Consider using more than one tool if necessary to make sure you have considered all of the costs, expenses, estimated yield and prices and other inputs to the tools. Many tools are available as excel spreadsheets, allowing you to enter your own information to customize it for yourself. Some tools include options for different yields and prices for determining profitability, but if not it may be useful to do several budgets on the same crop using different yields and prices, so you have a better understanding of what you need as a minimum yield and price to break-even and reduce risks of losses.

4.2 Example Cost/Return Matrix

It is recommended to develop a cost/return matrix: an example based on the Ontario model for Hemp is provided below:
http://www.omafra.gov.on.ca/english/crops/facts/00-067.htm

Industrial Hemp - Costs and Returns per Acre

Land Rent

Operating Expenses	Fibre Only	Grain Only	Grain & Fibre	Your Budget
Seed $9.90/kg. 40 & 20lb./ac	180	90	90	
Fertilizer 11-52-0 @ 70 kg/ha Urea @200 kg/ha 0-0-50 @ 100 kg/ha	106	106	106	
Fertilizer Application (Custom)	7	7	7	
Herbicide				
Pesticide				
Fuel 29L at $0.55	16	16	16	
Repairs, Maintenance and Depreciation	20	20	20	
Crops Insurance Premiums	20	12	14	
Police Security Check	5	5	5	
Global Positioning	10	10	10	
THC Sampling and Testing	40	40	40	
Harvesting	15 Swather and Mowing	60 Combining	15 Swather and Mowing	
Raking/tedding: 2 passes @ $10	20		20	
Baling (Custom)	53		27	
Trucking (Grain = $12/t, Straw = $17/t)	51	4	30	
Straw Storage 7 sq. feet per bale	45		23	
Grain Drying $0.30 per lb.		24	24	
Grain Storage				

Stalk Shredding		10		
Consulting/Labour				
Interest in Operating: *10% for 6 months*	29	20	25	
Total Operating Expenses	**617**	**424**	**532**	

Revenue

Operating Expenses	Fibre Only	Grain Only	Grain & Fibre	Your Budget
Expected Yield, Fibre___t @ $___				
Expected Yield, Grain___lbs. @ $___				
Yield per Acre: Fibre 3.0 t @ $170	510			
Fibre: 1.5t @ $120			180	
Grain: 800 lbs. @ $0.50		400	400	
Total Revenue	**510**	**400**	**580**	

Breakeven Points (B/E)

Operating Expenses	Fibre Only	Grain Only	Grain & Fibre	Your Budget
Price needed at 3.0 t straw yield	$206/t			
Yield needed if straw price at $120/t	5.1 t			
Yield needed if straw price at $90/t	6.9 t			
Price needed if grain yield at 800 lbs.		0.53/lb.		
Yield needed if grain priced at $0.50/lb.		848 lb.		
Yield needed if grain priced at $0.45/lb.		942 lb.		

4.3 Example Crop Calculators

Below are examples of calculators to help you evaluate the costs and returns of your cropping systems. You can use these examples, or other tools that work best for you.

http://www.agf.gov.bc.ca/busmgmt/budgets/crop_profit.htmhttp://www.agric.gov.ab.ca/app21/ldcalc

http://www.agriculture.gov.sk.ca/Default.aspx?DN=71987997-30df-425c-86da-1466e8732faa

http://www.gov.mb.ca/agriculture/business-and-economics/financial-management/farm-software-and-worksheets.html

http://www.omafra.gov.on.ca/english/busdev/downtown.htm

4.4. Links to Budgeting Tools

Below are links to various available budgeting tools to help you develop enterprise and whole farm budgets for your cropping systems. Find and use the tools that work best for you.

http://www.agf.gov.bc.ca/busmgmt/budgets_pfp.htm

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/econ10219

http://www.agriculture.gov.sk.ca/Production_Economics

http://www.gov.mb.ca/agriculture/business-and-economics/financial-management/cost-of-production.html - crops-and-forage

http://www.omafra.gov.on.ca/english/busdev/bear2000/Budgets/budgettools.htm

http://www2.gnb.ca/content/gnb/en/departments/10/agriculture/content/publications.html

http://novascotia.ca/agri/programs-and-services/business-development/

http://www.gov.pe.ca/agriculture/index.php3?number=73117&lang=E

http://www.nr.gov.nl.ca/nr/publications/agrifoods/index.html - activityplans

http://www.emr.gov.yk.ca/agriculture/publications.html

http://www.mapaq.gouv.qc.ca/fr/Pages/Accueil.aspx ((french only))

http://www.foragebeef.ca

https://www.viterra.com/web/canada/profit-planner

4.5 Making the Decision

At this stage, you should now have all of the information you need to make a decision whether or not to go ahead with the new or different crop. Does the new crop fit into your business operation and strategy? You may find that another crop has a better fit in your rotation than your original selection. Starting with some trial plots may be a good strategy if you are still unsure of the suitability of a crop for your climate, soils and geographic location. You may have found you haven't planned ahead far enough, and may have to delay growing the crop until the next season, which will give you time to get any regulatory or certification permits in place, markets and contracts, seed, equipment and any other requirements. Be prepared, decide if you are willing to take the risk, develop a network and get connected with others in the industry.

5.0 New Information

When growing special crops it is important to keep updated and informed on new developments in the industry. Organizations and industry associations try to advance new crops with research and information about new varieties, new pest control options, new market opportunities and new technologies that could improve production, harvest, storage and handling and processing. New regulations may come into place that may change how you grow and market your crop. Keep connected and informed.

5.1 New Crop Research

There are various research projects and new crop variety developments going on across Canada and in other jurisdictions that may offer new tools and information to improve your success and best practices with new and different crops. Keep informed and get involved in research projects with local and provincial industry, government and university researchers.

- **New Research Project:** ***Crop Sequencing of Large Acreage Crops and Special Crops***
    - A new four-year research project, led by Bill May, Crop Management Agronomist with Agriculture and Agri-Food Canada (AAFC) in Indian Head, Saskatchewan in collaboration with other researchers at AAFC Swift Current, University of Saskatchewan and the Northeast Agriculture Research Foundation in Melfort will be initiated in the spring of 2015. This project will compare eight crops in rotation at four locations in various sequences to determine the best crop sequences across a wide range of environmental conditions. The crops include: wheat, oat, canola, pea/soybean, canaryseed, hemp, quinoa and coriander.
    - Many traditional crop growers are shifting production to include specialty crops in their rotation, but to date most information on sequences and rotation is anecdotal and the industry has identified the lack agronomic information as a major barrier to growth. This study will provide good information on which crop sequences are robust across a wide range of environmental conditions and which are better adapted to a more limited range of environmental conditions. This study will use crop sequences to determine the best crop to grow before each of these crops and the best crop to grow after each of these crops.

5.2 Stay Informed

Researching and watching the market trends and pricing strategies should be an ongoing process. Keep track of market trends and be ready to recognize new opportunities when they come along. Learn as much as you can about all stages of the supply chain, who the end consumer is, who is your competition. This can help you identify ways to improve your product and make it more valuable to the manufacturer and/or consumer. Take time to read newspapers and industry periodicals, find key sources on the internet, attend local and regional meetings and conferences. Consider attending at least one large industry

convention each year, which are invaluable for keeping you informed on industry trends and providing networking opportunities.

Keep up-to-date with regulations, information and training from industry organizations, government and university extension programs. Learn more about groups such as the SCVCRT that bring together industry leaders to address issues and challenges that affect a broad scope of the special crops industry and advocate for changes and advancements. Find out more about other programs such as the Minor Use Pesticide Program and others that can help keep you updated on new products that may be registered to address weed, disease or insect issues.

Keep informed on regulatory changes that may come from AAFC, CFIA, Health Canada, provincial governments and other jurisdictions. If you are following any certification or standards programs, regularly update your records and make sure you are using the most up to date standards and forms. Talk to other growers, researchers, processors and consumers to keep on top of crop and industry advancements.

5.3 Networking

Networking is key to helping you succeed in this industry and connect you to those with experience and business connections. Network by joining organizations integral to the industry for the crops you are thinking of growing and get involved with their activities and efforts. Join industry organizations early, as membership often provides access to specialized information for growers. Many of these organizations have collaborations for marketing and research projects, and hold regular events such as field and demonstration days, workshops, tradeshows and conferences. These events provide great opportunities to network with buyers, manufacturers, other growers, researchers, and other industry representatives.

Consider building a network of growers in your region. They also serve as a great way for exchanging information, tips, sharing equipment and supplies, and helping with marketing. If a local or regional organization is not available, consider starting a network of growers to share information and gain access to other initiatives and organizations.

6.0 Case Studies -- Lessons Learned and Tips

6.1 Sunflower Case Study

Kelly Dobson, Dobson Farms Ltd., Fairfax Manitoba
Industry Co-chair of the Special Crops Value Chain Roundtable, and Past President of the National Sunflower Association of Canada

Kelly Dobson, a fourth generation grower from Fairfax, Manitoba, grows a range of grains, oilseeds and special crops, including sunflower, in rotation. Sunflowers provide higher net returns than canola in his operation. They are drought tolerant and provide for a different broadleaf herbicide rotation. Growing sunflowers requires planning a year ahead and carefully selecting crop and herbicide rotations, as some crops and chemistries can restrict sunflower the following year.

Markets
Sunflowers are typically grown under contract and are classified by their end use as either confection (in-shell, dehull) or oil (dehull, birdseed and crushing industry). Dobson focuses on growing the higher value confection-type sunflowers, which have very high quality specifications for market, and require top production practices to achieve higher prices. However, poor quality can be unmarketable at times. Oil types have fewer quality specifications. There are two larger processors in western Canada, Spitz Canada (Alberta) and Legumex Walker (Manitoba), as well as smaller processors. Growers can also look to export markets in the U.S. Dobson also sees opportunities for market expansion as the demand for healthier foods and oils continues, and consumers seek alternatives to nut products.

Agronomics
Dobson encourages first time growers to start with oil crops to get experience. Plan the season before, start weed free and manage for volunteer canola and mustard. Sunflowers are sensitive to herbicide carryover, so carefully review products, follow labels and restriction recommendations (eg., avoid Lontrel, Heat, etc). Crop rotations are also very important, and Dobson prefers at least four years between canola and sunflowers, as sclerotinia can be a big issue, as well as volunteers. Sunflowers can be seeded into cereal stubble or flax, which is one of Dobson's preferences. They are also drought tolerant and are a scavenger of leached nitrogen.

Book your seed supply early, and make sure to get the right seed, the right type and seed size for your seeding system. Herbicide tolerant varieties are expected to be available soon. Oil crops can be solid seeded, but success with confection crops requires row cropping. This also allows for a June tillage operation, which is another great weed control tool. Sunflowers are competitive once they start growing, but starting with a clean field and early season weed control until they get established is very important. New herbicide products such as Authority have helped sunflower growers address many broadleaf weed issues. Scout for insect populations at planting and flowering and plan to spray as required. Plan ahead for harvest, consider desiccation as an alternative and adjust combines and speed to optimize seed quality.

Networks, Extension and Research
Get involved with the National Sunflower Association of Canada to get connected to a strong network of experienced growers and for up to date information including new varietal development. Recent investments have been made into the development of new confection varieties for the prairies that are adaptable, disease resistant and herbicide tolerant.

Lessons Learned and Tips:

- Get market contracts in place before starting to grow.
- Plan a year in advance. Manage crop rotations and know your herbicide rotations, as some chemistries restrict sunflower the following year.
- First time growers should start with oils.
- Row crop confections.
- Consult National Sunflower Association of Canada website for resources and contacts.
- Start with weed free fields, manage for volunteer canola, mustard and scout regularly for weeds, diseases and insects, and control as required.

6.2 Commercial Hops Case Study

Laurie Thatcher-Craig and John Craig, Clear Valley Hops, Nottawa, Ontario
http://www.clearvalleyhops.com

Although most of the world's commercial hops production is currently located in the US Pacific Northwest, entrepreneurs Laurie Thatcher-Craig and John Craig decided to take up the challenge and return commercial hop production to Ontario, which existed prior to the 1930s. They left high tech and marketing/tourism businesses and purchased in 74 acres perfect for hops production closer to family near Collingwood, Ontario and invested in this new venture.

Business Strategy
Investing in extensive research and building on her marketing background, Thatcher-Craig conducted an indepth study into the current state of the market. Recognizing the importance of location, tourism and the marketing story, she built their plan using the Niagara Wine Region as a model to apply to hops and the fast growing local craft beer market.

The hop business is divided into very large commercial farms (averaging 450 to 600 acres) in the Pacific Northwest in the Washington Yakima Valley (about 98% of global production) and several small 1 to 2 acre hobby farms in Canada and the US. The market for the past many years in the PNW has been largely owned and set by brokers. Thatcher-Craig's research has identified recent supply chain disruptions and market instability resulting from climate changes, patented crop failures, and unfulfilled contracts are threatening the status quo.

Production
Their initial production research led them to what was considered the main reference model released by Cornell and Vermont Universities in the north-eastern US, which was based on 1 to 4 acre operations. Thatcher-Craig says that information (which has recently been updated and corrected to 10 to 20 acres for success) was not suited to commercial growers, and created some initial costly mistakes for them. Using their own business forecasting and expertise, they realized a 10-20 acre operation was needed for profitability. This ultimately led them to look at similar sized operations in Germany, where 20-35-acre operations and similar climate and production practices existed. They also worked closely with the Ontario government, and various federal, provincial and university researchers to find local answers.

The Craigs started with 13 acres of conventional hop production, with a plan to expand to 20 acres in the next few years. Hops are very susceptible to downy mildew and fungicides are critical to quality production in commercial operations. Hops should be ready to harvest in three years, however the 2012 drought killed about 60% of their initial crop and they had to reinvest and replant in 2013. Today they are producing 18 hop varieties, including a couple of native ones they discovered on their land. They sell commercial high quality hops to brewers and plant rhizomes to hobby growers.

New Technology and Processing
With a goal of selling the highest quality hops possible, the Craigs invested in a state-of-the-art whole leaf pelletizing process and nitrogen flush vacuum sealing process. They can harvest, process and flash freeze within 24 hours, the first of its kind process in the world. This process captures the essential oils and flavor at their peak in a pelletized form that is compatible with the brewing process.

Extensive sales and marketing efforts now have their commercial hops going to several major craft brewers in Ontario and Canada. Thatcher-Craig emphasizes the challenge and time investment into sales and having to convince brewers that this is a superior, high quality product that is worth switching to. The unpellatized hobby grower market, often of poorer quality, has created some negative impacts that have been difficult to overcome, but success is beginning to happen. The Craigs have linked their love of their unique hops with their passion of connecting consumers to the farm that their beer is ultimately made from through tourism and marketing partnerships. They continue to be involved with government and university research projects, and Thatcher-Craig teaches Hops 101 at Niagara College. Investing and succeeding with growing hops on a commercial scale is not for the faint of heart!

Lessons Learned and Tips:
- Commercial scale hop production is between 10 and 20 acres.
- Takes at least 4 years for first income, have enough money in the bank to support yourself in between.
- Site selection, soil conditions, climate and market access are critical. Genetically hops require a minimum 60-day dormancy period and ideally snow cover.

- Find the right models and examples that fit your business model, don't rely on one source.
- Study the market and make sure there is a good concentration of commercial brewers within 2 hours of your farm.
- Invest time and money into marketing - make sure you are comfortable selling face to face. Customers will not come to you.
- Research, research, research and research again.

6.3 Industrial Hemp Case Study

Larry Marshall, Certified Organic Grower, Shellbrook Saskatchewan

Industrial hemp is currently grown primarily for seed, either conventional or certified organic, although fiber markets are under development. Growing hemp requires a Health Canada permit in advance. Larry Marshall owns a 3000 acre certified organic farm that includes both annual crops and forages. He grows hemp in rotation because it is very competitive with weeds, offers great soil improvement and can be contracted for good net returns.

Markets

Marshall recommends having a contract in place for hemp seed, which ensures early delivery and sales. At the end of 2014, average prices were $1.50/lb for certified organic hemp seed and ~$.80/lb for conventional. An oversupply of conventional seed in 2014 meant few if any contracts available for 2015 and growing without a contract would be very risky. However, demand for certified organic hemp seed remains very strong as current supplies are limited.

Production

Hemp is seeded later than other crops, usually toward the last week of May once the soil has warmed up. The crop emerges quickly and grows fast, competing early with weeds. Marshall suggests growers focus more on fertility than weed control. Research has shown that doubling fertilizer N doubles seed yield, with conventional growers able to apply up to 200 lb/acre and still see increasing benefits.

Because hemp is light sensitive, the further north in latitude the taller it will grow (for example difference in height between Saskatoon and 100 miles north to Shellbrook can be 12 inches or more). Marshall prefers to grow dwarf varieties that grow to 5 or 6 feet. He has seeded hemp as late as July after a second flush of wild oats, and discovered the late crop grew very quickly and matured at the same time as the main crop seeded a month earlier.

Hemp is frost tolerant and can tolerate up to 6 or 8 degrees of frost before the crop shuts down, allowing for later harvest. Hemp has few insect or disease problems, although it is susceptible to sclerotinia (Contans WG can be used for control of sclerotinia in both organic and conventional hemp).

Harvest

Marshall straight cuts hemp and recommends harvesting when it is still very green at about 20 % moisture before the stem fibers begin to dry down and come off. If the crop is green enough it is easily harvested and causes few problems with the combine, but if it is drier the stem fibers can wrap around equipment. Combine straw choppers don't work well, and most growers (conventional or organic) prefer to drop the residue behind the combine. In Marshall's organic system, he uses a forage chopper behind the combine to chop the crop reside, which is left on the soil surface and returned into the soil the next spring when he seeds the following legume crop (peas or fababeans). He usually broadcasts the legume seeds onto the hemp residue, following with a tandem disc operation with excellent success and very high yields.

Post-Harvest
After hemp seed is harvested it must be aerated immediately as it can easily begin to heat. Marshall recommends investing in a drier to achieve the best quality. The seed should be dried down to 8 % moisture for long term storage to prevent mold and other issues. Processors expect the hemp seed to be delivered cleaned in bulk to their facility and will often assist with finding a cleaner who can handle hemp.

Lessons Learned and Tips:

- Start planning in advance.
- Get Health Canada permit in place early.
- Establish a contract before planting. Hemp seed is a food crop and requires different handling than a commodity grain crop.
- Avoid seeding into cereal stubble or contamination with wheat or barley. Some processers are selling into gluten-free markets. Also wheat and barley seeds are similar sized and difficult to clean.
- Harvest when crop is green.
- Make sure good drying capability is available (dry to 8% moisture for longer term storage to protect quality).
- Contact the Canadian Hemp Trade Alliance, consider becoming a member for full access to information. Attend their annual conference for great new information and networks.

6.4 Forages Case Study

Forages Case Study: Benefits and Opportunities
Henry Nelson, Winnipeg MB
Vice-Chair, Manitoba Forage and Grassland Association
Co-chair CFGA Environment Committee of Canadian Forage and Grassland Association

Henry Nelson brings years of industry experience and a national perspective to forages, although he has recently retired from full-time production. Forages cover over 70 million acres in Canada, with 36 million or more in native grasslands and 34 million in annual or perennial forages or tame grasslands. The majority of forages are marketed through livestock (beef, dairy, sheep), and also for the equine market and hay export markets, or a

much smaller seed market. Using forage mixtures for grazing returns 80 % or more of the nutrients back to soil.

Benefits and Opportunities
There are several benefits to growing forages, including soil health/nutrients, water management, biodiversity/habitat and carbon sequestration. Building soil health and water management, including flood mitigation and water filtration, can provide fairly immediate benefits to producers. Although the other benefits of biodiversity, particularly in providing habitat for pollinators, and carbon sequestration are important, Nelson recognizes that producers are not currently paid for these very important goods and services. He expects this to change over the long-term, but it won't be immediately.

New Trends
Nelson is encouraged that the forage industry is beginning to move away from monoculture plantings as they see the benefits of mixtures or polycultures. Monocultures typically have the same root system, the same canopy and utilize the same nutrients. A mixture of different species has a varied root system, from shallow to very deep, have different canopies and growth habits and can access nutrients from a bigger range of the soil profile. Nelson sees this trend as reaching an understanding that rather than trying to manage nature, success will come from trying to mimic nature.

Lessons Learned and Tips:

- Establishment of forages can be tricky for those without experience. Get as much information as you can ahead or consider having forages custom seeded.
- Consider trading land with another producer to gain the benefits of forage production, while continuing with annual crop production. This can be a particular benefit to intensive crop production such as potatoes, beans, sunflowers and others.
- A positive trend in forages is using forage mixtures and polycultures along with multi-species grazing.

Forages Case Study: Grassfed Beef, Forage Seed Production
Jim Lintott, Dugald, Manitoba
Chair, Manitoba Forage and Grassland Association

Jim Lintott has experience with many aspects of forage production, adapting as necessary to market and weather conditions, industry issues and other factors over the years. He started many years ago as an alfalfa seed producer, then transitioned to export hay production for the horse market. Weather conditions impacted the hay quality, making it more suitable to feeding cattle. He bought 130 head of cattle in 2001, then was faced with BSE and market challenges in 2003. Today he markets his forages through beef cattle and is returning a portion of his rotation back to alfalfa seed production.

Marketing Beef Not Forages
Lintott's goal is to never take hay off of his land, unless it is turned into beef first. Alfalfa hay removes high levels of nutrients, similar to corn, so selling hay off the land takes the

nutrients off the farm and requires additional fertilizer inputs to return fertility to the land. Lintott buys additional hay if needed and puts nutrients back on the land through the cattle. He is currently producing grassfed beef, which have an excellent fit with his forage production rotation. The next transition may be to a certified organic grain production system, which currently offers substantial premiums.

Rotations

For Lintott, the ideal rotation is hay and alfalfa seed production, followed by pasture and winter bale grazing and finally to annual grains and oilseeds, such as canola, wheat and oats. Alfalfa or other forage seed production is a good fit, as only the seed is removed at harvest and the biomass is left behind to be converted to beef and nutrients. A field can be kept in certified alfalfa seed production for 5 years, and longer as common seed production if the quality is good enough.

Production

Forage seed crops such as meadow fescue are harvested in July, with the straw baled and used for winter feed. The regrowth is used for fall grazing in September through December. In the year of removal from the rotation, the forage field stubble will be allowed to regrow and then is worked in with a tandem disk operation when it is lush and green to return the highest amount of nutrients back to the soil. The following spring an annual crop can be seeded, such as canola, wheat or soybeans. Planning ahead for the right crop, so that volunteers can be controlled with a normal in-crop spraying program is important. Soybeans and canola can be a good choice and have a good fit.

When returning the rotation to forages, Lintott prefers to use winter wheat or spring wheat. He will seed winter wheat into the stubble in August and just before freezeup overseed with forages, preferably just before the first snow. The new forage stand can also be seeded in the spring into the winter wheat crop or into the spring wheat crop after spraying. Perennial weed control applications can be made after the winter wheat is up but just prior to seeding forages. Watch for herbicide residues. Winter wheat is generally harvested in July, the straw is chopped and spread, and the cover crop is big enough to handle the trash layer left behind. Straight cutting can be an option if the forage cover crop gets too tall. Trying to use the same system with barley or oats that are typically swathed doesn't work, as it often kills the cover crop under the swath before harvest.

Lessons Learned and Tips:

- With all of the changes over the years through many different market conditions, focusing on the soil first is the main priority, then the rest of the production requirements will work out.
- Concept of keeping something growing all the time through cover crops and forages looks like the right way to go, and happens faster if include cattle in the plan.
- The best grassfed beef gains have been with fall grazing on forage seed production fields. This leaves the nutrients on the land and improves weight gain for the cattle.

Forages Case Study: Beef, Annual Forages, Polycultures
Doug Wray, Irricana, Alberta
Chair, Canadian Forage and Grassland Association
CFGA Representative, Alberta Forage & Industry Network

Doug Wray produces annual and perennial forages to feed his 300 head beef cattle herd. Pairs and yearlings summer graze legume-grass pastures, which have proven resilient, maintaining their productivity for 15 years. Grazing is extended on native range in late fall and early winter. Swath grazing is the foundation of his winter feeding program. He also buys hay for supplemental feeding and as a contingency in case of harsh winter conditions. Swath grazing provides significant savings and economic benefits from the cattle feeding side and also returns most of the nutrients back to the field for the next crop.

Annual Forage Production
Wray has been growing annual crops for swath grazing for the past several years. He typically seeds oats and barley in a mixture, using a seeding rate of 1.5 bu/acre oats and 1 bu/acre barley. A pre-seed burnoff is used to control weeds and volunteers, particularly those in the swath row. Seeding is usually done in June by a neighbor who custom seeds the crops with an air drill. In crop weed control is usually required and in recent years a fungicide application has been required for net blotch and leaf diseases in barley and wheat. The crop is swathed when the oats are in the milk stage and the barley is usually at the soft dough stage, and then left for winter feeding.

Keeping on top of new forage varieties is also important for Wray. He currently grows CDC Baler oats and is hoping to get access to seed of some new forage oats varieties that are supposed to offer higher yields. He also prefers smooth awn barley varieties, as they reduce the risk of mouth sores on cattle that can sometimes happen with the awned varieties.

Mixtures Benefit Beef Production
Wray chose the barley and oats swath grazing mix as a good way to provide winter feed and extra energy to his calves. They are moved onto swath grazing right after weaning in November and are generally kept on swath grazing until the end of April or early May until the grass is ready. During extreme weather, or deep snow, calves are supplemented with hay.

New Forage Mixtures and Polycultures
This past year, Wray decided to try adding forage brassicas (kale) into his annual forage mixture to see if he can increase the weight gain another quarter pound a day, up from about a pound a day. The seeding rate for the three-way mixture was 2 lb/acre forage brassica seed, 3/4 bu/acre barley and 1 bu/acre oats. The forage brassica is a very high energy feed at 24% protein and 72% or more TDN. He is hoping this high-energy crop will provide a boost to the feed to get the calves through the winter in a little better shape. The jury is still out as he won't know until he weighs the calves when they go to grass whether he has achieved the additional gains he was looking for.

Wray sees the interest in annual forage mixtures and polycultures continuing to grow, with acreage in the prairies increasing from 1,000 acres in 2014 to over 15,000 acres in 2015. Producers are using a range of mixtures, some with as many as six or eight different species and for a range of uses from summer pasture to fall grazing and others. They are looking to get some value added feed at the same time as building the soil fertility of the land. This concept has a history in North and South Dakota and is beginning to be adopted by producers across the Canadian prairies and elsewhere.

Lessons Learned and Tips:

- When bringing new crops into your operation, do your research. Start small, test the waters with the new crop and figure out how it works for you.
- Consider joining your provincial association (who belongs to the Canadian Forage and Grassland Association). Networking is probably the biggest advantage, and opens opportunities to be in places where people are thinking outside the box and trying and working on the leading edge of these new production strategies.
- Grain growers who can successfully include a legume mix in their rotation for three or four years gain nutrients and benefit from soil improvement and a break for weeds, diseases and pests that can attack monoculture grain crops.
- Consider swapping land and partnering with other people to create more options for growing the crops that you want to grow. This can be a win-win for partners.

7.0 Sources of Information and Weblinks

A list of selected resources is included to help with your research. The list is not exhaustive and you will likely find other relevant sources as you work through your research and decision-making.

7.1 Sources of Crop Specific Information and General Crop Planning Guides

7.1.1 Overview of Canadian Special Crops Industry

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/archived-overview-of-the-canadian-special-crops-industry-2009/?id=1410083148455

7.1.2 Buckwheat

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/buckwheat/?id=1174581273612

Canadian Special Crops Association
http://www.specialcrops.mb.ca/crops/buckwheat.html

Canadian Grain Commission
https://www.grainscanada.gc.ca/buckwheat-sarrasin/bsm-mbs-eng.htm

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex103?opendocument

Manitoba Trade and Investment
http://www.gov.mb.ca/trade/globaltrade/agrifood/commodity/buckwheat.html

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/CropOp/en/field_grain/spec_grains/buck.html
http://www.omafra.gov.on.ca/english/crops/pub811/7other.htm - buckwheat

Cornell University
http://www.hort.cornell.edu/bjorkman/lab/buck/guide/sowinghow.php

7.1.3 Camelina

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/CropOp/en/indus_misc/oil_crops/cam.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/Default.aspx?DN=67a5b5a3-b4fc-402b-9ede-abcebb2b64b8

Canadian Food Inspection Agency
http://www.inspection.gc.ca/plants/plants-with-novel-traits/applicants/directive-94-08/biology-documents/camelina-sativa-l-/eng/1330971423348/1330971509470

Montana State University
http://store.msuextension.org/publications/AgandNaturalResources/MT200701AG.pdf

United States Department of Agriculture
http://www.plants.usda.gov/plantguide/pdf/pg_casa2.pdf

May, W. E., Johnson, E.N., Lafond, G. P. and Holzapfel, C.B. 2011. *The development of new crops: case studies of niger and camelina***.** Pages 67- 82 in H. J. Beckie and L. M. Hall, eds. New crops and crops with second-generation traits: Weed management challenges. Topics in Canadian Weed Science Vol. 9. Pinawa, Manitoba: Canadian Weed Science Society 101pp.
http://www.weedscience.ca/publications

7.1.4 Canary Seed

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/canary-seed/?id=1174582426353

Canadian Grain Commission
https://www.grainscanada.gc.ca/grainsc-cgrains/canary-canaris-eng.htm

Canary Seed Development Commission of Saskatchewan
http://www.canaryseed.ca/about.html

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex120?opendocument

Manitoba Trade and Investment
http://www.gov.mb.ca/trade/globaltrade/agrifood/commodity/canary_seed.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/Default.aspx?DN=b3b1fd99-df9c-4da2-bd0e-6342bdef9e69

7.1.5 Carinata

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/CropOp/en/indus_misc/oil_crops/car.html

Saskatchewan Mustard Development Commission
http://www.saskmustard.ca/grower/growing/pdfs/Carinata_Production_Manual_080213.pdf

Agrisoma Biosciences Inc
http://agrisoma.com/images/pdfs/ResonanceCarinataProductionManual2015_Canada.pdf

7.1.6 Caraway Seed

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/caraway-seed/?id=1174583114403

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex123

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/crops/production/caraway.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/Default.aspx?DN=3ab32959-9a01-4d97-b97d-feb19a251b86

7.1.7 Coriander Seed

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/coriander-seed/?id=1174583737005

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex121?opendocument

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/crops/production/coriander.html

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/CropOp/en/herbs/culinary/cilan.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/Default.aspx?DN=bbd5605d-c129-478d-bde3-bbd6da56aa34

7.1.8 Forages

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/forage/?id=1174594338500

Alberta Agriculture and Rural Development
http://www.agric.gov.ab.ca/app21/seltopic?cat1=Crops&cat2=Forages+%26+Range
http://www.agric.gov.ab.ca/app21/infopage?cat1=Crops&cat2=Grass %26 Legume Seed

British Columbia Ministry of Agriculture
http://www.agf.gov.bc.ca/forage/factsheets.htm

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/crops/production/forages/index.html

Manitoba Trade and Investment
http://www.gov.mb.ca/trade/globaltrade/agrifood/commodity/forage_seed.html

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/english/crops/field/forages.html

Prince Edward Island Agriculture, Fisheries and Aquaculture
http://www.gov.pe.ca/agriculture/forages

Newfoundland and Labrador Natural Resources and Agri-foods
http://www.nr.gov.nl.ca/nr/agrifoods/crops/forage.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/Forage-Crop-Production-Guide
http://www.agriculture.gov.sk.ca/Forages-Annual
http://www.agriculture.gov.sk.ca/Forages-Native
http://www.agriculture.gov.sk.ca/Forages-Perennial

Beef Cattle Research Council
http://www.beefresearch.ca/research/forage-grasslands.cfm

Canadian Forage & Grassland Association
http://www.canadianfga.ca/resources/technical-information/

Forage Beef
http://www.foragebeef.ca

Alberta Forage Industry Network
http://www.albertaforages.ca

Manitoba Forage and Grassland Association
http://mfga.net

Ontario Forage Council
http://www.ontarioforagecouncil.com

Saskatchewan Forage Council
http://www.saskforage.ca

7.1.9 Industrial Hemp

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/industrial-hemp/?id=1174595656066

Health Canada
http://www.hc-sc.gc.ca/hc-ps/substancontrol/hemp-chanvre/index-eng.php
http://www.hc-sc.gc.ca/hc-ps/substancontrol/hemp-chanvre/about-apropos/faq/index-eng.php

Canadian Hemp Trade Alliance
http://www.hemptrade.ca/grow_hemp.php

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex126

British Columbia Ministry of Agriculture
http://www.agf.gov.bc.ca/speccrop/publications/documents/hempinfo.pdf

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/crops/production/hemp.html

Manitoba Trade and Investment
http://www.gov.mb.ca/trade/globaltrade/agrifood/commodity/industrial_hemp.html

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/english/crops/facts/00-067.htm
http://www.omafra.gov.on.ca/english/crops/hort/hemp.html
http://www.omafra.gov.on.ca/CropOp/en/indus_misc/fibre/hemp.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/Default.aspx?DN=bee18d0a-c34d-4496-a706-f295f172fb6e

North American Industrial Hemp Council
http://www.naihc.org/hemp-information

7.1.10 Mustard Seed

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/mustard-seed/?id=1175116081724

Canadian Grain Commission
https://www.grainscanada.gc.ca/mustard-moutarde/mmm-mmm-eng.htm

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex12947

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/mustard

Saskatchewan Mustard Development Commission
http://www.saskmustard.ca/grower/growing/index.html

Viterra
https://www.viterra.com/documents/48315/312453/MustardFactSheet.pdf/41c86458-bf56-483f-990b-ad562e6196ac

United States Department of Agriculture
http://plants.usda.gov/plantguide/pdf/pg_brrar.pdf

7.1.11 Sunflower Seed

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/sunflower-seed/?id=1174599801414

Canadian Grain Commission
https://www.grainscanada.gc.ca/sunflower-tournesol/stm-mst-eng.htm

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/english/crops/pub811/7other.htm#sunflower

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/trade/globaltrade/agrifood/commodity/sunflowers.html

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/sunflower

National Sunflower Association of Canada
http://www.canadasunflower.com/production/sunflower-production-guide/

American National Sunflower Association
http://www.sunflowernsa.com/growers/

7.1.12. Various Herbs and Spices

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/spices/?id=1174598719031

http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/pulses-and-special-crops-canadian-industry/canada-s-medicinal-plant-industry/?id=1174597176899

Alberta Agriculture and Rural Development
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/crop4220

British Columbia Ministry of Agriculture
http://www.al.gov.bc.ca/speccrop/index.htm

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/crops/production/index.html

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/CropOp/en/index.html
http://www.omafra.gov.on.ca/english/crops/facts/09-043w.htm
http://www.omafra.gov.on.ca/english/crops/facts/12-033.htm

Saskatchewan Ministry of Agriculture

http://www.agriculture.gov.sk.ca/herbs-spices

CHSNC/SHSA Specialty Ag Association
http://shsaspecialtyag.ca/directory-tools-practices.html

7.2. General Crop Planning Guides

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca/crops
http://www.agriculture.gov.sk.ca/crop-planning-guides

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/crops/guides-and-publications/

British Columbia Ministry of Agriculture
http://www.agf.gov.bc.ca/cropprot/prodguide.htm

Ontario Ministry of Agriculture, Food & Rural Affairs
http://www.omafra.gov.on.ca/english/crops/vegpubs/vegpubs.htm

Best Management Practices for Pollination in Ontario
http://www.pollinator.ca/bestpractices/crop_index.html

7.3 Markets and Exporting

Agriculture and Agri-Food Canada
http://www.agr.gc.ca/eng/industry-markets-and-trade/exporting-importing-and-buying-assistance/?id=1410072148276

Government of Canada - Canada Business Network
http://www.canadabusiness.ca/eng/page/2686//

Agriculture and Agri-Food Canada - AGPAL
http://www.agpal.ca

7.4 Industry Associations and Contacts

Canadian Hemp Trade Alliance
http://www.hemptrade.ca/grow_hemp.php

Canadian Forage & Grassland Association
http://www.canadianfga.ca

Canadian Seed Growers Association - Pedigreed Seed
http://www.seedlocator.net

Canadian Special Crops Association
http://www.specialcrops.mb.ca

Canary Seed Development Commission of Saskatchewan
http://www.canaryseed.ca

Ginseng Ontario
http://www.ginsengontario.com

National Sunflower Association of Canada
http://www.canadasunflower.com

Ontario Lavender Association
http://ontariolavenderassociation.com

Canada Organic Trade Association
http://www.ota.com/canada-ota

CHSNC/SHSA Specialty Ag Association
http://shsaspecialtyag.ca

Saskatchewan Mustard Development Commission
http://www.saskmustard.ca

Forage Beef
http://www.foragebeef.ca

Alberta Forage Industry Network
http://www.albertaforages.ca

Manitoba Forage and Grassland Association
http://mfga.net

Ontario Forage Council
http://www.ontarioforagecouncil.com

Saskatchewan Forage Council
http://www.saskforage.ca

7.5 Federal Government

Agriculture and Agri-Food Canada - Crops
http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/?id=1361290484419

Agriculture and Agri-Food Canada - Exporting/Importing
http://www.agr.gc.ca/eng/industry-markets-and-trade/exporting-importing-and-buying-assistance/?id=1410072148276

Canada Business Network
http://www.canadabusiness.ca/eng/page/2686//

Canadian Food Inspection Agency - Plants
http://www.inspection.gc.ca/plants/eng/1299162629094/1299162708850

Canadian Food Inspection Agency - Organic Certification
http://www.inspection.gc.ca/food/organic-products/certification-and-verification/certification-bodies/eng/1327860541218/1327860730201

Environment Canada
http://www.ec.gc.ca

Environment Canada. CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora
http://www.ec.gc.ca/cites/default.asp?lang=En&n=1BC82E16-1

Health Canada - Industrial Hemp
http://www.hc-sc.gc.ca/hc-ps/substancontrol/hemp-chanvre/index-eng.php

Health Canada - Minor Use Program
http://www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/minor-limite/index-eng.php

7.6 Provincial Government Contacts

British Columbia Ministry of Agriculture
http://www.gov.bc.ca/agri/

Alberta Agriculture, Food and Rural Development
http://www.agric.gov.ab.ca

Saskatchewan Ministry of Agriculture
http://www.agriculture.gov.sk.ca

Manitoba Agriculture, Food and Rural Development
http://www.gov.mb.ca/agriculture/index.html

Ontario Ministry of Agriculture, Food and Rural Affairs
http://www.omafra.gov.on.ca

Quebec Ministry of Agriculture
http://www.mapaq.gouv.qc.ca/fr/Pages/Accueil.aspx
New Brunswick Agriculture, Aquaculture and Fisheries
http://www2.gnb.ca/content/gnb/en/departments/10.html

Nova Scotia Department of Agriculture
http://novascotia.ca/agri/

Prince Edward Island Department of Agriculture and Forestry
http://www.gov.pe.ca/agriculture

Newfoundland and Labrador Department of Natural Resources
http://www.nr.gov.nl.ca/nr/agrifoods/index.html

Yukon Department of Energy, Mines and Resources - Agriculture
http://www.emr.gov.yk.ca/agriculture/index.html

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Agriculture and Agri-Food Canada. Canadian Medicinal Crops. http://www.agr.gc.ca/eng/science-and-innovation/science-publications-and-resources/resources/canadian-medicinal-crops/?id=1300813974177

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Agriculture and Agri-Food Canada. The Economic Potential of Medicinal Plant Production with Particular Reference to Quebec. http://www.agr.gc.ca/eng/science-and-innovation/science-publications-and-resources/resources/canadian-medicinal-crops/the-business-of-medicinal-plants/the-economic-potential-of-medicinal-plant-production-with-particular-reference-to-quebec/?id=1302131510h

Agriculture and Agri-Food Canada. Food Allergen Labelling. http://www.agr.gc.ca/eng/industry-markets-and-trade/food-regulations/food-policy-and-regulatory-issues/current-food-policy-and-regulatory-issues/food-allergen-labelling/?id=1170955456381

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Agriculture and Agri-Food Canada. Pesticide Risk Reduction Program. Pest Management Centre. Weed Database. http://www.weedinfo.ca

ATTRA Sustainable Agriculture. Alternative Agronomic Crops. https://attra.ncat.org/attra-pub/summaries/summary.php?pub=84

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http://www.farmdiversity.com.au

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http://www.bakingassoccanada.com/content/govt.aspx

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http://www.al.gov.bc.ca/speccrop/publications/evaluate_spcrop.htm

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http://www.inspection.gc.ca/plants/plant-breeders-rights/overview/guide/eng/1409074255127/1409074255924

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http://www.inspection.gc.ca/plants/plant-protection/imports/eng/1324569244509/1324569331710

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Canadian Food Inspection Agency. Plants.
http://www.inspection.gc.ca/plants/eng/1299162629094/1299162708850

Canadian Food Inspection Agency. Plants With Novel Traits.
http://www.inspection.gc.ca/plants/plants-with-novel-traits/eng/1300137887237/1300137939635

Canadian Food Inspection Agency. Organic Certification.
http://www.inspection.gc.ca/food/organic-products/certification-and-verification/certification-bodies/eng/1327860541218/1327860730201

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Canadian Grain Commission. Protection of farm-stored grains, oilseeds and pulses from insects, mites and moulds.
http://www.grainscanada.gc.ca/storage-entrepose/aafc-aac/pfsg-pgef-eng.pdf

Canadian Seed Growers Association.
http://seedgrowers.ca

Canadian Seed Growers Association. Resources For Farmers.
http://seedgrowers.ca/farmers

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http://www.croplife.ca/wp-content/uploads/2012/02/CLCCoexistenceBMPEN.pdf

Environment Canada. CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora.
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http://www.hc-sc.gc.ca/fn-an/securit/allerg/fa-aa/co-mingling-melange-eng.php

Health Canada. Food allergies and Intolerances.
http://www.hc-sc.gc.ca/fn-an/securit/allerg/index-eng.php

Health Canada. Industrial Hemp.
http://www.hc-sc.gc.ca/hc-ps/substancontrol/hemp-chanvre/index-eng.php

Health Canada. Pest Management Regulatory Agency (PMRA). Growers and Commercial Users.
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Health Canada. Maximum Residue Limits For Pesticides.
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Health Canada. User Requested Minor Use. Pesticides and Pest Management.
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http://www.omafra.gov.on.ca/english/crops/facts/09-043w.htm

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http://www.organicriskmanagement.umn.edu

University of Minnesota. Organic Risk Management. Ch 14. Alternative Crops
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